Notice and Agenda of a Meeting of the Beaumont Basin Watermaster

Wednesday, June 2, 2021 at 10:00 a.m.

Watermaster Members:

City of Banning
City of Beaumont
Beaumont Cherry Valley Water District
South Mesa Water Company
Yucaipa Valley Water District

This meeting is available by calling (888) 475-4499 using Meeting ID 997-7493-5433#

Online Meeting Participation Link: https://zoom.us/j/99774935433
Meeting Passcode: 526438

There will be no public physical location for attending this meeting in person.

I. **Call to Order**

II. **Roll Call**

City of Banning: Arturo Vela (Alternate: Luis Cardenas)

City of Beaumont: Jeff Hart (Alternate: Robert Vestal)

Beaumont Cherry Valley Water District: Daniel Jaggers (Alternate: Mark Swanson)

South Mesa Water Company: George Jorritsma (Alternate: Dave Armstrong)

Yucaipa Valley Water District: Joseph Zoba (Alternate: Jennifer Ares)

III. **Pledge of Allegiance**

IV. **Public Comments** At this time, members of the public may address the Beaumont Basin Watermaster on matters within its jurisdiction; however, no action or discussion may take place on any item not on the agenda. To provide comments on specific agenda items, please complete a Request to Speak form and provide that form to the Secretary prior to the commencement of the meeting.

V. **Consent Calendar**

A. Meeting Minutes

1. Meeting Minutes for April 7, 2021 [Page 4 of 169]

VI. Reports

A. Report from Engineering Consultant - Hannibal Blandon, ALDA Engineering

B. Report from Hydrogeological Consultant - Thomas Harder, Thomas Harder & Co.

C. Report from Legal Counsel - Thierry Montoya/Keith McCullough, Alvarado Smith

VII. Discussion Items

A. Financial Status Report [Memorandum No. 21-21, Page 14 of 169]

Recommendation: Presentation Only - No Action Required.

B. Status Report on Water Level Monitoring throughout the Beaumont Basin through May 13, 2021 [Memorandum No. 21-22, Page 16 of 169]

Recommendation: Presentation - No recommendation.

C. Production and Allowable Extractions through April 2021 [Memorandum No. 21-23, Page 27 of 169]

Recommendation: No recommendation - For informational purposes only.

D. Discussion Regarding Task Order No. 25 with ALDA Inc. for On-Call Engineering Services [Memorandum No. 21-24, Page 28 of 169]

Recommendation: That the Watermaster Committee approves Task Order No. 25 for a sum not to exceed $25,000.

E. Development of a Policy to Account for Storage Losses in the Beaumont Basin – Initial Approach [Memorandum No. 21-25, Page 31 of 169]

Recommendation: That the Watermaster Committee authorize the expenditure of up to $10,000 under Task 25 On-Call Services, to cover the expenses associated with this task.

F. Update on Development of a Return Flow Accounting Methodology [Memorandum No. 21-26, Page 53 of 169]

Recommendation: That the Watermaster Committee receive the Draft Report and provide comments that will be addressed at the August 2021 regular meeting.

G. 2020 Consolidated Annual Report and Engineering Report - Presentation of Comments Received on Draft Report [Memorandum No. 21-27, Page 154 of 169]

Recommendation: That the Watermaster Committee Consider Approving the 2020 Annual Report after Comments Received on the Draft Report are Presented and Discussed.

VIII. Topics for Future Meetings

A. Development of a methodology and policy to account for groundwater storage losses in the basin resulting from the artificial recharge of water resources.

B. Development of a methodology and policy to account for recycled water recharge.

C. Discussion Regarding the Addition of Various Topics to Future Meetings.

IX. Comments from the Watermaster Committee Members

X. Announcements

A. The next regular meeting of the Beaumont Basin Watermaster is scheduled for Wednesday, August 4, 2021 at 10:00 a.m.

B. Future Meeting Dates:

i. Wednesday, October 6, 2021 at 10:00 a.m.

ii. Wednesday, December 1, 2021 at 10:00 a.m.

XI. Adjournment

DRAFT
Record of the Minutes of the
Beaumont Basin Committee Meeting of the
Beaumont Basin Watermaster
Regular Meeting
Wednesday, April 7, 2021

Meeting Location:

There was no public physical meeting location due to the coronavirus pandemic.
Meeting held via video teleconference pursuant to:
California Government Code Section 54950 et. seq. and
California Governor's Executive Orders N-29-20 and N-33-20

I. Call to Order

Chairman Arturo Vela called the meeting to order at 10:00 a.m.

II. Roll Call

City of Banning	*Arturo Vela*	*Present*
City of Beaumont	*Jeff Hart*	*Present*
Beaumont-Cherry Valley Water District	*Daniel Jaggers*	*Present*
South Mesa Water Company	*George Jorritsma*	*Present*
Yucaipa Valley Water District	*Joseph Zoba*	*Present*

Thierry Montoya was present representing legal counsel for the Beaumont Basin Watermaster (BBWM). Hannibal Blandon and Thomas Harder were present as engineers for the BBWM.

Members of the public who registered and / or attended:
Lance Eckhart, San Gorgonio Pass Water Agency
Mark Swanson, Beaumont-Cherry Valley Water District
Erica Gonzales, Beaumont-Cherry Valley Water District
Jennifer Ares, Yucaipa Valley Water District
Dave Armstrong, South Mesa Water Company
Lonni Granlund, Yucaipa Valley Water District
Logan Largent
Joyce McIntire
Allison Edmisten, Yucaipa Valley Water District
John Covington, Beaumont-Cherry Valley Water District / Morongo Band of Mission Indians
Kyle Warsinski, City of Beaumont
James Bean, Beaumont-Cherry Valley Water District
Michele Staples

III. Pledge of Allegiance

Chair Vela led the pledge.

IV. Public Comments:

None.

V. Consent Calendar

1. Meeting Minutes for October 7, 2020
2. Meeting Minutes for February 3, 2021
3. Meeting Minutes for February 18, 2021

It was moved by Member Zoba and seconded by Member Hart to approve the Meeting Minutes.

AYES:	Hart, Jaggers, Jorritsma, Vela, Zoba
NOES:	None.
ABSTAIN:	None.
ABSENT:	None.
STATUS:	Motion Approved

VI. Reports

A. Report from Engineering Consultant – Hannibal Blandon, ALDA Engineering

Mr. Blandon reported that the 2019 Annual Report was approved at the last meeting, and differences between the water transfer from BCVWD to the City of Banning has been addressed and the final report will be submitted to Mr. Zoba for uploading to the BBWM website by this Friday.

B. Report from Hydrogeological Consultant – Thomas Harder, Thomas Harder & Co.

Mr. Harder said he will be providing an update later in the meeting.

C. Report from Legal Counsel – Thierry Montoya, Alvarado Smith

Mr. Montoya advised of a conversation with Michele Staples related to the parcel gifted to the Beaumont-Cherry Valley Recreation and Parks District, and whether its well could be used to provide water for grading on the adjacent parcel. Generally speaking, entities can lease their water rights to another party, he said, and noted that he asked Ms. Staples to put the request in writing.

In response to Chair Vela, Mr. Montoya indicated this may not be something in which the Watermaster would need to be involved since it *is not a water transfer. Mr. Jaggers pointed out that an overlier leasing rights to a non-overlier / non-appropriator parcel may have ramifications.*

VII. Discussion Items

A. Certification of Groundwater Production and Imported Water Use during Calendar Year 2020

Recommendation: That the Watermaster Committee certify groundwater production, imported water spreading, and change in storage in the Beaumont Groundwater Basin during Calendar Year 2021.

Engineer Hannibal Blandon reminded the Committee that the Final Groundwater Production and Imported Water and Water Use for 2020 is required to be filed with the State by April 1. Because that is not possible, a letter has been written documenting the groundwater production of 18,600, 14 acre-feet of which is unmetered, and a total of 11,469 acre-feet (af) imported in 2020. Total water use in the Basin was 18,636 af and a negative change in storage of 5,577 af, he noted.

Member Jaggers confirmed that the report was uploaded to the State on April 1. A copy of the final annual report must be certified and submitted later in the year, Blandon advised.

It was moved by Member Jaggers and seconded by Member Jorritsma to certify groundwater production, imported water spreading, and change in storage in the Beaumont Groundwater Basin during Calendar Year 2021 and approved by the following vote:

AYES:	Hart, Jaggers, Jorritsma, Vela, Zoba
NOES:	None.
ABSTAIN:	None.
ABSENT:	None.
STATUS:	Motion Approved

B. Presentation of the 2020 Consolidated Annual Report and Engineering Report

Recommendation: That the Watermaster Committee consider approving the Draft Report depending on the nature of the comments.

Mr. Blandon reviewed the report. No resolutions were adopted in 2020, he noted. He described historical precipitation in the Basin with an *average of 13.97 inches per year between 1996 and 2020, compared to the hundred-year average of 17.04. Blandon compared annual production in 2020 to the 2016-2020 average for each appropriator, noting total production was 17.2 percent higher than the five-year average and was the highest on record.*

Blandon noted that overliers produced 138 af less than the average between 2016-2020 and there is a continued downward trend. The overliers have been producing on average 30.6 percent of the overlying right. None of the overliers are close to producing 100 percent of their right, and their 2020 production was the lowest on record, he said.

The City of Banning, BCVWD and SGPWA imported 11,469 af in 2020, for an overall running total in excess of 126,000 af since 2003, Blandon reported.

Recycled water recharge from the City of Beaumont Wastewater Treatment Plant shows a continued increase to an annual total of 4,305 af, Blandon explained. All discharge has been to Coopers Canyon.

In 2020, Blandon continued, there were no transfers of water between appropriators. Allocated conversion of underproduction to 2020 from 2015 was 4,614 af, he noted. Under Resolution 17-02, the conversion of Oak Valley Partners LP (OVP) overlying right to YVWD started in 2018, continued in 2019, but there are no conversions for 2020 at this point, Blandon said.

A total of 183.05 af have been transferred from OVP to YVWD, Blandon stated, and cited Section 3.4.2, the stipulated judgment, Resolution 17-02, CY 2020 meeting minutes and the Form 5 submitted on Nov. 19, 2019 by YVWD.

Blandon reviewed the 2020 production vs allowable extractions and noted that total production exceeded the amount of storage by 673 af. Member Zoba clarified that on a calendar year basis YVWD had not produced more than allowed. He suggested adding a row to the table to indicate storage account balances.

Blandon presented the 2020 storage balance and noted that overall, the storage decreased by 458 af. Chair Vela pointed out differing numbers for the City of Banning; Mr. Blandon indicated it is a rounding issue – probably about 1/10th acre-foot. Overall, water in storage accounts equals 40.5 percent of total potential storage, he said. In 2020, 4,606 af of unused overlying water rights were distributed among the agencies from 2015 according to the percentages provided in the judgment, Blandon reported.

Engineer Thomas Harder gave a presentation on the operating safe yield including flow patterns and changes in groundwater levels. He estimated that overall, the basin lost about 5,577 af of storage from 2019-2020, which is the largest drop in storage on a year over year basis. The effects of the dry period are being felt in the basin, he added. Member Jaggers pointed out that BCVWD pumping affects the groundwater levels.

Mr. Harder stated that this basin is by no means in overdraft. These are temporary changes in groundwater levels; the long-term trend is still relatively stable, he said, but the effects of drought are being seen. He explained the calculation of the 2020 estimated operating safe yield of 1,590 af which is the lowest seen in the last 10 years, primarily due to the relatively large negative change in storage.

Mr. Blandon reviewed the water quality evaluation, noting that no primary standards were exceeded. He recommended the Committee develop a policy to account for groundwater storage losses, new yield, and recycled water recharge, develop a protocol to increase accuracy and consistency of data reporting, and file the annual reports with the Court.

Member Zoba noted that the customers within the adjudicated area of the overlying water rights of OVP have now exceeded the 183 af as referenced in the report and has climbed to 215. He said he anticipates this will continue to climb, and asked how Blandon anticipates incorporating that data from 2020 into the report. Blandon noted he had not before heard this information, and said that based on Resolution 17-02, OVP has transferred 183.05 and that the issue of the Form 5 continues to be debated, he would have to say that it is 183.05. Zoba said he would provide written documentation for consideration.

Chair Vela asked that if the transfer had been exceeded, would the overage not come from another source of supply. Zoba said it is an issue of OVP not producing any water but is now being made up by appropriate use over those same parcels.

Jaggers said there have been submittals in the past from new tracts developing and transfer of those overlying rights, and suggested clarification of the actual production in the previously transferred areas more than was transferred, or whether there are new areas that are also in the overall consumption area. Zoba said the consumption is all within the parcels of the consolidated overlying water rights and consistent with Form 5.

In response to a question from Jaggers, Zoba assured the Committee that the Form 5 has been filed to document all of the overlying water rights, so it includes the area consistent with the Watermaster regulation for the transfer and use of overlying water rights. Chair Vela *reminded that the Watermaster received a couple of letters specifically that identified certain tract numbers and a certain amount of water that was going to be transferred (the 183.05). He noted the question of whether there are now additional tracts and asked if the consumption in excess of the 183.05 also includes recycled water. Zoba said it is both potable and recycled water. It is in addition to the original tracts received by the Watermaster, he noted, but superseded with the filing of the Form 5.*

Mr. Jaggers acknowledged and referenced the Form 5 transfer, stating he continues to reference Resolution 17-02 as the format. He recommended documentation to be provided to Mr. Blandon and said that if the water is being used, he is supportive of that as it converts over. Zoba said he would send his notes to Blandon, and Blandon advised he would coordinate with legal counsel as to how the data is to be presented in the report.

Mr. Jaggers acknowledged the concerns of YVWD and suggested the approval of the 2020 Consolidated Annual Report and Engineering Report be continued. He pointed out some potential terminology clarification. Chair Vela agreed and indicated need for fine-tuning the 2020 numbers. Jaggers proposed that the Committee show transfers with a bi-monthly report.

Mr. Blandon indicated he would delay submitting the final 2019 report until numbers had been finalized between BCVWD and the City of Banning. Chair Vela indicated he would respond.

Chair Vela continued the 2020 Consolidated Annual Report and Engineering Report to the meeting on June 2, 2021 at 10 a.m.

C. A Comparison of Production and Allowable Extractions through February 2021

Recommendation: No recommendation; informational only

Mr. Blandon shared the table of Production vs. Allowable Extractions through February 2021 and pointed out a total of 4,763 af of overlying rights transferred from 2016, the transfer of overlying rights of OVP to YVWD of 183 and imported 479 af totaling 5,425. Production was 46.2 percent of the 5,425 resulting in a positive storage impact, he said.

Blandon presented alternate ways to look at storage as an informational item, resulting in water in storage at 117,533 af. Production is not even touching the unused overlying production, he noted. Overall, extractions from the Beaumont Basin could continue for another seven years before the water in storage was exhausted, he noted.

Member Zoba pointed out that unused overlying water right transfers remain a big issue. It is not supplemental water as identified in the judgment; it was a creation of this group, he said, and that is problematic. Representing that there is a lot of water, inconsistent with the judgment, Zoba said, indicates a problem that needs to be tended to immediately. Member Jaggers pointed out that the judgment identifies that once the overlier rights are satisfied in a particular year, the remainder gets redistributed or is available to the appropriators as outlined. BCVWD's takeaway is that each year, the first water pumped is allocated back to the District, and everything else is a balance of storage vs. usage. During any particular year, if the overliers' needs are met, the rest of the water becomes available to the appropriators at the percentage outlined in Table C of the judgement, Jaggers stated, and said he is interested in resolving the issue. Blandon pointed out that there is no distinction as to which water is to be used first.

Jaggers requested a future agenda item on the issue.

D. Status Report on Water Level Monitoring throughout the Beaumont Basin through March 21, 2021

Recommendation: Presentation - No recommendation

Mr. Blandon presented a report and noted anomalies with the level monitoring at YVWD Well 34. He reported a jump of 0.7 feet in water level seven hours prior to a March 12 earthquake, and a jump of 0.8 feet seven hours after a March 18 earthquake. Member Zoba indicated that all equipment has been restored to the Well.

In response to Member Jaggers, Mr. Harder assured that data is examined and outliers are weeded out to make sense of the information in a larger context. Mr. Blandon indicated he would continue to dig into the data.

Mr. Blandon explained he is investigating fluctuating levels at Banning Well M9 and said there are no equipment needs at this time.

E. Financial Status Report

Recommendation: Presentation Only - No recommendation

Member Zoba reminded the Committee that this overview was requested at the last meeting. He detailed the process for invoicing and payments and noted that the bank account balance is slightly below

$200,000. He noted that information on operating expenses is included in the agenda packet. Administrative expenses such as legal are not billed out but there are enough funds to cover those expenses for the time being and for next year, Zoba reported.

Per consensus, this report will be added to the consent calendar monthly.

F. Independent Accountant's Financial Report of Agreed-Upon Procedures for the Beaumont Basin Watermaster

Recommendation: That the Watermaster Committee receive and file the Independent Accountant's Financial Report for the period ending June 30, 2020.

Member Zoba presented the report showing long term trends and reminded the Committee that the public had originally asked for this tally of the operation's expenditures. He noted that everything appears to be in order and said that auditor Rogers, Anderson, Malody and Scott will be coming in again this year.

It was moved by Member Jaggers and seconded by Member Jorritsma to receive and file the Independent Accountant's Financial Report for the period ending June 30, 2020. The motion was approved by the following vote:

AYES:	Hart, Jaggers, Jorritsma, Vela, Zoba
NOES:	None.
ABSTAIN:	None.
ABSENT:	None.
STATUS:	Motion Approved

G. Consideration of the Watermaster Budget for Fiscal Year 2021-2022

Recommendation: That the Watermaster approve the budget for Fiscal Year 2021-2022.

Member Zoba advised that invoices are sent out as each task order is approved and through each agency's financial departments Watermaster year-to-year spending trends can be followed. Administration is working to ensure that expenses do not cross over the fiscal year, he explained.

Zoba explained the proposed budget of $246,700.

It was moved by Chair Vela and seconded by Member Hart to approve the budget for Fiscal Year 2021-2022. The motion was approved by the following vote:

AYES:	Hart, Jaggers, Jorritsma, Vela, Zoba
NOES:	None.
ABSTAIN:	None.
ABSENT:	None.
STATUS:	Motion Approved

H. Discussion Regarding Proposed Revisions to Section 2.2 of the Rules and Regulations

Member Jaggers advised that the proposal to bolster Section 2.2 was prompted by receipt of a request from an overlying party for a special Committee meeting over the Christmas holidays. In trying to resolve the request, Jaggers determined that the process was not clearly defined.

The proposal is for a process on how to approach getting an item on the agenda while assuring there is enough time for preparation of the agenda packet without burden of a last-minute request, Jaggers explained.

Member Zoba indicated concern related to the Brown Act and suggested a companion document that would allow addition of agenda items freely based on the needs of the particular agency. Any one of the managers should have the ability to add items to the agenda, he noted.

Member Jaggers assured that the proposal is merely to clarify a process. Legal Counsel Montoya acknowledged the potential Brown Act issue and said he favors Member Zoba's approach.

Chair Vela said it would be helpful to have the process defined a little more in Section 2.2. Zoba suggested working together to define one document for the Board to consider. Member Hart advocated for inclusion of timing for submittals to be agendized.

VIII. Topics for Future Meetings

a. Development of a methodology and policy to account for groundwater storage losses in the basin resulting from the artificial recharge of water resources.

b. Development of a methodology and policy to account for recycled water recharge.

c. Discussion of changes in storage accounts vs. production.

IX. Comments from the Watermaster Committee Members

None.

X. Announcements

a. The next regular meeting of the Beaumont Basin Watermaster is scheduled for Wednesday, June 2, 2021 at 10:00 a.m.

b. Future Meeting Dates:

   i. Wednesday, August 4, 2021 at 10:00 a.m.
   ii. Wednesday, October 6, 2021 at 10:00 a.m.
   iii. Wednesday, December 1, 2021 at 10:00 a.m.

XI. Adjournment

Chairman Vela adjourned the meeting at 11:54 p.m.

Attest:

DRAFT UNTIL APPROVED

____
Daniel Jaggers, Secretary
Beaumont Basin Watermaster

BEAUMONT BASIN WATERMASTER
MEMORANDUM NO. 21-21

Date: June 2, 2021

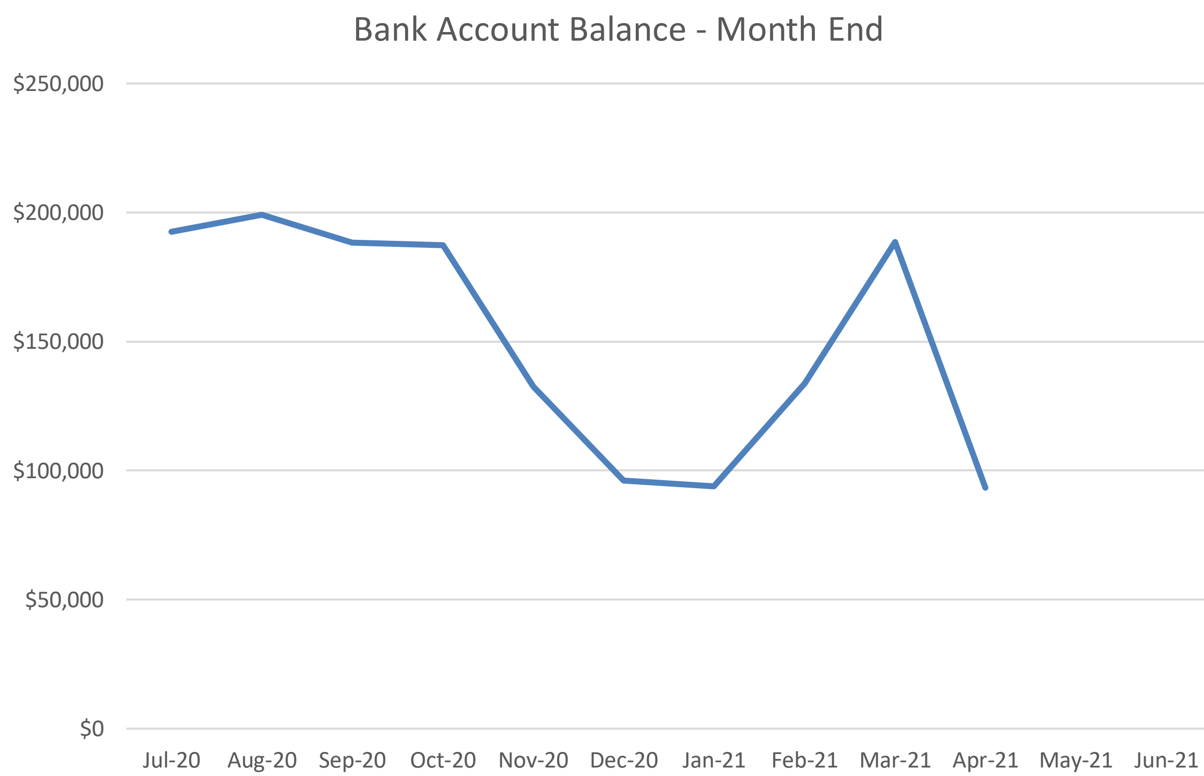
From: Joseph Zoba, Treasurer

Subject: Financial Status Report

Recommendation: Presentation Only - No Action Required

The following information has been compiled to provide an update on the financial status of the Beaumont Basin Watermaster.

Account Balance - The bank account balance will increase with the receipt of payments from the Watermaster Committee and decrease with the payment of routine expenses incurred by the Watermaster.



Budget Monitoring - Revenue for the Beaumont Basin Watermaster is received when one of the following events occur: (1) the Watermaster Committee approves a task order; (2) the Watermaster Committee approves a special project; (3) when a budget is adopted with a recommendation to replenish the anticipated administrative expenses for the year; or (4) when the administrative funds have been depleted and additional funds are required.

Based on the current status of the budget, the anticipated budget line item overage for Legal Expenses will be funded from Reserve Funds.

OPERATING EXPENSES:	Approved Budget Fiscal Year 2021	Year-To-Date Expenses	Percentage of Approved Budget
Bank Fees & Interest	$50.00	-$26.86	-53.7%
Miscellaneous & Meeting Expenses	$250.00	$0.00	0.0%
Acquisition/Computation & Annual Report	$100,000.00	$87,972.50	88.0%
Annual Audit	$1,300.00	$1,360.00	104.6%
Engineering Services	$50,000.00	$48,193.75	96.4%
Monitoring & Data Acquisition	$50,000.00	$48,006.58	96.0%
Meter Installation	$10,000.00	$0.00	0.0%
Legal Expenses	$25,000.00	$31,960.15	127.8%
Reserve Funding	$10,000.00	$0.00	0.0%
Special Project - Engineering	$0.00	$0.00	0.0%
Special Project - Litigation	$0.00	$0.00	0.0%
Total Operating Expense	**$246,600.00**	**$217,466.12**	**88.2%**

Summary of Consultant Task Orders - The following Task Orders are open with our consultants.

Task Order	Description	Contract Amount	Payments to Date	Percent Billed to Date
8	On-Call Services	$20,000	$18,062.50	90%
17	Return Flow Analysis	$98,280	$67,431.25	69%
20	2020 Support Services	$95,970	$83,442.50	87%
21	2020 Water Level Monitoring	$21,520	$18,000.00	84%
22	Water Quality Monitoring	$43,750	$41,953.75	96%
23	2020 Annual Report	$95,970	$62,497.50	65%
24	2021 Water Level Monitoring	$21,520	$7,500.00	35%

BEAUMONT BASIN WATERMASTER
MEMORANDUM NO. 21-22

Date: June 2, 2021

From: Hannibal Blandon, ALDA Inc.

Subject: Status Report on Water Level Monitoring throughout the Beaumont Basin through May 13, 2021

Recommendation: Presentation - No recommendation.

At the present time, there are 15 monitoring wells collecting water level information on an hourly basis at various locations throughout the basin. In addition, there are two monitoring probes collecting barometric pressures at opposite ends of the Beaumont Basin. The location of active monitoring wells is depicted in the attached Figure No. 1.

Water levels at selected locations are depicted in Figures 2 through 7 and are described as follows:

- ✓ Figure No. 2 – Water levels at YVWD Well No. 34 and Oak Valley Well No. 5 are considered representative of basin conditions in the Northwest portion of the basin. Through the summer of 2019 water levels at these two wells have been fairly steady; however, over the two years a significant declined has been observed. A 11-foot decline has been recorded at YVWD 34 over this period. The decline at Oak Valley 5 has been steeper with a drop 24 feet in the last year despite of the fact that this well has not been pumped since the last fall. This monitoring well is in the process of being destroyed as part of a residential development in the area.

- ✓ Figure No. 3 – Two of the Noble Creek observation wells are presented in this figure representing the shallow and deep aquifers. From the summer of 2016 through the spring of 2018, the water level in the shallow aquifer monitoring well increased over 90 feet to an elevation of 2,422 ft. Water level continued to increase, although at a lower rate, over the ensuing 18 months reaching a peak elevation of 2,431 ft in the fall of 2019. Since it has declined 21 feet to the current elevation of 2,410 ft. In the deeper aquifer, the increase in water level was steady from the summer of 2016 through the spring of 2020 reaching a peak elevation of 2,302 ft.; a decline of ten feet has been recorded since to the current elevation of 2,292 ft.

- ✓ Figure No. 4 – Southern Portion of the Basin. Water level at the Summit Cemetery well is highly influenced by a nearby pumping well that is used to irrigate the cemetery grounds. The water level at this well continues to fluctuate over a 20-foot band. Conversely, the water level at the Sun Lakes well has fluctuated minimally over the same period and it is currently at the same level as when monitoring began in the summer of 2015.

- ✓ Figure No. 5 illustrates water levels at three wells owned by the City of Banning in the Southeast portion of the basin. While water level at the Old Well No. 15 (Chevron Well) has been fairly flat over the last four years, a somewhat significant and steady decline, close to 33 feet, has been recorded at Banning M-8 between the summer of 2015 and the spring of 2021 to its current elevation of 2,047 ft. Water level at Banning M-9 has fluctuated in a 17-foot range, between 2,130 ft and 2,147 ft. since monitoring began in the summer of 2015. Recently, water levels at this well have been inconsistent; however, fluctuations may be related to the recording probe despite of the fact that a new probe was recently installed.

- ✓ Figure No. 6 illustrate recorded water level at BCVWD No. 2 and BCVWD No. 25. Water levels at these two wells follow seasonal pumping patterns peaking in the spring to begin a gradual decline into the fall to later recover again. This was observed during the 2016-21 period. Of particular importance is the above average decline recorded during the summer of 2020 when static levels dropped close to 27 ft. The decline in level at Well No. 2 is related to increase pumping from nearby Well No. 3.

- ✓ Figure No. 7 depicts the recorded water level at the two newest observation wells, BCVWD No. 29 and Tukwet Canyon Well "B". BCVWD No. 29 is a pumping well that is now more actively used to meet peak summer demands. A decline in water level of nine feet has been recorded at this well since monitoring began in the spring of 2019. Tukwet B is a dedicated monitoring well in the southern portion of the basin with minimal fluctuations in levels since the probe was installed in the spring of 2019.

New Monitoring Wells

No additional monitoring wells were added during this reporting period.

New Equipment Installation

- None

Troubleshooting Issues

The following malfunctioning issues were encountered during our May 13, 2021 field visit:

- ✓ YVWD 34 – Barometric pressure from the probe could not be downloaded. We are in communications with Solinst to determine the nature of the problem since we are using a new type of probe.

- ✓ Banning M-9 – Water level information could not be downloaded from the probe. The problem here may also be related to the new equipment from Solinst that we are currently using.

New Monitoring Sites

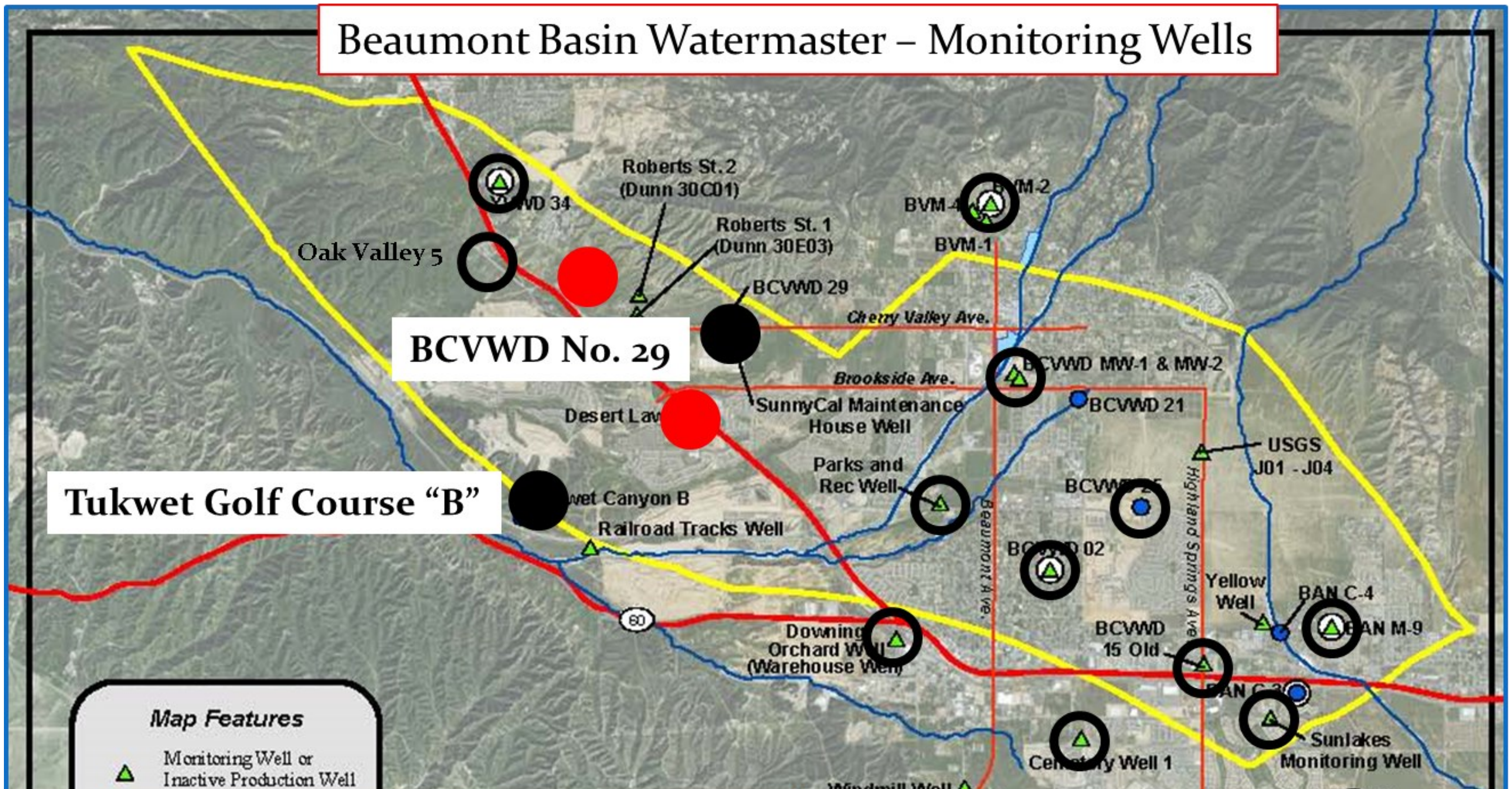
During the month of March, we had the opportunity to evaluate three wells owned and operated by the South Mesa Water Company as potential sites to select one additional well to monitor water levels in the Calimesa Basin, just north of the Beaumont Basin.

After visiting the sites and evaluating historical water levels, it was decided that there was no need to monitor water levels in the southern portion of the Calimesa Basin since the changes in static water levels are very small. Figure 8 illustrates historical water levels at Wells No. 1, No. 3, and No. 5 since 2011. The following observations are made;

- ✓ The water level over the last 10 years at Wells No. 1 and No. 3 has changed minimally. These wells are observation wells with no pump equipment installed.
- ✓ The water level at Well No. 5, a pumping well, fluctuates between 300 and 350 ft below ground as a result of seasonal pumping. Over the 10-year period, there is no trend as levels are relatively flat.

Due to the current pandemic, all communications with owners of potential well sites have stalled. We will restart communications in the future as the country gradually goes back to normal. The following sites are being considered:

- ✓ Catholic Dioceses of San Bernardino-Riverside counties, near Rancho Calimesa Mobile Home Park has three abandoned wells. Two of these wells cannot be used at this time because the probe could not be lowered; however, the third site has great potential. This well is approximately 400 ft deep and the water level is at approximately 160 feet below ground.
- ✓ Sharondale Well No. 1 – This well is operated by Clearwater Operations. We initiated contact with this company to install a water level probe at this well, but progress has not been made.
- ✓ At Plantation by the Lake, another potential monitoring well site, communications with owner have not be reestablished.



Wells with Working Monitoring Probes	
Bonita Vista No. 2	BCVWD Old 15 (Banning)
Noble Creek Ponds 4 Deep	Summit Cemetery No. 1
Noble Creek Ponds 4 Shallow	Sun Lakes Golf Course
Noble Creek Park	Banning M-8
BCVWD No. 2	Banning M-9
BCVWD No. 25	YVWD No. 34
BCVWD No. 29	Tukwet Golf Course "B"
Oak Valley Partners No. 5	ICON Warehouse

Potential Monitoring Wells	
Desert Lawn	Sharondale Mesa Owners A.
Rancho Calimesa Mobile HP	

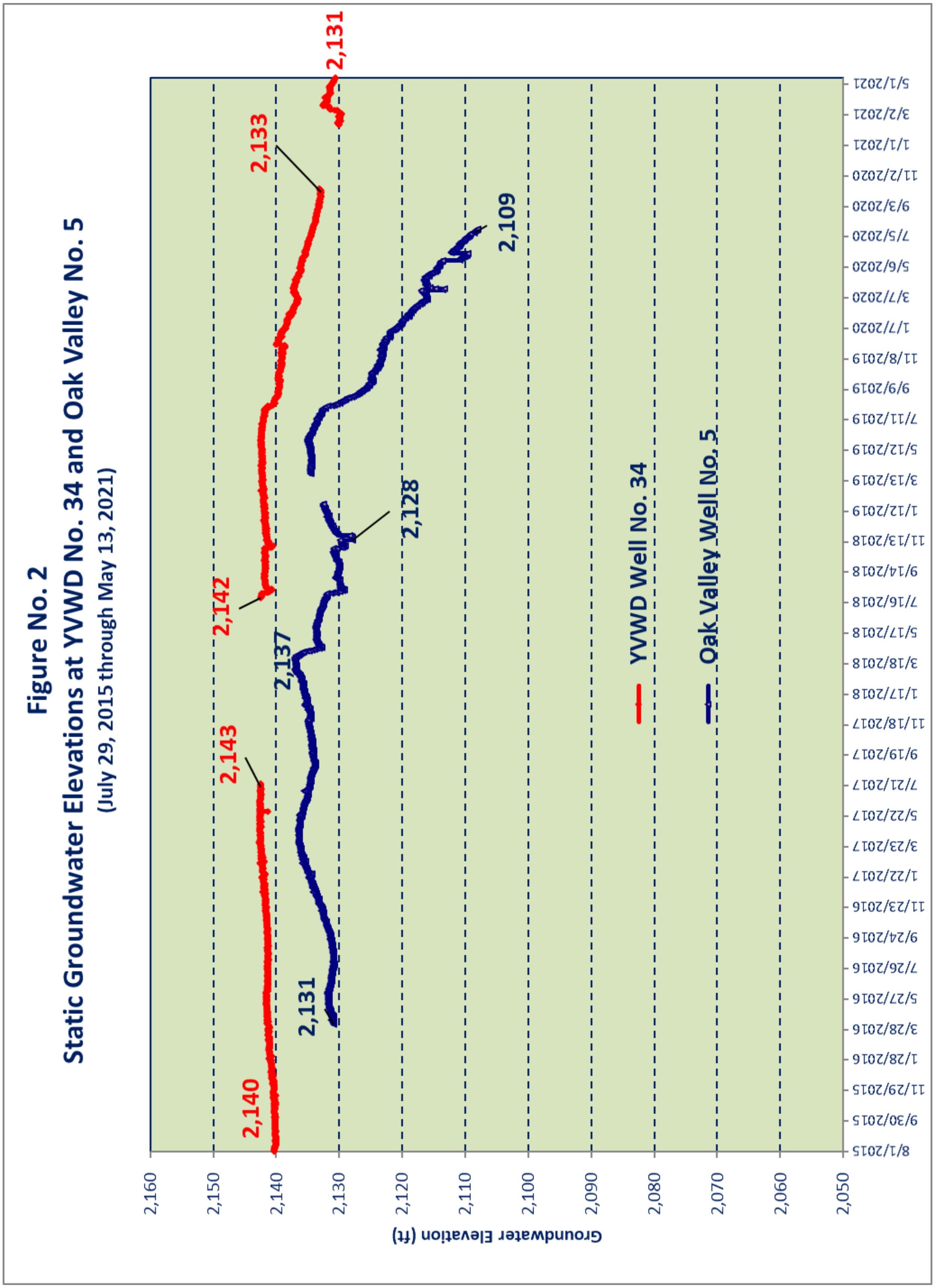


Figure No. 2
Static Groundwater Elevations at YVWD No. 34 and Oak Valley No. 5
(July 29, 2015 through May 13, 2021)
Groundwater Elevation (ft)
2,160
2,150
2,140
2,130
2,120
2,110
2,100
2,090
2,080
2,070
2,060
2,050
8/1/2015
9/30/2015
11/29/2015
1/28/2016
3/28/2016
5/27/2016
7/26/2016
9/24/2016
11/23/2016
1/22/2017
3/23/2017
5/22/2017
7/21/2017
9/19/2017
11/18/2017
1/17/2018
3/18/2018
5/17/2018
7/16/2018
9/14/2018
11/13/2018
1/12/2019
3/13/2019
5/12/2019
7/11/2019
9/9/2019
11/8/2019
1/7/2020
3/7/2020
5/6/2020
7/5/2020
9/3/2020
11/2/2020
1/1/2021
3/2/2021
5/1/2021
2,140
2,143
2,142
2,133
2,131
2,131
2,137
2,128
2,109
YVWD Well No. 34
Oak Valley Well No. 5

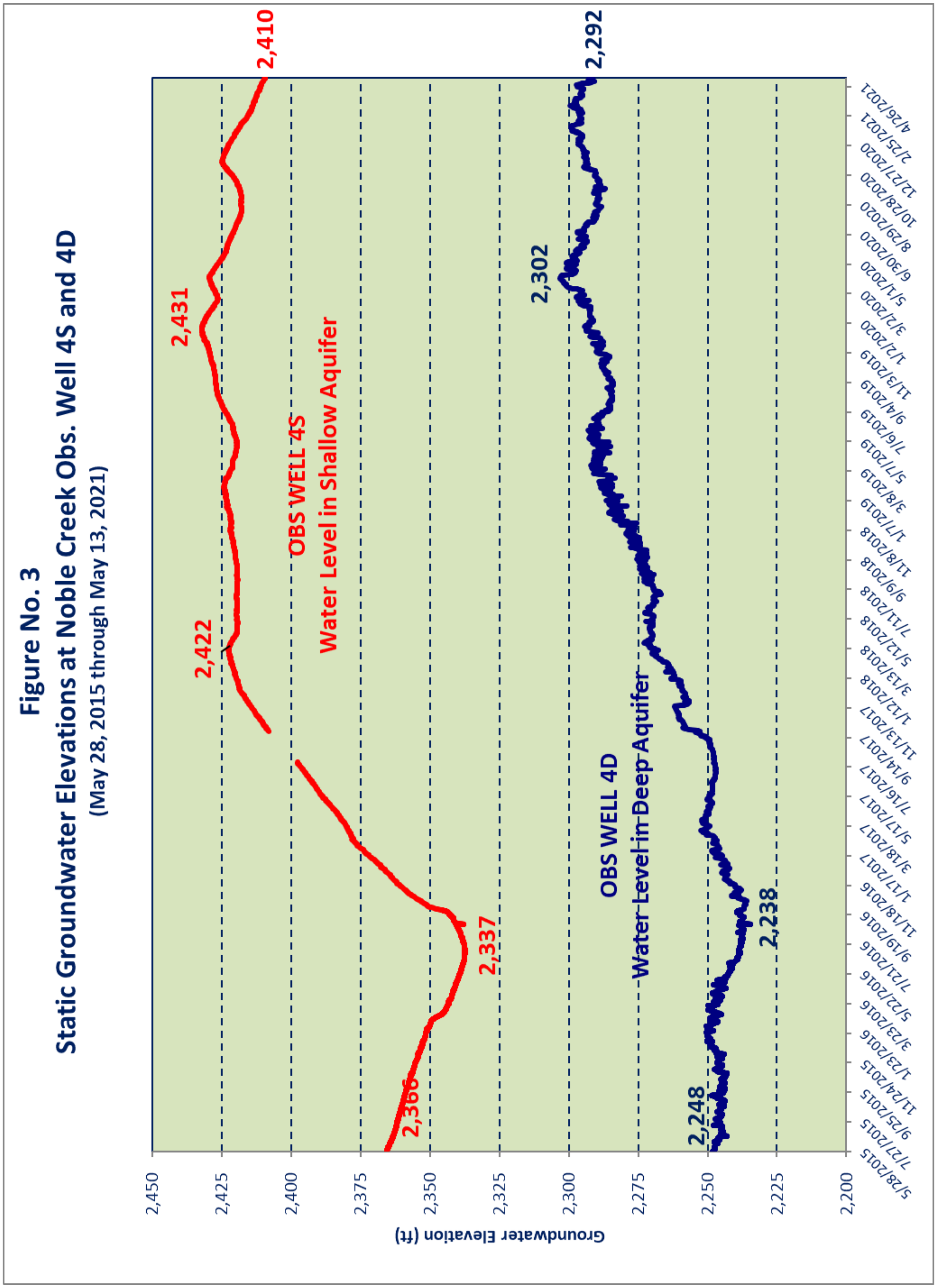


Figure No. 3
Static Groundwater Elevations at Noble Creek Obs. Well 4S and 4D
(May 28, 2015 through May 13, 2021)
Groundwater Elevation (ft)
2,450
2,425
2,400
2,375
2,350
2,325
2,300
2,275
2,250
2,225
2,200
5/28/2015
7/27/2015
9/25/2015
11/24/2015
1/23/2016
3/23/2016
5/22/2016
7/21/2016
9/19/2016
11/18/2016
1/17/2017
3/18/2017
5/17/2017
7/16/2017
9/14/2017
11/13/2017
1/12/2018
3/13/2018
5/12/2018
7/11/2018
9/9/2018
11/8/2018
1/7/2019
3/8/2019
5/7/2019
7/6/2019
9/4/2019
11/3/2019
1/2/2020
3/2/2020
5/1/2020
6/30/2020
8/29/2020
10/28/2020
12/27/2020
2/25/2021
4/26/2021
2,410
2,431
2,422
OBS WELL 4S
Water Level in Shallow Aquifer
2,366
2,337
2,292
2,302
OBS WELL 4D
Water Level in Deep Aquifer
2,248
2,238

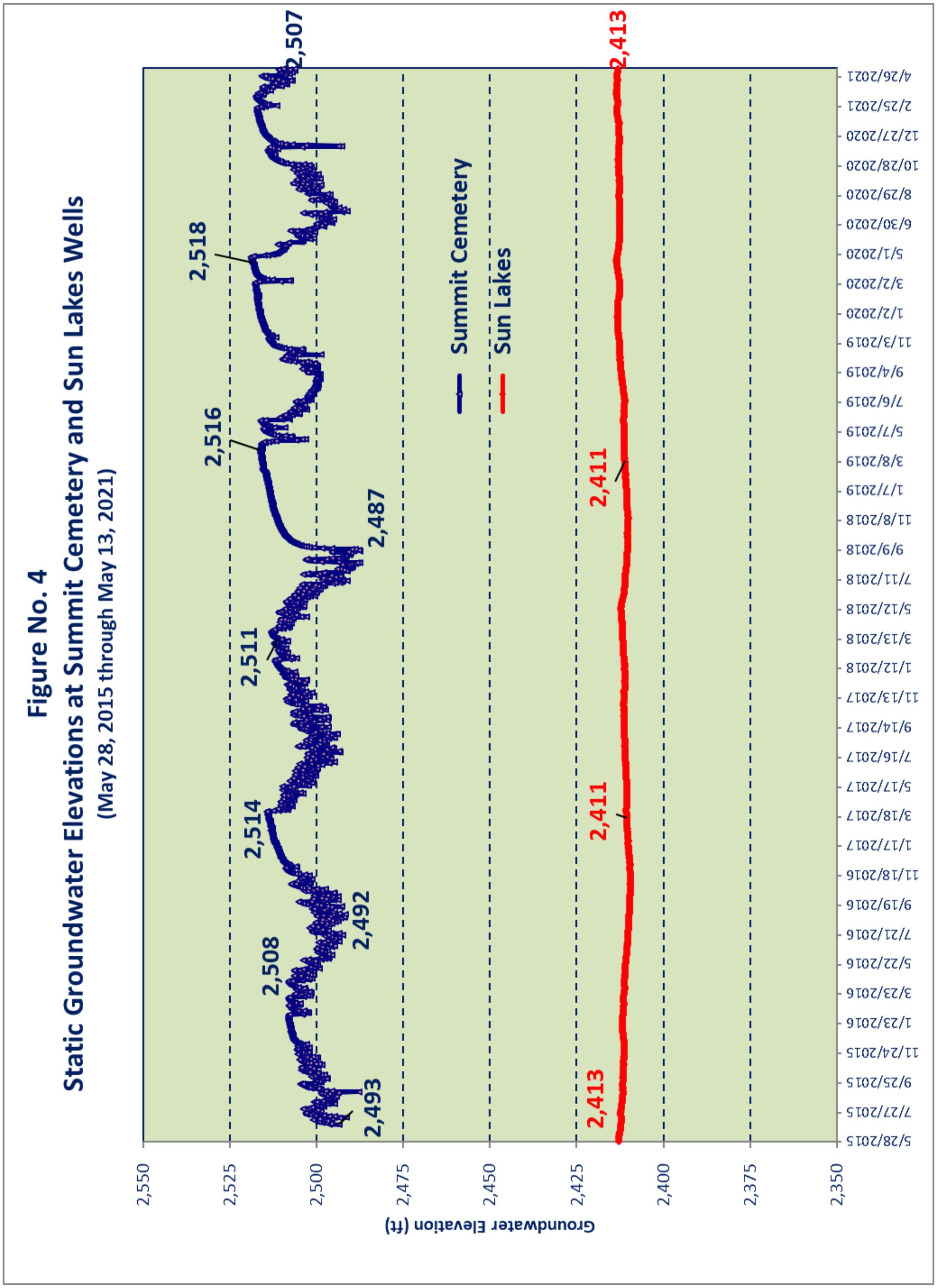


Figure No. 4
Static Groundwater Elevations at Summit Cemetery and Sun Lakes Wells
(May 28, 2015 through May 13, 2021)
Groundwater Elevation (ft)
2,550
2,525
2,500
2,475
2,450
2,425
2,400
2,375
2,350
5/28/2015
7/27/2015
9/25/2015
11/24/2015
1/23/2016
3/23/2016
5/22/2016
7/21/2016
9/19/2016
11/18/2016
1/17/2017
3/18/2017
5/17/2017
7/16/2017
9/14/2017
11/13/2017
1/12/2018
3/13/2018
5/12/2018
7/11/2018
9/9/2018
11/8/2018
1/7/2019
3/8/2019
5/7/2019
7/6/2019
9/4/2019
11/3/2019
1/2/2020
3/2/2020
5/1/2020
6/30/2020
8/29/2020
10/28/2020
12/27/2020
2/25/2021
4/26/2021
Summit Cemetery
Sun Lakes
2,493
2,508
2,492
2,514
2,511
2,487
2,516
2,518
2,507
2,413
2,411
2,411
2,413

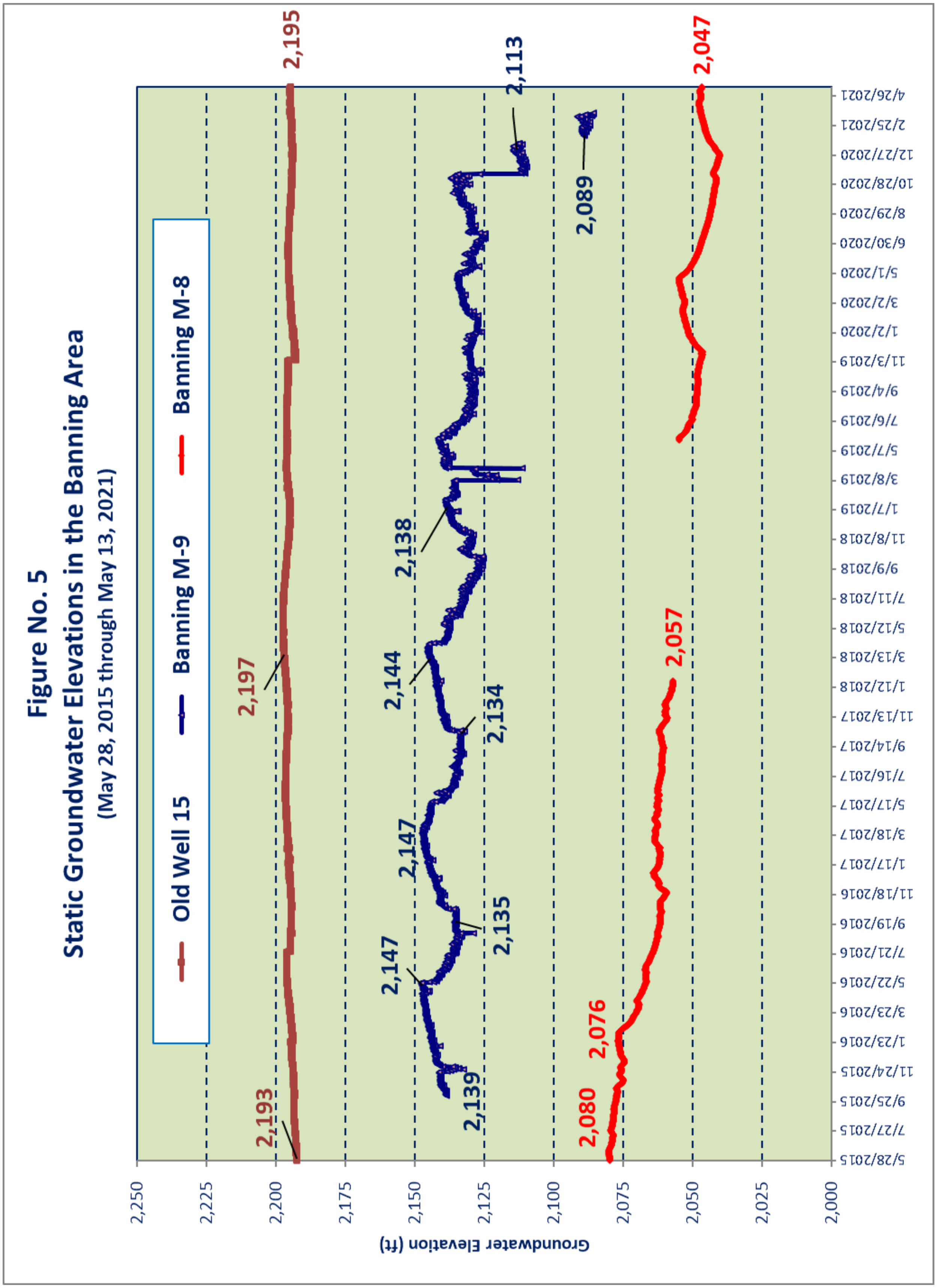


Figure No. 5
Static Groundwater Elevations in the Banning Area
(May 28, 2015 through May 13, 2021)
Old Well 15
Banning M-9
Banning M-8
Groundwater Elevation (ft)
2,250
2,225
2,200
2,175
2,150
2,125
2,100
2,075
2,050
2,025
2,000
5/28/2015
7/27/2015
9/25/2015
11/24/2015
1/23/2016
3/23/2016
5/22/2016
7/21/2016
9/19/2016
11/18/2016
1/17/2017
3/18/2017
5/17/2017
7/16/2017
9/14/2017
11/13/2017
1/12/2018
3/13/2018
5/12/2018
7/11/2018
9/9/2018
11/8/2018
1/7/2019
3/8/2019
5/7/2019
7/6/2019
9/4/2019
11/3/2019
1/2/2020
3/2/2020
5/1/2020
6/30/2020
8/29/2020
10/28/2020
12/27/2020
2/25/2021
4/26/2021
2,193
2,197
2,195
2,139
2,147
2,135
2,147
2,134
2,144
2,138
2,113
2,089
2,080
2,076
2,057
2,047

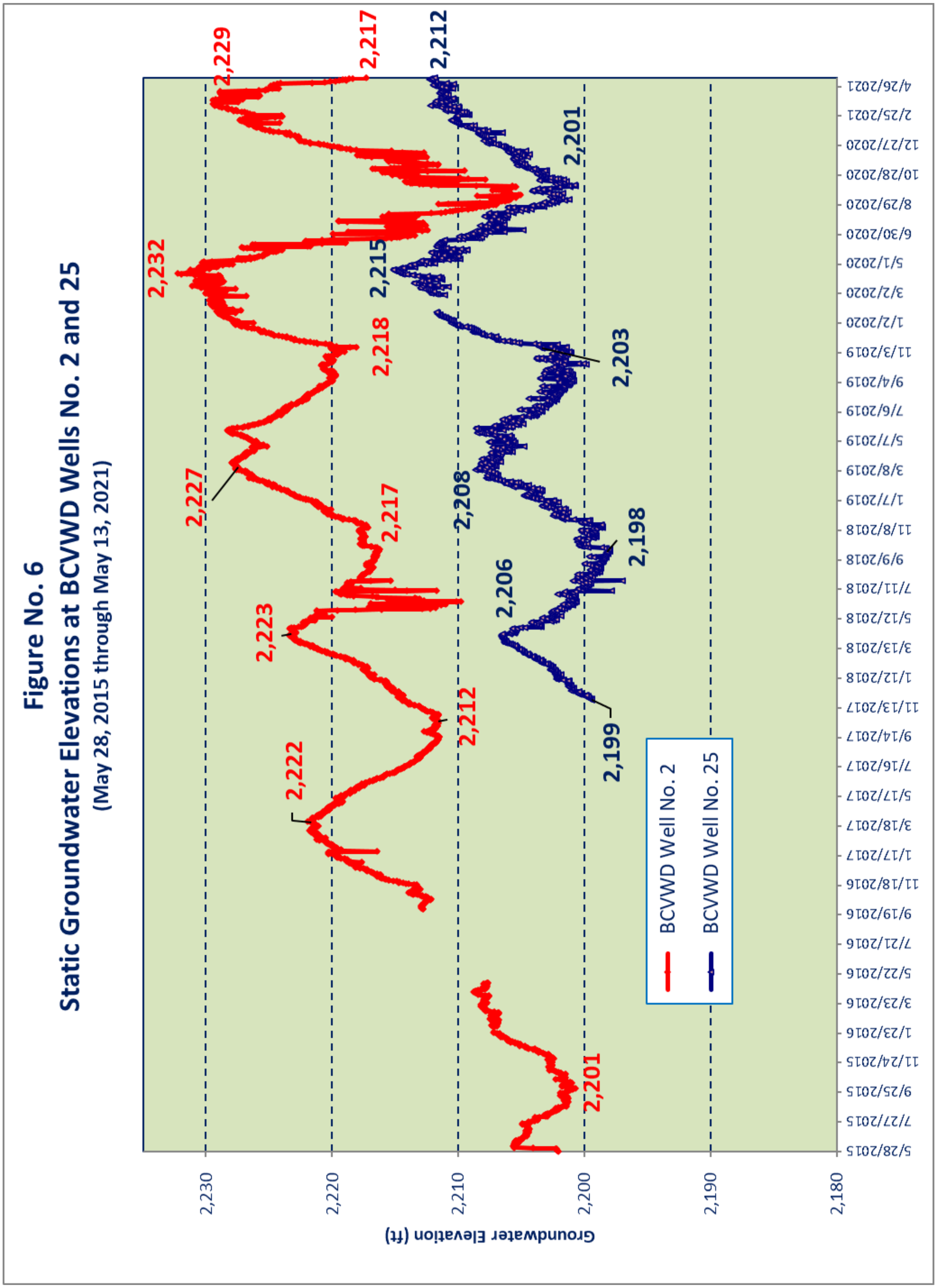


Figure No. 6
Static Groundwater Elevations at BCVWD Wells No. 2 and 25
(May 28, 2015 through May 13, 2021)

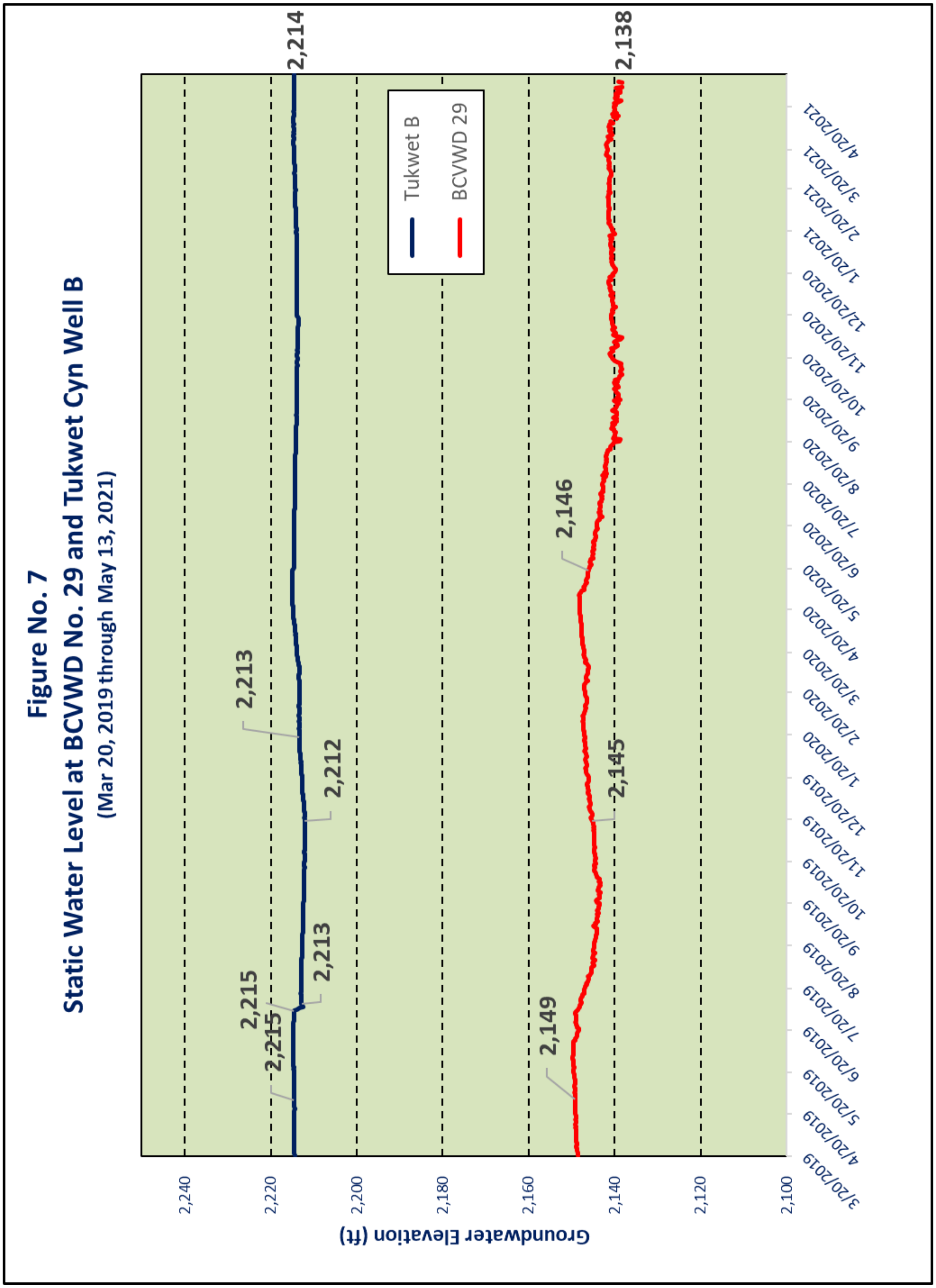


Figure No. 7
Static Water Level at BCVWD No. 29 and Tukwet Cyn Well B
(Mar 20, 2019 through May 13, 2021)
Groundwater Elevation (ft)
2,240
2,220
2,200
2,180
2,160
2,140
2,120
2,100
3/20/2019
4/20/2019
5/20/2019
6/20/2019
7/20/2019
8/20/2019
9/20/2019
10/20/2019
11/20/2019
12/20/2019
1/20/2020
2/20/2020
3/20/2020
4/20/2020
5/20/2020
6/20/2020
7/20/2020
8/20/2020
9/20/2020
10/20/2020
11/20/2020
12/20/2020
1/20/2021
2/20/2021
3/20/2021
4/20/2021
Tukwet B
BCVWD 29
2,215
2,215
2,213
2,212
2,213
2,214
2,149
2,145
2,146
2,138

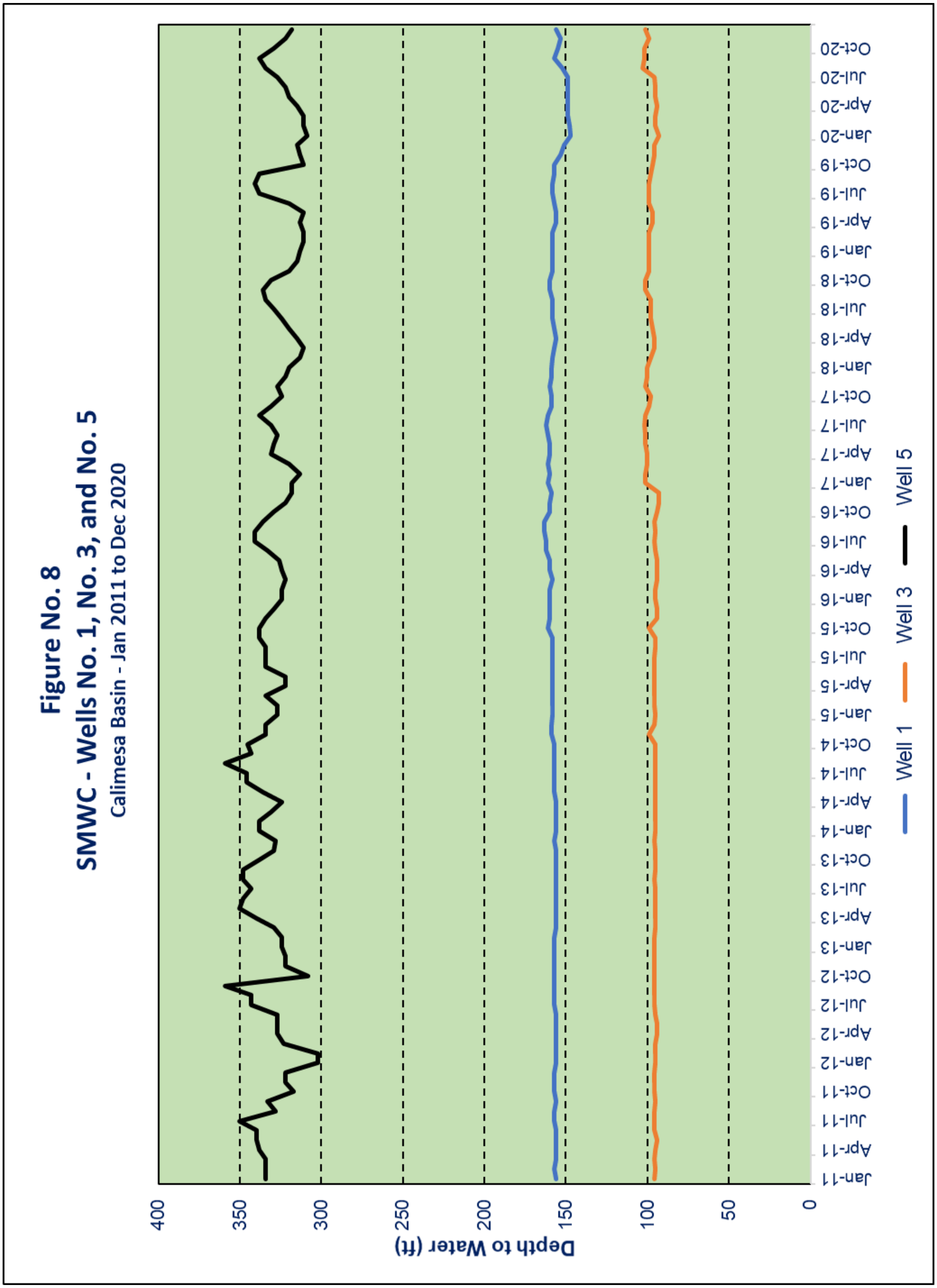


Figure No. 8
SMWC - Wells No. 1, No. 3, and No. 5
Calimesa Basin - Jan 2011 to Dec 2020
Depth to Water (ft)
400
350
300
250
200
150
100
50
0
Jan-11
Apr-11
Jul-11
Oct-11
Jan-12
Apr-12
Jul-12
Oct-12
Jan-13
Apr-13
Jul-13
Oct-13
Jan-14
Apr-14
Jul-14
Oct-14
Jan-15
Apr-15
Jul-15
Oct-15
Jan-16
Apr-16
Jul-16
Oct-16
Jan-17
Apr-17
Jul-17
Oct-17
Jan-18
Apr-18
Jul-18
Oct-18
Jan-19
Apr-19
Jul-19
Oct-19
Jan-20
Apr-20
Jul-20
Oct-20
Well 1
Well 3
Well 5

BEAUMONT BASIN WATERMASTER
MEMORANDUM NO. 21-23

Date: June 2nd, 2021

From: Hannibal Blandon, ALDA Inc.

Subject: Production and Allowable Extractions through April 2021

Recommendation: No recommendation - For informational purposes only

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This Technical Memorandum presents a comparison of production rights from the Basin against actual production by Appropriators. Production rights consist of the sum of: a) unused production by overlying users from 2016 as transferred to Appropriators for 2021; b) transfers of overlying water rights from OVP to YVWD to serve certain parcels within the Basin; and c) imported water spreading. Final numbers will be documented in the 2021 Annual Report.

Total production by Appropriators for the first four months in 2021 was 4,126 ac-ft; imported water spreading was reported at 1,671 ac-ft exclusively by BCVWD. Allowable production for the reporting period was estimated at 6,617 ac-ft. Transfers of Overlying Production from OVP to YVWD were 183.05 ac-ft. Overall, Appropriators have produced 62.4 percent of their allowable production during the first four months of the year. These numbers are anticipated to change as agencies continue to spread imported water. The table also lists the amount of water in storage for each agency as of the end of 2020, which is also available for production, if needed. All numbers are reported in ac-ft.

	City of Banning	Beaumont Cherry Valley W. D.	South Mesa Mutual W. C.	Yucaipa Valley W. D.	Total
Transfer of Overlying Rights from 2016	1,497	2,025	594	647	**4,763**
Transfer of Overlying Rights - OVP to YVWD	0	0	0	183	**183**
Imported Water	0	1,671	0	0	**1,671**
Total	**1,497**	**3,696**	**594**	**830**	**6,617**
Production	808	2,918	95	305	**4,126**
% of Total	54.0%	79.0%	16.0%	36.7%	**62.4%**
Storage Impact	689	778	499	525	**2,491**
Water in Storage as of Dec 2020	50,889	39,750	10,134	16,288	**117,533**

BEAUMONT BASIN WATERMASTER
MEMORANDUM NO. 21-24

Date:	June 2, 2021
From:	Hannibal Blandon, ALDA Inc.
Subject:	Discussion Regarding Task Order No. 25 with ALDA Inc. for On-Call Engineering Services
Recommendation:	That the Watermaster Committee approves Task Order No. 25 for a sum not to exceed $25,000.

At the October 7, 2015, regular meeting the Watermaster Committee approved Task Order No. 8 with ALDA Inc. for On-Call Engineering Services for a sum not to exceed $20,000.00.

The approval of this task order has allowed ALDA Inc. to continue providing technical support services to the Watermaster on an as-needed basis. Over the last 5+ years, the following on-call services have been provided:

	Task Description	Cost to Complete
✓	Morongo Band of Mission Indians Storage Project	$ 2,422.50
✓	SAWPA Data Request	$ 3,422.50
✓	Review Storage Losses	$ 2,430.00
✓	Review of Oak Glen Partners Water Rights	$ 3,082.50
✓	Provide Well Logs and Water Levels for YVWD	$ 465.00
✓	SGPWA Model Assistance	$ 6,240.00
	Total expenditures to date:	**$ 18,062.50**

Considering the following:

- ✓ Current budget under Task Order No. 8 has been over 90 percent spent,
- ✓ A significant amount of work will be necessary to evaluate groundwater storage losses and to develop a policy that can be implemented by the Watermaster; and
- ✓ Technical Support Services will continue to be requested from Watermaster's Engineer on an as-needed basis.

In light of this, it is recommended that Watermaster Committee approves Task Order No. 25 (See Attached) for a sum not to exceed $25,000.00.

ALDA Inc.
5928 Vineyard Avenue
Alta Loma, CA 91701
Tel: (909) 587-9916
Fax: (909) 498-0423

June 2nd, 2021

Joseph B. Zoba, General Manager
Yucaipa Valley Water District
12770 Second Street
Yucaipa, California 92399

Subject: **Beaumont Basin Watermaster – Task Order No. 25**
On-Call General Consulting Services

Dear Mr. Zoba:

Please find attached our proposed Task Order No. 25 under the Engineering Services contract with the Beaumont Basin Watermaster dated May 10, 2012 and amended in February 2017. This task order is for On-Call Technical Support Services and as such it does not have a defined scope of services at this time. Scope of services for individual assignments to be conducted under this task will be defined in the future as the need arises.

Should you have any questions on our proposed services or need further information, please contact us at 909-587-9916 during normal business hours.

Very truly yours

ALDA Inc.

F. Anibal Blandon, P.E.
Principal

Beaumont Basin Watermaster – Task Order No. 25
On-Call Technical Support Services Jun 2nd, 2021

TASK OBJECTIVE

This task is intended to be used to provide technical support services to the Beaumont Basin Watermaster on an as needed basis as requested and authorized by the Watermaster. Projects under this task order will be authorized individually and an upper limit may be established for individual projects.

COST ESTIMATE

An upper limit of $25,000.00 (Twenty-Five Thousand and 00/100) has been allocated for this task order. Technical support services will be billed on a Time and Materials basis according to the billing schedule below for calendar year 2021.

Billing Rates for ALDA Inc.

Billing rates for Task Order No. 25 for 2021:

Position	Hourly Rate
Project Manager	$180.00
Project Engineer	$150.00
Staff Engineer	$130.00

Billing Rates for Thomas Harder and Company

Billing rates for Task Order No. 25 for 2021:

Position	Hourly Rate
Principal Hydrogeologist	$180.00
Senior Hydrogeologist	$140.00
Project Hydrogeologist	$120.00
Staff Hydrogeologist	$ 95.00
Field Technician	$ 70.00
Graphics	$ 85.00
Clerical	$ 65.00
Expert Witness	$360.00

BEAUMONT BASIN WATERMASTER
MEMORANDUM NO. 21-25

Date: June 2, 2021

From: Hannibal Blandon, ALDA Inc.

Subject: Development of a Policy to Account for Storage Losses in the Beaumont Basin – Initial Approach

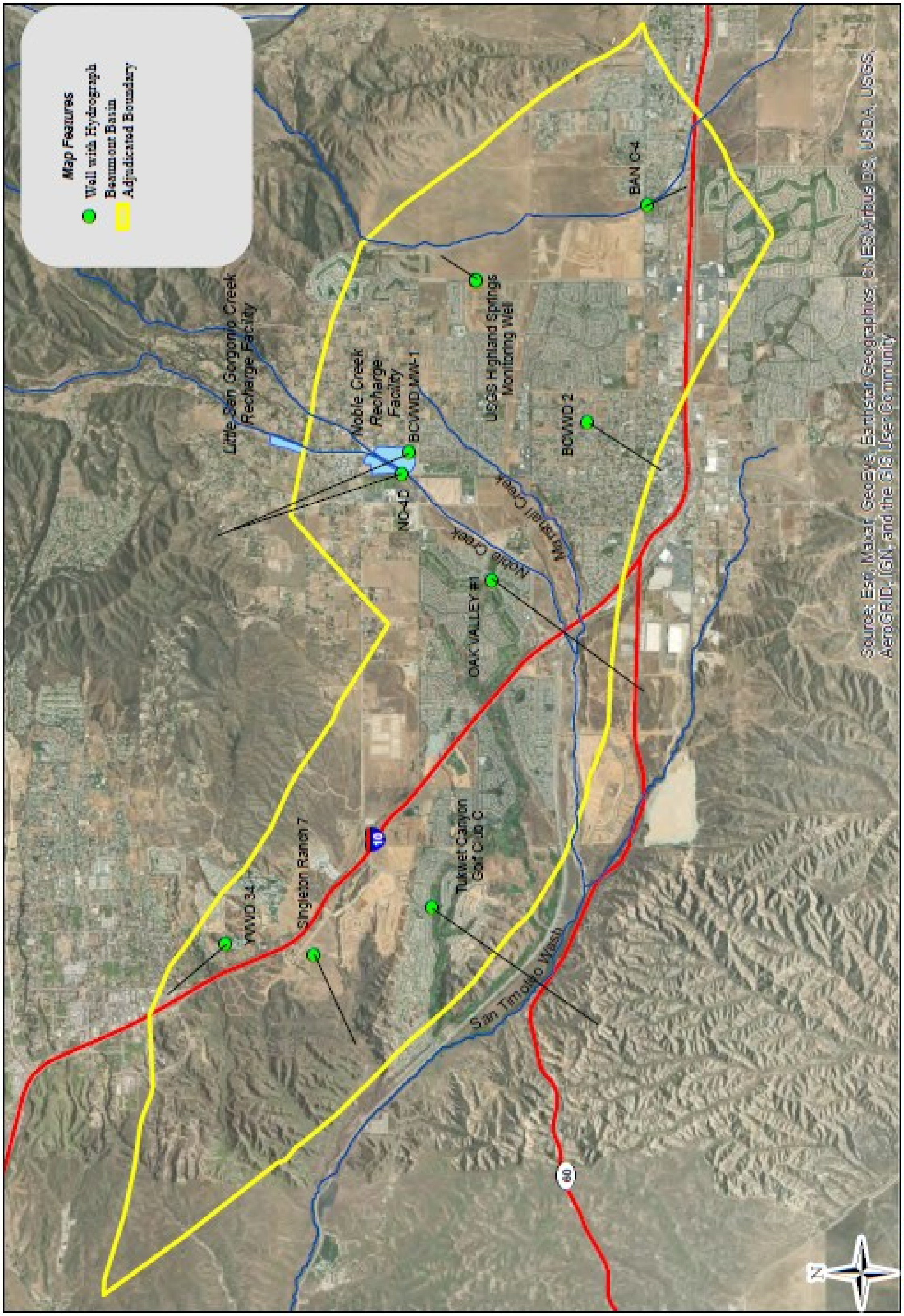
Recommendation: That the Watermaster Committee authorize the expenditure of up to $10,000 under Task 25 On-Call Services, to cover the expenses associated with this task.

In August 2017, under Task Order 14, the Watermaster Committee authorized ALDA Inc., in Association with Thomas Harder and Company, to estimate groundwater storage losses from selected locations in the basin and under various groundwater recharge and extraction conditions. This study, documented in September 2018, documented six scenarios under which various spreading and pumping patterns were evaluated using the calibrated groundwater model of the Beaumont Basin.

The results of the study (attached) indicate that a substantial amount of groundwater has been historically lost in the eastern portion of the basin towards the City of Banning. Storage losses could exceed 10 percent of the amount of water spread if additional pumping in the eastern portion of the groundwater basin is not increased.

From the inception of the Judgment, Appropriators have accumulated water in their storage accounts as a result of the initial allocation of storage surplus, transfers of unproduced water from Overlying users, and spreading of imported water. The accumulation of storage has not taken into consideration potential storage losses along the eastern basin boundary. The amount of total water in Appropriator storage accounts has increased from a few thousand ac-ft in 2004 to over 117,000 ac-ft at the end of calendar year 2020. While the increase in storage over the last 17 years should result in higher water levels, the water level at some of the wells is not reflective of this condition, as documented in the attached figure (Figure 3-10 of the 2020 Draft Annual Report).

Developing a technically defensible approach to accounting for storage losses is essential to ensure that the accounting of water in storage accounts is compatible with the physical conditions in the Beaumont Basin. We are requesting an initial budget of $10,000.00 under the On-Call services task (Task No. 25) to develop an initial operating framework from which ideas, alternatives, and/or conditions for accounting for basin storage losses are further evaluated.



Groundwater Level Trends at Key Wells

Figure 3-10

Beaumont Basin Storage Loss Analysis

September 6, 2018

Prepared for

Beaumont Basin Watermaster

Prepared by

Thomas Harder

Thomas Harder
Principal Hydrogeologist

CERTIFIED HYDROGEOLOGIST • THOMAS E. HARDER No: 588 • STATE OF CALIFORNIA

In Association with Alda Inc.

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4. 2026 Projected Groundwater Production

1.0 Introduction

This report presents the results of an evaluation of the impacts of various managed recharge and groundwater pumping scenarios on subsurface groundwater storage losses within the Beaumont Basin. As reported in the 2013 Reevaluation of the Beaumont Basin Safe Yield (TH&Co, 2015), groundwater underflow losses occur in various locations along the southern and western boundaries of the Beaumont Basin (see Figure 1). The amount of loss varies with time and is sensitive to pumping and recharge from both within and outside the Beaumont Basin. Further, the losses are affected by the location of managed recharge, the rates and location of groundwater pumping and the duration of underground storage.

1.1 Purpose and Scope

The purpose of this analysis is to address the following questions:

1. What impact has historical managed recharge in the Beaumont Basin had on underflow outflow from the basin?
2. How are underflow losses predicted to change in the future with additional managed recharge and/or pumping?

1.2 Analysis Methodology

Basin losses were analyzed using a calibrated numerical groundwater flow model of the Beaumont Basin adjudicated area. The calibrated model incorporates a comprehensive hydrogeological database of the basin, as summarized in TH&Co (2015). The types of data used to develop the model include geology, soils/lithology, groundwater levels, hydrogeology, surface water hydrology, and groundwater recharge and pumping. Information regarding predicted model stresses was provided by Beaumont-Cherry Valley Water District (BCVWD) and the City of Banning.

Basin losses were evaluated by comparing the model-generated subsurface outflow of a baseline condition with that of a recharge or production scenario. Both historical and predictive future scenarios were developed for analysis using the model. As the basin is bifurcated into two separate hydrologic areas, separate subsurface outflow comparisons were made for the area of the Beaumont Basin located west of the central Beaumont Plains Fault and the area east of the central Beaumont Plains Fault (see Figure 2).

2.0 Scenarios for Analysis Using the Groundwater Flow Model

Model analysis scenarios were described in TH&Co (2017) and modified for this analysis to address Beaumont Basin Watermaster (Watermaster) comments. Each scenario was developed to address a different storage issue. Issues that were considered for this analysis included:

- Location of managed recharge,
- Location of groundwater pumping, and
- Groundwater extraction amounts.

Each scenario is evaluated relative to a baseline basin operational condition in order to evaluate potential changes in basin losses under various recharge and pumping conditions. Assumptions for each scenario and baseline are summarized in Table 1 and described below.

Scenario 1 – Evaluation of Storage Losses from Historical Managed Recharge

Scenario 1 was developed to estimate the historical changes in storage losses that have occurred in the Beaumont Basin as a result of the managed recharge of supplemental water in Beaumont-Cherry Valley Water District's (BCVWD's) Noble Creek Recharge Facility. The baseline for the Scenario 1 historical analysis is the actual groundwater basin condition represented by the calibrated model. The baseline historical condition was compared to a simulation with no historical supplemental recharge in the BCVWD Noble Creek basins (2006 through 2016).

Scenario 2 – Projected Future Storage Losses from Planned Recharge by the San Gorgonio Pass Water Agency

The San Gorgonio Pass Water Agency (SGPWA) is planning a recharge facility immediately west of Beaumont Avenue and south of Brookside Avenue (see Figure 2). The purpose of Scenario 2 was to evaluate the potential increase in storage losses from predicted managed recharge within this facility.

Scenario 2 is a 10-year future simulation for the period from 2017 through 2026. The baseline condition for comparison with the scenario incorporates future Beaumont Basin groundwater production in accordance with agency Urban Water Management Plans (UWMPs) (see Tables 1 and 2). Managed recharge at the BCVWD Noble Creek facility for the baseline future projection is based on projections published in the BCVWD 2015 UWMP (see Table 2). There is no managed recharge at the SGPWA recharge facility in the baseline.

Managed recharge at the SGPWA recharge facility for Scenario 2 was simulated to be 1,333 acre-ft/yr between 2019 and 2024 and 2,500 acre-ft/yr in 2025 and 2026. It is noted that there is no projected recharge in the first two years of the 10-yr predictive simulation as it is assumed that the recharge facility will not be ready to receive water until 2019. The managed recharge at the SGPWA basins is the only difference between the Scenario 2 baseline and Scenario 2.

Scenario 3 – Increased Groundwater Production

Scenario 3 was developed to evaluate the impact of increased groundwater production in the eastern portion of the Beaumont Basin on subsurface losses associated with managed recharge in the same portion of the basin. This scenario includes two sub-scenarios:

Scenario 3A Groundwater production in the scenario is based on UWMP projections of future production from 2017 through 2026 and compared to a baseline condition where future groundwater production is fixed at 2016 pumping rates. Managed recharge is from the BCVWD Noble Creek facility only (no SGPWA recharge).

Scenario 3B Baseline and scenario projections of future groundwater production are the same as 3A. Managed recharge from both the BCVWD Noble Creek facility and SGPWA facility are included.

Future projections of groundwater production for Scenarios 3A and 3B are based on the most recent UWMPs for BCVWD and the City of Banning. BCVWD groundwater production was increased from 12,218 acre-ft/yr in 2016 to 16,576 acre-ft/yr in 2026. The increase in pumping was apportioned to BCVWD's wells as summarized in Table 3 and shown on Figures 3 and 4. City of Banning groundwater production within the Beaumont Basin adjudicated area was increased from 1,472 acre-ft/yr in 2016 to 2,155 acre-ft/yr in 2026. The increase in pumping was apportioned to the City's wells as summarized in Table 4 and shown on Figures 3 and 4.

Scenario 4 – Additional Groundwater Recharge – North-Central Basin

Scenario 4 was developed to potential future changes in basin losses from a hypothetical recharge project west of the Beaumont Plains Fault Zone. The hypothetical recharge project is located in the north-central part of the Beaumont Basin northeast of BCVWD's Well 29 (see Figure 2). The baseline condition for each of the three sub-scenarios that were developed is the same as for Scenario 2 and includes future pumping and recharge in accordance with each basin agency's UWMPs but no future SGPWA recharge. Assumptions for the sub-scenarios are summarized as follows:

Scenario 4A Managed recharge at a constant annual rate of 500 acre-ft/yr for the predictive period of 2017 through 2026.

Scenario 4B Managed recharge at a constant annual rate of 1,000 acre-ft/yr for a predictive period of 2017 through 2026.

Scenario 4C Managed recharge at a constant annual rate of 1,800 acre-ft/yr for a predictive period of 2017 through 2026.

For each recharge scenario, groundwater production in the western portion of the basin was kept at 2016 levels for the first four years of the predictive period. For the last six years, groundwater production at Yucaipa Valley Water District's Well 34 was increased by 450 acre-ft/year in order to accommodate the additional water demand for Oak Valley Partners' planned development.

Scenario 5 – Additional Groundwater Recharge – South-Central Basin

Scenario 5 analyzes impacts of a hypothetical recharge project in the south-central part of the Beaumont Basin in the vicinity of the area previously proposed for recharge by the Morongo Band of Mission Indians (see Figure 2). The baseline condition for this scenario is the same for Scenario 4. For this scenario, 500 acre-ft/year was added to the hypothetical recharge area for the 10 year predictive period from 2017 through 2026.

Scenario 6 – In-Lieu Pumping of BCVWD Well 29

Scenario 6 was developed to estimate the potential effects on basin losses from delivering water from an outside source to the western portion of the Beaumont Basin in-lieu of pumping BCVWD's Well 29. The baseline condition for this scenario is the same for Scenarios 4 and 5. For this scenario, groundwater production from BCVWD's Well 29 is not included in the future projection from 2017 to 2026. It is noted that there is no assumed reduction in BCVWD Noble Creek recharge in Scenario 6.

3.0 Findings and Conclusions

Scenario 1 – Evaluation of Storage Losses from Historical Managed Recharge

Comparison of basin underflow losses from the historical baseline condition (calibrated model) with the underflow losses in a hypothetical basin scenario with no managed recharge at the BCVWD Noble Creek facility shows that managed recharge at this facility has resulted in increased underflow losses out of the basin. The estimated additional losses with managed recharge is approximately 14,100 acre-ft over the 11-yr period between 2006 and 2016 (i.e. approximately 1,280 acre-ft/yr averaged over the period) (see Table 5). The majority of the losses (approximately 13,800 acre-ft) occur in the eastern portion of the basin. The balance of additional loss (approximately 260 acre-ft) occurs in the western portion of the basin.

Scenario 2 – Projected Future Storage Losses from Planned Recharge by the San Gorgonio Pass Water Agency

Comparison of potential future basin underflow losses from a baseline condition that does not include SGPWA recharge with a scenario that includes a cumulative of 13,000 acre-ft of SGPWA recharge over a 10 year period shows that the simulated additional recharge would result in a cumulative increase in basin losses of approximately 2,000 acre-ft over the 10-yr future predictive period (i.e. approximately 200 acre-ft/yr). The majority of the losses (approximately 1,900 acre-ft) occur in the eastern portion of the basin (see Table 5). The balance of additional loss (approximately 75 acre-ft) occurs in the western portion of the basin. It is noted that the predictive scenario with SGPWA recharge does not include any additional groundwater production above that predicted from UWMPs.

Scenario 3 – Increased Groundwater Production

Predictive model simulation results that include increased groundwater pumping in the area downgradient of the existing BCVWD and planned SGPWA basins, relative to simulations with lesser groundwater pumping, show that the additional groundwater pumping reduces the basin losses otherwise incurred. Comparison of basin underflow losses from a baseline condition with groundwater production fixed at 2016 rates with a scenario that simulates higher rates of groundwater production consistent with predictions in UWMPs shows that the higher rates of production result in lower basin losses. An increase in groundwater production on the order of 5,000 acre-ft/yr in the area directly downgradient of the area of managed recharge results in a 10-yr decrease in basin losses of approximately 13,100 acre-ft (1,310 acre-ft/yr) in the eastern portion of the basin and approximately 14,100 acre-ft in the basin as a whole. This reduction in loss occurs with or without managed recharge at the planned SGPWA basins.

Scenario 4 – Additional Groundwater Recharge – North-Central Basin

Increasing managed recharge in the north-central basin, as simulated with a conceptual recharge basin immediately northeast of BCVWD Well 29, will increase losses in the western portion of the basin proportionate to the amount of water recharged. Increasing recharge by 500 acre-ft/yr with a commensurate increase in groundwater pumping at YVWD Well 34 (Scenario 4A) results in a decrease in basin loss of 134 acre-ft on the west side of the basin (approximately 13 acre-ft/yr) and a decrease of 255 acre-ft basin-wide. Increasing recharge by 1,000 acre-ft/yr with a commensurate increase in groundwater pumping at YVWD Well 34 results in an increase in basin loss of 256 acre-ft on the west side of the basin and an increase of 165 acre-ft basin-wide. Increasing recharge by 1,800 acre-ft/yr increases basin losses by approximately 1,998 acre-ft over the 10 year period (200 acre-ft/yr) with an approximate 400 acre-ft reduction in losses on the east side of the basin (see Table 5). The analysis suggests that pumping YVWD Well 34 at the same rates as recharge helps reduce the losses. However, this well is not located in an area to fully take advantage of managed recharge in the north central portion of the basin west of the Beaumont Plains Faults, particularly at recharge rates greater than 500 acre-ft/yr.

Managed recharge in the western portion of the basin would be beneficial to address declining groundwater levels from historical pumping and may be necessary to ensure basin sustainability in this area when planned future developments are constructed. Future recharge in this area should include new production wells or increased production from existing wells located directly downgradient of the basin in order to fully take advantage of the water stored in the aquifer and minimize losses out of the basin.

Scenario 5 – Additional Groundwater Recharge – South-Central Basin

Increasing managed recharge in a conceptual recharge facility in the south-central portion of the basin is predicted to increase underflow losses out of the basin. Comparison of potential future basin underflow losses from a baseline condition that does not include the south-central basin recharge with a scenario that includes a cumulative of 5,000 acre-ft of imported recharge over a 10 year period (500 acre-ft/yr) shows that the simulated additional recharge would result in a cumulative increase in basin losses of approximately 540 acre-ft over the 10-yr future predictive period (i.e. approximately 54 acre-ft/yr). Based on model results, it appears that the basin losses from this recharge will occur to the northwest of the conceptual recharge location. It is noted that this scenario is predicted to result in increased basin losses in the eastern portion of the basin although it is not clear why.

Scenario 6 – In-Lieu Pumping of BCVWD Well 29

The model scenario where BCVWD Well 29 is turned off and the water demand otherwise met by the well is assumed to be delivered to the western portion of the Beaumont Basin from outside the area shows that basin losses are projected to increase by approximately 970 acre-ft over the 10-yr predictive period (97 acre-ft/yr). Basin losses are projected to be slightly less (9 acre-ft/yr) on the east side of the basin as a result of this scenario.

4.0 Recommendations

The groundwater basin loss analysis presented herein shows that losses associated with managed supplemental water recharge are highly sensitive to the volume of recharge and the location and pumping capacity of downgradient production wells to capture the water. Historically, groundwater pumping on the east side of the basin has not been adequate to capture water recharged in the BCVWD Noble Creek basins and the basin losses are significantly higher than they otherwise would have been without the recharge. Quantifying future losses associated with managed supplemental water recharge in both the east and west portions of the Beaumont Basin will require an understanding of the complex and sensitive relationship between recharge and pumping.

Quantifying and accounting for losses from supplemental water recharge is necessary to ensure that the water balance accounting of the Beaumont Basin is as accurate and representative as possible. The calibrated groundwater flow model of the Beaumont Basin is the best available tool for accounting for supplemental water recharge losses in the future. The numerical model accounts for both the spatial and temporal variability in pumping and recharge basin-wide as well as specific areas. The model can be used on an annual basis to quantify losses from the previous year by comparing the subsurface outflow from the updated calibrated model to the subsurface outflow in a model scenario with no managed recharge, similar to Scenario 1 of this analysis. Storage losses could either by accounted on a year-by-year basis or on a 5-yr rolling average.

5.0 References

Thomas Harder & Co., 2015. 2013 Reevaluation of the Beaumont Basin Safe Yield. April 3, 2015.

Thomas Harder & Co., 2017. Preliminary Recharge and Recovery Scenarios for Analysis to Estimate Storage Losses in the Beaumont Basin. Technical Memorandum dated August 29, 2017.

Beaumont Basin Watermaster / Alda, Inc.
Beaumont Basin Storage Loss Analysis

Table 1

Summary of Model Scenario Assumptions

		Baseline Assumptions			Scenario Assumptions		
Scenario	Time Period	BCVWD[1] Recharge	SGPWA[2] Recharge	Groundwater Pumping	BCVWD Recharge	SGPWA Recharge	Groundwater Pumping
1	2006 -2016	Reported	N/A[3]	Reported	No	N/A	Reported
2	2017 - 2026	UWMP	No	UWMP	UWMP[4]	Yes	UWMP
3A	2017 - 2026	UWMP	No	2016 Fixed	UWMP	No	UWMP
3B	2017 - 2026	UWMP	Yes	2016 Fixed	UWMP	Yes	UWMP
4A	2017 - 2026	UWMP	No	UWMP	UWMP	No	UWMP/YVWD 34[5]
4B	2017 - 2026	UWMP	No	UWMP	UWMP	No	UWMP/YVWD 34[5]
4C	2017 - 2026	UWMP	No	UWMP	UWMP	No	UWMP/YVWD 34[5]
5	2017 - 2026	UWMP	No	UWMP	UWMP	No	UWMP
6	2017 - 2026	UWMP	No	UWMP	UWMP	No	UWMP/No BCVWD Well 29

Notes:

[1] BCVWD = Beaumont-Cherry Valley Water District.
[2] SGPWA = San Gorgonio Pass Water Agency.
[3] N/A = Not Applicable.
[4] UWMP = Production and recharge based on published values in Urban Water Management Plans.
[5] See Table 2

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6-Sep-18

Table 2

Production and Recharge Input Summary

Scenario		Artificial Recharge Basin	Baseline Acre-ft/yr 2017 to 2024	Baseline Acre-ft/yr 2025 to 2026	Baseline Total 2017 to 2026	Scenario Acre-ft/yr 2017 to 2024	Scenario Acre-ft/yr 2025 to 2026	Scenario Total 2017 to 2026
1	Production	-	N/A	N/A		N/A	N/A	
	Recharge	Noble Creek	N/A	N/A	0	N/A	N/A	0
		SGPWA			0			0
2	Production	-	23,556	25,653	239,750	23,556	25,653	239,750
	Recharge	Noble Creek	11,313	12,907	116,318	11,313	12,907	116,318
		SGPWA	0	0	0	1,333	2,500	15,667
3A	Production	-	17,324		173,240	23,556	25,653	239,750
	Recharge	Noble Creek	11,313	12,907	116,318	11,313	12,907	116,318
		SGPWA	0	0	0	0	0	0
3B	Production	-	17,324		173,240	23,556	25,653	239,750
	Recharge	Noble Creek	11,313	12,907	116,318	11,313	12,907	116,318
		SGPWA	1,333	2,500	13,000	1,333	2,500	15,667
4A	Production	-	23,556	25,653	239,750	23,838	26,153	243,008
	Recharge	Noble Creek	11,313	12,907	116,318	11,313	12,907	116,318
		SGPWA	0	0	0	0	0	0
		North-Central	0	0	0	500	500	5,000
4B	Production	-	23,556	25,653	239,750	24,038	26,653	245,608
	Recharge	Noble Creek	11,313	12,907	116,318	11,313	12,907	116,318
		SGPWA	0	0	0	0	0	0
		North-Central	0	0	0	1,000	1,000	10,000
4C	Production	-	23,556	25,653	239,750	24,202	27,453	248,522
	Recharge	Noble Creek	11,313	12,907	116,318	11,313	12,907	116,318
		SGPWA	0	0	0	0	0	0
		North-Central	0	0	0	1,800	1,800	18,000
5	Production	-	23,556	25,653	239,750	23,556	25,653	239,750
	Recharge	Noble Creek	11,313	12,907	116,318	11,313	12,907	116,318
		SGPWA	0	0	0	0	0	0
		South-Central	0	0	0	500	500	5,000
6	Production	-	23,556	25,653	239,750	23,556	25,653	239,750
	Recharge	Noble Creek	11,313	12,907	116,318	11,313	12,907	116,318
		SGPWA	0	0	0	0	0	0

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Beaumont Basin Watermaster / Alda, Inc.
Beaumont Basin Storage Loss Analysis

Table 3

BCVWD Production Allocation - Storage Loss Analysis

Well	Total Production (acre-ft/yr)	Projected Production (acre-ft/yr)	
	2016	2017 - 2024	2025 - 2026
BCVWD 1	0	1,000	1,000
BCVWD 2	0	1,000	1,000
BCVWD 3	2,138	2,039	2,426
BCVWD 16	762	762	762
BCVWD 21	2,693	2,569	3,057
BCVWD 22	872	832	989
BCVWD 23	2,138	2,039	2,426
BCVWD 24	1,097	1,047	1,245
BCVWD 25	0	1,000	1,000
BCVWD 26	1,128	1,076	1,280
BCVWD 29	1,390	1,390	1,390
Total (Acre-ft/yr):	12,218	14,753	16,576

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Beaumont Basin Watermaster / Alda, Inc.
Beaumont Basin Storage Loss Analysis

Table 4

Banning Production Allocation - Storage Loss Analysis

Well	Total Production (acre-ft/yr)	Projected Production (acre-ft/yr)	
	2016	2017 - 2024	2025 - 2026
Banning C2	0	73	79
Banning C2A	94	79	105
Banning C3	318	541	582
Banning C4	602	720	776
Banning M2	0	0	0
Banning M3	458	569	613
Banning M9	0	0	0
Total (Acre-ft/yr):	1,472	1,983	2,155

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Storage Loss Scenarios

Table 5

Summary of Storage Loss Analysis Results

Scenario	Time Period	Total Supplemental Recharge	Total Pumping	Relative Basin Loss Baseline - Scenario: East	Relative Basin Loss Baseline - Scenario: West	Total Storage Loss
1	2006 - 2016	70,123	172,251	13,826	261	14,087
2	2017 - 2026	131,985	239,750	1,920	75	1,995
3A		116,318	239,750	-13,119	-961	-14,080
3B		131,985	239,750	-13,145	-1,015	-14,160
4A		121,318	243,008	-122	-134	-255
4B		126,318	245,608	-91	256	165
4C		134,318	248,522	-409	1,998	1,589
5		121,318	239,750	-37	538	501
6		116,318	239,750	-88	967	879

Note:

All values in acre-ft.
Positive values indicate a loss out of the basin relative to the base case.
Negative values indicate a gain.

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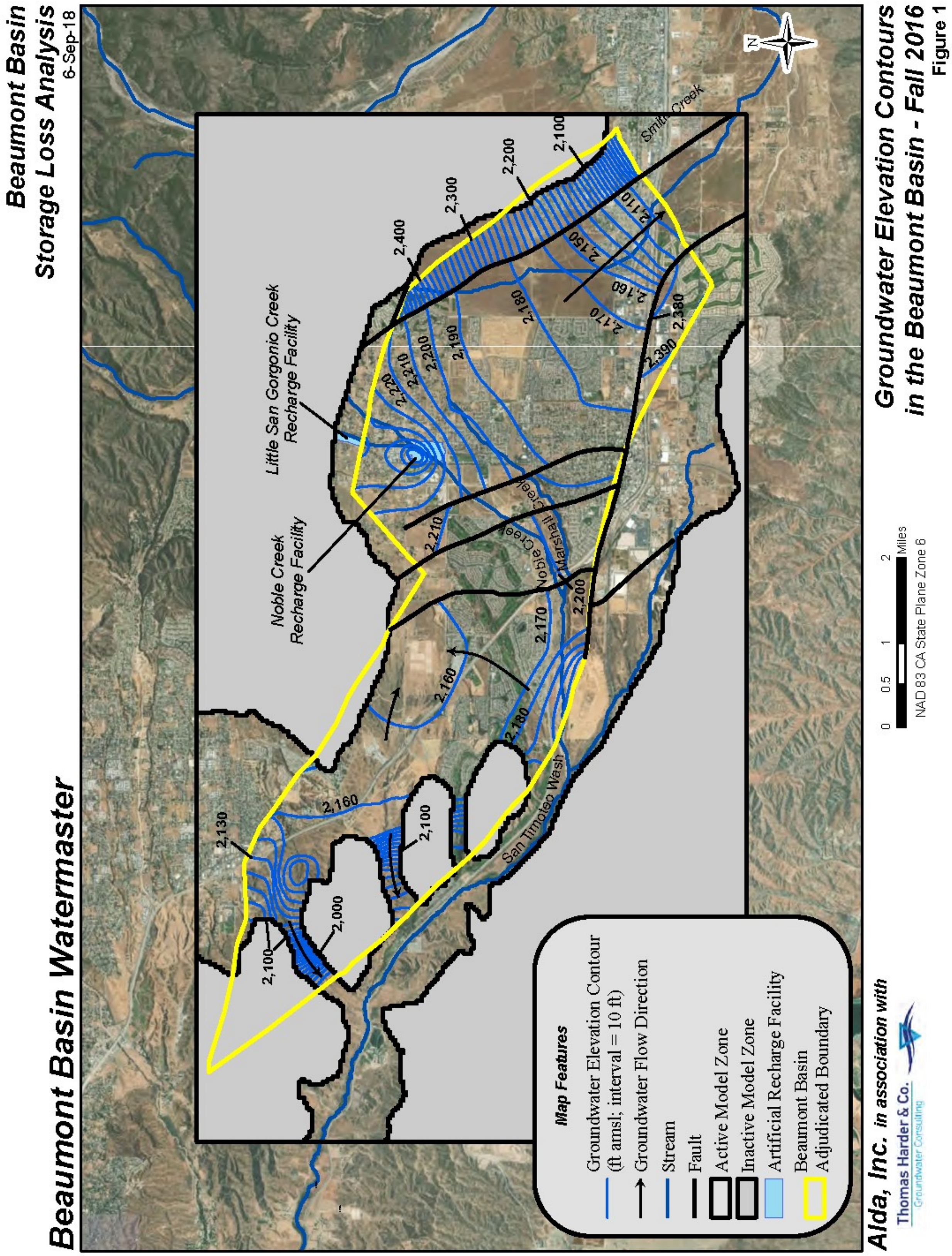
Beaumont Basin Watermaster
Beaumont Basin
Storage Loss Analysis
6-Sep-18
Groundwater Elevation Contours
in the Beaumont Basin - Fall 2016
Figure 1
Little San Gorgonio Creek
Recharge Facility
Noble Creek
Recharge Facility
Smith Creek
Noble Creek
Marshall Creek
San Timoteo Wash
2,400
2,300
2,200
2,100
2,110
2,150
2,160
2,170
2,180
2,190
2,200
2,210
2,220
2,380
2,390
2,170
2,160
2,180
2,130
2,100
2,000
N
0 0.5 1 2 Miles
NAD 83 CA State Plane Zone 6
Map Features
Groundwater Elevation Contour
(ft amsl; interval = 10 ft)
Groundwater Flow Direction
Stream
Fault
Active Model Zone
Inactive Model Zone
Artificial Recharge Facility
Beaumont Basin
Adjudicated Boundary
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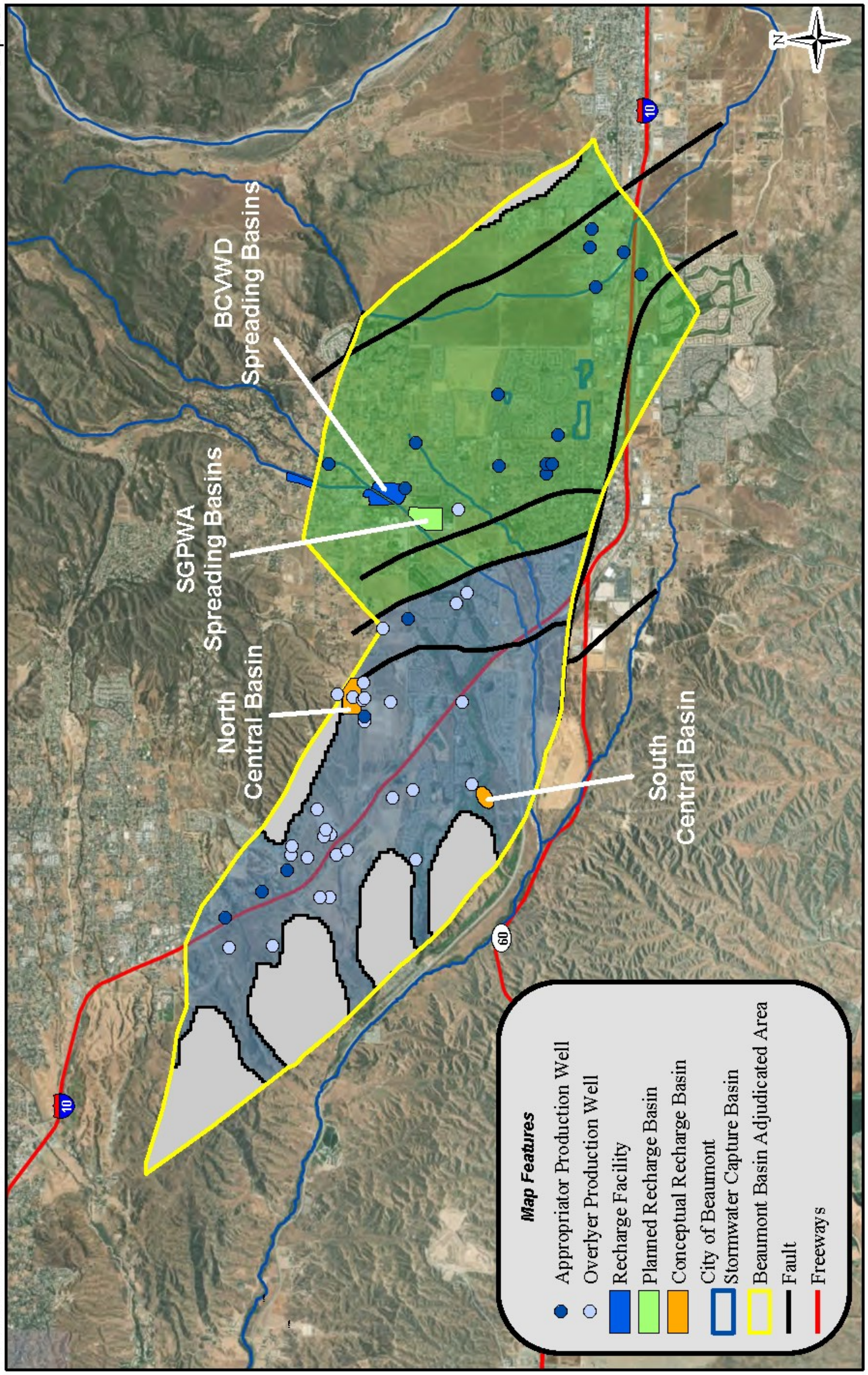
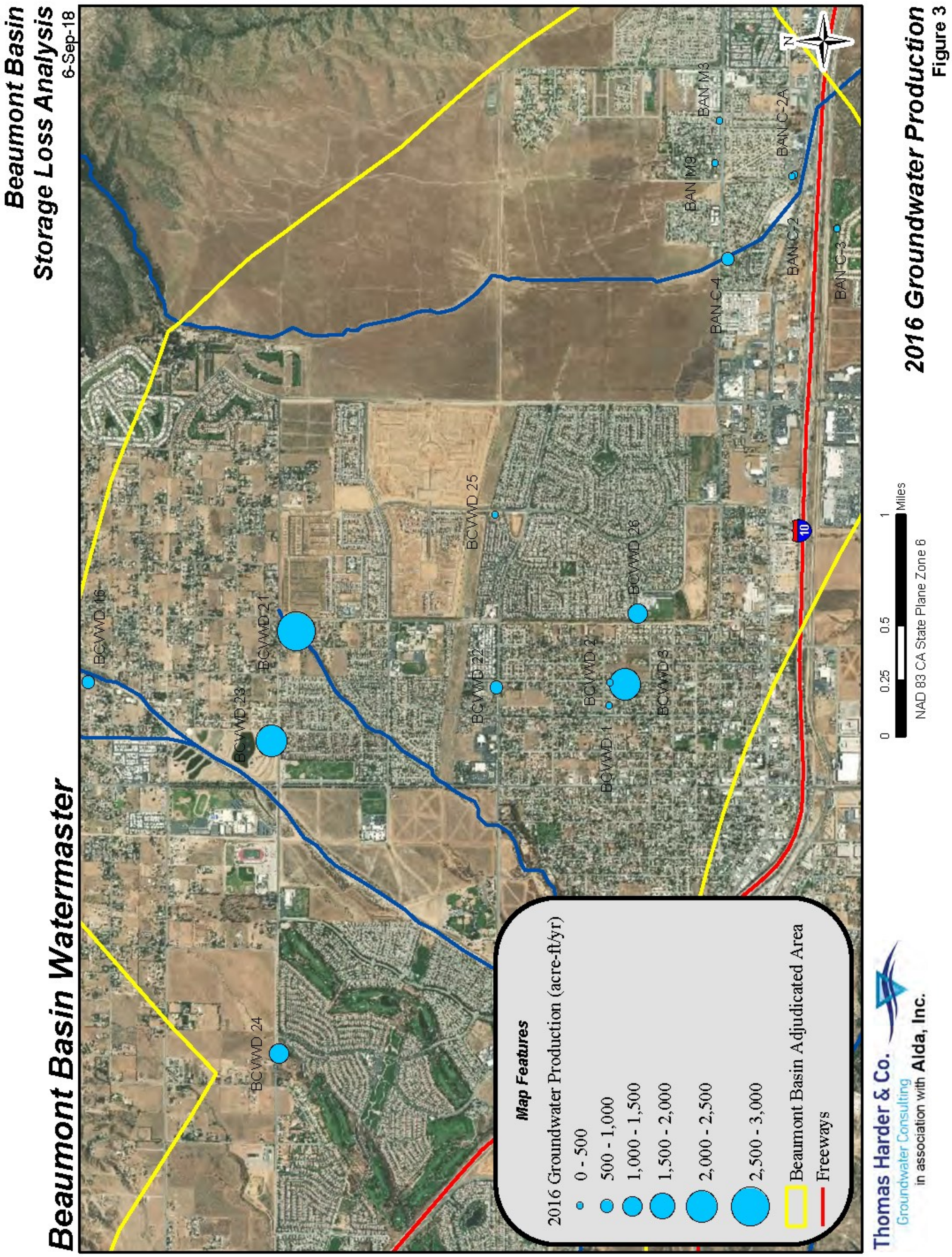
Beaumont Basin Watermaster

Beaumont Basin
Storage Loss Analysis
6-Sep-18



Zone Budget Areas for Estimating Storage Losses
Figure 2



Beaumont Basin Watermaster
Beaumont Basin
Storage Loss Analysis
6-Sep-18
BCVWD 16
BCVWD 21
BCVWD 23
BCVWD 24
BCVWD 22
BCVWD 25
BCVWD 26
BCVWD 2
BCVWD 1
BCVWD 3
BAN M3
BAN M9
BAN-C-2A
BAN-C-2
BAN-C-4
BAN-C-3
10
N
0 0.25 0.5 1 Miles
NAD 83 CA State Plane Zone 6
Map Features
2016 Groundwater Production (acre-ft/yr)
0 - 500
500 - 1,000
1,000 - 1,500
1,500 - 2,000
2,000 - 2,500
2,500 - 3,000
Beaumont Basin Adjudicated Area
Freeways
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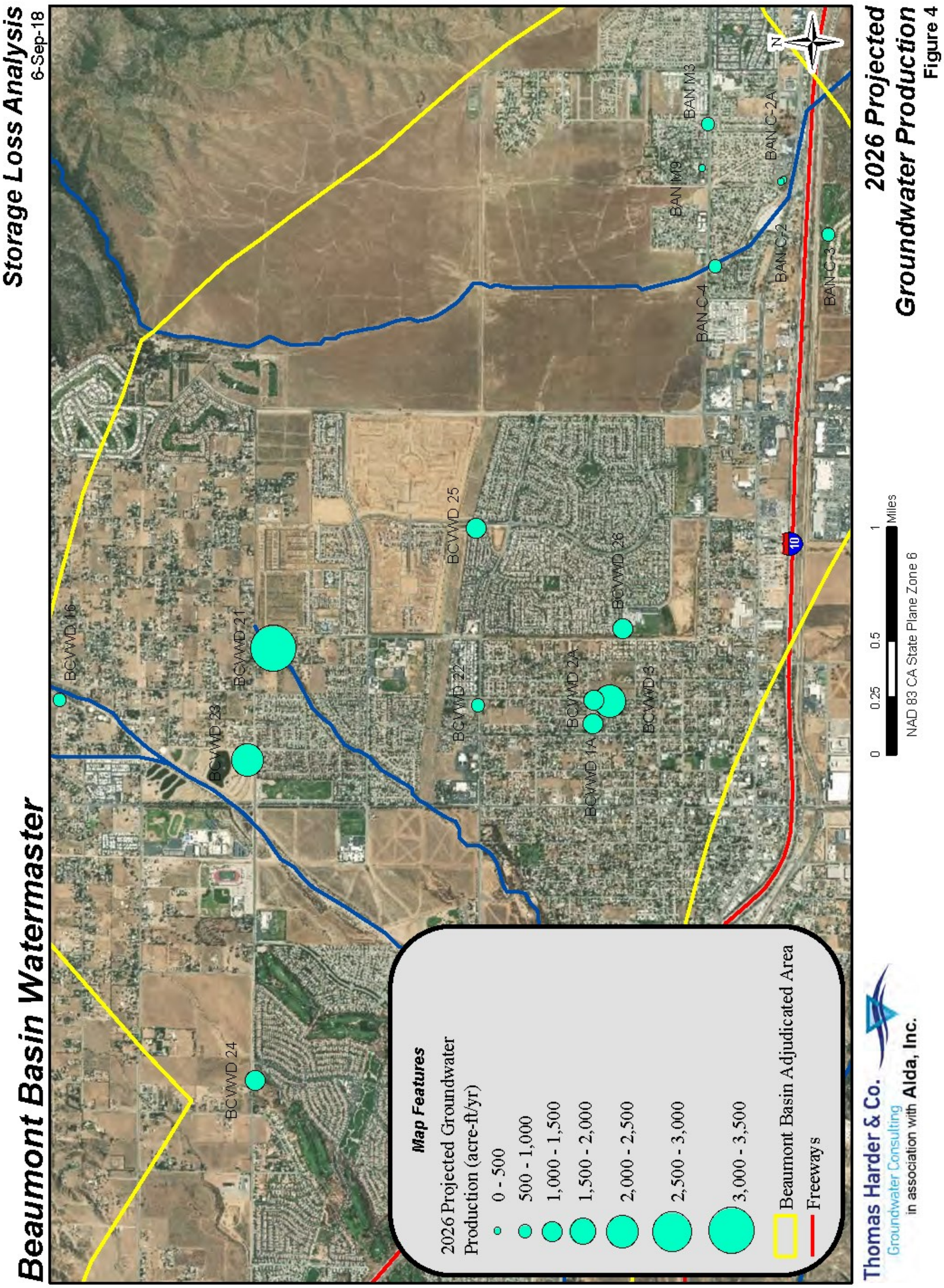
2016 Groundwater Production
Figure 3


Beaumont Basin Watermaster
Beaumont Basin
Storage Loss Analysis
6-Sep-18
2026 Projected
Groundwater Production
Figure 4
BCVWD 16
BCVWD 21
BCVWD 23
BCVWD 24
BCVWD 25
BCVWD 22
BCVWD 26
BCVWD 2A
BCVWD 1A
BCVWD 3
BAN M3
BAN M9
BAN C-2A
BAN C-2
BAN C-3
BAN C-4
10
N
0 0.25 0.5 1 Miles
NAD 83 CA State Plane Zone 6
Map Features
2026 Projected Groundwater Production (acre-ft/yr)
0 - 500
500 - 1,000
1,000 - 1,500
1,500 - 2,000
2,000 - 2,500
2,500 - 3,000
3,000 - 3,500
Beaumont Basin Adjudicated Area
Freeways
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BEAUMONT BASIN WATERMASTER
MEMORANDUM NO. 21-26

Date: June 2, 2021

From: Thomas Harder, Thomas Harder & Company

Subject: Update on Development of a Return Flow Accounting Methodology

Recommendation: That the Watermaster Committee receive the Draft Report and provide comments that will be addressed at the August 2021 regular meeting.

In consideration of the fact that irrigation return flow contributes to the Safe Yield of the Beaumont Basin, the Beaumont Basin Watermaster Board (Watermaster) directed ALDA/Thomas Harder & Co. (ALDA/TH&Co) to develop a methodology to account for the return flow that occurs overlying each Appropriator service area. Under Task No. 17, the work was started in 2018 and resulted in submittal of a draft return flow methodology in July 2019. Per the Watermaster's direction, this return flow methodology was updated to account for:

1. Modifications to indoor/outdoor water use for the City of Banning and YVWD
2. Further evaluation of landscape irrigation efficiency
3. Incorporation of commercial water deliveries as an additional water delivery account type
4. Pipeline losses and infiltration and inflow
5. Potential changes in total dissolved solids (TDS) concentration in groundwater associated with return flow

The refined methodology was applied to the most recent complete set of available water delivery data (2019). Preliminary results of this analysis were presented at the February 2021 regular meeting.

A draft Technical Memorandum (TM) summarizing the revised and updated return flow methodology is provided for review and consideration by the Watermaster. The analysis of potential changes in groundwater TDS concentrations from return flow is provided in Attachment A to the TM.

We welcome your thorough review of the attached document. Please forward your comments to Mr. Blandon by Wednesday, July 21st, 2021

Technical Memorandum

DRAFT

To: Mr. Hannibal Blandon
Alda, Inc.

From: Thomas Harder, P.G., CH.G.
Thomas Harder & Co.

Date: 24-May-21

Re: Updated Return Flow Accounting Methodology for the Beaumont Basin Adjudicated Area

1. Introduction

This Technical Memorandum (TM) describes a recommended return flow accounting methodology to develop annual estimates of return flow by Appropriator within the Beaumont Basin Adjudication area. The Appropriators within the Beaumont Basin Adjudicated area include Beaumont-Cherry Valley Water District (BCVWD), the City of Banning, and Yucaipa Valley Water District (YVWD). The return flow accounting methodology will enable Appropriators to account for the portion of annual return flow that occurs over their service areas. Return flow is herein referred to as the portion of water applied to landscaping or crops that is in excess of the plant's needs and percolates below the root zone to become groundwater recharge.

1.1 Background and Purpose

Estimates of return flow in the Beaumont Basin adjudicated area, by Appropriator, were published in the 2013 Reevaluation of the Beaumont Basin Safe Yield (TH&Co, 2015[1]). In general, the previous estimates were based on assumptions regarding indoor/outdoor water use and applied to general land use conditions. In 2018, the Beaumont Basin Watermaster Board (the Watermaster) directed the Alda/Thomas Harder & Co. team to develop a revised return flow methodology to consider parcel by parcel water delivery records, a more detailed accounting of indoor/outdoor

[1] TH&Co, 2015. 2013 Reevaluation of the Beaumont Basin Safe Yield. Prepared for Beaumont Basin Watermaster. Dated April 3, 2015.

water use, and account for differences in return flow lag time between the time of application and the arrival of the return flow at the groundwater.

The new return flow accounting methodology takes into account the following:

1. Accounting for water delivered to customers within Beaumont Basin adjudication boundary.
2. Assumptions as to how much water delivered to customers is applied for outdoor use.
3. Assumptions as to how much of the water applied to outdoor use becomes return flow.
4. Methodology for addressing parcels within Appropriator service areas that overlap and extend across the Beaumont Basin adjudication boundary.

The draft return flow methodology was submitted to the Watermaster in July 2019.[2] Based on input from the Watermaster, the return flow methodology from July 2019 has been modified, as presented in this revised draft TM, to address the following issues:

1. Modifications to indoor/outdoor water use for the City of Banning and YVWD
2. Further evaluation of landscape irrigation efficiency
3. Incorporation of commercial water deliveries as an additional water delivery account type
4. Pipeline losses and infiltration and inflow
5. Potential changes in total dissolved solids (TDS) concentration in groundwater associated with return flow

The refined methodology was applied to the most recent complete set of available water delivery data (2019).

2. Return Flow Accounting Methodology

The proposed return flow accounting methodology follows seven steps:

1. Identify Beaumont Basin Watermaster Appropriator water delivery records by accounts that are within the Beaumont Basin adjudicated area based on parcel, address or other location information.
2. Track the volume of delivered water for accounts that are within the Beaumont Basin adjudicated area, by Appropriator. Water delivered to accounts that overlap the boundary is assumed to be proportional to the area of the parcel in the boundary.
3. Classify each water account as either sewered, unsewered, landscape, construction or commercial.

[2] TH&Co, 2019. Draft Return Flow Accounting Methodology for the Beaumont Basin Adjudicated Area. Dated July 29, 2019.

4. Estimate the indoor and outdoor water use by account, according to the account type classification.
5. For sewered, landscape and commercial/industrial classifications, apply the return flow factors to outdoor water use by account.
6. For the unsewered classification, apply the return flow factors to both indoor and outdoor water use, by account.
7. Return flow associated with the construction classification is assumed to be zero.
8. Sum the return flow within the Beaumont Basin adjudicated area by Appropriator.

2.1 Identification of Delivered Water by Location

The first step in the return flow accounting methodology was to determine a location of each delivery record with respect to the Beaumont Basin adjudicated area. Water delivery records from 2017 were updated with new accounts from 2019 obtained from each of the Appropriators in the basin (BCVWD, City of Banning, and YVWD). Each of the Appropriators keep records of the water account locations by address and/or location description. In some cases, the accounts could be correlated with an APN within the Beaumont Basin based on other identifying information. The spatial distribution of APNs was obtained from Riverside County[3] as a Geographic Information System (GIS) shapefile, which was overlaid on a base map in GIS along with the Beaumont Basin Adjudication area.

In some cases, when APNs were not provided, it was necessary to manually look up the address or location description of the account to determine its location with respect to the adjudication boundary, and then determine whether the account/meter was in the Beaumont Basin adjudicated area based on the address. For 2019, more than 16,000 active water delivery accounts were identified within the Beaumont Basin adjudicated area.

2.2 Accounting for Delivered Water to Accounts Overlapping the Adjudication Boundary

While most of the APNs or accounts were either classified as completely inside or outside of the adjudicated boundary, some parcels overlapped the boundary (see Figure 1). For parcels overlapping the boundary, TH&Co determined the percentage area of the parcel inside of the boundary compared to the entire parcel area using GIS. The percentage area of overlapping parcels

[3] https://gis.rivcoit.org/GIS-Data-2

that occurred within the Beaumont Basin adjudicated area was applied to the volume of water delivered to that parcel.

2.3 Classification of Water Accounts by Type

TH&Co grouped water delivery accounts into five categories: sewered, unsewered, landscape, construction, and commercial/industrial. Sewered areas include high density residential land uses within the City of Banning's and YVWD's water service areas and the portion of the BCVWD within the City of Beaumont sewered area (see Figure 2).

The primary unsewered area within the adjudicated Beaumont Basin is the Cherry Valley community, a low-density residential area north of the City of Beaumont (see Figure 2). Residences in Cherry Valley discharge wastewater through individual household septic systems. Parcels in this area are generally larger and water deliveries to those parcels are generally higher, so it is assumed that their outdoor water use is greater. As shown on Figure 2, there are small areas of unsewered parcels in the Beaumont Basin that are outside of Cherry Valley.

Landscape includes accounts that were classified as irrigated agriculture as well as golf courses, parks and other urban landscape. However, this analysis does not include water production data from Overliers (private wells).

Some water delivery accounts were categorized as "floating meters" which indicates that the water was used for construction, fire suppression, or other uses, which were measured through portable meters. All of these uses were grouped under "construction" and were accounted for in the total water delivered in the basin.

Commercial/industrial water delivery accounts are labeled as such in Appropriator water delivery records. Water use at these accounts is expected to be predominantly indoors with very little landscape irrigation.

2.4 Estimation of Indoor and Outdoor Water Use for each Account based on Account Type

2.4.1 Water Use in Sewered Areas

For sewered areas, estimates of the portion of delivered water used indoors at each account were developed through an analysis of wastewater treatment plant inflows at the wastewater treatment plants for the City of Beaumont, City of Banning and YVWD (see Figure 3). It is assumed that the water delivered to the treatment plants is indicative of the indoor water use in the areas contributing water to the treatment plants, with the balance being used outdoors. The volumes of water delivered to the treatment plants was compared to the delivered water records for all accounts in the respective Appropriator areas (including outside the Beaumont Basin adjudicated area) to estimate indoor/outdoor water use ratios specific to each Appropriator.

Beaumont-Cherry Valley Water District

In 2019, the City of Beaumont reported 4,112 acre-ft of inflow to the treatment plant (see Table 1). During that same year (2019), the BCVWD delivered 8,026 acre-ft of water to non-landscape accounts within the sewered area. It is assumed for this analysis that the inflow to the treatment plant (4,112 acre-ft) represents the cumulative indoor water use for the BCVWD accounts within the sewered area of the district. Thus, the balance of delivered water (3,914 acre-ft) is assumed to be used outdoors. This results in 51 percent indoor use and 49 percent outdoor use (see Table 1). The average delivered water per account in 2019 for BCVWD was 0.49 acre/ft/account (see Table 2).

City of Banning

In 2019, the City of Banning reported 2,234 acre-ft of inflow to the treatment plant from all sewered accounts within the City (see Figure 3; Table 1). During that same year (2019), the City of Banning delivered 5,340 acre-ft of water to non-landscape accounts within the sewered area resulting in 42 percent indoor and 58 percent outdoor water use. The average delivered water per account in 2019 for the City of Banning was 0.47 acre-ft/account (see Table 2).

Yucaipa Valley Water District

In 2019, the YVWD reported 4,141 acre-ft of inflow to the treatment plant from all sewered accounts within the district (see Figure 3; Table 1). During that same year (2019), the YVWD delivered 7,947 acre-ft of water to non-landscape accounts within the sewered area resulting in 52 percent indoor and 48 percent outdoor water use. The average delivered water per account in 2019 for the YVWD was 0.47 acre-ft/account (see Table 2).

2.4.2 Water Use in Unsewered Areas

Based on 2019 water delivery records, the average delivered water per account per year in the unsewered area ranges from 0 acre-ft/account/yr in YVWD to 0.59 acre-ft/account/yr in BCVWD (see Table 2). In order to estimate the outdoor water use in the unsewered areas, it was assumed that indoor water use is the same for both sewered and unsewered areas (0.2 to 0.25 acre-ft/account/yr). The balance between the average delivered water per account (0 to 0.59 acre-ft/account/yr) and the indoor water use (0.2 to 0.25 acre-ft/account/yr) is assumed to be outdoor water use in the unsewered area (0 to 0.43 acre-ft/account/yr). When expressed as percentages, the estimated amount of indoor water use is 26 percent of delivered water and the estimated outdoor use is 74 percent of delivered water (see Table 2).

2.4.3 Landscape Water Use

All water delivered under this category is assumed to be used outdoors. The total volume of water used for landscape irrigation in the Beaumont Basin adjudicated area in 2019 was 1,790 acre-ft (see Tables 3a through 3c).

2.4.4 Construction Water Use

All water delivered under this category is assumed to be consumed with no return flow to the groundwater system. The total water delivered inside the adjudicated area for construction in 2019 was 11 acre-ft.

2.4.5 Commercial and Industrial Water Use

Each Appropriator has separate water delivery accounts for commercial and industrial water use. Water delivered to commercial and industrial accounts is assumed to be used primarily indoors as these properties typically have minimal landscaping. It is assumed for this methodology that indoor water use for these accounts is 95 percent of delivered water and outdoor water use is 5 percent of delivered water.

2.4.6 Uncertainty in Indoor/Outdoor Water Use Estimates

Inherent in the methodology presented herein is some uncertainty as it relates to the volume of water used indoors. The methodology assumes that indoor water use in the sewered areas is equal to the volume of water delivered to the wastewater treatment plants. Sewer pipeline leaks between the individual residences and the treatment plant will result in losses such that inflow to the treatment plant underestimates the indoor water use. Infiltration and inflow (I&I) into the sewer system from storm runoff and/or groundwater inflow where pipes are below the groundwater surface will add water to the treatment plant inflow not reflective of residential indoor water use, which overestimates indoor water use.

An evaluation of potential pipeline leakage rates indicates that it is not possible to estimate the leakage from sewer pipelines in the Beaumont Basin area with any degree of accuracy. Sewer lines located above the groundwater surface typically leak. A typical allowable leakage rate for new sewers is 200 gallons per day per inch mile (gpdim) of pipeline (ASTM, 2003).[4] However, this rate is a guidance value and varies from construction to construction according to pipeline materials and construction methods. Literature review suggests pipeline leakage rates can vary

[4] ASTM, 2003. Standard Test Method for Hydrostatic Infiltration and Exfiltration of Vitrified Clay Pipelines. C 1091-03.

from less than 100 gpdim[5] to over 10,000 gpdim.[6] ver time, the rate may increase with pipeline deterioration, root intrusions, or ground movement. Given the potential variability of this factor and the inability to measure the leakage, it is not recommended to account for sewer pipeline losses in the return flow methodology until a method to reliably quantify the losses can be identified and implemented.

Infiltration and inflow to the sewer system will also introduce uncertainty into the residential indoor/outdoor water use estimates for sewered areas. While groundwater infiltration is expected to be minimal in the Beaumont Basin area due to the significant depth of groundwater, storm runoff inflow will affect the volume of water entering the wastewater treatment plants. As this runoff varies from year to year according to precipitation amounts, the inflow to the sewer system varies accordingly. During years when precipitation and I&I are low, the indoor water use, using the methodology described herein, will be skewed low and the outdoor water use will be skewed high. During years when the I&I is high, the indoor water use will be skewed high and the outdoor water use will be skewed low. Over the long term, the impacts of I&I on return flow estimates will average out.

In summary, it is not recommended to incorporate estimates of sewer pipeline losses and I&I into the indoor/outdoor water use estimates for the return flow methodology. The losses and additions cannot be measured accurately, vary from year to year, and may change over a long period of time.

2.4.7 Accounting for Water Use Efficiency Over Time

The proportion of indoor to outdoor water use in the Beaumont Basin is expected to change over time with water use efficiency. In the last 15 years, California has begun to implement various water use efficiency goals and ordinances, including the 20 x 2020 Water Conservation Plan[7] and the 2015 California Model Water Efficient Landscape Ordinance.[8] In accordance with these goals, new housing developments in the Beaumont Basin are being constructed with smaller lawn footprints than older homes. As less water is used outdoors, the indoor/outdoor water use ratio is expected to change over time.

Changes in the indoor/outdoor water use ratios resulting from increased water use efficiency will be reflected in the indoor/outdoor water use estimates obtained through comparison of delivered

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[5] Gruenfeld, M. 2000. Exfiltration in Sewer Systems. Draft Report to the United States Environmental Protection Agency, National Risk Management Research Laboratory.

[6] Amick, R.S. and Burgess, E.H., 2000. Exfiltration in Sewer Systems. United States Environmental Protection Agency, National Risk Management Research Laboratory, Office of Research and Development. Report No. 600/R-01/034.

[7] California Department of Water Resources (CDWR), 2010. 20x2020 Water Conservation Plan. Dated February 2010.

[8] California Code of Regulations, Title 23, Division 2, Chapter 2.7, Sections 490 through 495.

water records and wastewater treatment plant inflows, as described herein. As less water is used indoors through efficiency, the volume of inflow to the treatment plants should reduce accordingly. Similarly, outdoor water use efficiency will be reflected in an increased ratio of treatment plant inflow to delivered water.

2.5 Applying the Return Flow Factor by Account Type

2.5.1 Assumption for Irrigation Efficiency (Return Flow Factor)

In any plant irrigation application, a portion of the water applied will infiltrate downward past the root zone of the plants and eventually percolate to the groundwater to become recharge. The volume of applied water that becomes deep infiltration (i.e. return flow) relative to the total applied water is the irrigation efficiency. The ratio of return flow to applied water is the return flow factor. Thus, if 75 percent of the applied water is used by the plants or evaporated and 25 percent becomes return flow, then the return flow factor is 25 percent or 0.25. The associated irrigation efficiency is 75 percent.

While there is no way to directly measure the volume of applied water that becomes return flow across any given area, there are studies that have published estimated irrigation efficiencies based on irrigation method. One of the more comprehensive accounting of irrigation efficiencies by irrigation method was published by the California Energy Commission (CEC) in 2006, as shown in the following table.[9]

[9] CEC, 2006. Estimating Irrigation Water Use for California Agriculture: 1950s – 2006.

Type of Irrigation System	Efficiency (%)
Surface Irrigation	
Basin	85
Border	77.5
Furrow	67.5
Wild Flooding	60
Gravity	75
Sprinkler	
Hand Move or Portable	70
Center Pivot and Linear Move	82.5
Solid Set or Permanent	75
Side Roll Sprinkler	70
Micro Sprinkler	87.5
Trickle Irrigation	
Surface Drip	87.5
Buried Drip	90
Subirrigation	90
LEPA (Low Energy Precision Application)	90
Unknown	75.5

While the efficiencies summarized in this table were originally applied to agricultural irrigation, the same efficiencies apply to landscape irrigation. As most residential lawns are irrigated with solid set or permanent sprinklers, an irrigation efficiency of 75 percent can be specified for lawn irrigation in accordance with the table. This efficiency rate, which results in 25 percent return flow, was also published in the 2015 California Model Water Efficient Landscape Ordinance.[10] The same document assumes an irrigation efficiency value of 81 percent for drip irrigated landscape. To be consistent with the recent State of California landscape ordinance, it is recommended to use a return flow factor of 25 percent (0.25) for lawns and 19 percent (0.19) for drip irrigated areas.

A review of recent aerial photographs of the Beaumont Basin area shows that, while newer residential developments generally have smaller landscape footprints, almost all include some lawn. There is no observable evidence of xeriscaping or other drought-tolerant landscaping that can be sustained from drip irrigation. As such, the only return flow factor used in this methodology is 0.25. If evidence of drip irrigated landscaping becomes apparent in future years, the methodology can be adjusted to account for the increased irrigation efficiency and reduced return flow.

[10] California Code of Regulations, Title 23, Division 2, Chapter 2.7, Section 492.13.

2.5.2 Return Flow in Sewered Areas

For water deliveries that occur in the sewered portions of each Appropriator's service area overlying the adjudicated Beaumont Basin, between 48 and 58 percent of delivered water was assumed to be used outdoors as per Section 2.4.1 of this Technical Memorandum (see also Table 2). Of the water used outdoors, 25 percent is assumed to become groundwater return flow. This method was applied to each of the accounts classified as "sewered" (see Tables 3a through 3c).

It is noted that deep percolation of applied landscape irrigation in residential areas overlying surface outcrops of the San Timoteo Formation, as mapped by the United States Geological Survey, is assumed to be negligible and is not included in the return flow volumes summarized in Tables 3a through 3c. Applied irrigation in these areas that is not consumed by landscape is assumed to become runoff to storm drains, ultimately flowing out of the adjudicated area as surface flow.

2.5.3 Return Flow in Unsewered Areas

As the discharge of water through individual septic systems also contributes return flow to the groundwater, total return flow in the unsewered area is the sum of septic system infiltration and deep infiltration of applied irrigation water. All water discharged through individual septic systems is assumed to become groundwater recharge. Thus, return flow from unsewered areas is the sum of indoor water use and 25 percent of outdoor water use.

2.5.4 Return Flow from Urban Landscape and Irrigated Agriculture

Return flow associated with urban landscape and irrigated agriculture is assumed to be 25 percent of delivered water. However, it is noted that return flow occurs in some portions of the Beaumont Basin adjudication area that are not within an Appropriator service area such as the Morongo Golf Course at Tukwet Canyon. This golf course uses private on-site wells for their own irrigation. This analysis does not include return flow from these or other Overlier private wells.

2.5.5 Return Flow from Construction

As mentioned in Section 2.4.4, water delivered under this category is assumed to be completely consumed with no return flow to the groundwater system. The total water delivered inside the adjudicated area for construction from all Appropriators in 2019 was 11 acre-ft and is negligible in the overall return flow estimate in the Beaumont Basin adjudicated area.

2.5.6 Return Flow from Commercial/Industrial Landscape

Of the water delivered to commercial and industrial accounts, only 5 percent is assumed to be used outdoors for landscape irrigation. Return flow associated with irrigation of landscape in commercial and industrial areas is assumed to be 25 percent of applied irrigation.

3. Estimates of Return Flow by Appropriator for 2019

Application of the return flow methodology outlined in this Technical Memorandum to the water delivery records of BCVWD, City of Banning, and YVWD for 2019 results in the return flow values shown in Table 4. The total return flow in 2019 for all accounts within the Appropriator service areas of the adjudicated Beaumont Basin is estimated to be 1,543 acre-ft. Of this, 1,215 acre-ft occurred in BCVWD, 308 acre-ft in the City of Banning, and 21 acre-ft in YVWD.

4. Applying the Return Flow Methodology for Future Years

The return flow accounting methodology reported herein can be implemented on an annual basis and reported in Beaumont Basin Watermaster annual reports. The data required to estimate return flow by Appropriator for annual reports will include:

- Water delivery records, by account, for each Appropriator, including any new accounts.
- City of Beaumont wastewater inflow volumes.
- Review of aerial photographs to confirm landscape irrigation methods.

It will be beneficial to conduct the analysis of indoor vs. outdoor water use on an annual basis in order to assess the effects of irrigation conservation efforts on return flow amounts.

5. Seepage Time Lag Analysis

Throughout most of the Beaumont Basin, groundwater is of sufficient depth below the land surface that there is a delay (or lag time) between the time the irrigation water is applied at the land surface and the time it reaches the groundwater table. TH&Co previously estimated the return flow lag time to be approximately 25 years in the vicinity of BCVWD Wells 1 and 2 (TH&Co, 2015).[11] This lag was estimated based on an analysis of hydrographs from BCVWD Wells 1 and 2. Specifically, stabilizing groundwater levels in the early 1960s, despite higher groundwater production and average precipitation conditions suggested that return flow from applied irrigation was reaching the groundwater table. As BCVWD began groundwater pumping in 1936, the return

[11] TH&Co, 2015. 2013 Reevaluation of the Beaumont Basin Safe Yield. Prepared for Beaumont Basin Watermaster. Dated April 3, 2015.

flow lag was estimated at this location to be approximately 25 years. Given that the depth to groundwater in 1961 was approximately 370 feet below ground surface (ft bgs) at BCVWD Well 1, the associated percolation rate is estimated to be approximately 15 feet per year (see Table 5).

As the depth to groundwater varies across the Beaumont Basin, the lag time will also vary accordingly. In the TH&Co (2015) report, the 25-yr lag time was applied equally across the basin. For this analysis, TH&Co varied the lag time across the Beaumont Basin adjudicated area by applying the return flow rate of 15 ft/yr to the depth to groundwater contour map shown on Figure 4. The depth to groundwater contour map was based on groundwater levels measured in December 2017. This percolation rate was applied to zones of similar groundwater level depth across the Beaumont Basin adjudicated area to determine return flow lag times. TH&Co assigned zones of equal lag time with each zone representing the area between each depth to groundwater contour, which are contoured at 100-ft intervals (see Figure 5). The return flow rate (15 ft per year) was multiplied by the average groundwater level depth in each zone to estimate the return flow lag time in years (see Table 5).

Applying the varying return flow lag times to the applied irrigation water overlying Appropriator service areas in the Beaumont Basin in 2017 results in the return flow recharge schedule shown in Table 6. It is noted that this recharge schedule assumes that the depth to groundwater conditions in 2017 are approximately the same as the depth to groundwater conditions will be in the future at the time of return flow arrival at the groundwater table. Assuming a constant average percolation rate, significant changes in groundwater level depth during return flow percolation (either up or down) could change the travel time from the land surface to the groundwater table. For example, in 1961, the depth to groundwater at BCVWD Well 1 was approximately 370 ft bgs. At that depth, the return flow lag time was 25 years (370 ft/15 ft/yr). In 2017, the return flow lag time has increased to 29 years (simplified to 30 years for this analysis based on Figure 5) because the depth to groundwater is now approximately 440 ft bgs (440 ft/15 ft/yr). Similar changes to the depth to groundwater in the future will impact the percolation lag time.

6. Analysis of Potential Total Dissolved Solids Concentrations Changes Associated with Return Flow

TH&Co conducted an analysis of potential future changes in groundwater total dissolved solids (TDS) concentrations in the Beaumont Basin adjudicated area associated with return flow (see Attachment A). The analysis was conducted using the Beaumont Basin groundwater flow model (MODFLOW) coupled with a solute transport model (MT3D-USGS). Through calibration of historical TDS concentration trends observed in basin wells, TH&Co estimated a TDS concentration flux rate (TDS mass loading) associated with return flow that was projected forward into the future. The mass loading rates for the various urban recharge zones in the model are shown in Table 3 of Attachment A.

Results of the model analysis of potential TDS changes in the Beaumont Basin show that, on a basin-wide average basis, the TDS concentration is not projected to rise above the Regional Water Quality Control Board Maximum Benefit Objective of 330 milligrams per liter (mg/L) (see Figure 7 of Attachment A). Model analysis suggests that there is potential for future exceedance of the TDS Maximum Benefit Objective at individual wells, including:

- South Mesa Water Company Well No. 1
- YVWD Well No. 34
- YVWD Well No. 35
- BCVWD Well No. 16
- BCVWD MW-1 (Well No. 23)

Recommendations for future refinements to the TDS water quality projections are provided in Attachment A.

7. Conclusions

Applying the return flow analysis methodology described herein to the 2017 water delivery records of each of the Appropriators within the Beaumont Basin adjudicated area results in the following estimated return flow volumes by Appropriator for 2019:

- BCVWD – 1,215 acre-ft
- Banning – 308 acre-ft
- YVWD – 21 acre-ft

The return flow methodology can be used to estimate and report return flow within the Beaumont Basin adjudicated area on an annual basis.

The estimated delay (i.e. lag time) between the application of water at the land surface in 2017 and the arrival of the return flow at the groundwater table varies based on varying depth to groundwater conditions in the Beaumont Basin. The schedule of this delay for water applied in 2019 is shown in Table 6. A return flow lag time schedule would need to be applied to each annual estimate of Appropriator return flow.

Basin-wide TDS concentrations are forecast to increase through 2032 but remain below the Maximum Benefit Objective of 330 mg/L. The cause for localized projected increases in TDS concentrations at YVWD Wells 34 and 35 are not immediately apparent as there is little residential landscaping in this area, although there is a golf course located nearby. In the area of BCVWD Well No. 16, historically high and project increases in TDS concentrations may be associated with discharges from individual septic systems in the Cherry Valley community.

Tables

Table 1
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Basis for Estimates of Indoor and Outdoor Water Use

	A	B	C[3]	D[4]
	Inflow to Wastewater Treatment Plant[1] (2019) (acre-ft)	Water Delivered within Sewered Area[2] (2019) (acre-ft)	Percent of Water Used Indoors	Percent of Water Used Outdoors
Beaumont Cherry Valley Water District	4,112	8,026	51%	49%
City of Banning	2,234	5,340	42%	58%
Yucaipa Valley Water District	4,141	7,947	52%	48%

Notes:

[1] City of Beaumont Wastewater Treatment Plant No.1, City of Banning Wastewater Reclamation Plant, or City of Yucaipa Wastewater Reclamation Facility

[2] Includes commercial, residential, and sewered accounts.

[3] C = A / B

[4] D = 1 - (A / B)

Volume of Indoor and Outdoor Water Use per Account in the Beaumont Basin

	Sewered Area						
	Total Water Delivered (acre-ft)	Number of Accounts	Average Acre-ft/ Account	Percent of Indoor Use	Percent of Outdoor Use	Volume of Indoor Use (acre-ft/acct)*	Volume of Outdoor Use (acre-ft/acct)
Beaumont Cherry Valley Water District	6,231	12,634	0.49	51%	49%	0.25	0.24
City of Banning	1,467	3,119	0.47	42%	58%	0.20	0.27
Yucaipa Valley Water District	198	421	0.47	52%	48%	0.24	0.22

	Unsewered Area						
	Total Water Delivered (acre-ft)	Number of Accounts	Average Acre-ft/ Account	Percent of Indoor Use (acre-ft)	Percent of Outdoor Use	Volume of Indoor Use (acre-ft/acct)*	Volume of Outdoor Use (acre-ft/acct)
Beaumont Cherry Valley Water District	706	1,207	0.59	26%	74%	0.25	0.43
City of Banning	4	20	0.22	26%	74%	0.20	0.16
Yucaipa Valley Water District	0	2	0.00	26%	74%	0.24	0.00

Notes:
[1] Includes commercial, residential, and sewered accounts.
* The volume of indoor water use is assumed to be the same for both sewered and unsewered, but outdoor water use determined to be greater for larger homes in the unsewered area.

Beaumont Cherry Valley Water District Return Flow by Type Inside Beaumont Basin Adjudicated Area for 2019

Return Flow Methodology

Account Type	Total Water Delivered (ac-ft)	Indoor Use		Outdoor Use		Return Flow (ac-ft)
		Percent of Total Delivered	Infiltration Percent of Indoor Use	Total Delivered	Infiltration Percent of Outdoor Use	
Sewered	-	51%	0%	49%	25%	-
Unsewered	-	26%	100%	74%	25%	-
Landscape[1]	-	0%	N/A	100%	25%	-
Construction	-	0%	N/A	100%	0%	-
Commercial	-	95%	0%	5%	25%	-

Account Type	A	B	C	D	E[2]	F[3]
	Total Water Delivered (ac-ft)	Indoor Use		Outdoor Use		Return Flow (ac-ft)
		Total Delivered	Infiltration	Total Delivered	Infiltration	
Sewered	5,051	2,576	0	2,475	619	619
Unsewered	679	176	176	502	126	302
Landscape	1,136	0	N/A[4]	1,136	284	284
Construction	10	0	N/A	10	0	0
Commercial	781	742	0	39	10	10
Total	**7,657**	**3,495**	**176**	**4,162**	**1,038**	**1,215**

Notes:

[1] Landscape includes Irrigated Agriculture.

[2] E = D * 0.25

[3] F = C + E

[4] N/A = Not Applicable.

City of Banning Return Flow by Type Inside Beaumont Basin Adjudicated Area for 2019

Return Flow Methodology

Account Type	Total Water Delivered (ac-ft)	Indoor Use		Outdoor Use		Return Flow (ac-ft)
		Percent of Total Delivered	Infiltration Percent of Indoor Use	Total Delivered	Infiltration Percent of Outdoor Use	
Sewered	-	42%	0%	58%	25%	-
Unsewered	-	26%	100%	74%	25%	-
Landscape[1]	-	0%	N/A	100%	25%	-
Construction	-	0%	N/A	100%	0%	-
Commercial	-	95%	0%	5%	25%	-

Account Type	Total Water Delivered (ac-ft)	Indoor Use		Outdoor Use		Return Flow (ac-ft)
		Total Delivered	Infiltration	Total Delivered	Infiltration	
Sewered	935	393	0	542	136	136
Unsewered	4	1	1	3	1	2
Landscape	654	0	N/A	654	163	163
Construction	1	0	N/A	1	0	0
Commercial	528	502	0	26	7	7
Total	**2,122**	**896**	**1**	**1,227**	**306**	**308**

Notes:
[1] Landscape includes Irrigated Agriculture.
[2] E = D * 0.25
[3] F = C + E
[4] N/A = Not Applicable.

Table 3c
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Yucaipa Valley Water District Return Flow by Type Inside Beaumont Basin Adjudicated Area for 2019

Return Flow Methodology

Account Type	Total Water Delivered (ac-ft)	Indoor Use		Outdoor Use		Return Flow (ac-ft)
		Percent of Total Delivered	Infiltration Percent of Indoor Use	Total Delivered	Infiltration Percent of Outdoor Use	
Sewered	-	52%	0%	48%	25%	-
Unsewered	-	26%	100%	74%	25%	-
Landscape[1]	-	0%	N/A	100%	25%	-
Construction	-	0%	N/A	100%	0%	-
Commercial	-	95%	0%	5%	25%	-

Account Type	Total Water Delivered (ac-ft)	Indoor Use		Outdoor Use		Return Flow (ac-ft)
		Total Delivered	Infiltration	Total Delivered	Infiltration	
Sewered	174	90	0	83	21	21
Unsewered	0	0	0	0	0	0
Landscape	0	0	N/A	0	0	0
Construction	0	0	N/A	0	0	0
Commercial	24	23	0	1	0.3	0.3
Total	**198**	**113**	**0**	**85**	**21**	**21**

Notes:
[1] Landscape includes Irrigated Agriculture.
[2] E = D * 0.25
[3] F = C + E
[4] N/A = Not Applicable.

2019 Water Delivery Summary Table

Appropriator	Total Water Delivered (Acre-ft)	Deliveries Inside the Beaumont Basin Adjudicated Area (Acre-ft)	Return Flow Inside the Beaumont Basin Adjudicated Area (Acre-ft)
BCVWD	11,247	7,657	1,215
Banning	6,295	2,122	308
YVWD	7,993	198	21
Total	**25,535**	**9,977**	**1,543**

Table 5
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Return Flow Lag Time Analysis in the Beaumont Basin

A	B	C	D[1]
Depth to Water Zone (ft)	Average Depth to Water (ft)	Feet per Year	Return Flow Lag Time (Years)
0 - 100	50	14.8	3
100 - 200	150	14.8	10
200 - 300	250	14.8	17
300 - 400	350	14.8	24
400 - 500	450	14.8	30
500 - 600	550	14.8	37
600 - 700	650	14.8	44

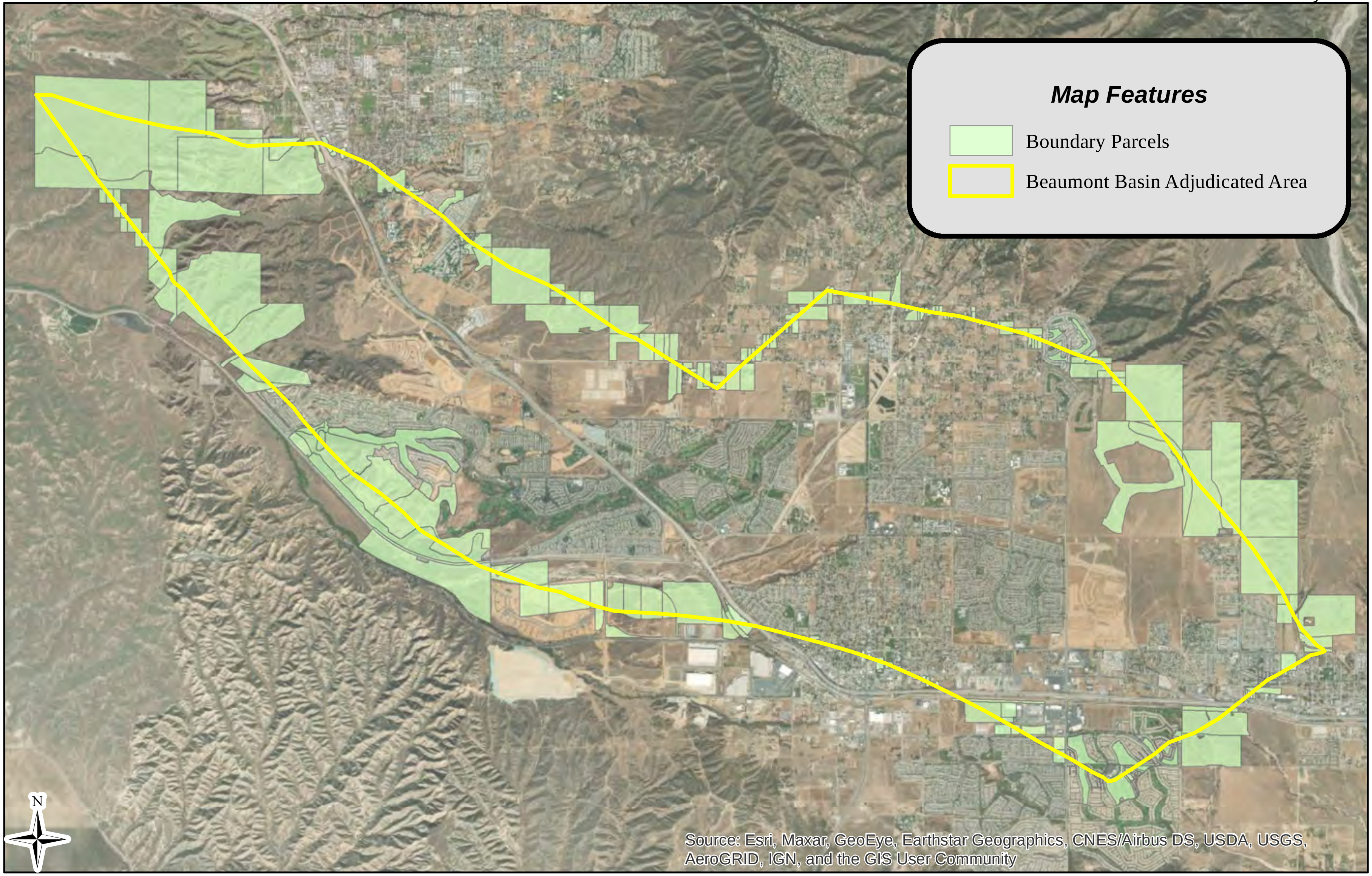
Notes:
[1] D = B / C

Return Flow Lag Time by Appropriator Inside Beaumont Basin Adjudicated Area for 2019

Return Flow Lag Time	Return Flow Inside the Beaumont Basin Adjudicated Area (ac-ft)		
	Beaumont Cherry Valley Water District	City of Banning	Yucaipa Valley Water District
3 Years	5	0	0
10 Years	39	0	8
17 Years	129	0	13
24 Years	225	207	0
30 Years	495	46	0
37 Years	182	55	0
44 Years	140	0	0
No Flow	0	0	0
Total	**1,215**	**308**	**21**

Grand Total **1,543**

Figures



Thomas Harder & Co.
Groundwater Consulting
in association with **Alda, Inc.**

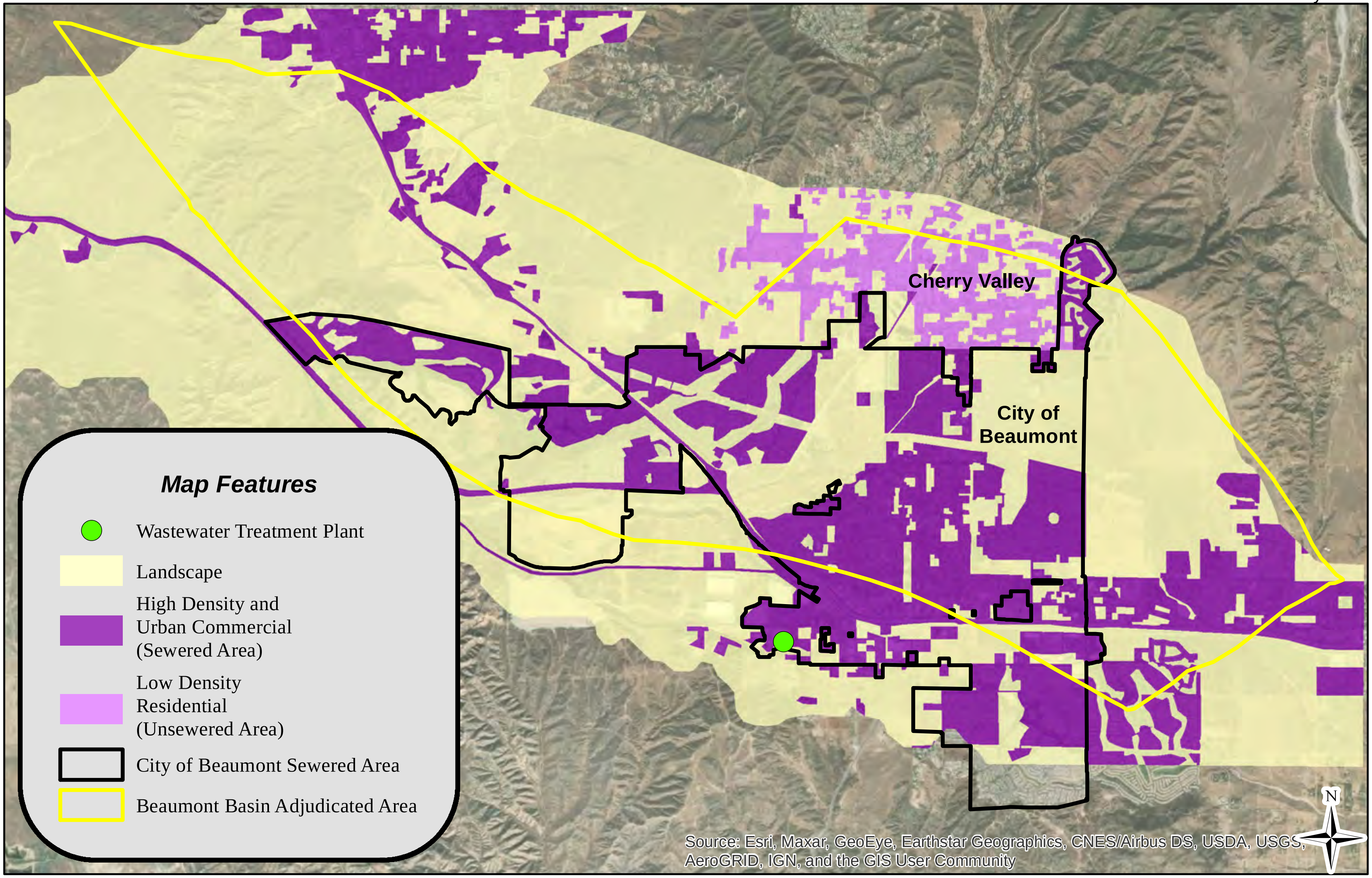
NAD 83 State Plane Zone 6

Note: Parcels from Riverside County Parcel Assessor 2015.

Parcels Overlapping the Adjudication Boundary

Figure 1

DRAFT



Thomas Harder & Co.
Groundwater Consulting
in association with Alda, Inc.

NAD 83 State Plane Zone 6

Notes: Sewer area is modified from UCR Nitrate Study, 2012
and Sewer manhole locations provided by the City of Beaumont.
Land use is modified from 2010 Land Use Google Aerial Imagery.

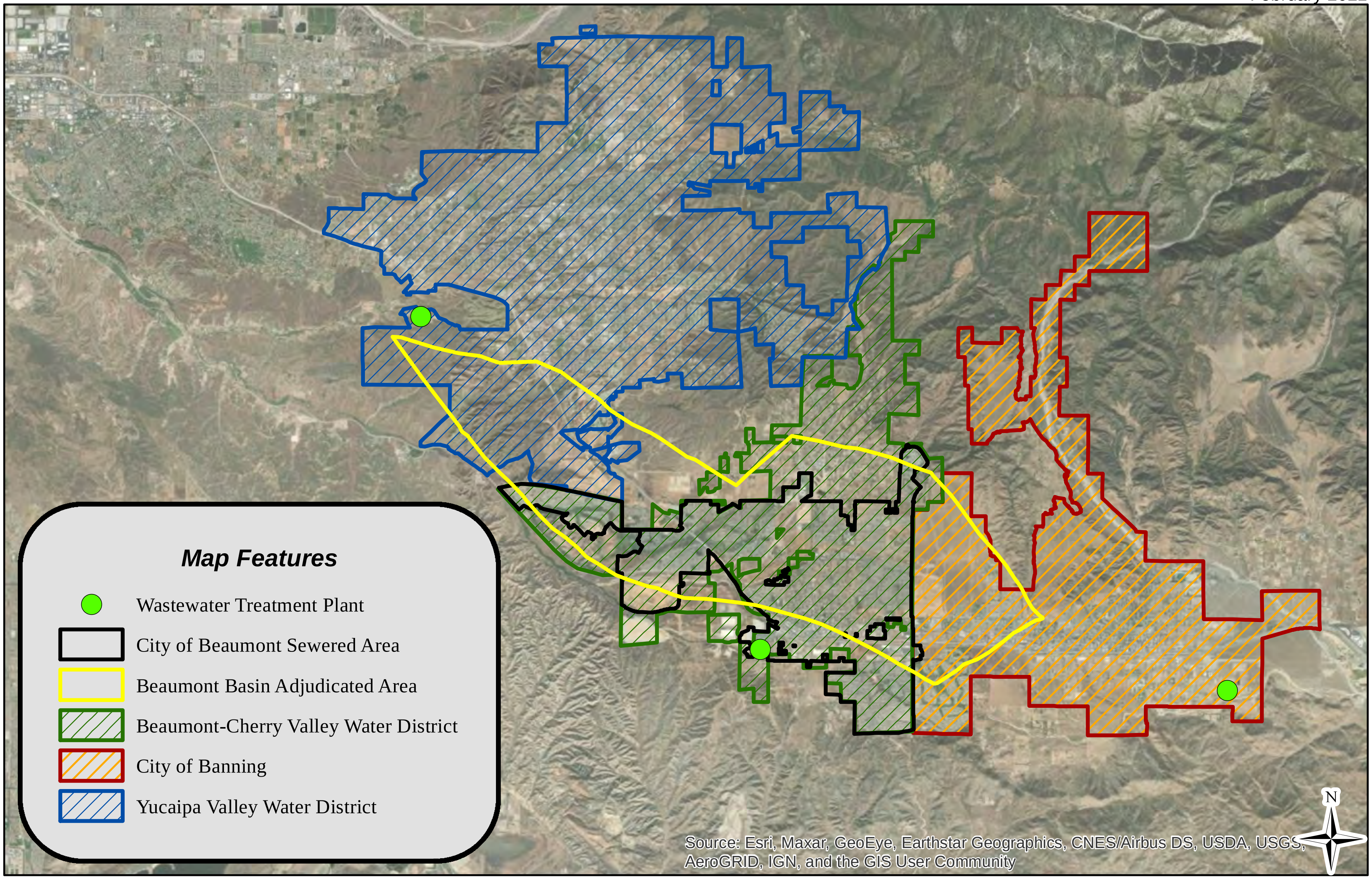
2010 Land Use

Figure 2

DRAFT

Beaumont Basin Watermaster

February 2021



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in association with **Alda, Inc.**

0 1 2 4 Miles

NAD 83 State Plane Zone 6

Note: Sewer area is modified from UCR Nitrate Study, 2012 and Sewer manhole locations provided by the City of Beaumont.

Appropriator Areas and City of Beaumont Sewered Area

Figure 3

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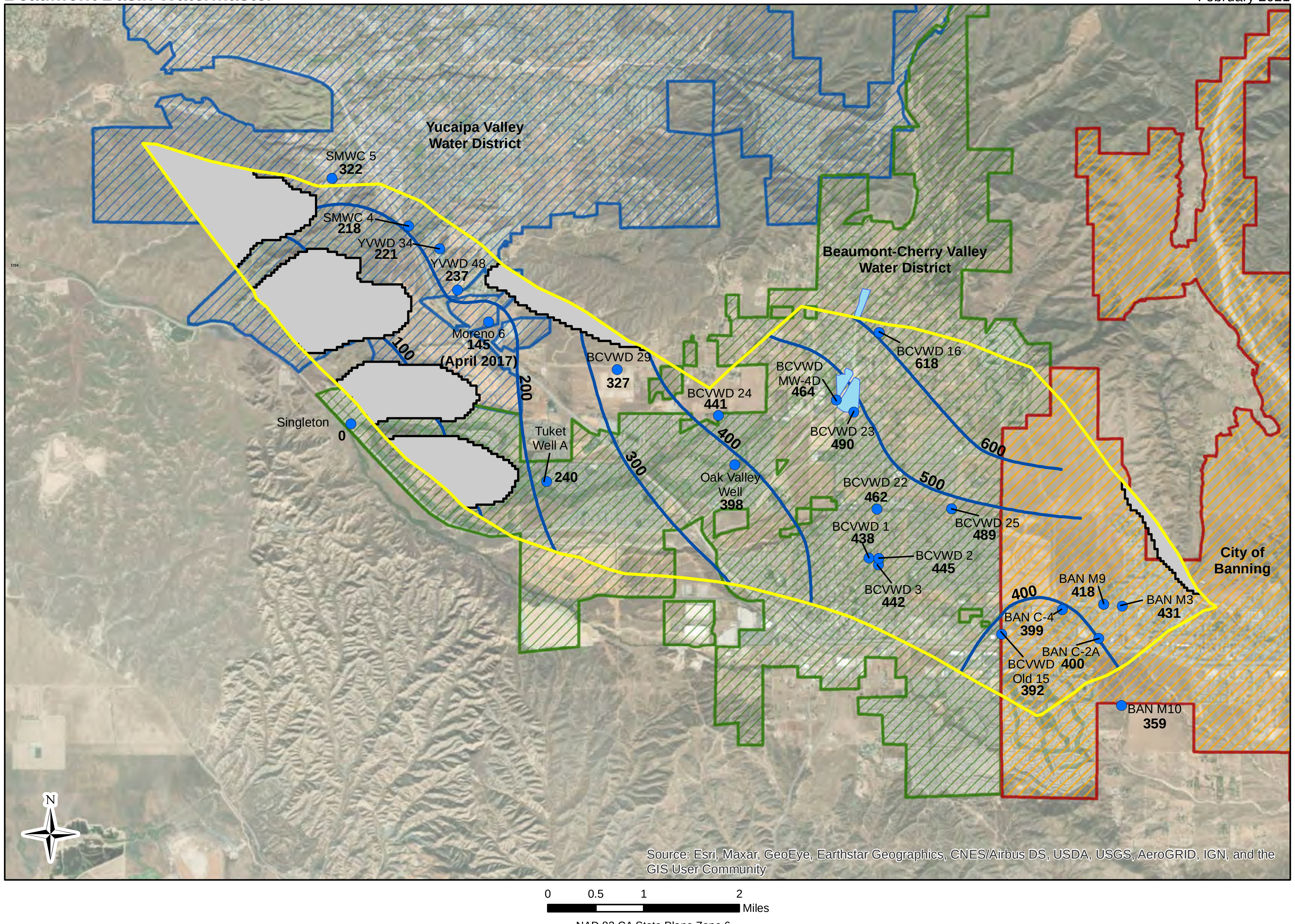

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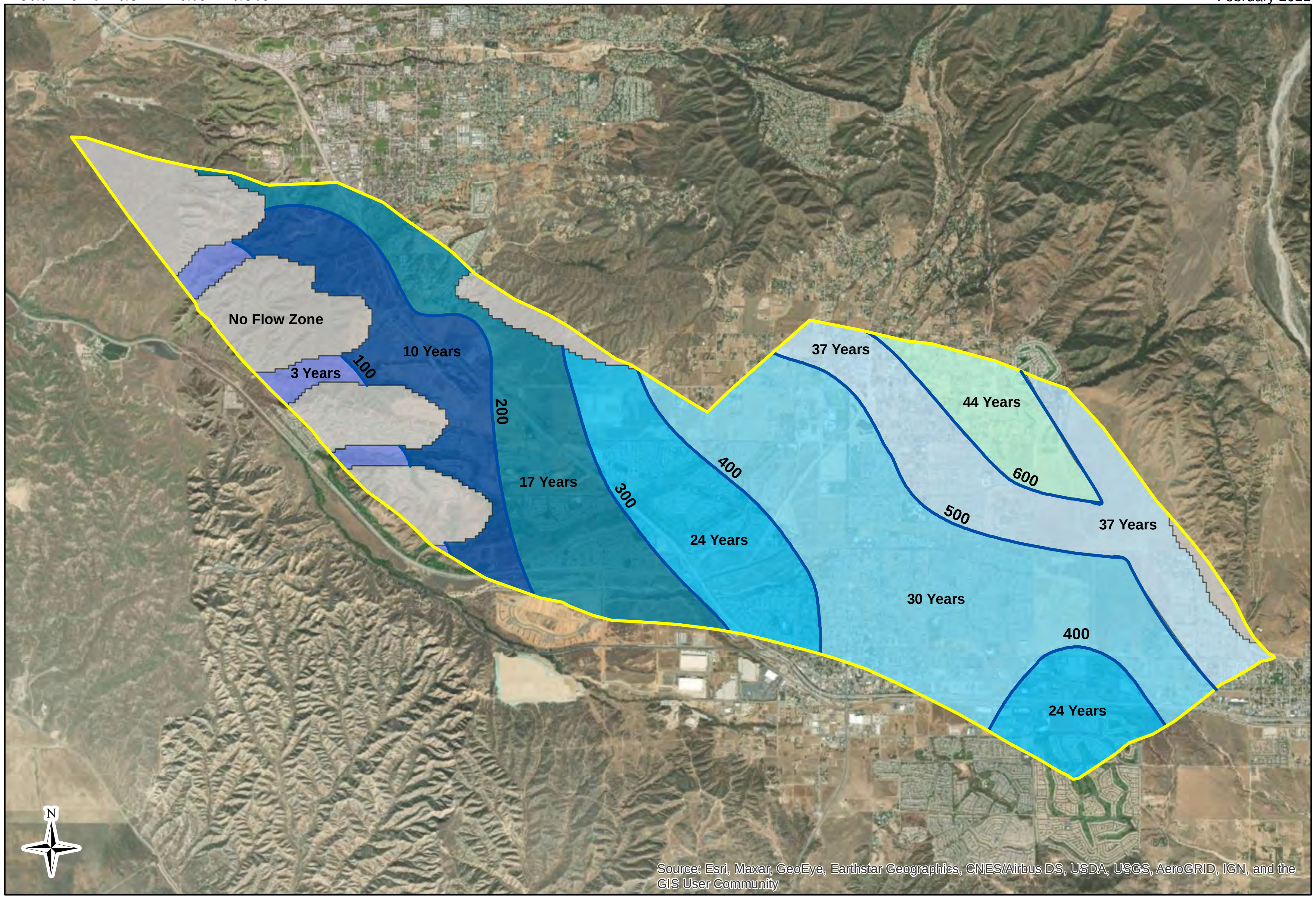
in association with Alda, Inc.

Depth to Groundwater Contours December 2017

Figure 4
DRAFT

Return Flow Accounting Methodology for the Beaumont Basin



Map Features

- 400 Depth to Groundwater Contour (ft bgs)
- Return Flow Lag Time to Groundwater Table
  - 3 Years
  - 10 Years
  - 17 Years
  - 24 Years
  - 30 Years
  - 37 Years
  - 44 Years
  - No Flow
- Beaumont Basin Adjudicated Boundary

Thomas Harder & Co. Groundwater Consulting in association with Alda, Inc.

Return Flow Lag Time Zones

Figure 5
DRAFT

Attachment A

Analysis of Return Flow Impacts on Groundwater Quality

Technical Memorandum

DRAFT

To: Mr. Hannibal Blandon
Alda, Inc.

From: Jim Van de Water, P.G., CH.G.
Thomas Harder & Co.

Date: 03-Mar-21

Re: Analysis of Return Flow Impacts on Groundwater Quality in the Beaumont Basin

1.0 INTRODUCTION

Concentrations of total dissolved solids (TDS or "salt") have been increasing in some groundwater wells within the Beaumont Basin (Thomas Harder & Company [TH&Co], 2019[1], **Figure 1**). It has been postulated by some stakeholders that the increase of TDS in groundwater may be attributable to high TDS concentrations in "return flow" water[2]. If true, the concern has been raised that, left unchecked, TDS concentrations may increase in some areas to unacceptable levels from a consumer and/or regulatory standpoint – particularly within the Adjudication Area (the boundaries of which are also shown on **Figure 1**). This report presents an analysis to address this concern.

1.1 Purpose and Scope

The purpose of this analysis is to forecast TDS concentrations throughout the Beaumont Basin through 2032. Given the availability of data through 2019, the forecast is therefore a 13-year forecast (i.e., January 2020 through December 2032).

The scope of this analysis includes the use of the calibrated groundwater flow model (GFM), which TH&Co has maintained and updated annually since 2013, in association with a solute transport model (STM). The most recent version of the GFM extends through 2019. An earlier version of

[1] TH&Co, 2019. Draft Return Flow Accounting Methodology for the Beaumont Basin Adjudicated Area. Technical Memorandum submitted Alda, Inc. July 29th.
[2] Return flow water is that portion of water applied at the ground surface (e.g., rainfall, agricultural and/or landscape irrigation/watering, and recharge facilities) that makes its way downward through the vadose zone to the water table. That is, return flow is that portion of water applied at the surface that is: 1) not consumed by evaporation and/or transpiration and 2) not taken up into plant storage and/or vadose zone moisture storage.

the GFM, as documented in TH&Co (2015)[3], included a 20-year forecast based on measured data through 2012 and assumed future hydrologic conditions to obtain forecasted groundwater elevations from 2013 through 2032. Given the availability of actual (measured) data from 2013 to 2019 that has already been incorporated into the GFM via the annual updates, the input files for the GFM were modified to include the assumed future hydrologic conditions for the period spanning 2020 through 2032. This revised GFM was then used to generate an input file containing flow terms required by the STM. Input files in which TDS concentrations are specified were then developed for the STM based on statistical methods. The spatial configuration of the return flow areas in the GFM were then used without modification as TDS source terms in the STM. After conducting test simulations to ensure proper functionality of the STM, the TDS concentrations and timing of TDS impacts to groundwater for each return flow area were adjusted using a manual iterative approach ("trial-and-error" calibration) by varying parameters specific to the STM until a reasonable best-fit to historical TDS concentrations were achieved. Upon completion of the calibration, a forecast run was conducted to provide model-predicted TDS concentrations through 2032.

As such, the scope can be summarized as follows:

1. Modify the GFM to include the 2020 to 2032 forecast;
2. Using the modified GFM developed in the previous step, generate the flow term file required by the STM;
3. Develop input files for the STM;
4. Calibrate the STM;
5. Run the STM forecast simulation; and
6. Document the results of this analysis in this technical memorandum.

1.2 Types and Sources of Data

The GFM used in the analysis incorporates a comprehensive hydrogeological database of the Beaumont Basin. The types of data used to develop the model include geology, soils/lithology, groundwater levels, hydrogeology, surface water hydrology, and groundwater recharge and pumping, as summarized in TH&Co (2015) and annual update reports that have been submitted since 2014 and most recently, in 2020 (TH&Co, 2020[4]).

Groundwater quality data, on which the STM is based, were provided by the appropriators and overliers within the Beaumont Basin and the San Gorgonio Pass Water Agency (SGPWA).

[3] TH&Co, 2015. 2013 Reevaluation of the Beaumont Basin Safe Yield. Submitted to Alda, Inc. April 3rd.
[4] TH&Co, 2020. Evaluation of Groundwater Conditions and Operating Safe Yield for the Beaumont Basin – Calendar Year 2019. Technical Memorandum submitted to Alda, Inc. May 20th.

1.3 Methodology

The GFM described in TH&Co (2015 and 2020) used the United States Geological Survey (USGS) code MODFLOW-2005[5]. For this analysis, an updated version of MODFLOW-2005 known as MODFLOW-NWT[6] was used and employs a forecast period the spans 2020 through 2032 (i.e., a 13-year forecast period) based on the forecast period documented in TH&Co (2015) and described in the following subsection.

The resulting GFM was then coupled to the USGS solute transport code MT3D-USGS[7] using the USGS's "ModelMuse" graphical user interface (GUI)[8]. The MT3D-USGS transport code used output from the GFM, along with user-specified TDS concentrations and other transport parameters described below, to forecast future TDS concentrations at selected locations throughout the Beaumont Basin.

2.0 GROUNDWATER FLOW MODEL (GFM)

As the GFM is described extensively in TH&Co (2015) and the subsequent annual reports, discussion of the GFM in this technical memorandum is limited to the forecast period and its coupling to the STM through a flow term file.

2.1 GFM Forecast Period

The GFM documented in TH&Co (2015) used measured data through 2012 and assumed future hydrologic conditions to obtain a 20-year forecast of groundwater elevations from 2013 through 2032. Given the availability of actual (measured) data for the 7-year period spanning 2013 to 2019 already incorporated in the GFM, only the last 13 years of the forecast period (i.e., 2020 through 2032) was appended to the GFM to create the forecasting model used in this analysis. In addition to a time discretization file, future hydrologic conditions (and therefore the forecast itself) are specified by parameter values within head and flux boundary condition files in the GFM. These files are as follows:

1. general head file (head-dependent flux boundary conditions);
2. evapotranspiration file (head-dependent flux boundary conditions);
3. well file (flux boundary conditions);

[5] Harbaugh, A.W., 2005, MODFLOW-2005, The U.S. Geological Survey modular ground-water model—the Ground-Water Flow Process: U.S. Geological Survey Techniques and Methods 6-A16.
[6] Niswonger, R.G., Panday, Sorab, and Ibaraki, Motomu, 2011, MODFLOW-NWT, A Newton formulation for MODFLOW-2005: U.S. Geological Survey Techniques and Methods 6–A37, 44 p.
[7] Bedekar, Vivek, Morway, E.D., Langevin, C.D., and Tonkin, Matt, 2016, MT3D-USGS version 1: A U.S. Geological Survey release of MT3DMS updated with new and expanded transport capabilities for use with MODFLOW: U.S. Geological Survey Techniques and Methods 6-A53, 69 p., *http://dx.doi.org/10.3133/tm6A53*.
[8] Winston, R.B., 2009, ModelMuse—A graphical user interface for MODFLOW–2005 and PHAST: U.S. Geological Survey Techniques and Methods 6–A29, 52 p., available only online at http://pubs.usgs.gov/tm/tm6A29. Updated Version 4.3.0.14 (September 28, 2020; ModelMuse: A Graphical User Interface for Groundwater Models (usgs.gov)).

4. streamflow routing file (head-dependent flux boundary conditions);
5. recharge file (flux boundary conditions); and
6. constant head file (head boundary conditions).

The first four files (i.e., general head, evapotranspiration, well, and streamflow routing files) assume identical (repeating) annual conditions throughout the 13-year forecast period. The remaining two files (i.e., the recharge and constant head files) assume conditions that differ from year to year throughout the forecast period. Further details regarding the forecast assumptions are documented in TH&Co (2015).

2.2 GFM Flow Term File

The MT3D-USGS code itself does not contain a flow simulator. Instead, this code is a stand-alone transport simulator that can be used with most variants of MODFLOW, including MODFLOW-NWT as used in this analysis. The linkage between MODFLOW-NWT and MT3D-USGS is through an add-on package (the LMT package) that saves the flow solution required for the transport simulation (i.e., the 'FTL' file).[9] The FTL file contains flow terms associated with:

- flow into and out of constant head cells;
- flow into and out of general head cells;
- flow from wells;
- inflow of water due to recharge (downward flow across the ground surface);
- removal of water due to evapotranspiration (upward flow across the ground surface); and
- flow into and out of streams.

Because these terms are provided across the face of every model cell for every time step of the GFM, the FTL can be quite large. Fortunately, only one FTL file was needed for this analysis as only one set of hydrogeologic stresses was evaluated. That is, the GFM was only run a single time to produce a single FTL. If alternative pumping or recharge scenarios were evaluated, separate FTL files would be required for each alternative scenario.

3.0 Solute Transport Model (STM)

As noted above, the STM is based on the MT3D-USGS code. The input files (a.k.a. "packages") for the STM, as required by MT3D-USGS, are as follows:

- BTN (basic transport package);
- SSM (source-sink mixing package);

[9] Zheng, C., Hill, M.C., and Hsieh, P.A., 2001, MODFLOW-2000, the U.S. Geological Survey Modular Ground-Water Model: User Guide to the LMT6 Package, the Linkage with MT3DMS for Multi-species Mass Transport Modeling: U.S. Geological Survey Open-File Report 01–82, 43 p.

- ADV (advection package);
- DSP (dispersion package); and
- GCG (generalized conjugate gradient solver package).

3.1 BTN Package

The BTN package handles basic tasks that are required by the STM. Among these tasks are definition of the simulation problem (i.e., layers, rows, and columns and identification of active and inactive cells), output times and locations, appropriate transport step size, and porosity. Porosity was a calibration parameter for this analysis and was initially assumed to be 0.25. Initial and boundary conditions with respect to TDS concentrations are also specified in this package and are described the subsections below.

3.1.1 Initial Concentration Conditions

Like the GFM, the starting time for the MT3D-USGS simulation is January 1, 1927. For this analysis, it was assumed that: 1) extensive residential, commercial, and agricultural development of the Beaumont Basin began in 1935 and 2) based on TH&Co (2015), return flow from this development did not reach the water table until 1960 (i.e., a 25-year "delay"). That is, ambient conditions with respect to TDS concentrations were assumed to have prevailed throughout the Beaumont Basin between 1927 until 1960. Put another way, starting in 1960, there existed the possibility that return flow could cause TDS concentrations to increase in the Beaumont Basin.

To specify initial conditions, TH&Co statistically evaluated historical TDS concentration data for 92 wells (**Appendix A**). The locations of wells for which TDS data were provided are shown on **Figure 1**. **Appendix B** contains figures that show the locations of wells for which TDS concentration data are available for each decade spanning 1960 to 2000. TDS concentration data were provided as far back as January 1, 1955 and as recently as November 30, 2011. **Table 1** provides the names of those wells that are within the Adjudication Area, whether there were sufficient TDS concentration data points to apply statistical methods (after removal of low and high outliers at a 5% significance level)[10], and whether the data exhibited a statistically significant trend (i.e., increasing or decreasing at a 5% significance level)[11]. As shown in the table, the datasets for 55 of the 92 wells were sufficiently large to assess trends. Of those 55 wells, 7 of them (Old Slack, YVWD 35, Fisherman's Retreat #1, BCVWD 02, BAN C-4, SMWC 05, and BCVWD 16) demonstrated an increasing trend in TDS concentrations. The substantive findings of the statistical analysis are displayed on **Figure 2**.

[10] Dixon's outlier test was used for wells having less than 25 records whereas Rosner's outlier test was used for wells having at least 25 records. The datasets were also qualitatively assessed using Q-Q plots and box-and-whisker plots.
[11] The Theil-Sen method was used to conduct the trend analysis.

The mean (arithmetic average) TDS concentrations of those wells with both sufficient data and which did not demonstrate a statistically significant trend were used to establish the initial (January 1, 1927) TDS concentration (ambient) conditions. Specifically, using each well as a control point, values were estimated between control points through interpolation (specifically, kriging) using ArcGIS (ESRI, 2009[12]). The resulting interpolated raster file was then used as the initial TDS concentration conditions (see **Figure 3**). These ambient values are shown in the last column of **Table 1**.

The approach described above for establishing initial TDS concentration conditions assumed sufficient time had passed for TDS concentrations to have demonstrated an increasing trend if one indeed exists. That is, if no trend was demonstrated, it is assumed return flow volumes and/or TDS concentrations were insufficient to have impacted groundwater (i.e., ambient, pre-development conditions prevail).

3.1.2 Concentration Boundary Conditions

All TDS concentration boundary conditions were specified in the SSM package described below in **Section 3.2**. TDS concentration boundary conditions were specified at:

- all perimeter specified head and flux boundaries prescribed in the GFM; these boundaries include constant and general head boundaries and mountain front/block recharge wells; and
- all areal (plan-view) recharge boundaries.

3.2 SSM Package

All perimeter specified head and flux boundaries were assigned a constant TDS concentration equal to the average (ambient) value established by the interpolation procedure described in **Section 3.1.1**. This constant TDS concentration was set to a single value (the ambient value) for the entire simulation (i.e., 1927 through 2032) and remained unchanged through the calibration process described below in **Section 4**.

The TDS concentrations at the areal recharge boundaries were specified using 30 'return flow zones' (RFZs) that cover the entire model domain (**Figure 4**) and are an integral part of the GFM. Details regarding the configuration of the RFZs is described in TH&Co (2015). TDS concentrations were temporally varied and with respect to magnitude in each individual RFZ as a 'specified mass-loading' boundary as part of the calibration process described below in **Section 4**. This approach was taken to simulate mixing of TDS in return flow waters with groundwater in a more representative way and in accordance with how MT3D-USGS simulates solute transport.

[12] ESRI, 2009. ArcGIS 10.6.1.

3.3 ADV Package

The ADV package directs the STM which advection solution to use and the Courant number. Additional items can also be specified in this package depending on the advection solution chosen.

For this analysis, the third-order total-variation-diminishing (TVD) scheme for solving the advection term was used based on experience and as noted by the original code developer[13]. TVD is mass conservative but does not introduce excessive numerical dispersion and artificial oscillation that can occur with other available solution schemes.

The Courant number is the number of cells (or fraction of a cell) advection is allowed in any direction in one transport step. There is no limit on its value, but for accuracy reasons, it is generally not set much greater than one. For this analysis, the Courant number was set to the default value of 1 based on performance and experience. For the TVD scheme used in this analysis, the Courant number is also a stability constraint which must not exceed one (and is automatically reset to one by the code if a value greater than one is specified).

3.4 DSP Package

Longitudinal, transverse, and vertical dispersivities (α_L, α_T, and α_Z; expressed in units of feet) and diffusion coefficients (which are expressed in units of feet^2/day) are specified in the DSP package. In planview or cross-sectional view, dispersivities control the degree to which a "plume" takes on an elliptical shape; the higher the dispersivity, the more elongated the plume. As such, dispersivity also controls the slope of the concentration versus time plot. The higher the dispersivity, the smaller the slope of the concentration versus time plot. Dispersivities are associated with advection (and therefore hydraulic gradients in part) and, as such, have a significantly larger influence on the model forecasts than diffusion coefficients, the latter of which are associated only with concentration gradients. Dispersivities are typically adjusted during calibration with the initial value of α_L set to one-tenth the cell dimension, α_T set to one-tenth α_L, and α_Z set to one-tenth α_T. Given the 164-foot by 164-foot (i.e., 50 meters by 50 meters) cells used in the GFM, α_L, α_T, and α_Z were initially set to 16, 1.6, and 0.16 feet in all model cells, respectively. Diffusion was ignored in this analysis (i.e., it was set to 0 feet^2/day in all model cells) given the expected dominance of advection.

[13] Zheng, Chunmiao, and Wang, P. Patrick. (1999). "MT3DMS: A modular three-dimensional multispecies transport model for simulation of advection, dispersion, and chemical reactions of contaminants in groundwater systems; documentation and user's guide," Contract Report SERDP-99-1, U.S. Army Engineer Research and Development Center, Vicksburg, MS.

3.5 GCG Package

The GCG solver package must now be used in every simulation because the dispersion, sink/source and reaction terms are now always solved by the implicit finite-difference method, regardless of the method used to solve the advection term.

Settings in the GCG package were left at their default values as prescribed in the GUI for this analysis as experience has shown them to be generally reliable and result in reasonably low mass balance errors.

4.0 STM CALIBRATION AND FORECAST SIMULATION

Given the overall model setup and to ensure reasonable future forecasts and model stability, calibration of the STM and the STM forecast simulation were conducted concurrently.

4.1 STM Calibration

Calibration of the STM involved a manual iterative approach ("trial-and-error" calibration) in which parameters specific to the STM were varied until an acceptable best-fit to historical (January 1955 through July 2011) TDS concentrations were achieved in selected 'calibration target' wells. The locations of the target calibration wells are shown in **Figure 5**. No GFM parameters, including the geometry and recharge rates for each RFZ, were adjusted during calibration.

The STM parameters that were varied, and their impact on simulated TDS concentrations, are summarized below.

- Longitudinal dispersivity (α_L): This parameter was varied from its initial value of 16.4 feet. A value of 10 feet was found to provide a slightly better fit to the historical data and was therefore used for the forecast.
- Mass loading concentration: This was the primary calibration parameter. As described above, it is the TDS concentration and associated time schedule associated with the RFZs. The final RFZ-specific calibrated values for this parameter are summarized in **Table 2**. The mass loading concentrations input to the STM are listed relative to ambient (January 1927 through December 1959) TDS concentrations. As shown the table, mass loading concentrations throughout the model domain (i.e., all 30 RFZs) ranged from 0.8 to 1.5 times the ambient concentration. That is, if the average ambient concentration over all model cells comprising a given RFZ was 300 milligrams per liter (300 mg/L) and the value

listed in the table is "Ambient x 1.2", the average return flow zone TDS concentration used to calibrate the STM was 300 mg/L x 1.2 or 360 mg/L.[14]

Calibration hydrographs (model-predicted and measured TDS concentrations versus time) are provided in **Appendix C**. This appendix also includes model-predicted TDS concentrations versus time for several additional wells for which no TDS are available to provide more extensive areal coverage of the model domain. The fits were generally good, and particularly for the notable increase in BCVWD 16.

4.2 STM Forecast Simulation

The forecast simulation, which can be described as an extension of the calibration simulation, forecasts TDS concentrations through 2032. As such, the calibration hydrographs included as **Appendix C** show the forecasted TDS concentrations. The mass contributions of each RFZ to the Adjudication Area based on the model forecast are listed in **Table 3** and shown on **Figure 6**. The table lists, from left to right, the values associated with the calculation of the mass contributions: 1) area within the Adjudicated Area, 2) return flow (recharge) rate, and 3) the calibrated concentration in the return flow. The mass contribution is directly proportional to these values; that is, the larger these values, the large the mass contribution. The mass loading rates are then provided in the table for ambient conditions (January 1927 through December 1959) to provide the baseline needed to calculate the mass contributions, which are presented in the two righthand-most columns in the table. While the two largest mass contributors (the Noble Creek Recharge Basin and Little San Gorgonio Creek / Noble Creek) are comparatively small in area, they have higher return flow concentrations and significantly higher return flow rates in comparison to the other RFZs.

The average TDS concentration within the Adjudication Area versus time is shown as the blue line on **Figure 7**. The dashed line on the figure show the basin-wide water quality objective (330 mg/L) and basin-wide TDS concentrations based on 20-year averages as reported to, and published by, the California State Regional Water Quality Control Board (2014)[15]. The data used to arrive at these reported values are as follows:

- Water Quality Objective (330 mg/L): Data sampling period was 20 years (1954-1973);
- 1997 Ambient (290 mg/L): Data sampling period was 20 years (1978-1997);
- 2003 Ambient (260 mg/L): Data sampling period was 20 years (1984-2003);

[14] Given that return flow zone TDS concentrations vary from cell to cell due to the interpolation procedure described above in **Section 3.1.1**, the cell-specific return flow zone TDS concentrations comprising this particular RFZ were individually multiplied by 1.2 in this example.
[15] California State Regional Water Quality Control Board, 2014. Water Quality Objectives, Ambient Water Quality, and Assimilative Capacity for TDS table. Prepared by Wildermuth Environmental, Inc. Available online at: https://www.waterboards.ca.gov/santaana/water_issues/programs/basin_plan/docs/SMP/2014-0005/A-C_Tables_with_2012_data.pdf

- 2006 Ambient (260 mg/L): Data sampling period was 20 years (1987-2006);
- 2009 Ambient (280 mg/L): Data sampling period was 20 years (1990-2009); and
- 2012 Ambient (290 mg/L): Data sampling period was 20 years (1993-2012).

Thus, the reported average TDS concentration ranges between 260 and 290 mg/L. The forecasted TDS concentration in 2032 within the Adjudication Area (approximately 280 mg/L) falls within this range and results in a forecasted 'assimilative capacity' of approximately 50 mg/L (i.e., 330 mg/L – 280 mg/L = 50 mg/L).

5.0 UNCERTAINTIES, FINDINGS, AND RECOMMENDATIONS

5.1 Uncertainties

All model forecasts are uncertain to some degree because of simplifying assumptions inherent in the governing equations on which the model codes are based, simplifying assumptions made during model development, and imperfections in the calibration. Because the forecasts are uncertain, any calculations that rely on them (e.g., mass contributions presented in **Table 3** and projected concentrations throughout the Adjudication Area presented on **Figure 7**) are also uncertain.

It is generally accepted that solute transport models harbor greater uncertainties than groundwater flow models. That said, those areas in which the GFM is not as well-calibrated will transmit more uncertainty to the STM.

Simplifying assumptions are required due to the complex nature of the subsurface. That is, subsurface model parameters (e.g., hydraulic conductivities and storage coefficients), which are heterogeneous (spatially variable) and anistropic (directionally variable) at every scale, are averaged over comparatively large distances (i.e., the length and width of each model cell) and are interpolated from field data over even larger distances (e.g., commonly miles). Measurement errors (e.g., errors in measured groundwater levels and reported TDS values due to sampling and/or analytical errors) also lead to uncertainty. By way of example, measurement and interpolation errors may explain why the reported basin-wide averages shown in **Figure 7** are reported to the nearest 10 mg/L.

The overall implication is that basin-scale models such as the GFM and STM cannot be perfectly calibrated - even if infinite time and resources were available. Therefore, there exist numerous sets of parameters that can similarly calibrate the models. Evaluation of multiple parameter sets is known as predictive uncertainty analysis and was beyond the scope of this effort.

Finally, the forecast presented here was based on assumed future hydrologic conditions (e.g., climate, land use, streamflows, and projected pumping) that are imperfectly known. That is, the future is inherently uncertain. Along these same lines, it is noted that the most recent measured TDS data available for this analysis to establish the initial conditions, identify trends, and calibrate the STM were obtained a decade ago (i.e., in 2011) and commonly associated with wells within the Beaumont Cherry Valley Water District. TDS data in other areas of the Beaumont Basin were generally older. Regardless of location, the data used to calibrate the STM were dated.

5.2 Findings and Recommendations

The findings of this analysis are as follows:

1. Basin-wide TDS concentrations are forecast to increase through 2032 but remain below the Water Quality Objective of 330 mg/L;
2. The assimilative capacity forecasted for 2032 within the Adjudicated Area is estimated to be approximately 50 mg/L; and
3. The forecasted TDS concentrations are within the reported historical range based on 20-year averages and appear reasonable given the known increased development within the Beaumont Basin and measured TDS concentrations.

5.3 Recommendations

It is recommended that more frequent and widespread data collection efforts be undertaken on an ongoing basis. The overall goal of the recommendations listed below is to reduce the uncertainty associated with forecasting analyses of TDS concentrations that may be conducted at a future date. Specifically:

1. Obtain TDS concentrations at additional wells to give broader spatial coverage throughout the Beaumont Basin and on an ongoing basis;
2. Obtain TDS concentrations of water delivered to recharge facilities on an ongoing basis;
3. Obtain TDS concentrations in surface water bodies (e.g., creeks, streams, and recharge facilities – particularly in the vicinity of BCVWD 16) and irrigated areas (e.g., parks and golf courses) on an ongoing basis;
4. Obtain TDS concentrations at shallow wells adjacent to surface water bodies on an ongoing basis to establish any correlation between the two;
5. Revisit the GFM calibration using more recent data and, if sufficient additional TDS data can be obtained as recommended above, consider using TDS concentrations to inform GFM parameters to assist in any effort to recalibrate the GFM (and STM); and
6. Revisit the assumptions reported in TH&Co (2015) that were used to develop the future hydrologic conditions on which the forecast was based and modify as warranted based on more recent data.

Ambient TDS Values in Wells in the Beaumont Basin (mg/L)

Well	Number of Data Points	Outliers	Trend/No Trend	Ambient TDS (mg/L)
335651116590901	1	N/A	Insufficient Data	N/A
335838116582409	5	No Outliers	No Increasing Trend	244.4
335838116582501	10	No Outliers	No Increasing Trend	290.4
335838116582505	10	1 - Low	No Increasing Trend	240.3
335840116581702	2	N/A	Insufficient Data	N/A
335840116581706	1	N/A	Insufficient Data	N/A
335902116580901	1	N/A	Insufficient Data	N/A
335903116580902	1	N/A	Insufficient Data	N/A
335903116581001	1	N/A	Insufficient Data	N/A
335903116581004	1	N/A	Insufficient Data	N/A
335907116580801	2	N/A	Insufficient Data	N/A
Almo	5	No Outliers	No Increasing Trend	336.7
BAN C-2A	8	No Outliers	No Increasing Trend	227.7
BAN C-3	11	1 - Low	No Increasing Trend	190.7
BAN C-4	11	N/A	Increasing Trend	N/A
BAN M3	4	No Outliers	No Increasing Trend	263.3
BCVWD 01	35	1 - Low	No Increasing Trend	214.7
BCVWD 02	10	N/A	Increasing Trend	N/A
BCVWD 03	15	No Outliers	No Increasing Trend	202.8
BCVWD 04A	40	N/A	Increasing Trend	N/A
BCVWD 05	11	N/A	Increasing Trend	N/A
BCVWD 06	26	No Outliers	No Increasing Trend	265.8
BCVWD 07	3	N/A	Insufficient Data	N/A
BCVWD 09	5	N/A	Insufficient Data	N/A
BCVWD 10	16	No Outliers	No Increasing Trend	243.3
BCVWD 11	17	1 - High	No Increasing Trend	234.4
BCVWD 12	7	No Outliers	No Increasing Trend	248.9
BCVWD 14	10	No Outliers	No Increasing Trend	279.4
BCVWD 16	30	No Outliers	No Increasing Trend	320.0
BCVWD 18	7	No Outliers	No Increasing Trend	234.3
BCVWD 19	15	No Outliers	No Increasing Trend	251.6
BCVWD 20	9	No Outliers	No Increasing Trend	251.3
BCVWD 21	15	No Outliers	No Increasing Trend	280.0
BCVWD 22	19	1 - Low	No Increasing Trend	227.9
BCVWD 23	5	No Outliers	No Increasing Trend	266.9
BCVWD 24	4	No Outliers	No Increasing Trend	211.1

Ambient TDS Values in Wells in the Beaumont Basin (mg/L)

Well	Number of Data Points	Outliers	Trend/No Trend	Ambient TDS (mg/L)
BCVWD 25	2	N/A	Insufficient Data	N/A
BCVWD 26	3	N/A	Insufficient Data	N/A
BCVWD 29	2	N/A	Insufficient Data	N/A
Beaumont Cemetary Well 1	3	N/A	Insufficient Data	N/A
Beaumont Cemetary Well 2	3	N/A	Insufficient Data	N/A
Beaumont Irrigation District	5	N/A	Insufficient Data	N/A
Beaumont Unified School District	2	N/A	Insufficient Data	N/A
BH-19	6	No Outliers	No Increasing Trend	670.0
Bonita Vista Mutual Water Co. 1	3	N/A	Insufficient Data	N/A
Bonita Vista Mutual Water Co. 2	3	N/A	Insufficient Data	N/A
Bonita Vista Mutual Water Co. 4	4	N/A	Insufficient Data	N/A
Cherry Valley Mutual Water Co. 1	4	N/A	Insufficient Data	N/A
Cherry Valley Nursery	5	No Outliers	No Increasing Trend	263.3
Desert Lawn	4	No Outliers	No Increasing Trend	243.8
Dowling, Francis	2	N/A	Insufficient Data	N/A
Dowling Orchard Well	3	N/A	Insufficient Data	N/A
E236b	1	N/A	Insufficient Data	N/A
El Cas Lake	5	1 - Low	No Increasing Trend	667.5
Fisherman's Retreat 1	8	N/A	Increasing Trend	N/A
Fisherman's Retreat 2	8	No Outliers	No Increasing Trend	422.5
G. Witter	1	N/A	Insufficient Data	N/A
Heartland Well	9	No Outliers	No Increasing Trend	354.7
Illy, Stefan	5	No Outliers	No Increasing Trend	275.7
Joe Pistilli	5	No Outliers	No Increasing Trend	270.0
Larry Britton	5	No Outliers	No Increasing Trend	229.6
Oak Valley #1	7	No Outliers	No Increasing Trend	203.3
Oak Valley #2	3	N/A	Insufficient Data	N/A
Oak Valley Office	4	No Outliers	No Increasing Trend	246.5
Old Slack	5	N/A	Increasing Trend	N/A
Parks and Rec	1	N/A	Insufficient Data	N/A

Ambient TDS Values in Wells in the Beaumont Basin (mg/L)

Well	Number of Data Points	Outliers	Trend/No Trend	Ambient TDS (mg/L)
Ranch Well	5	1 - High	No Increasing Trend	625.0
Randy Downing	4	N/A	Increasing Trend	N/A
SanTim-1	5	No Outliers	No Increasing Trend	412.0
SanTim-2B/1	6	No Outliers	No Increasing Trend	247.7
SanTim-2B/2	6	No Outliers	No Increasing Trend	219.6
Schwenckert	7	1 - High	No Increasing Trend	855.0
Singleton Ranch 5	2	N/A	Insufficient Data	N/A
Singleton Ranch 7	5	No Outliers	No Increasing Trend	246.7
SMOA 1	2	N/A	Insufficient Data	N/A
SMOA 2	1	N/A	Insufficient Data	N/A
SMWC 2nd No. 4 Well	6	No Outliers	No Increasing Trend	191.5
SMWC 04	5	1 - High	No Increasing Trend	208.6
SMWC 05	37	N/A	Increasing Trend	N/A
SMWC 07	1	N/A	Insufficient Data	N/A
SMWC 09	1	N/A	Insufficient Data	N/A
SMWC 11	7	No Outliers	No Increasing Trend	345.9
SMWC 14	1	N/A	Insufficient Data	N/A
SMWC 16	1	N/A	Insufficient Data	N/A
Stearns, Leonard	3	N/A	Insufficient Data	N/A
Sunny Cal Ranch	3	N/A	Insufficient Data	N/A
Tukwet A	7	1 - High	No Increasing Trend	199.6
Tukwet D	6	No Outliers	No Increasing Trend	226.6
Wilkins, James	1	N/A	Insufficient Data	N/A
YVWD 34	5	No Outliers	No Increasing Trend	284.4
YVWD 35	27	N/A	Increasing Trend	N/A
YVWD 47	2	N/A	Insufficient Data	N/A
YVWD 48	13	No Outliers	No Increasing Trend	205.4

Mass Loading Calibration Summary

Return Flow Zone	Name of Facility or General Description	Mass Loading Concentration (relative to ambient concentration; see text)			Average Ambient Concentration (mg/L)[1]
		January 1927 through December 1959	January 1960 through May 2007	June 2007 through December 2032	
1	High-Density Residential	Ambient	Ambient x 1.2		241
2	High-Density Residential	Ambient			219
3	High-Density Residential	Ambient			236
4	High-Density Residential	Ambient			278
5	High-Density Residential	Ambient			254
6	Urban Landscape	Ambient			259
7	Urban Landscape	Ambient			224
8	High-Density Residential	Ambient			233
9	High-Density Residential	Ambient			292
10	Low-Density Residential	Ambient			275
11	High-Density Residential	Ambient	Ambient x 0.8		252
12	Urban Landscape	Ambient	Ambient x 1.2		299
13	Irrigated Grains	Ambient			354
14	Urban Commercial	Ambient			N/A[2]
15	Little San Gorgonio Pass Recharge Basin	Ambient		Ambient x 1.5	251

Mass Loading Calibration Summary

<table>
<tr><th rowspan="2">Return Flow Zone</th><th rowspan="2">Name of Facility or General Description</th><th colspan="3">Mass Loading Concentration (relative to ambient concentration; see text)</th><th rowspan="2">Average Ambient Concentration (mg/L)[1]</th></tr>
<tr><th>January 1927 through December 1959</th><th>January 1960 through May 2007</th><th>June 2007 through December 2032</th></tr>
<tr><td>16</td><td>Noble Creek Recharge Basin</td><td colspan="2">Ambient</td><td>Ambient x 1.5</td><td>267</td></tr>
<tr><td>17</td><td>High-Density Residential</td><td colspan="3">Ambient</td><td>230</td></tr>
<tr><td>18</td><td>High-Density Residential</td><td colspan="3">Ambient</td><td>230</td></tr>
<tr><td>19</td><td>High-Density Residential</td><td colspan="3">Ambient</td><td>228</td></tr>
<tr><td>20</td><td>Cooper's Creek / San Timoteo Creek</td><td>Ambient</td><td colspan="2">Ambient x 1.2</td><td>N/A</td></tr>
<tr><td>21</td><td>Little San Gorgonio Creek / Noble Creek</td><td colspan="2">Ambient</td><td>Ambient x 1.4</td><td>285</td></tr>
<tr><td>22</td><td>Noble Creek</td><td colspan="3">Ambient</td><td>269</td></tr>
<tr><td>23</td><td>Noble Creek</td><td colspan="3">Ambient</td><td>228</td></tr>
<tr><td>24</td><td>Noble Creek</td><td colspan="3">Ambient</td><td>241</td></tr>
<tr><td>25</td><td>Marshall Creek</td><td colspan="3">Ambient</td><td>238</td></tr>
<tr><td>26</td><td>High-Density Residential</td><td colspan="3">Ambient</td><td>231</td></tr>
<tr><td>27</td><td>Urban Commercial</td><td>Ambient</td><td colspan="2">Ambient x 1.2</td><td>248</td></tr>
<tr><td>28</td><td>Native Vegetation</td><td>Ambient</td><td colspan="2">Ambient x 1.2</td><td>244</td></tr>
<tr><td>29</td><td>Urban Landscape</td><td colspan="3">Ambient</td><td>222</td></tr>
<tr><td>30</td><td>Native Vegetation</td><td colspan="3">Ambient</td><td>253</td></tr>
</table>

Notes:

[1] Average concentrations shown are within the Beaumont Basin Adjudicated Area only.

[2] N/A = Not applicable; no part of the return flow zone is within the Adjudicated Area.

Mass Loading Contribution Summary

Return Flow Zone	Name of Facility or General Description	Area (acres; within the BBAA only)[1]	Time-Averaged Return Flow Rate (acre-ft/year)			Return Flow Concentration (mg/L)			Time-Averaged Mass Loading Rate (lbs/day)			Mass Loading Contribution Associated with Return Flow and Managed Recharge (lbs/day)	
			Jan. 1927 through Dec. 1959	Jan. 1960 through May 2007	June 2007 through Dec. 2032	Jan. 1927 through Dec. 1959	Jan. 1960 through May 2007	June 2007 through Dec. 2032	Jan. 1927 through Dec. 1959	Jan. 1960 through May 2007	June 2007 through Dec. 2032	Jan. 1960 through May 2007	June 2007 through Dec. 2032
1	High-Density Residential	135.6	27	27	30	241	289	289	49	59	64	10	14
2	High-Density Residential	241.2	21	22	124	219	219	219	34	35	202	0.9	168
3	High-Density Residential	579.6	19	20	30	236	236	236	34	35	52	0.7	18
4	High-Density Residential	197.0	2.5	34	81	278	278	278	5.2	69	168	64	163
5	High-Density Residential	356.3	7.3	26	66	254	254	254	14	49	126	35	112
6	Urban Landscape	72.0	24	24	27	259	259	259	47	47	51	0.3	4.7
7	Urban Landscape	1155.5	29	32	63	224	224	224	48	53	104	4.8	56
8	High-Density Residential	112.1	0.2	5.4	27	233	233	233	0.4	9.4	47	9.0	47

Mass Loading Contribution Summary

Return Flow Zone	Name of Facility or General Description	Area (acres; within the BBAA only)[1]	Time-Averaged Return Flow Rate (acre-ft/year)			Return Flow Concentration (mg/L)			Time-Averaged Mass Loading Rate (lbs/day)			Mass Loading Contribution Associated with Return Flow and Managed Recharge (lbs/day)	
			Jan. 1927 through Dec. 1959	Jan. 1960 through May 2007	June 2007 through Dec. 2032	Jan. 1927 through Dec. 1959	Jan. 1960 through May 2007	June 2007 through Dec. 2032	Jan. 1927 through Dec. 1959	Jan. 1960 through May 2007	June 2007 through Dec. 2032	Jan. 1960 through May 2007	June 2007 through Dec. 2032
9	High-Density Residential	40.8	0.9	5.4	8.5	292	292	292	2.0	12	18	10	16
10	Low-Density Residential	1238.1	116	290	488	275	275	275	238	594	999	356	761
11	High-Density Residential	637.4	15	35	116	202	202	202	28	53	174	25	146
12	Urban Landscape	47.1	0.6	18	35	299	359	359	1.2	49	94	48	93
13	Irrigated Grains	82.9	5.3	7.8	6.9	354	354	354	14	21	18	6.7	4.4
14	Urban Commercial	Not within the BBAA											
15	Little San Gorgonio Pass Recharge Basin	0.2	0.01	0.02	16	251	251	377	0.01	0.04	45	0.03	45
16	Noble Creek Recharge Basin	16.9	1.2	127	7835	267	267	401	2.4	253	23380	251	23377

Mass Loading Contribution Summary

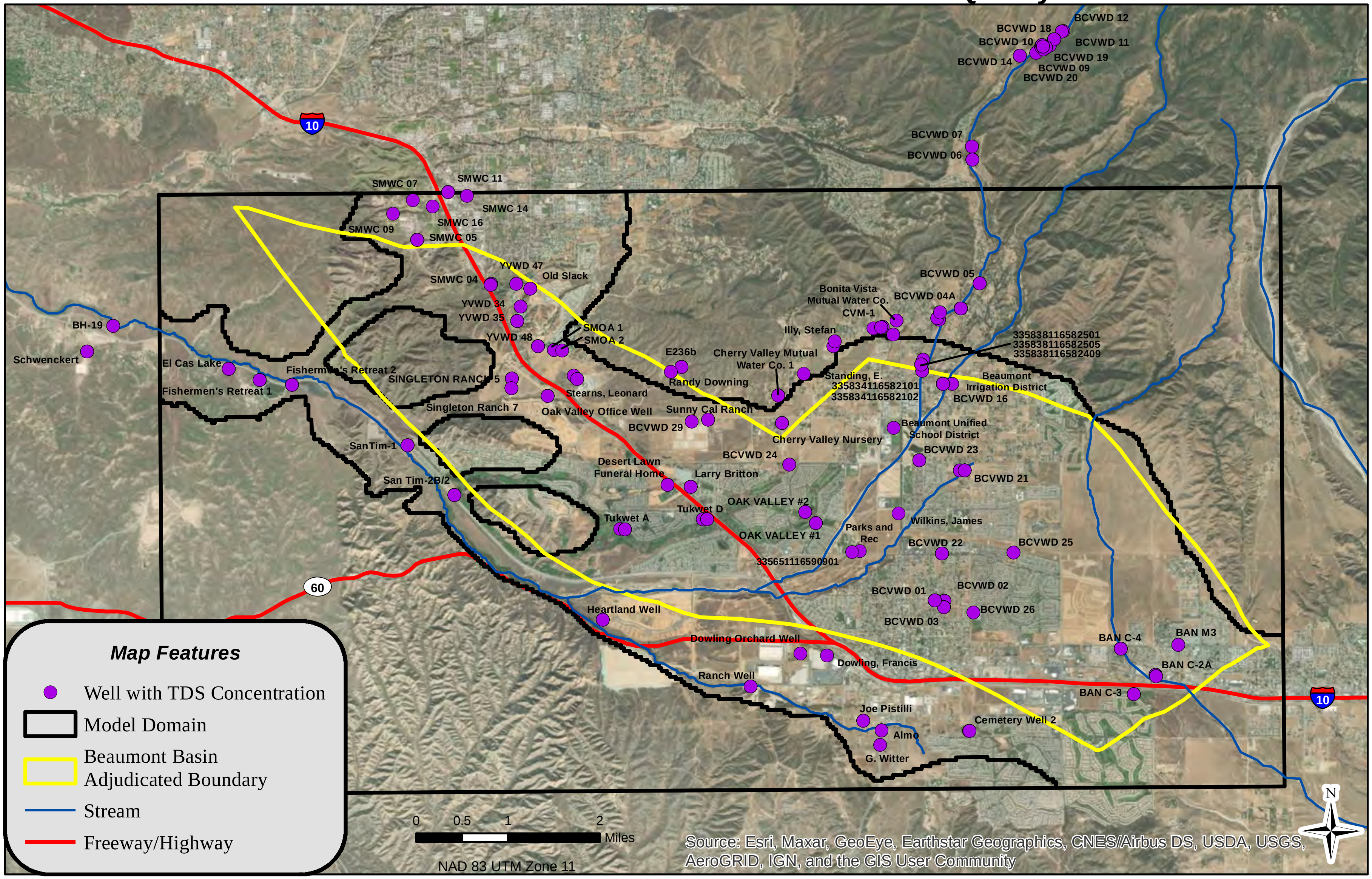
Return Flow Zone	Name of Facility or General Description	Area (acres; within the BBAA only)[1]	Time-Averaged Return Flow Rate (acre-ft/year)			Return Flow Concentration (mg/L)			Time-Averaged Mass Loading Rate (lbs/day)			Mass Loading Contribution Associated with Return Flow and Managed Recharge (lbs/day)	
			Jan. 1927 through Dec. 1959	Jan. 1960 through May 2007	June 2007 through Dec. 2032	Jan. 1927 through Dec. 1959	Jan. 1960 through May 2007	June 2007 through Dec. 2032	Jan. 1927 through Dec. 1959	Jan. 1960 through May 2007	June 2007 through Dec. 2032	Jan. 1960 through May 2007	June 2007 through Dec. 2032
17	High-Density Residential	470.7	0.6	23	21	230	230	230	1.0	40	37	39	36
18	High-Density Residential	28.4	0.3	0.3	0.4	230	230	230	0.5	0.5	0.6	0.004	0.1
19	High-Density Residential	15.8	1.6	1.6	3.2	228	228	228	2.6	2.8	5.4	0.1	2.8
20	Cooper's Creek / San Timoteo Creek	Not within the BBAA											
21	Little San Gorgonio Creek / Noble Creek	33.9	25	116	4178	285	285	399	53	246	12403	193	12350
22	Noble Creek	No recharge assigned to this zone (Noble Creek is lined in this area)											
23	Noble Creek	55.6	16	47	51	228	228	228	27	80	87	53	59
24	Noble Creek	57.4	1.0	1.0	1.0	241	241	241	1.8	1.8	1.8	0.0004	0.0001

Mass Loading Contribution Summary

Return Flow Zone	Name of Facility or General Description	Area (acres; within the BBAA only)[1]	Time-Averaged Return Flow Rate (acre-ft/year)			Return Flow Concentration (mg/L)			Time-Averaged Mass Loading Rate (lbs/day)			Mass Loading Contribution Associated with Return Flow and Managed Recharge (lbs/day)	
			Jan. 1927 through Dec. 1959	Jan. 1960 through May 2007	June 2007 through Dec. 2032	Jan. 1927 through Dec. 1959	Jan. 1960 through May 2007	June 2007 through Dec. 2032	Jan. 1927 through Dec. 1959	Jan. 1960 through May 2007	June 2007 through Dec. 2032	Jan. 1960 through May 2007	June 2007 through Dec. 2032
25	Marshall Creek	83.8	132	389	423	238	238	238	234	689	748	455	514
26	High-Density Residential	1130.1	7.3	163	307	231	231	231	13	281	528	268	516
27	Urban Commercial	510.0	73	92	136	248	297	297	135	204	300	69	165
28	Native Vegetation	Native vegetation - not included in calculation											
29	Urban Landscape	489.0	45	45	226	222	222	222	74	75	374	1.0	300
30	Native Vegetation	Native vegetation - not included in calculation											

Beaumont Basin Watermaster

Analysis of Return Flow Impacts on Groundwater Quality in the Beaumont Basin



Thomas Harder & Co.
Groundwater Consulting

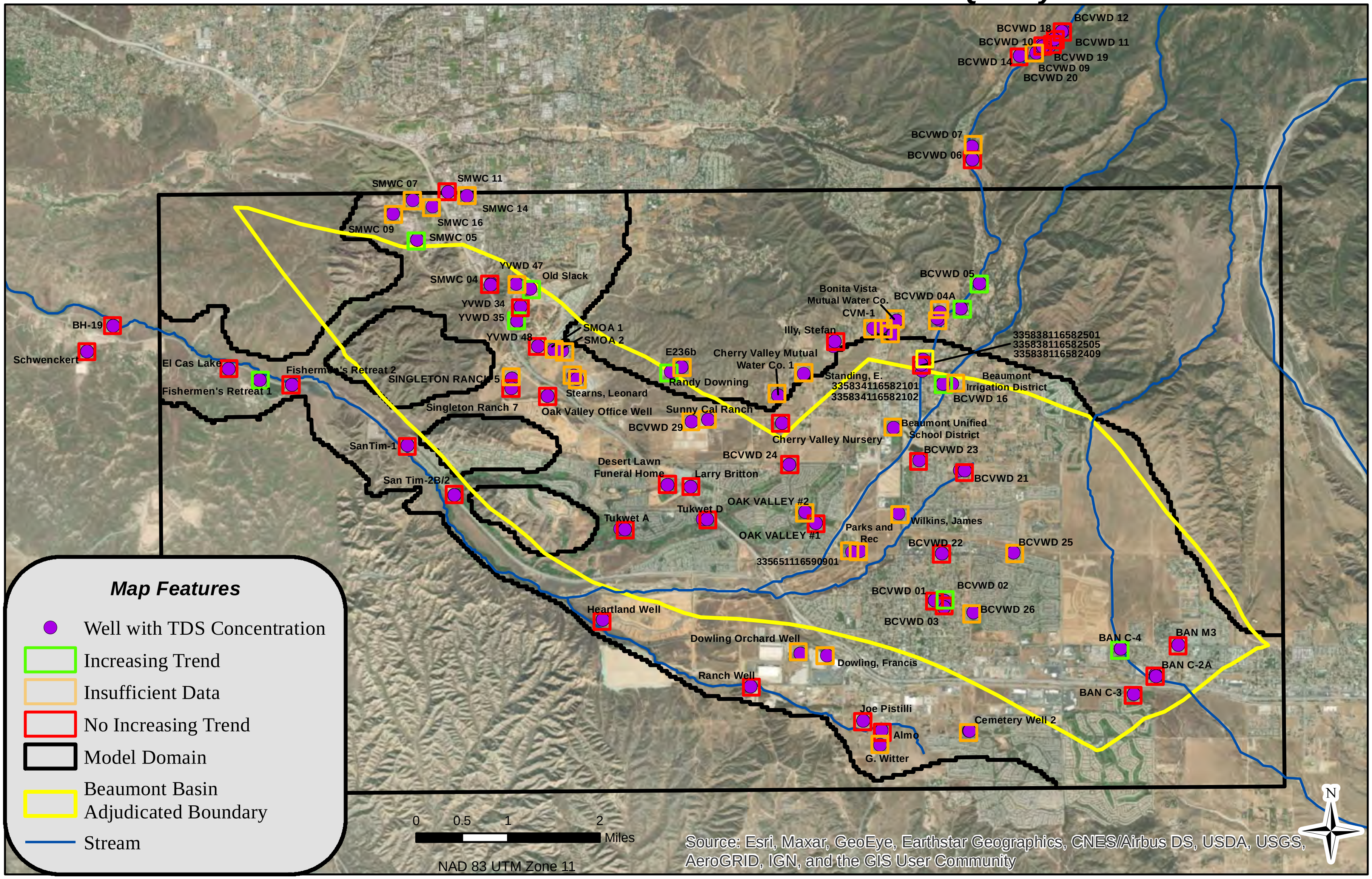
March 2021

Site Location Map

Figure 1

Beaumont Basin Watermaster

Analysis of Return Flow Impacts on Groundwater Quality in the Beaumont Basin



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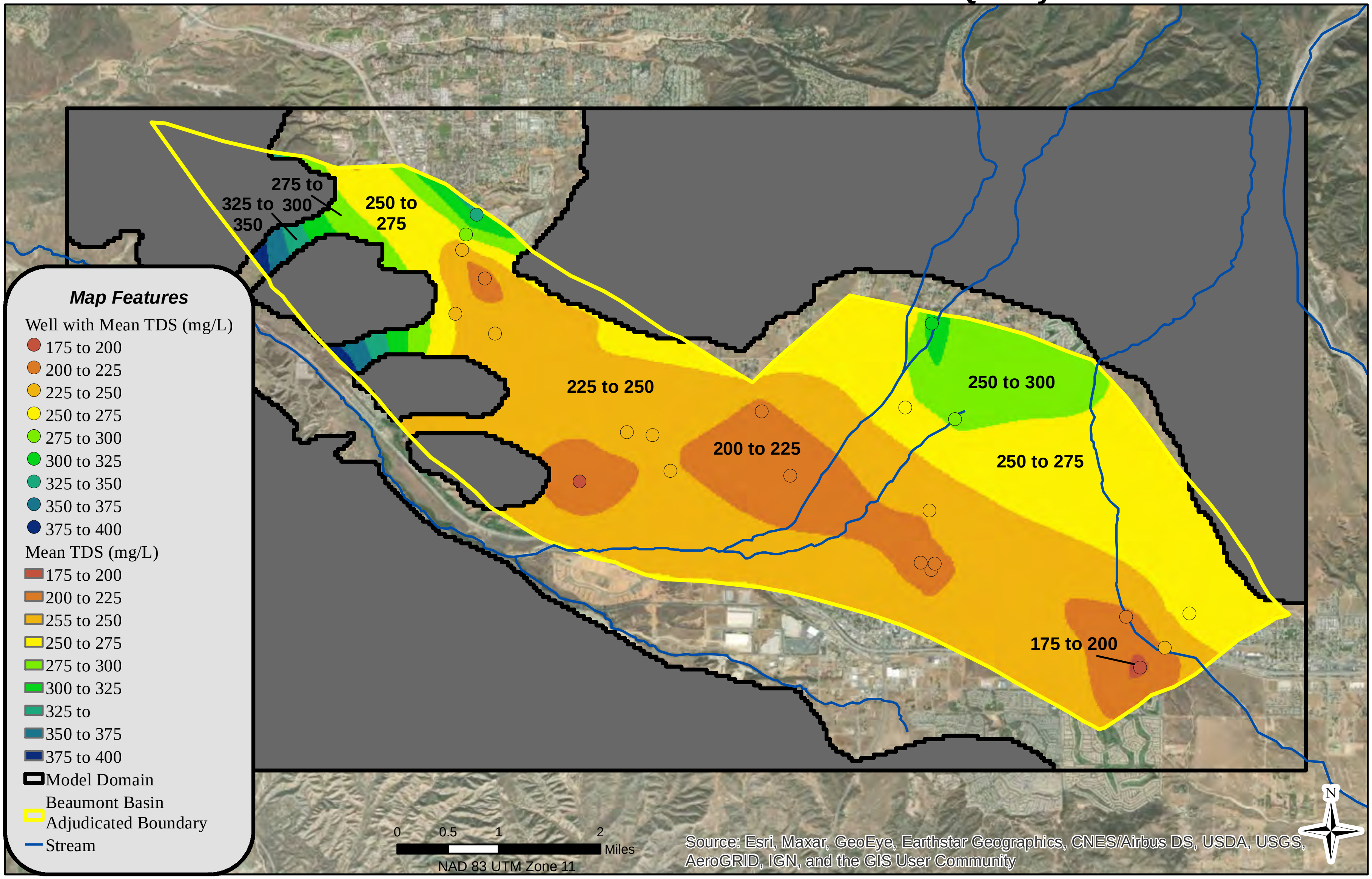
Results of Statistical Analysis

Figure 2

Beaumont Basin Watermaster

Analysis of Return Flow Impacts on Groundwater Quality in the Beaumont Basin



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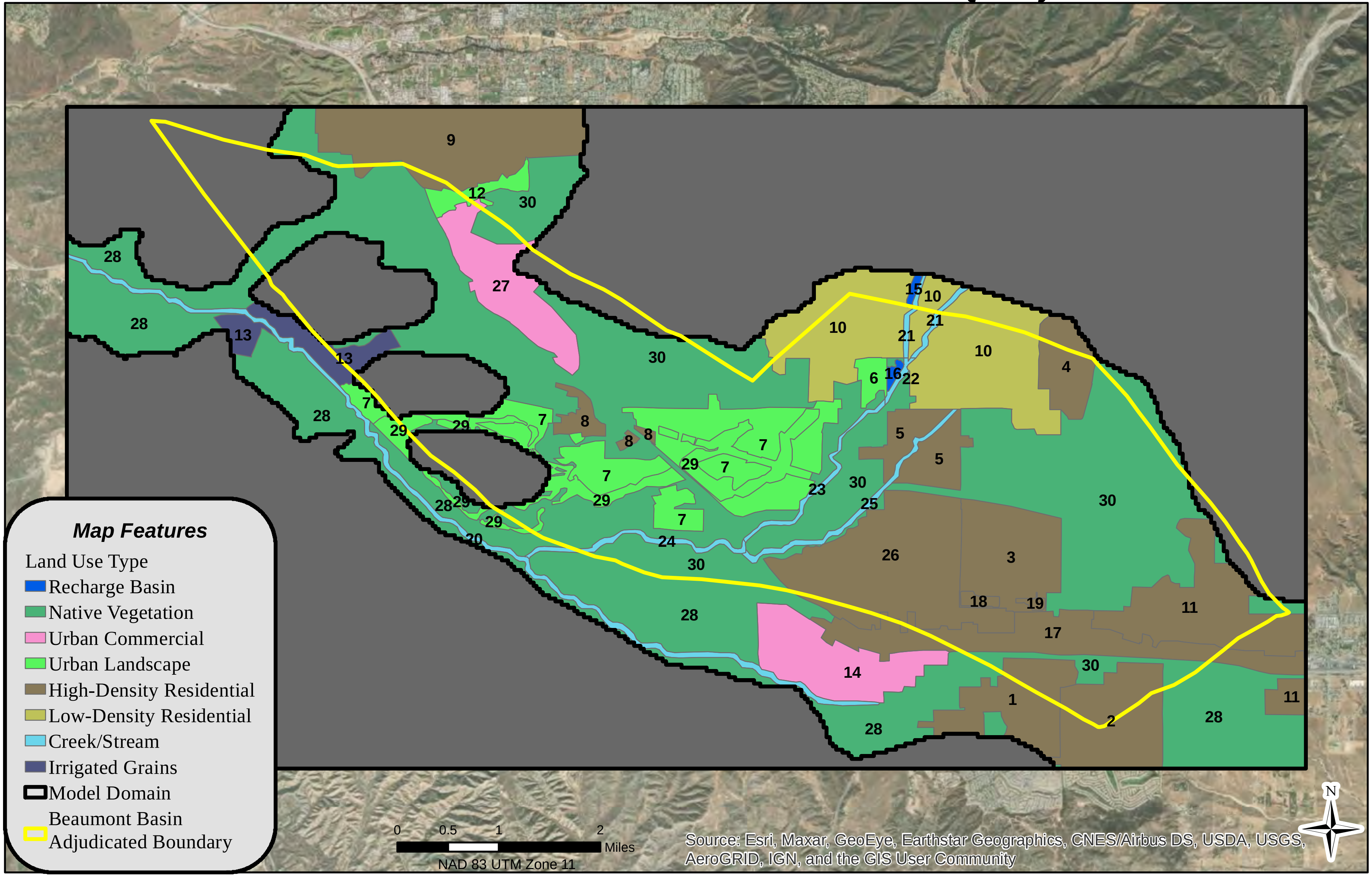
Ambient Concentrations (Initial TDS Concentration Conditions)

Figure 3

Analysis of Return Flow Impacts on Groundwater Quality in the Beaumont Basin



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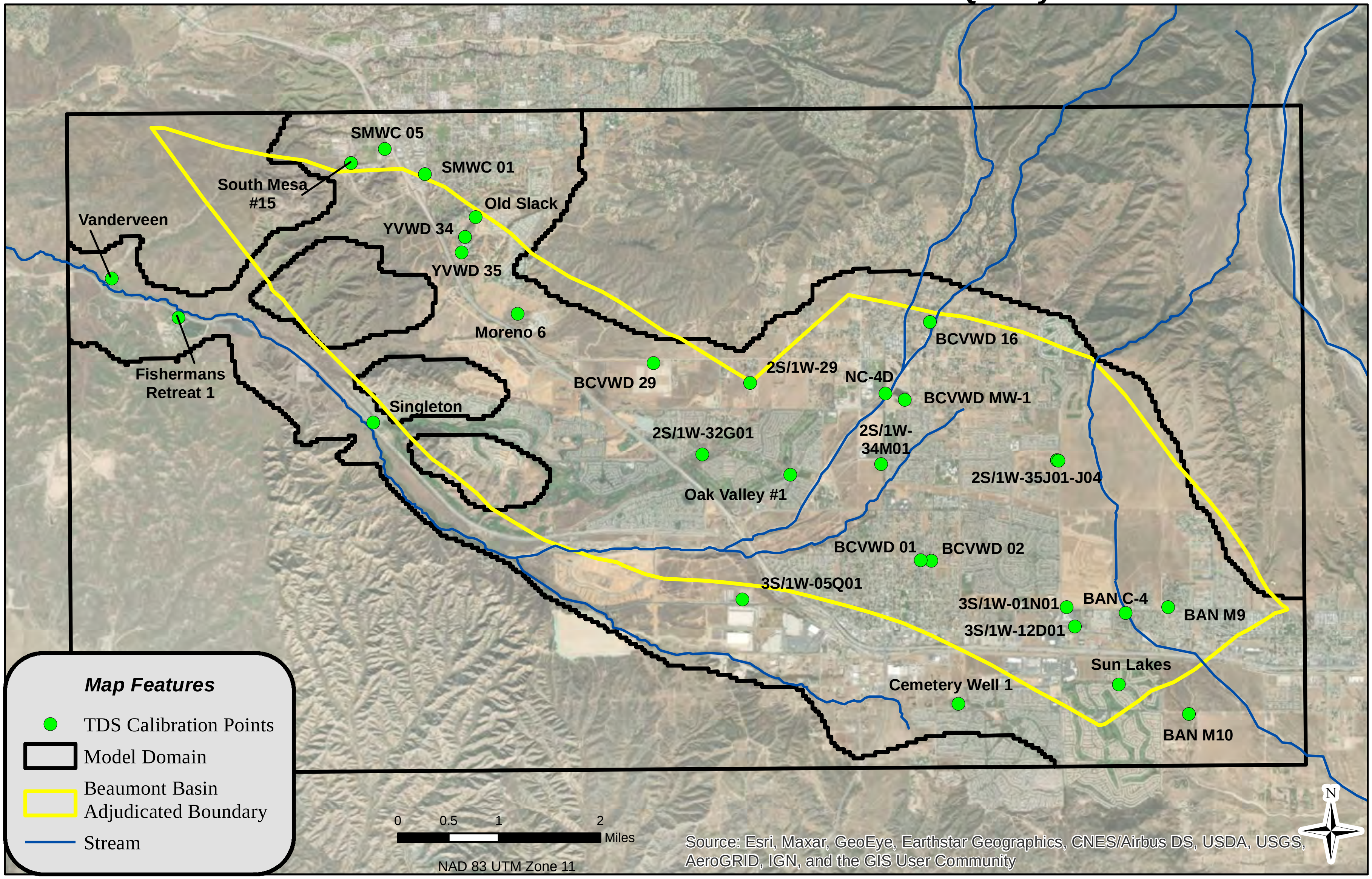
Configuration of Areal Recharge Concentration Boundary Condition Zones

Figure 4

Analysis of Return Flow Impacts on Groundwater Quality in the Beaumont Basin



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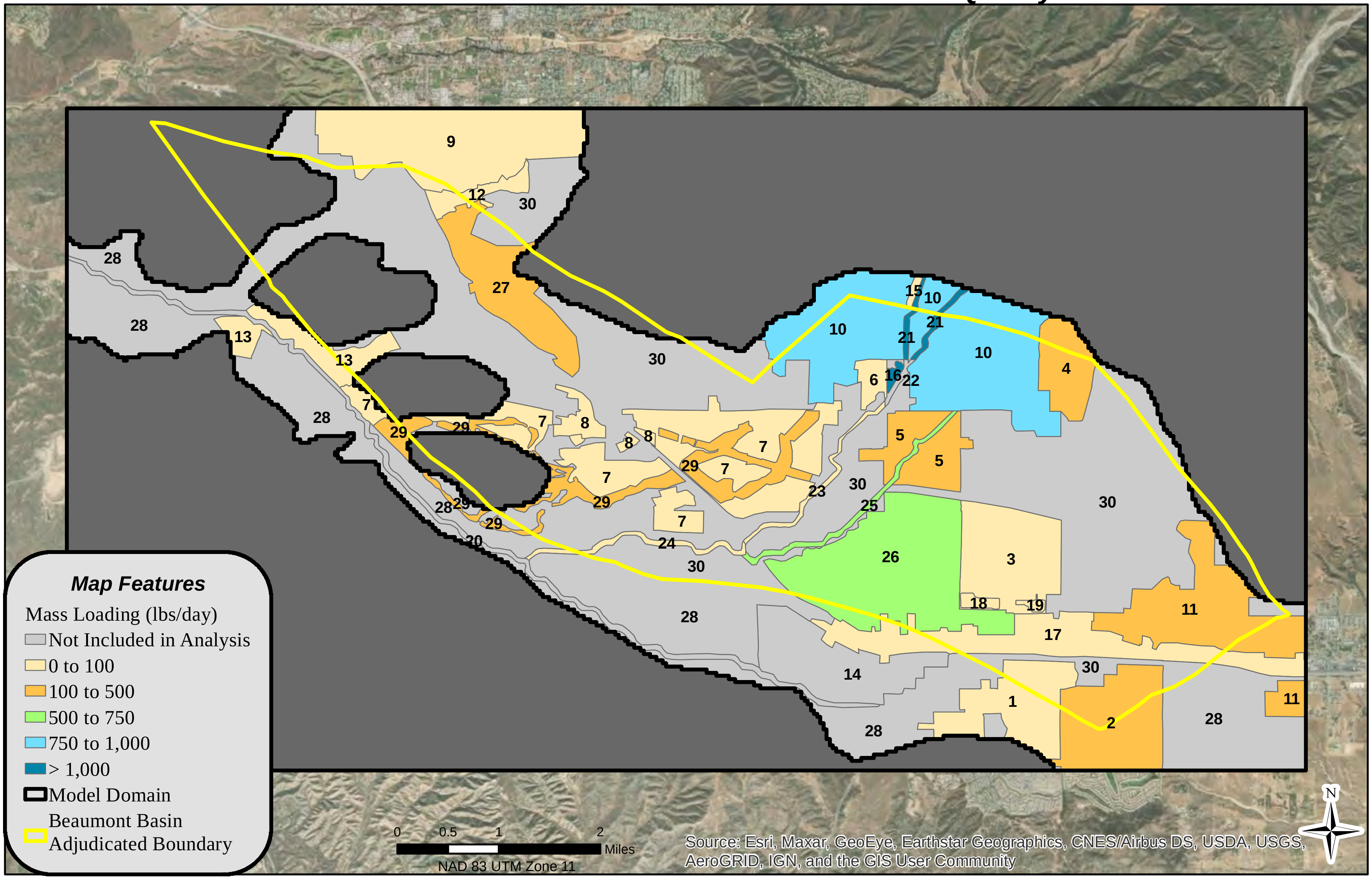
Calibration Well Locations

Figure 5

Beaumont Basin Watermaster

Analysis of Return Flow Impacts on Groundwater Quality in the Beaumont Basin



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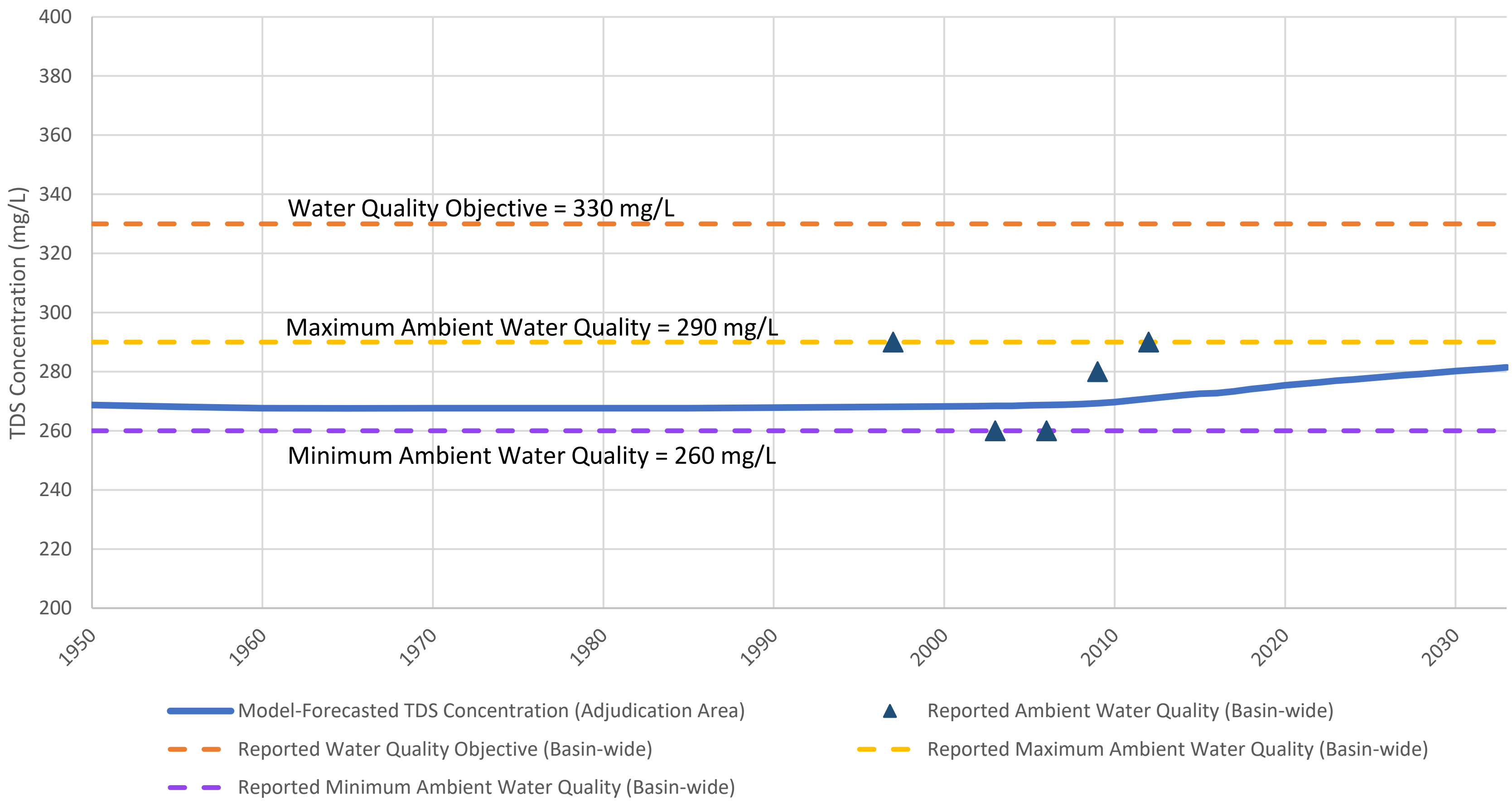
Mass Loading Contribution Associated with Return Flow and Managed Recharge (Jun 2007 through Dec 2032)

Figure 6

Reported and Model-Predicted TDS Concentrations Versus Time



Note: Data from 'Water Quality Objectives, Ambient Water Quality, and Assimilative Capactiy for TDS' table from Wildermuth Environmental Inc, 2014. Prepared for the California State Water Resources Control Board.

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Appendix A - Groundwater Quality Data

Well ID	Well Name	Owner	Sample Date	Analyte	Result	Source
1206844	1	SMOA 1	2/10/2005	TDS	240	Max Benefit
1206844	1	SMOA 1	2/8/2007	TDS	320	Max Benefit
1206854	1	Sunny Cal Ranch	9/22/2006	TDS	310	Max Benefit
1206854	1	Sunny Cal Ranch	11/13/2007	TDS	400	Max Benefit
1206854	1	Sunny Cal Ranch	11/11/2008	TDS	250	Max Benefit
1206845	2	SMOA 2	2/10/2005	TDS	300	Max Benefit
1201558	3	Stearns, Leonard	11/21/1996	TDS	260	SGPWA
1201558	3	Stearns, Leonard	7/14/2003	TDS	280	SGPWA
1003069	4	Stearns, Leonard	11/21/1996	TDS	280	SGPWA
1003069	4	Stearns, Leonard	1/15/2002	TDS	240	SGPWA
1003069	4	Stearns, Leonard	7/14/2003	TDS	260	SGPWA
1207760	335651116590901	USGS	8/28/1997	TDS	223	SGPWA
1207762	335704117014401	USGS	7/29/2005	TDS	203	SGPWA
1207766	335709117004701	USGS	4/4/2000	TDS	219	SGPWA
1207766	335709117004701	USGS	6/15/2000	TDS	221	SGPWA
1207766	335709117004701	USGS	6/24/2004	TDS	207	SGPWA
1207783	335740116575001	USGS	8/28/1997	TDS	281	SGPWA
1207783	335740116575001	USGS	8/10/1999	TDS	273	SGPWA
1207783	335740116575001	USGS	6/25/2001	TDS	267	SGPWA
1207783	335740116575001	USGS	6/10/2003	TDS	281	SGPWA
1207827	335834116582101	USGS	11/30/2007	TDS	300	Max Benefit
1207828	335834116582102	USGS	11/30/2007	TDS	390	Max Benefit
1007031	BAN C-2A	Banning	9/24/1996	TDS	230	Max Benefit
1007031	BAN C-2A	Banning	3/3/1999	TDS	230	Max Benefit
1007031	BAN C-2A	Banning	8/11/1999	TDS	228	Max Benefit
1007031	BAN C-2A	Banning	8/27/2002	TDS	189	Max Benefit
1007031	BAN C-2A	Banning	11/6/2002	TDS	260	Max Benefit
1007031	BAN C-2A	Banning	7/27/2005	TDS	228	Max Benefit
1007031	BAN C-2A	Banning	1/10/2006	TDS	210	Max Benefit
1007031	BAN C-2A	Banning	2/4/2009	TDS	240	Max Benefit
1004377	BAN C-3	Banning	3/2/1990	TDS	185	Max Benefit
1004377	BAN C-3	Banning	3/7/1994	TDS	200	Max Benefit
1004377	BAN C-3	Banning	9/5/1996	TDS	210	Max Benefit
1004377	BAN C-3	Banning	9/24/1996	TDS	106	Max Benefit
1004377	BAN C-3	Banning	3/2/1999	TDS	170	Max Benefit
1004377	BAN C-3	Banning	8/11/1999	TDS	192	Max Benefit
1004377	BAN C-3	Banning	6/14/2000	TDS	194	Max Benefit

Appendix A - Groundwater Quality Data

Well ID	Well Name	Owner	Sample Date	Analyte	Result	Source
1004377	BAN C-3	Banning	11/6/2002	TDS	220	Max Benefit
1004377	BAN C-3	Banning	6/23/2004	TDS	176	Max Benefit
1004377	BAN C-3	Banning	1/11/2006	TDS	180	Max Benefit
1004377	BAN C-3	Banning	2/4/2009	TDS	180	Max Benefit
1206706	BAN C-4	Banning	3/7/1994	TDS	225	Max Benefit
1206706	BAN C-4	Banning	8/28/1995	TDS	230	Max Benefit
1206706	BAN C-4	Banning	9/5/1996	TDS	220	Max Benefit
1206706	BAN C-4	Banning	9/24/1996	TDS	212	Max Benefit
1206706	BAN C-4	Banning	8/18/1998	TDS	212	Max Benefit
1206706	BAN C-4	Banning	3/2/1999	TDS	210	Max Benefit
1206706	BAN C-4	Banning	8/27/2002	TDS	190	Max Benefit
1206706	BAN C-4	Banning	11/6/2002	TDS	230	Max Benefit
1206706	BAN C-4	Banning	7/27/2005	TDS	220	Max Benefit
1206706	BAN C-4	Banning	1/11/2006	TDS	210	Max Benefit
1206706	BAN C-4	Banning	12/20/2011	TDS	240	DDW
1206706	BAN C-4	Banning	3/13/2014	TDS	180	DDW
1206706	BAN C-4	Banning	3/6/2017	TDS	190	DDW
1206706	BAN C-4	Banning	3/11/2020	TDS	200	DDW
1206706	BAN C-4	Banning	1/27/2009	TDS	200	Max Benefit
1206700	BAN M3	Banning	8/18/1998	TDS	243	Max Benefit
1206700	BAN M3	Banning	1/4/2003	TDS	280	Max Benefit
1206700	BAN M3	Banning	1/12/2006	TDS	280	Max Benefit
1206700	BAN M3	Banning	2/3/2009	TDS	250	Max Benefit
	Banning C-2	Banning	1/1/1955	TDS	325	SGPWA
	Banning C-2	Banning	1/1/1963	TDS	303	SGPWA
	Banning C-2	Banning	1/1/1964	TDS	286	SGPWA
	Banning C-2	Banning	1/1/1965	TDS	238	SGPWA
	Banning C-2	Banning	1/1/1966	TDS	229	SGPWA
	Banning C-2	Banning	1/1/1967	TDS	213	SGPWA
	Banning C-2	Banning	1/1/1968	TDS	180	SGPWA
	Banning C-2	Banning	1/1/1969	TDS	233	SGPWA
	Banning C-2	Banning	1/1/1970	TDS	230	SGPWA
	Banning C-2	Banning	1/1/1971	TDS	228	SGPWA
	Banning C-2	Banning	1/1/1972	TDS	220	SGPWA
	Banning C-2	Banning	1/1/1973	TDS	216	SGPWA
	Banning C-2	Banning	1/1/1974	TDS	241	SGPWA
	Banning C-2	Banning	1/1/1975	TDS	217	SGPWA

Appendix A - Groundwater Quality Data

Well ID	Well Name	Owner	Sample Date	Analyte	Result	Source
	Banning C-2	Banning	1/1/1976	TDS	231	SGPWA
	Banning C-2	Banning	1/1/1977	TDS	216	SGPWA
	Banning C-2	Banning	1/1/1978	TDS	217	SGPWA
	Banning C-2	Banning	1/1/1985	TDS	205	SGPWA
1004351	BCVWD 01	BCVWD	1/1/1955	TDS	295	SGPWA
1004351	BCVWD 01	BCVWD	1/1/1957	TDS	263	SGPWA
1004351	BCVWD 01	BCVWD	1/11/1961	TDS	235	Max Benefit
1004351	BCVWD 01	BCVWD	1/1/1963	TDS	285	SGPWA
1004351	BCVWD 01	BCVWD	4/6/1965	TDS	217	Max Benefit
1004351	BCVWD 01	BCVWD	9/23/1966	TDS	208	Max Benefit
1004351	BCVWD 01	BCVWD	4/14/1967	TDS	199	Max Benefit
1004351	BCVWD 01	BCVWD	10/10/1967	TDS	184	Max Benefit
1004351	BCVWD 01	BCVWD	4/23/1968	TDS	200	Max Benefit
1004351	BCVWD 01	BCVWD	10/23/1968	TDS	171	Max Benefit
1004351	BCVWD 01	BCVWD	5/11/1969	TDS	233	Max Benefit
1004351	BCVWD 01	BCVWD	10/26/1969	TDS	120	Max Benefit
1004351	BCVWD 01	BCVWD	4/24/1970	TDS	230	Max Benefit
1004351	BCVWD 01	BCVWD	11/23/1970	TDS	248	Max Benefit
1004351	BCVWD 01	BCVWD	5/4/1971	TDS	172	Max Benefit
1004351	BCVWD 01	BCVWD	11/12/1971	TDS	228	Max Benefit
1004351	BCVWD 01	BCVWD	5/19/1972	TDS	184	Max Benefit
1004351	BCVWD 01	BCVWD	5/18/1973	TDS	190	Max Benefit
1004351	BCVWD 01	BCVWD	9/16/1973	TDS	222	Max Benefit
1004351	BCVWD 01	BCVWD	5/19/1974	TDS	198	Max Benefit
1004351	BCVWD 01	BCVWD	9/30/1974	TDS	240	Max Benefit
1004351	BCVWD 01	BCVWD	2/12/1975	TDS	185	Max Benefit
1004351	BCVWD 01	BCVWD	5/11/1975	TDS	217	Max Benefit
1004351	BCVWD 01	BCVWD	11/2/1975	TDS	210	Max Benefit
1004351	BCVWD 01	BCVWD	5/23/1976	TDS	231	Max Benefit
1004351	BCVWD 01	BCVWD	10/3/1976	TDS	166	Max Benefit
1004351	BCVWD 01	BCVWD	1/26/1978	TDS	225	Max Benefit
1004351	BCVWD 01	BCVWD	11/4/1978	TDS	217	SGPWA
1004351	BCVWD 01	BCVWD	8/18/1982	TDS	230	Max Benefit
1004351	BCVWD 01	BCVWD	6/28/1991	TDS	215	Max Benefit
1004351	BCVWD 01	BCVWD	3/30/2004	TDS	230	Max Benefit
1004351	BCVWD 01	BCVWD	6/20/2007	TDS	260	Max Benefit
1004351	BCVWD 01	BCVWD	3/24/2010	TDS	220	Max Benefit

Appendix A - Groundwater Quality Data

Well ID	Well Name	Owner	Sample Date	Analyte	Result	Source
1004351	BCVWD 01	BCVWD	5/10/2011	TDS	257	Max Benefit
1004351	BCVWD 01	BCVWD	7/19/2011	TDS	236	Max Benefit
1004349	BCVWD 02	BCVWD	11/4/1978	TDS	216	SGPWA
1004349	BCVWD 02	BCVWD	8/18/1982	TDS	240	SGPWA
1004349	BCVWD 02	BCVWD	7/12/1991	TDS	285	SGPWA
1004349	BCVWD 02	BCVWD	9/7/1994	TDS	235	SGPWA
1004349	BCVWD 02	BCVWD	6/23/1997	TDS	250	SGPWA
1004349	BCVWD 02	BCVWD	8/17/1998	TDS	222	SGPWA
1004349	BCVWD 02	BCVWD	5/13/1999	TDS	220	SGPWA
1004349	BCVWD 02	BCVWD	1/8/2001	TDS	210	SGPWA
1004349	BCVWD 02	BCVWD	6/27/2001	TDS	220	SGPWA
1004349	BCVWD 02	BCVWD	10/24/2003	TDS	200	SGPWA
1004350	BCVWD 03	BCVWD	11/12/1971	TDS	234	Max Benefit
1004350	BCVWD 03	BCVWD	6/25/1975	TDS	190	Max Benefit
1004350	BCVWD 03	BCVWD	5/23/1976	TDS	249	Max Benefit
1004350	BCVWD 03	BCVWD	9/25/1985	TDS	200	SGPWA
1004350	BCVWD 03	BCVWD	7/25/1995	TDS	210	Max Benefit
1004350	BCVWD 03	BCVWD	8/28/1997	TDS	188	Max Benefit
1004350	BCVWD 03	BCVWD	8/28/1998	TDS	230	Max Benefit
1004350	BCVWD 03	BCVWD	8/10/1999	TDS	176	Max Benefit
1004350	BCVWD 03	BCVWD	6/14/2000	TDS	186	Max Benefit
1004350	BCVWD 03	BCVWD	7/6/2001	TDS	190	Max Benefit
1004350	BCVWD 03	BCVWD	6/23/2004	TDS	175	Max Benefit
1004350	BCVWD 03	BCVWD	7/5/2005	TDS	200	Max Benefit
1004350	BCVWD 03	BCVWD	6/20/2007	TDS	180	Max Benefit
1004350	BCVWD 03	BCVWD	3/24/2010	TDS	190	Max Benefit
1004350	BCVWD 03	BCVWD	5/10/2011	TDS	242	Max Benefit
1002938	BCVWD 16	BCVWD	8/14/1964	TDS	413	Max Benefit
1002938	BCVWD 16	BCVWD	4/6/1965	TDS	236	Max Benefit
1002938	BCVWD 16	BCVWD	10/8/1965	TDS	327	Max Benefit
1002938	BCVWD 16	BCVWD	9/23/1966	TDS	320	Max Benefit
1002938	BCVWD 16	BCVWD	10/10/1967	TDS	313	Max Benefit
1002938	BCVWD 16	BCVWD	4/23/1968	TDS	314	Max Benefit
1002938	BCVWD 16	BCVWD	4/24/1970	TDS	319	Max Benefit
1002938	BCVWD 16	BCVWD	5/19/1972	TDS	269	Max Benefit
1002938	BCVWD 16	BCVWD	11/7/1972	TDS	306	Max Benefit
1002938	BCVWD 16	BCVWD	9/16/1973	TDS	291	Max Benefit

Appendix A - Groundwater Quality Data

Well ID	Well Name	Owner	Sample Date	Analyte	Result	Source
1002938	BCVWD 16	BCVWD	2/12/1975	TDS	305	Max Benefit
1002938	BCVWD 16	BCVWD	3/6/1979	TDS	305	Max Benefit
1002938	BCVWD 16	BCVWD	9/25/1985	TDS	230	SGPWA
1002938	BCVWD 16	BCVWD	7/1/1991	TDS	230	Max Benefit
1002938	BCVWD 16	BCVWD	9/7/1994	TDS	320	Max Benefit
1002938	BCVWD 16	BCVWD	7/25/1995	TDS	330	Max Benefit
1002938	BCVWD 16	BCVWD	8/28/1997	TDS	334	Max Benefit
1002938	BCVWD 16	BCVWD	8/18/1998	TDS	325	Max Benefit
1002938	BCVWD 16	BCVWD	8/28/1998	TDS	340	Max Benefit
1002938	BCVWD 16	BCVWD	1/8/2001	TDS	310	Max Benefit
1002938	BCVWD 16	BCVWD	6/26/2001	TDS	328	Max Benefit
1002938	BCVWD 16	BCVWD	6/10/2003	TDS	320	Max Benefit
1002938	BCVWD 16	BCVWD	7/5/2005	TDS	330	Max Benefit
1002938	BCVWD 16	BCVWD	7/7/2005	TDS	360	Max Benefit
1002938	BCVWD 16	BCVWD	8/2/2005	TDS	319	Max Benefit
1002938	BCVWD 16	BCVWD	3/30/2007	TDS	324	Max Benefit
1002938	BCVWD 16	BCVWD	6/20/2007	TDS	340	Max Benefit
1002938	BCVWD 16	BCVWD	3/24/2010	TDS	380	Max Benefit
1002938	BCVWD 16	BCVWD	5/26/2011	TDS	415	Max Benefit
1002938	BCVWD 16	BCVWD	5/26/2011	TDS	410	Max Benefit
1201487	BCVWD 21	BCVWD	11/9/1988	TDS	290	Max Benefit
1201487	BCVWD 21	BCVWD	6/28/1991	TDS	275	Max Benefit
1201487	BCVWD 21	BCVWD	9/7/1994	TDS	265	Max Benefit
1201487	BCVWD 21	BCVWD	6/16/1997	TDS	270	Max Benefit
1201487	BCVWD 21	BCVWD	8/28/1997	TDS	281	Max Benefit
1201487	BCVWD 21	BCVWD	8/10/1999	TDS	273	Max Benefit
1201487	BCVWD 21	BCVWD	10/24/2000	TDS	290	Max Benefit
1201487	BCVWD 21	BCVWD	6/25/2001	TDS	267	Max Benefit
1201487	BCVWD 21	BCVWD	6/10/2003	TDS	281	Max Benefit
1201487	BCVWD 21	BCVWD	10/24/2003	TDS	250	Max Benefit
1201487	BCVWD 21	BCVWD	7/7/2005	TDS	300	Max Benefit
1201487	BCVWD 21	BCVWD	5/9/2006	TDS	270	Max Benefit
1201487	BCVWD 21	BCVWD	3/31/2009	TDS	290	Max Benefit
1201487	BCVWD 21	BCVWD	5/11/2011	TDS	318	Max Benefit
1201487	BCVWD 21	BCVWD	7/19/2011	TDS	322	Max Benefit
1002966	BCVWD 22	BCVWD	1/11/1961	TDS	243	Max Benefit
1002966	BCVWD 22	BCVWD	10/8/1965	TDS	225	Max Benefit

Appendix A - Groundwater Quality Data

Well ID	Well Name	Owner	Sample Date	Analyte	Result	Source
1002966	BCVWD 22	BCVWD	4/23/1968	TDS	222	Max Benefit
1002966	BCVWD 22	BCVWD	10/23/1968	TDS	206	Max Benefit
1002966	BCVWD 22	BCVWD	4/24/1970	TDS	253	Max Benefit
1002966	BCVWD 22	BCVWD	5/4/1971	TDS	224	Max Benefit
1002966	BCVWD 22	BCVWD	5/19/1972	TDS	205	Max Benefit
1002966	BCVWD 22	BCVWD	5/18/1973	TDS	221	Max Benefit
1002966	BCVWD 22	BCVWD	5/19/1974	TDS	213	Max Benefit
1002966	BCVWD 22	BCVWD	9/30/1974	TDS	228	Max Benefit
1002966	BCVWD 22	BCVWD	5/11/1975	TDS	242	Max Benefit
1002966	BCVWD 22	BCVWD	5/23/1976	TDS	248	Max Benefit
1002966	BCVWD 22	BCVWD	10/3/1976	TDS	108	Max Benefit
1002966	BCVWD 22	BCVWD	9/15/1998	TDS	239	Max Benefit
1002966	BCVWD 22	BCVWD	10/24/2003	TDS	210	Max Benefit
1002966	BCVWD 22	BCVWD	7/5/2005	TDS	230	Max Benefit
1002966	BCVWD 22	BCVWD	6/20/2007	TDS	220	Max Benefit
1002966	BCVWD 22	BCVWD	3/24/2010	TDS	200	Max Benefit
1002966	BCVWD 22	BCVWD	5/11/2011	TDS	273	Max Benefit
1207328	BCVWD 23	BCVWD	3/6/2006	TDS	240	Max Benefit
1207328	BCVWD 23	BCVWD	5/9/2006	TDS	260	Max Benefit
1207328	BCVWD 23	BCVWD	3/31/2009	TDS	240	Max Benefit
1207328	BCVWD 23	BCVWD	5/11/2011	TDS	307	Max Benefit
1207328	BCVWD 23	BCVWD	7/19/2011	TDS	287	Max Benefit
1208224	BCVWD 24	BCVWD	9/23/2005	TDS	220	Max Benefit
1208224	BCVWD 24	BCVWD	6/11/2008	TDS	200	Max Benefit
1208224	BCVWD 24	BCVWD	5/11/2011	TDS	245	Max Benefit
1208224	BCVWD 24	BCVWD	11/30/2011	TDS	180	Max Benefit
1220057	BCVWD 25	BCVWD	6/11/2009	TDS	220	Max Benefit
1220057	BCVWD 25	BCVWD	5/11/2011	TDS	269	Max Benefit
1220058	BCVWD 26	BCVWD	3/31/2009	TDS	200	Max Benefit
1220058	BCVWD 26	BCVWD	5/10/2011	TDS	233	Max Benefit
1220058	BCVWD 26	BCVWD	7/19/2011	TDS	232	Max Benefit
1201480	BCVWD 29	BCVWD	6/11/2009	TDS	220	Max Benefit
1201480	BCVWD 29	BCVWD	5/11/2011	TDS	265	Max Benefit
1206995	A	Tukwet Canyon Golf Club	1/16/2003	TDS	190	Max Benefit
1206995	A	Tukwet Canyon Golf Club	7/29/2005	TDS	203	Max Benefit

Appendix A - Groundwater Quality Data

Well ID	Well Name	Owner	Sample Date	Analyte	Result	Source
1206995	A	Tukwet Canyon Golf Club	1/5/2006	TDS	280	Max Benefit
1206995	A	Tukwet Canyon Golf Club	12/3/2007	TDS	210	Max Benefit
1206995	A	Tukwet Canyon Golf Club	11/19/2008	TDS	180	Max Benefit
1206995	A	Tukwet Canyon Golf Club	10/18/2010	TDS	190	Max Benefit
1206995	A	Tukwet Canyon Golf Club	3/31/2011	TDS	224	Max Benefit
1206996	D	Tukwet Canyon Golf Club	4/4/2000	TDS	219	Max Benefit
1206996	D	Tukwet Canyon Golf Club	6/15/2000	TDS	221	Max Benefit
1206996	D	Tukwet Canyon Golf Club	6/24/2004	TDS	207	Max Benefit
1206996	D	Tukwet Canyon Golf Club	11/19/2008	TDS	220	Max Benefit
1206996	D	Tukwet Canyon Golf Club	10/13/2009	TDS	250	Max Benefit
1206996	D	Tukwet Canyon Golf Club	3/31/2011	TDS	243	Max Benefit
1002958	N/A	Desert Lawn Funernal Home	9/21/2006	TDS	250	Max Benefit
1002958	N/A	Desert Lawn Funernal Home	11/7/2007	TDS	220	Max Benefit
1002958	N/A	Desert Lawn Funernal Home	11/11/2008	TDS	240	Max Benefit
1002958	N/A	Desert Lawn Funernal Home	3/2/2011	TDS	265	Max Benefit
1002965	N/A	Wilkins, James	6/13/2000	TDS	249	SGPWA
1007025	OAK VALLEY #1	Oak Valley Partners	11/20/1997	TDS	208	Max Benefit
1007025	OAK VALLEY #1	Oak Valley Partners	8/17/1998	TDS	211	Max Benefit
1007025	OAK VALLEY #1	Oak Valley Partners	8/12/1999	TDS	211	Max Benefit
1007025	OAK VALLEY #1	Oak Valley Partners	11/28/2006	TDS	160	Max Benefit
1007025	OAK VALLEY #1	Oak Valley Partners	11/27/2007	TDS	190	Max Benefit
1007025	OAK VALLEY #1	Oak Valley Partners	10/13/2009	TDS	210	Max Benefit

Appendix A - Groundwater Quality Data

Well ID	Well Name	Owner	Sample Date	Analyte	Result	Source
1007025	OAK VALLEY #1	Oak Valley Partners	3/2/2011	TDS	233	Max Benefit
1207769	OAK VALLEY #2	Oak Valley Partners	10/13/2009	TDS	200	Max Benefit
1207769	OAK VALLEY #2	Oak Valley Partners	10/18/2010	TDS	190	Max Benefit
1207769	OAK VALLEY #2	Oak Valley Partners	3/2/2011	TDS	223	Max Benefit
1201561	Oak Valley Office Well	Oak Valley Partners	9/21/2006	TDS	210	Max Benefit
1201561	Oak Valley Office Well	Oak Valley Partners	11/9/2007	TDS	240	Max Benefit
1201561	Oak Valley Office Well	Oak Valley Partners	11/11/2008	TDS	270	Max Benefit
1201561	Oak Valley Office Well	Oak Valley Partners	3/17/2011	TDS	266	Max Benefit
1003056	Old Slack	YVWD	6/22/1989	TDS	180	SGPWA
1003056	Old Slack	YVWD	7/6/1994	TDS	305	SGPWA
1003056	Old Slack	YVWD	2/13/1997	TDS	322	SGPWA
1003056	Old Slack	YVWD	2/2/2000	TDS	330	SGPWA
1003056	Old Slack	YVWD	3/31/2003	TDS	360	SGPWA
1207014	Parks and Rec	Beaumont-Cherry Valley Recreation And Parks District	6/27/2001	TDS	210	SGPWA
1003075	SINGLETON RANCH 5	Oak Valley Partners	9/21/2006	TDS	180	Max Benefit
1003075	SINGLETON RANCH 5	Oak Valley Partners	10/6/2009	TDS	100	Max Benefit
1003072	Singleton Ranch 7	Oak Valley Partners	9/21/2006	TDS	250	Max Benefit
1003072	Singleton Ranch 7	Oak Valley Partners	11/9/2007	TDS	190	Max Benefit
1003072	Singleton Ranch 7	Oak Valley Partners	11/11/2008	TDS	240	Max Benefit
1003072	Singleton Ranch 7	Oak Valley Partners	10/12/2010	TDS	250	Max Benefit
1003072	Singleton Ranch 7	Oak Valley Partners	3/1/2011	TDS	281	Max Benefit
1003035	SMWC 04	SMWC	7/17/1997	TDS	186	Max Benefit
1003035	SMWC 04	SMWC	9/10/2003	TDS	187	Max Benefit
1003035	SMWC 04	SMWC	3/31/2004	TDS	180	Max Benefit
1003035	SMWC 04	SMWC	3/6/2007	TDS	180	Max Benefit

Appendix A - Groundwater Quality Data

Well ID	Well Name	Owner	Sample Date	Analyte	Result	Source
1003035	SMWC 04	SMWC	3/22/2010	TDS	310	Max Benefit
1003034	SMWC 2ND NO. 4 WELL	SMWC	9/15/1987	TDS	247	SGPWA
1003034	SMWC 2ND NO. 4 WELL	SMWC	2/27/1990	TDS	156	SGPWA
1003034	SMWC 2ND NO. 4 WELL	SMWC	1/28/1993	TDS	240	SGPWA
1003034	SMWC 2ND NO. 4 WELL	SMWC	1/19/1996	TDS	162	SGPWA
1003034	SMWC 2ND NO. 4 WELL	SMWC	8/21/1998	TDS	184	SGPWA
1003034	SMWC 2ND NO. 4 WELL	SMWC	2/19/2001	TDS	160	SGPWA
1003059	YVWD 34	YVWD	5/16/1979	TDS	261	SGPWA
1003059	YVWD 34	YVWD	5/30/1980	TDS	145	SGPWA
1003059	YVWD 34	YVWD	7/6/1994	TDS	305	SGPWA
1003059	YVWD 34	YVWD	5/4/2000	TDS	355	SGPWA
1003059	YVWD 34	YVWD	6/25/2004	TDS	356	SGPWA
1003058	YVWD 35	YVWD	8/2/1961	TDS	252	SGPWA
1003058	YVWD 35	YVWD	10/19/1966	TDS	180	Max Benefit
1003058	YVWD 35	YVWD	5/8/1967	TDS	196	Max Benefit
1003058	YVWD 35	YVWD	10/9/1967	TDS	179	Max Benefit
1003058	YVWD 35	YVWD	4/30/1968	TDS	222	Max Benefit
1003058	YVWD 35	YVWD	10/18/1968	TDS	170	Max Benefit
1003058	YVWD 35	YVWD	5/1/1969	TDS	211	Max Benefit
1003058	YVWD 35	YVWD	10/28/1969	TDS	170	Max Benefit
1003058	YVWD 35	YVWD	4/17/1970	TDS	181	Max Benefit
1003058	YVWD 35	YVWD	11/24/1970	TDS	165	Max Benefit
1003058	YVWD 35	YVWD	11/1/1971	TDS	233	Max Benefit
1003058	YVWD 35	YVWD	5/19/1972	TDS	228	Max Benefit
1003058	YVWD 35	YVWD	5/3/1973	TDS	149	Max Benefit
1003058	YVWD 35	YVWD	10/21/1973	TDS	180	Max Benefit
1003058	YVWD 35	YVWD	5/9/1974	TDS	175	Max Benefit
1003058	YVWD 35	YVWD	4/28/1976	TDS	300	Max Benefit
1003058	YVWD 35	YVWD	5/20/1976	TDS	208	Max Benefit
1003058	YVWD 35	YVWD	9/24/1976	TDS	245	Max Benefit
1003058	YVWD 35	YVWD	5/16/1977	TDS	261	Max Benefit
1003058	YVWD 35	YVWD	5/16/1979	TDS	261	Max Benefit
1003058	YVWD 35	YVWD	5/27/1980	TDS	255	Max Benefit

Appendix A - Groundwater Quality Data

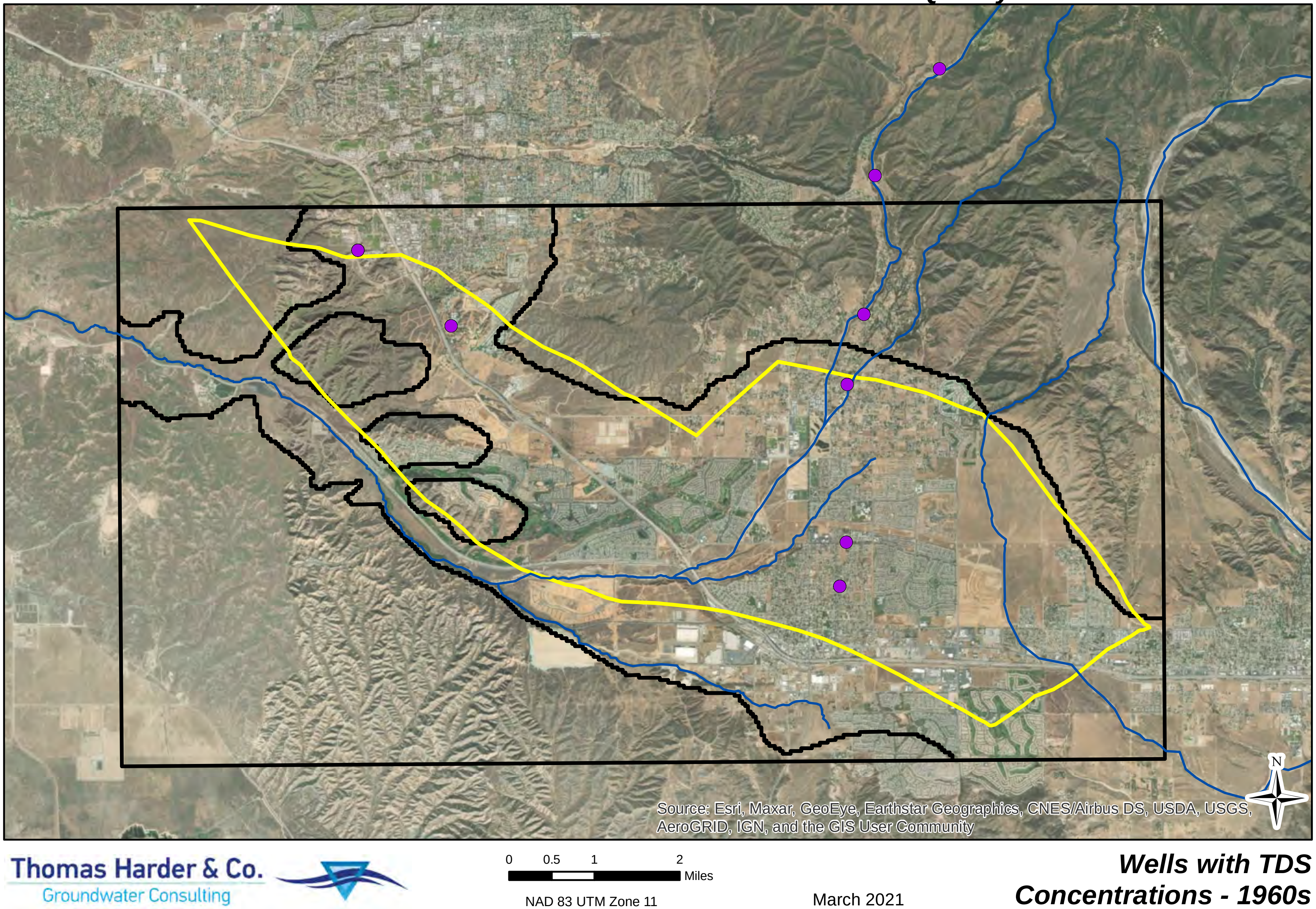
Well ID	Well Name	Owner	Sample Date	Analyte	Result	Source
1003058	YVWD 35	YVWD	1/24/1990	TDS	384	Max Benefit
1003058	YVWD 35	YVWD	1/5/1994	TDS	294	Max Benefit
1003058	YVWD 35	YVWD	2/13/1997	TDS	322	
1003058	YVWD 35	YVWD	2/2/2000	TDS	330	
1003058	YVWD 35	YVWD	3/31/2003	TDS	360	Max Benefit
1003058	YVWD 35	YVWD	1/30/2006	TDS	360	
1003058	YVWD 35	YVWD	11/21/2006	TDS	280	
1003058	YVWD 35	YVWD	8/23/2007	TDS	340	Max Benefit
1003058	YVWD 35	YVWD	8/20/2008	TDS	220	Max Benefit
1003058	YVWD 35	YVWD	8/20/2009	TDS	340	Max Benefit
1003020	YVWD 47	YVWD	2/15/1982	TDS	230	SGPWA
1003020	YVWD 47	YVWD	3/17/1988	TDS	218	SGPWA
1003063	YVWD 48	YVWD	4/26/1990	TDS	204	Max Benefit
1003063	YVWD 48	YVWD	7/16/1997	TDS	213	Max Benefit
1003063	YVWD 48	YVWD	9/18/1997	TDS	190	Max Benefit
1003063	YVWD 48	YVWD	6/15/2000	TDS	214	Max Benefit
1003063	YVWD 48	YVWD	7/26/2000	TDS	212	Max Benefit
1003063	YVWD 48	YVWD	6/12/2003	TDS	227	Max Benefit
1003063	YVWD 48	YVWD	8/14/2003	TDS	220	Max Benefit
1003063	YVWD 48	YVWD	8/17/2006	TDS	170	Max Benefit
1003063	YVWD 48	YVWD	8/16/2007	TDS	200	Max Benefit
1003063	YVWD 48	YVWD	8/21/2008	TDS	220	Max Benefit
1003063	YVWD 48	YVWD	8/6/2009	TDS	180	Max Benefit
1003063	YVWD 48	YVWD	4/27/2011	TDS	200	Max Benefit
1003063	YVWD 48	YVWD	8/9/2011	TDS	220	Max Benefit
1002939	NA	Beaumont Irrigation District	7/1/1991	TDS	230	SGPWA
1002939	NA	Beaumont Irrigation District	9/7/1994	TDS	320	SGPWA
1002939	NA	Beaumont Irrigation District	7/25/1995	TDS	330	SGPWA
1002939	NA	Beaumont Irrigation District	8/28/1998	TDS	340	SGPWA
1002939	NA	Beaumont Irrigation District	1/8/2001	TDS	310	SGPWA
1201486	NA	Larry Britton	9/21/2006	TDS	200	Max Benefit
1201486	NA	Larry Britton	11/7/2007	TDS	230	Max Benefit
1201486	NA	Larry Britton	11/18/2008	TDS	250	Max Benefit

Appendix A - Groundwater Quality Data

Well ID	Well Name	Owner	Sample Date	Analyte	Result	Source
1201486	NA	Larry Britton	10/12/2010	TDS	210	Max Benefit
1201486	NA	Larry Britton	3/2/2011	TDS	258	Max Benefit
1207797	NA	Beaumont Unified School District	8/28/2002	TDS	245	SGPWA
1207797	NA	Beaumont Unified School District	7/14/2003	TDS	260	SGPWA
	1	Plantation on the Lake Park	5/9/1997	TDS	220	DDW
	1	Plantation on the Lake Park	6/29/2000	TDS	220	DDW
	1	Plantation on the Lake Park	1/29/2004	TDS	260	DDW
	1	Plantation on the Lake Park	3/19/2008	TDS	260	DDW
	1	Plantation on the Lake Park	3/17/2011	TDS	240	DDW
	1	Plantation on the Lake Park	3/18/2014	TDS	250	DDW
	1	Plantation on the Lake Park	3/20/2017	TDS	270	DDW
	1	Plantation on the Lake Park	3/24/2020	TDS	260	DDW
	NA	Randy Downing	9/28/2006	TDS	240	DDW
	NA	Randy Downing	11/13/2007	TDS	240	DDW
	NA	Randy Downing	11/11/2008	TDS	260	DDW
	NA	Randy Downing	10/21/2010	TDS	290	DDW

Beaumont Basin Watermaster

Analysis of Return Flow Impacts on Groundwater Quality in the Beaumont Basin



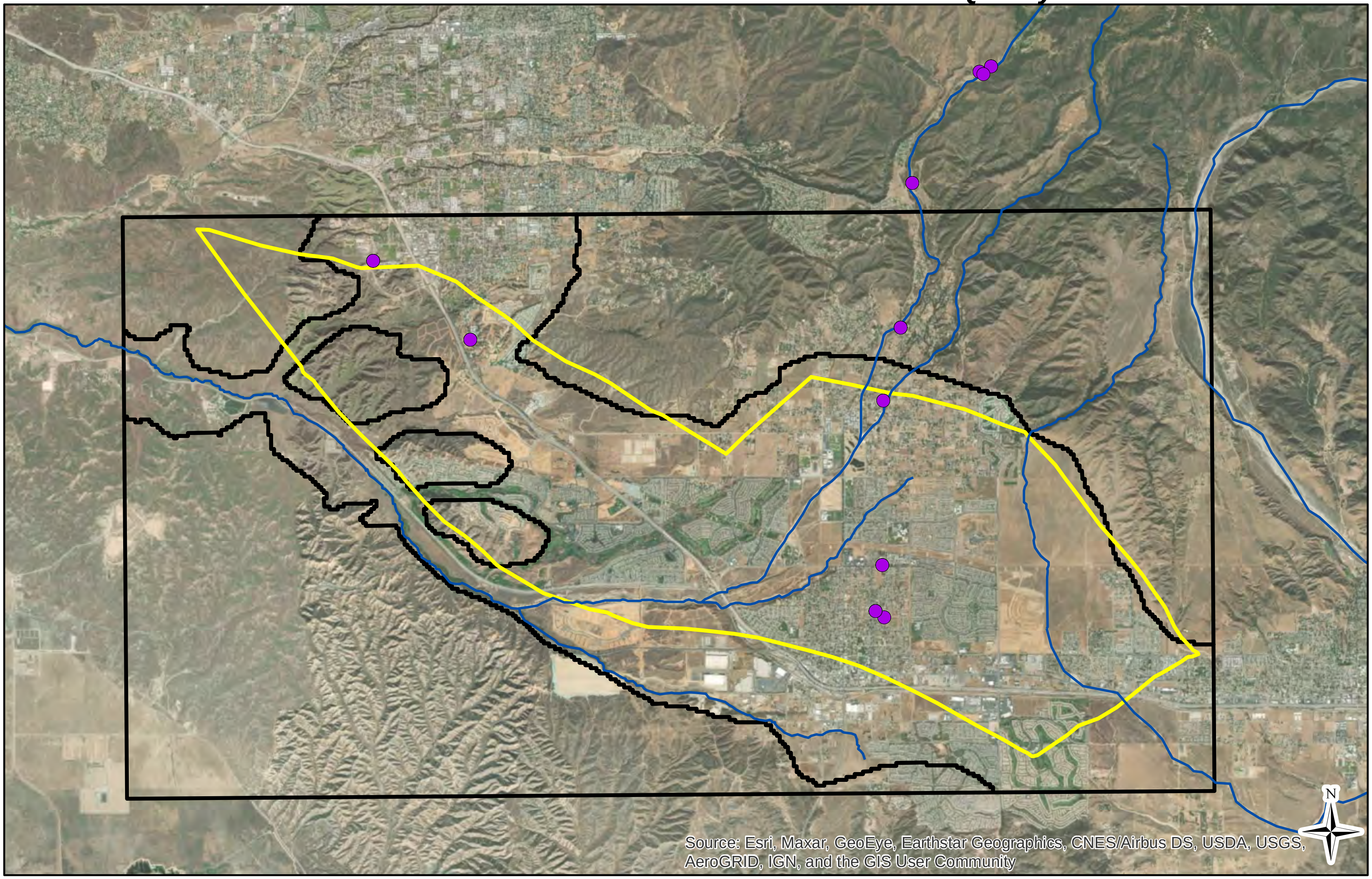
Thomas Harder & Co.
Groundwater Consulting

March 2021

Wells with TDS Concentrations - 1960s

Appendix B-1

Analysis of Return Flow Impacts on Groundwater Quality in the Beaumont Basin



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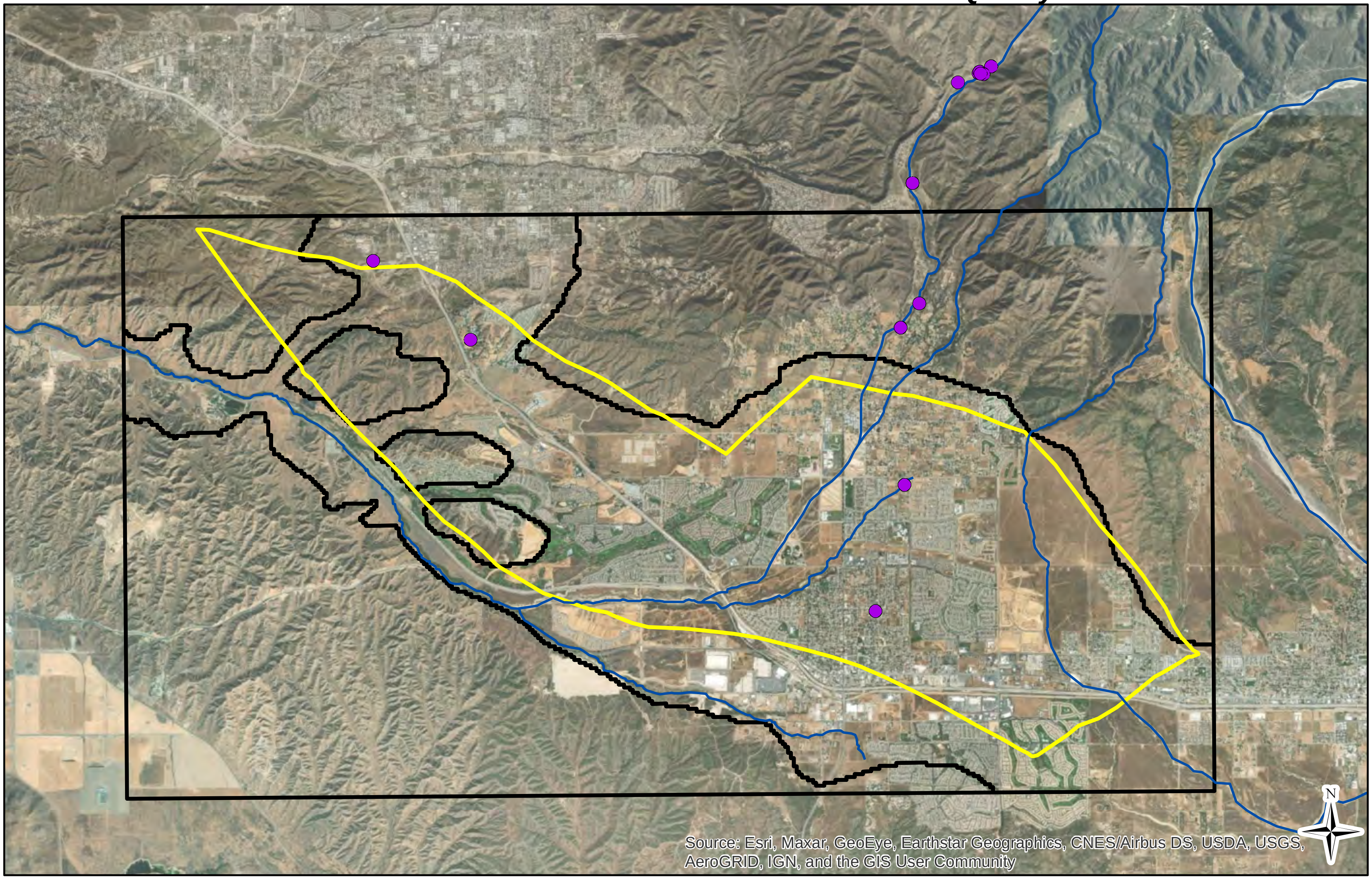
March 2021

Wells with TDS Concentrations - 1970s

Appendix B-2

Analysis of Return Flow Impacts on Groundwater Quality in the Beaumont Basin



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0 0.5 1 2 Miles

NAD 83 UTM Zone 11

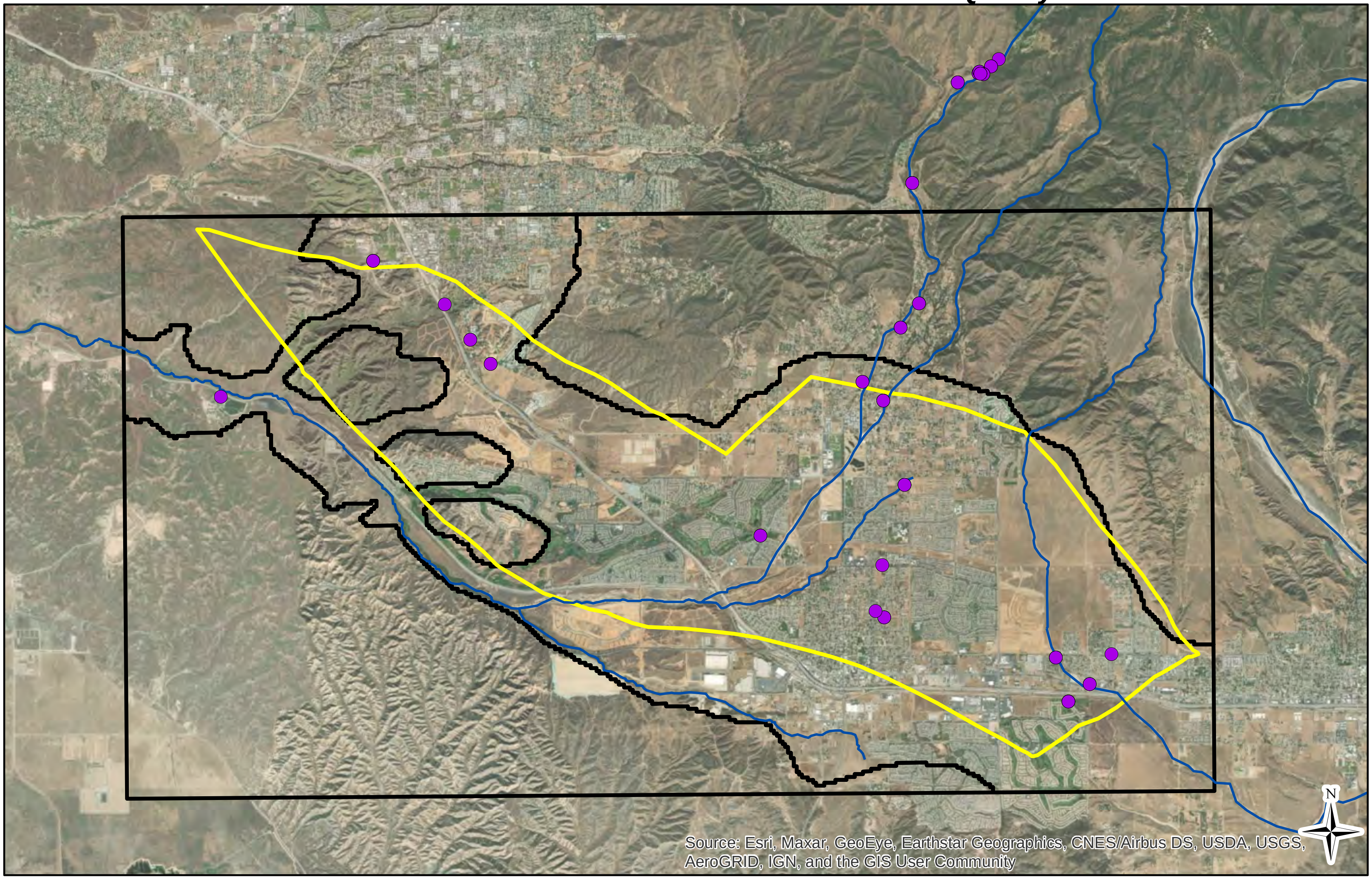
March 2021

Wells with TDS Concentrations - 1980s

Appendix B-3

Beaumont Basin Watermaster

Analysis of Return Flow Impacts on Groundwater Quality in the Beaumont Basin



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0 0.5 1 2 Miles

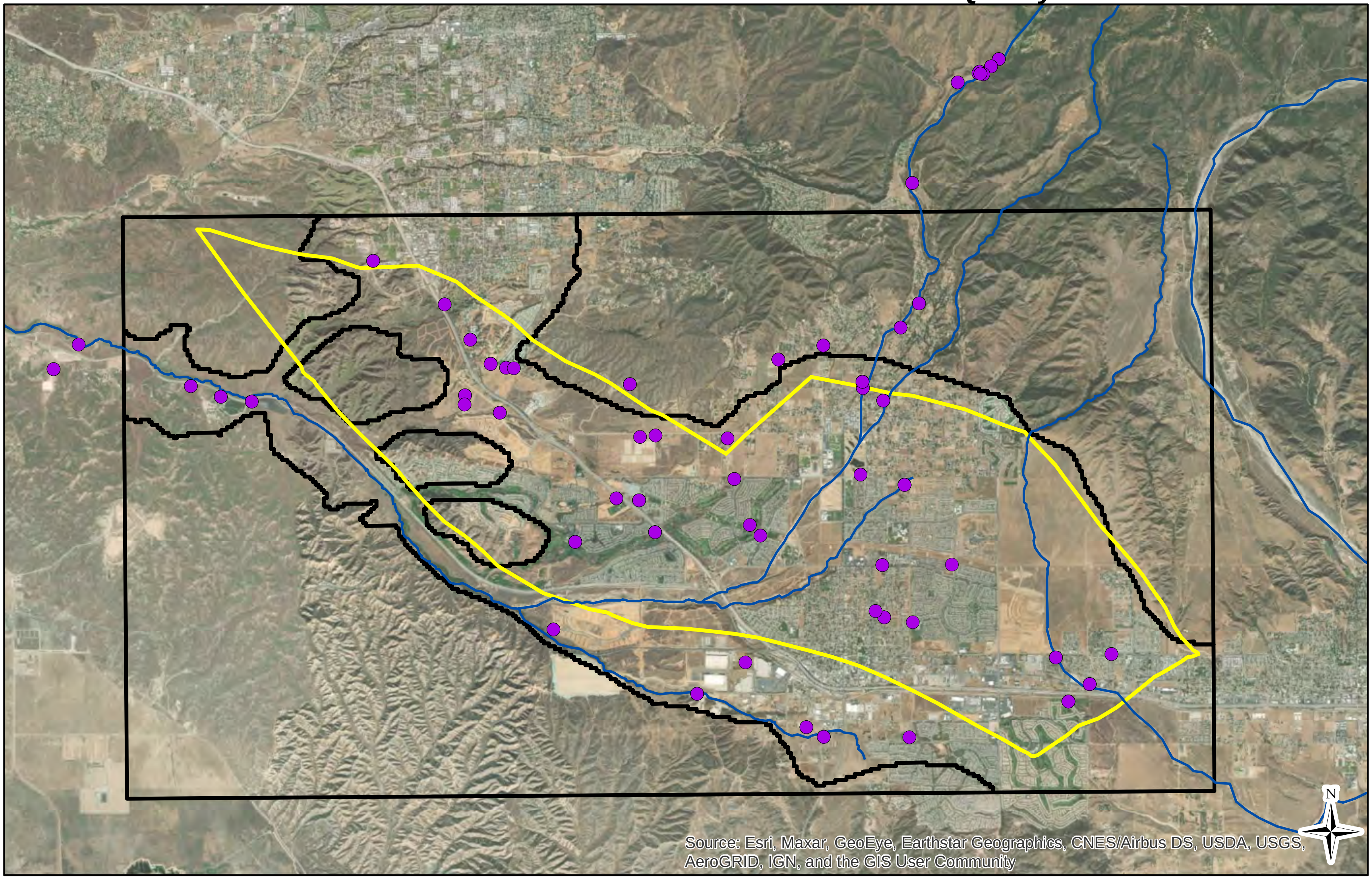
NAD 83 UTM Zone 11

March 2021

Wells with TDS Concentrations - 1990s

Appendix B-4

Analysis of Return Flow Impacts on Groundwater Quality in the Beaumont Basin



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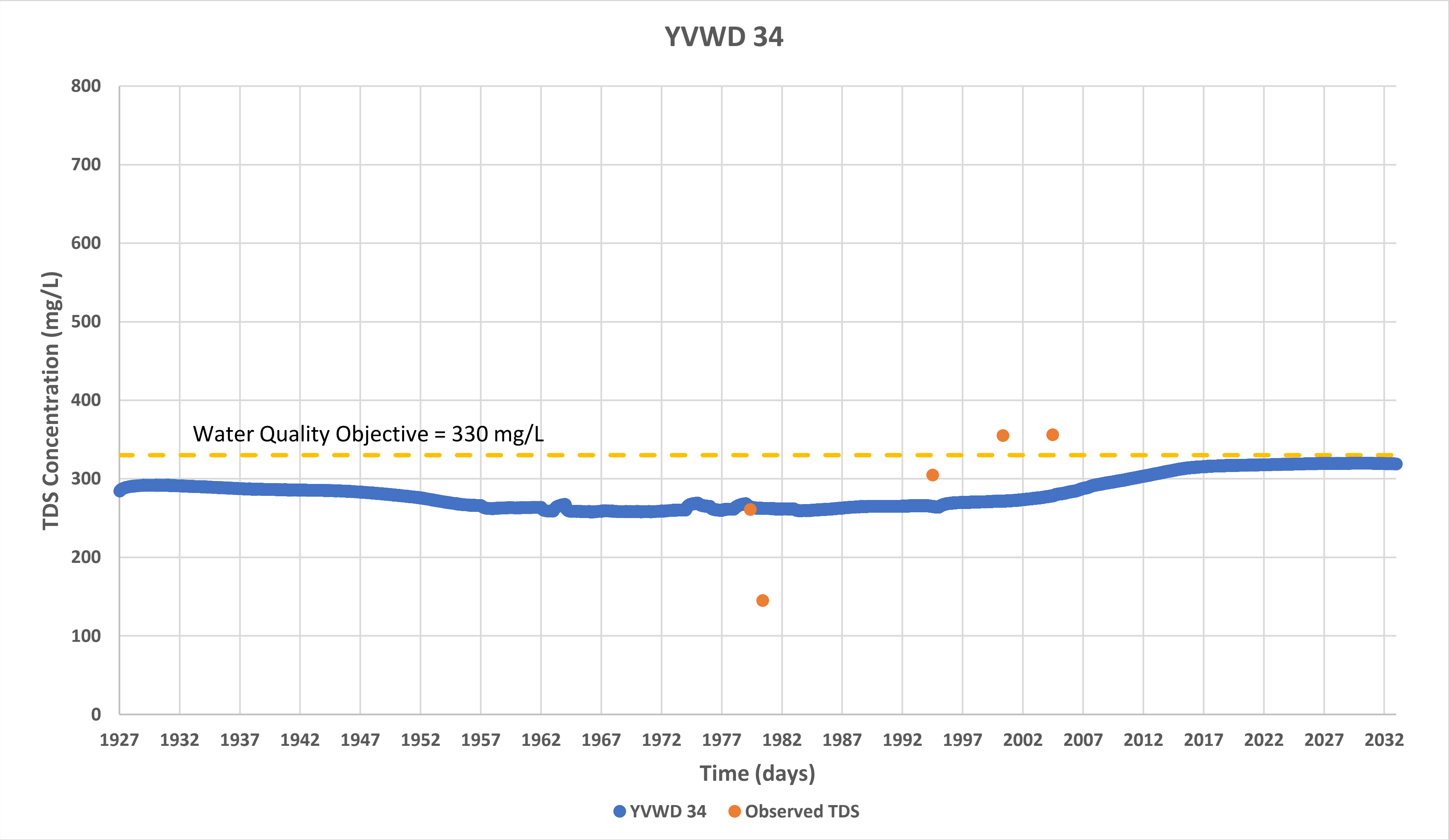
March 2021

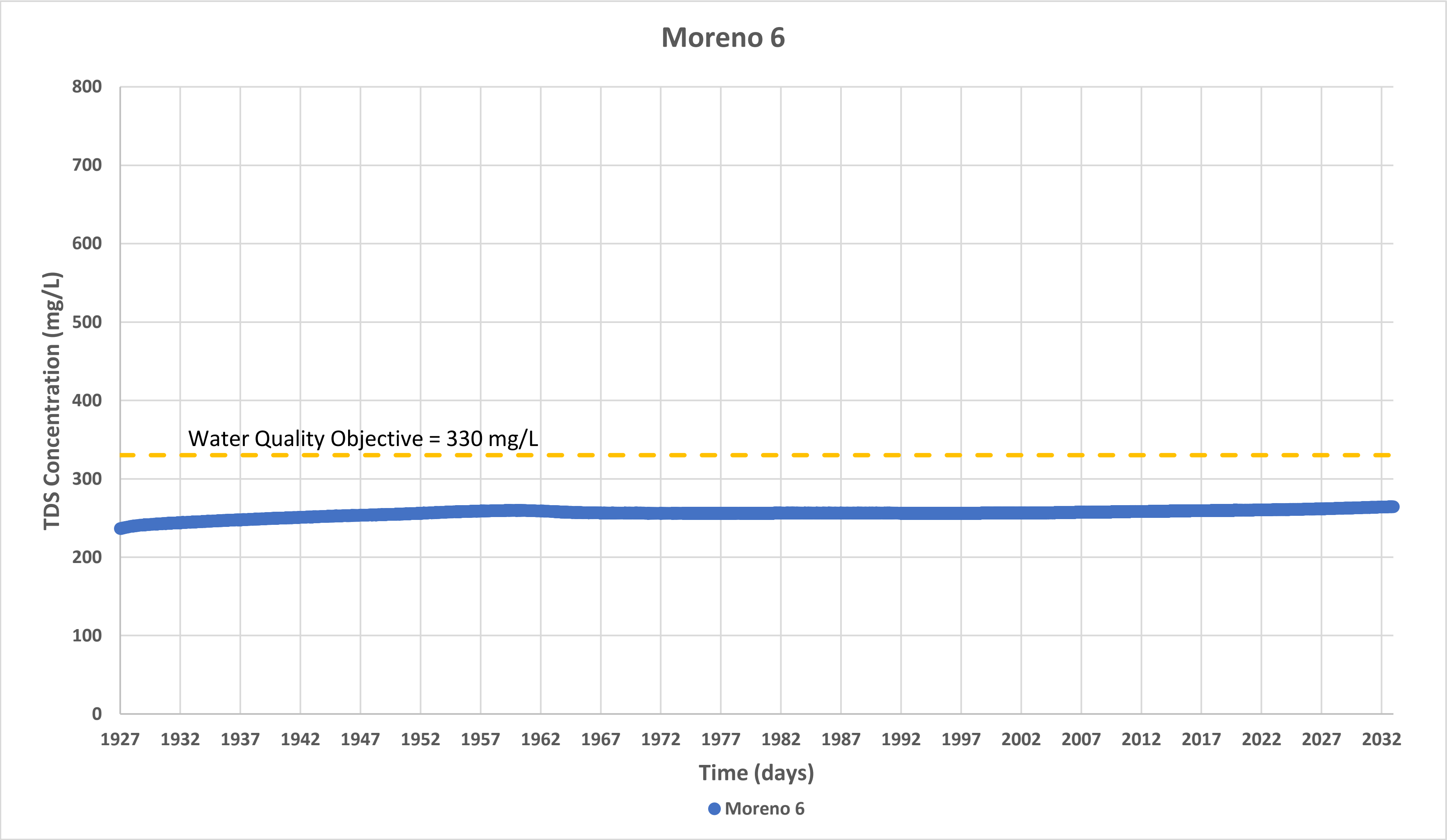
Wells with TDS Concentrations - 2000s

Appendix B-5

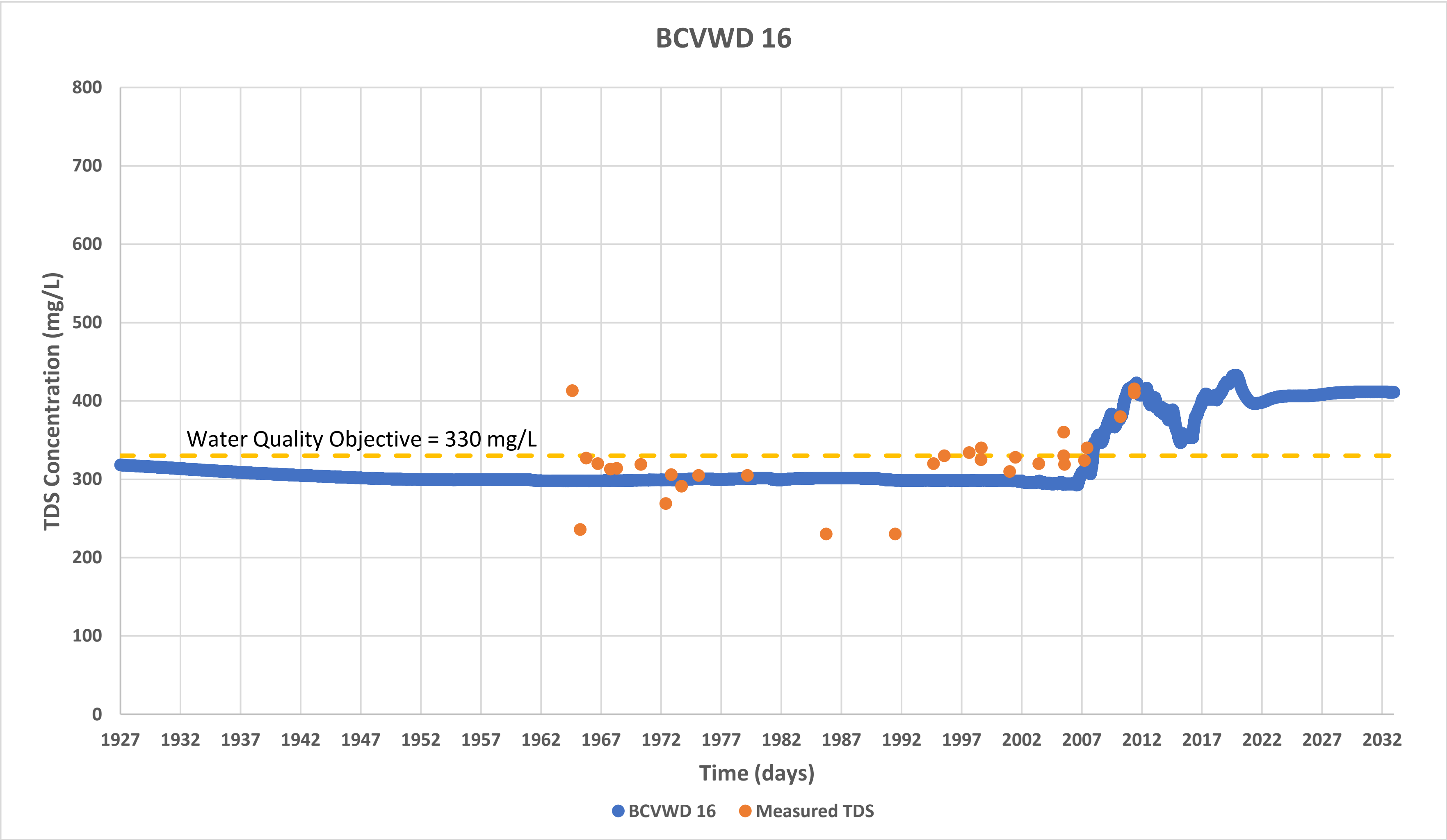
Model-Predicted TDS Concentrations vs. Time (mg/L)



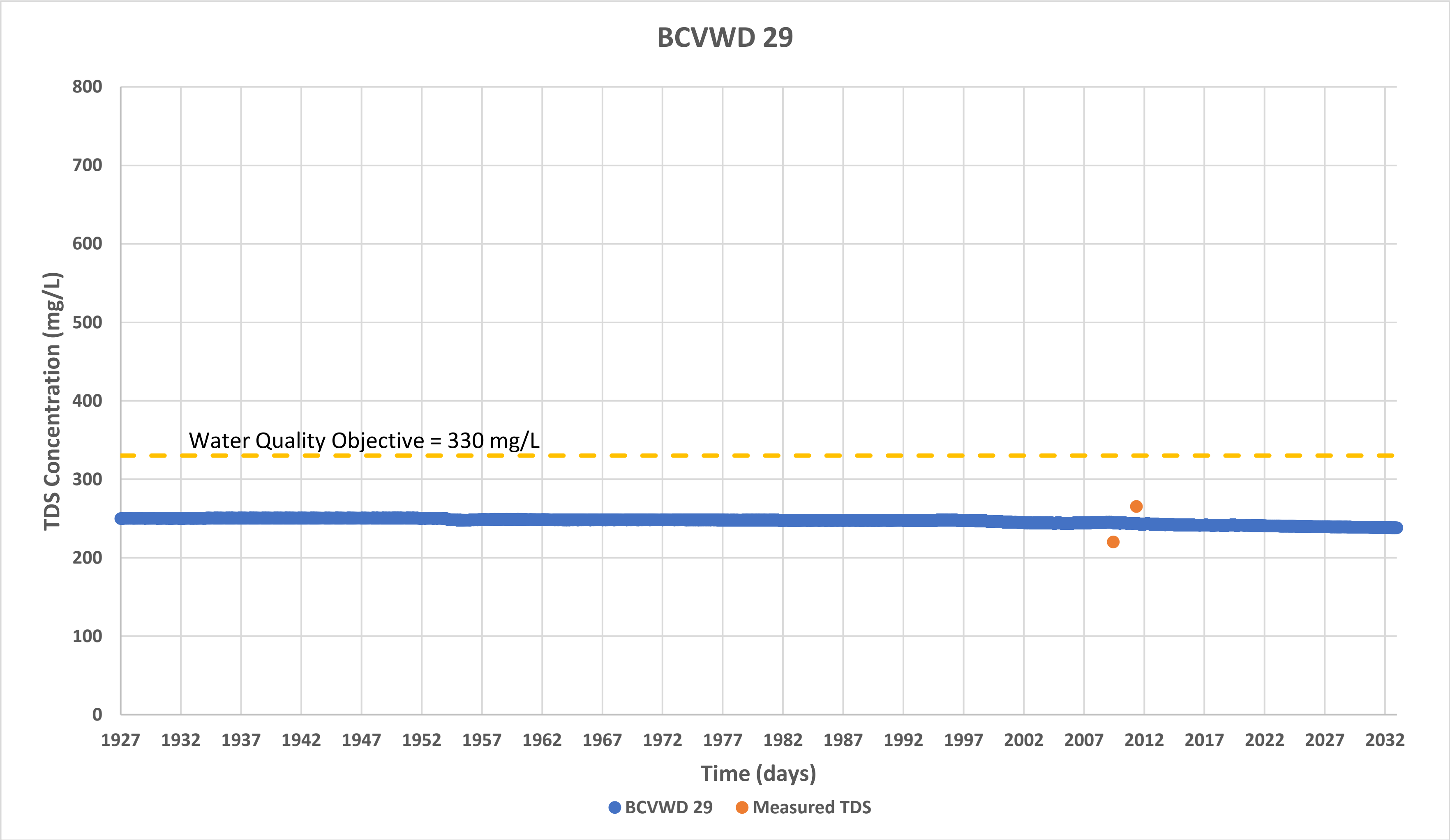
Model-Predicted TDS Concentrations vs. Time (mg/L)



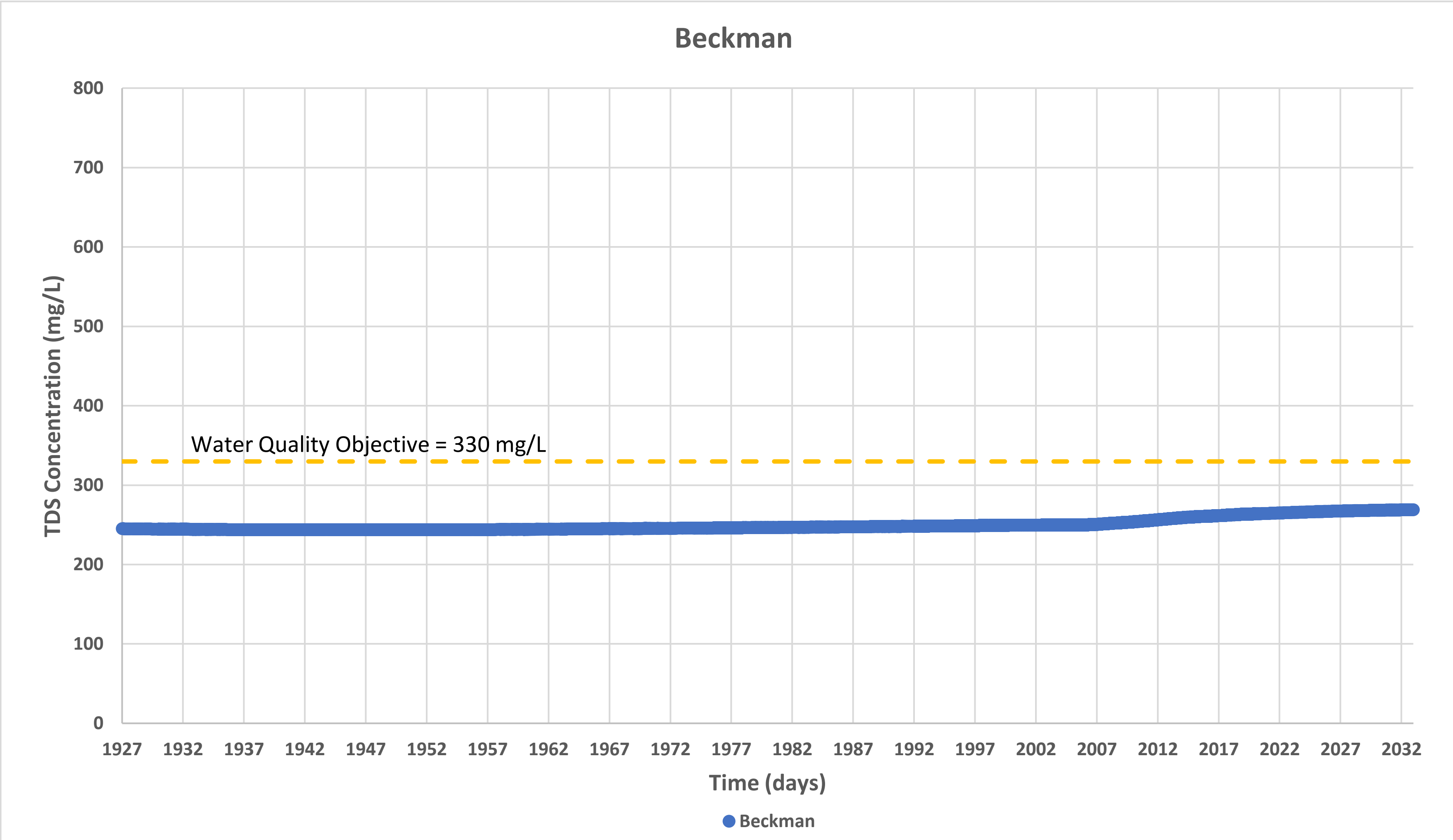
Model-Predicted TDS Concentrations vs. Time (mg/L)



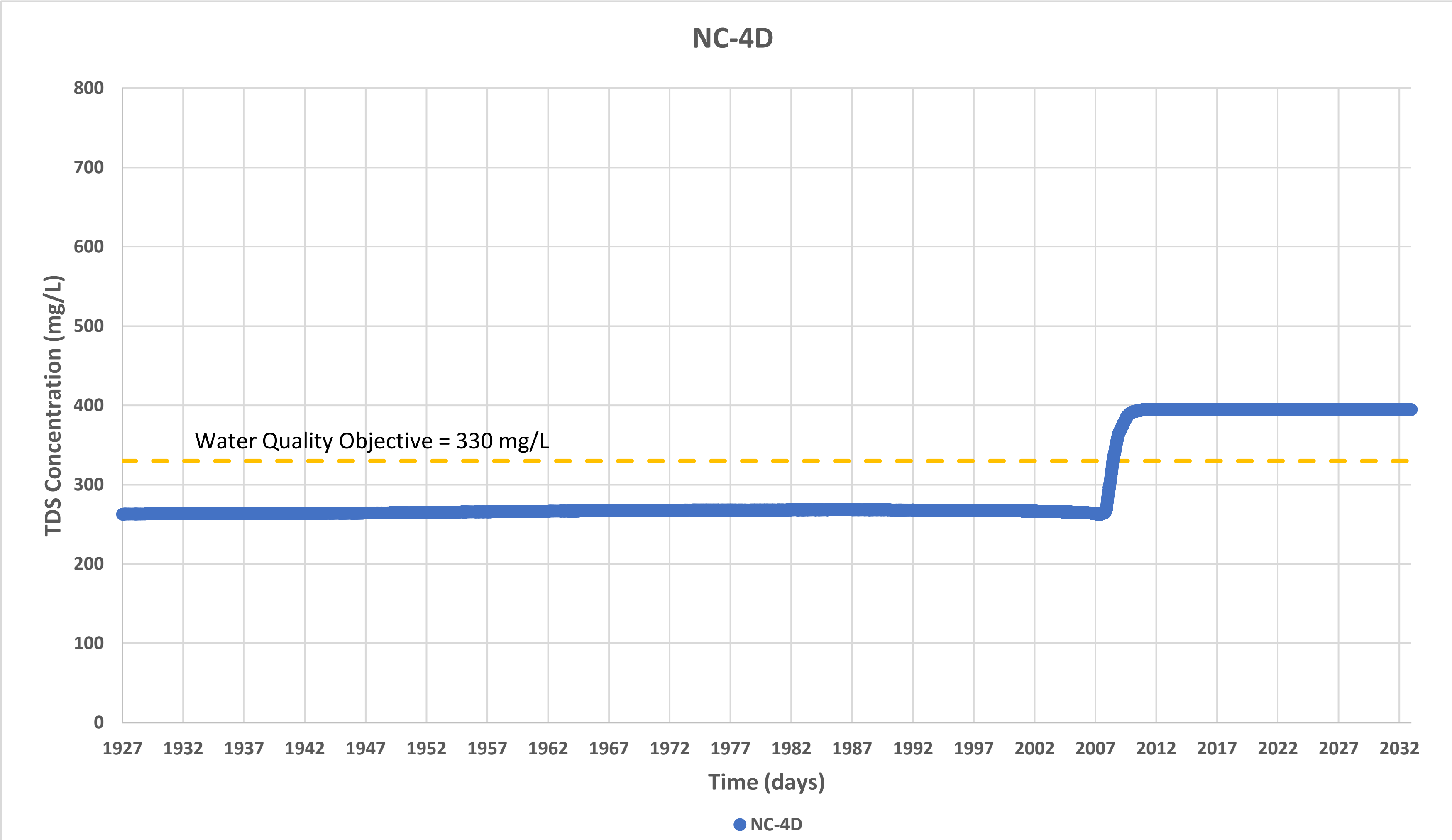
Model-Predicted TDS Concentrations vs. Time (mg/L)



Model-Predicted TDS Concentrations vs. Time (mg/L)



Model-Predicted TDS Concentrations vs. Time (mg/L)



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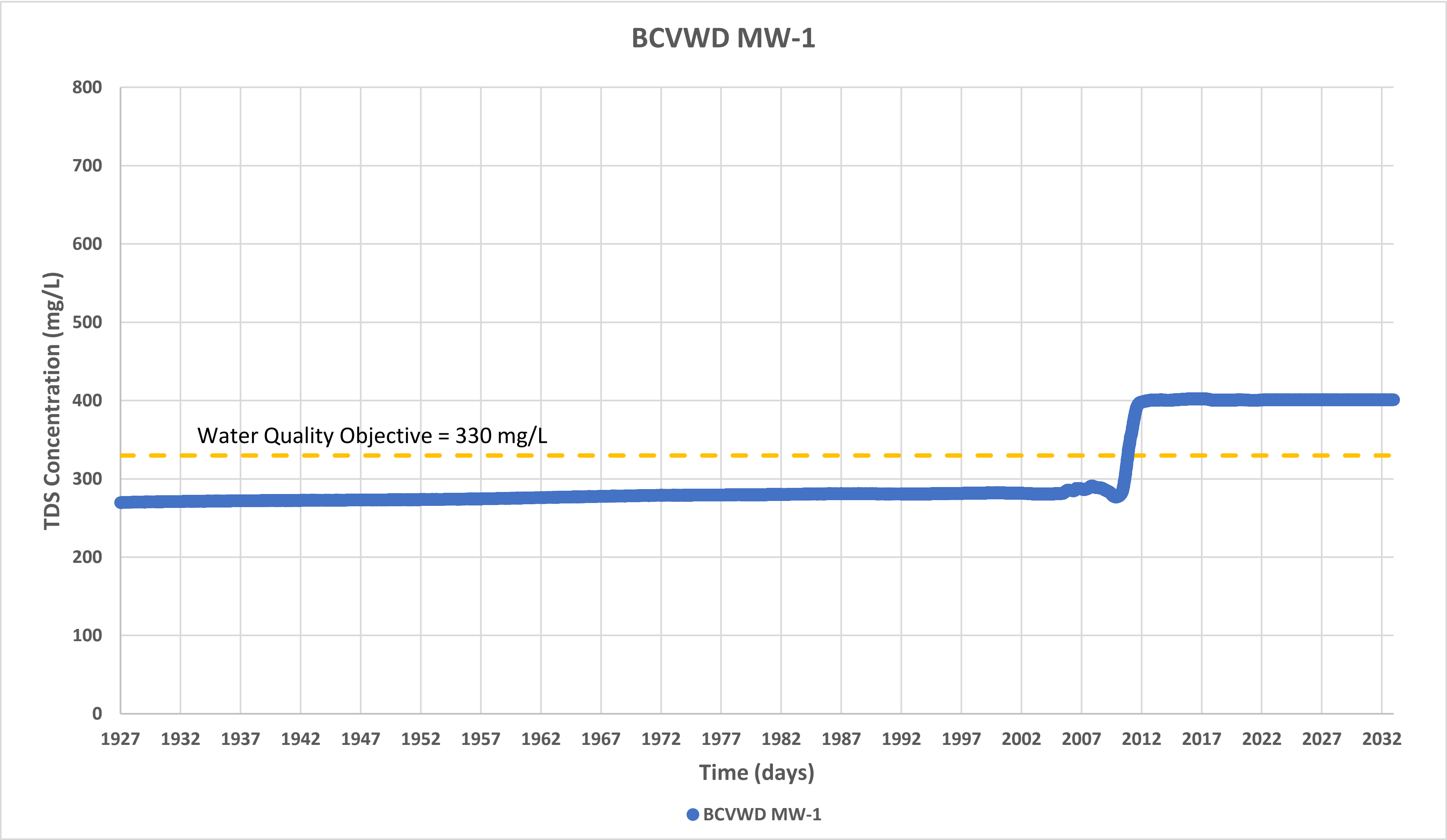

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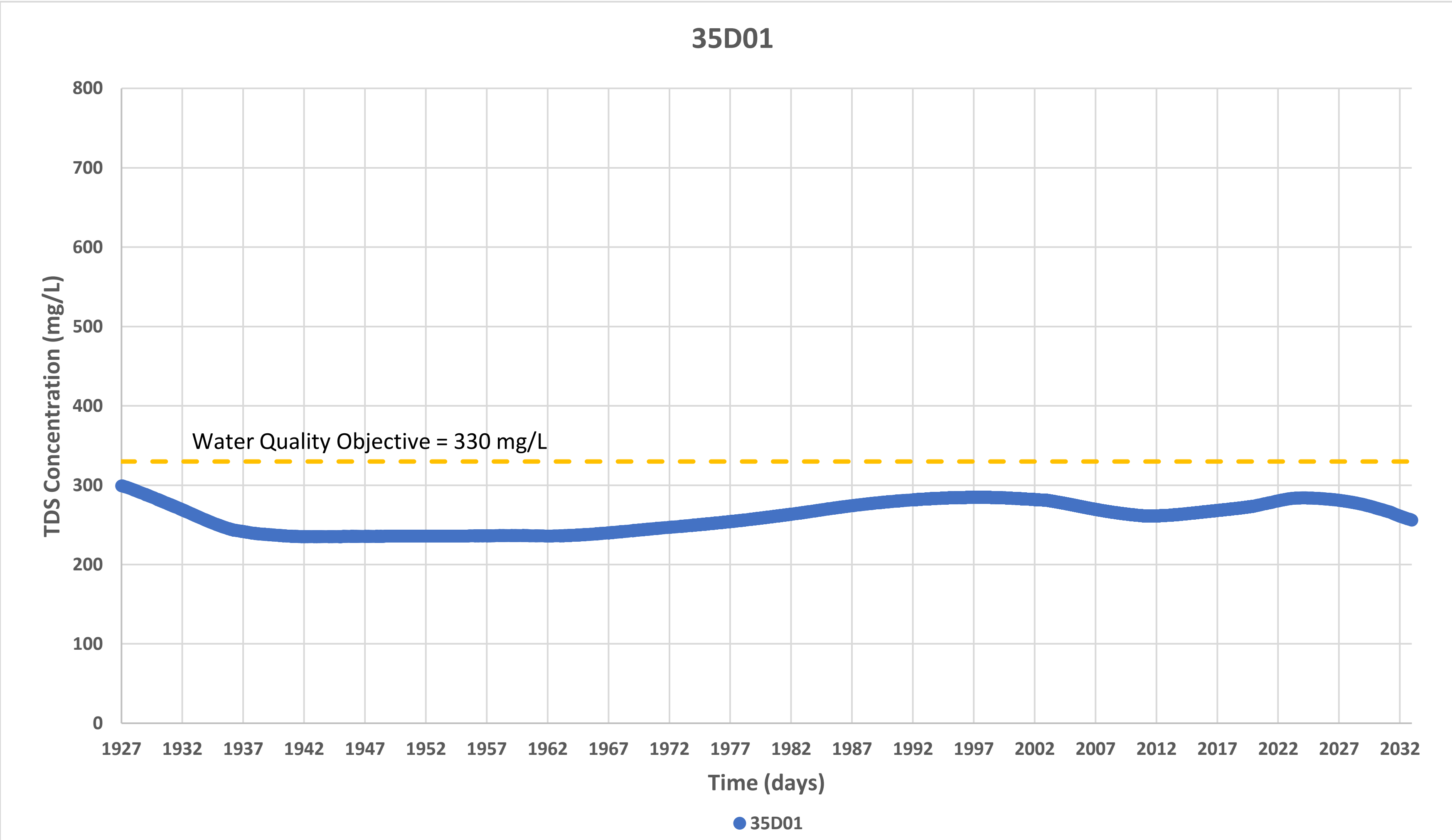

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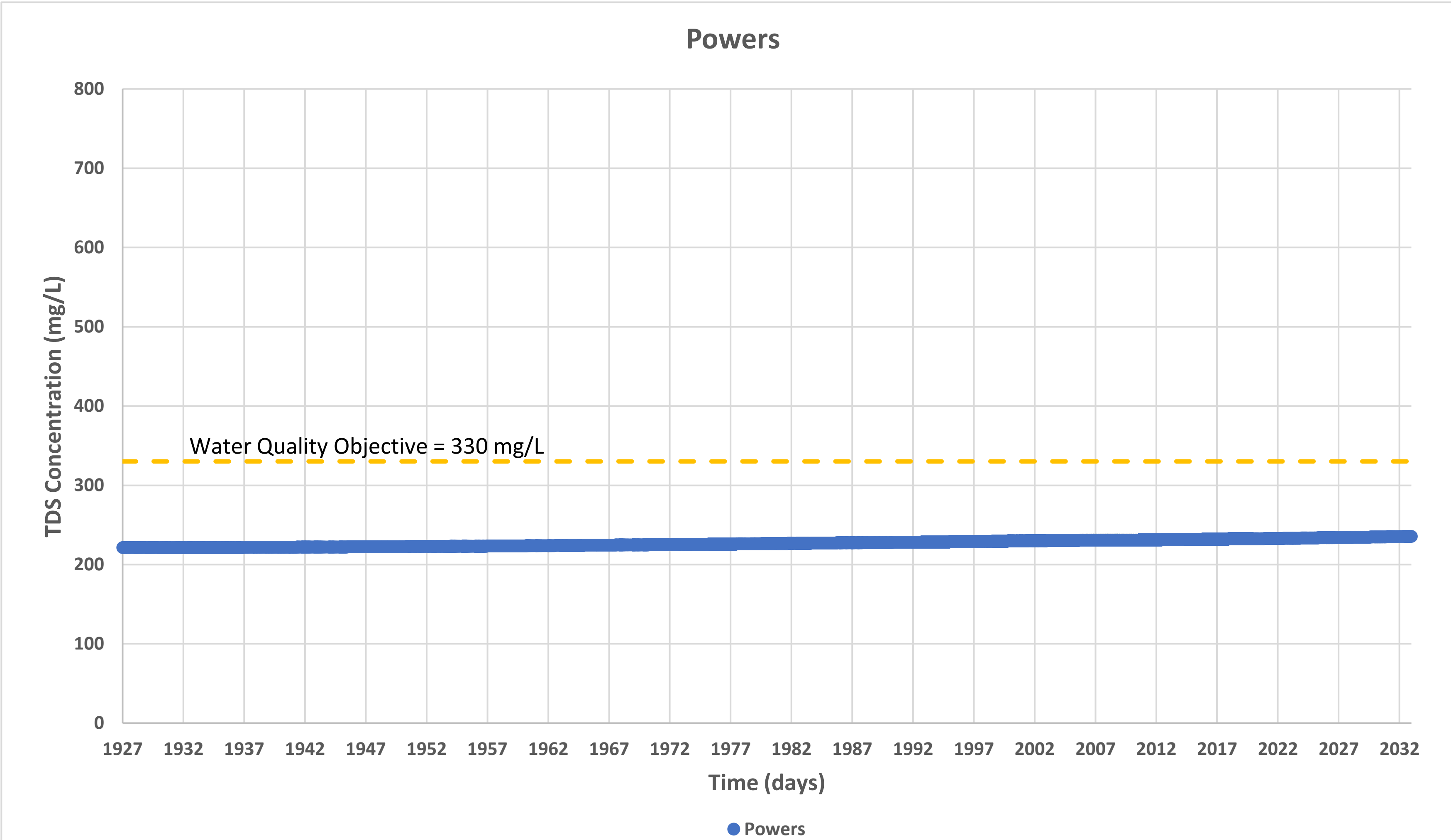

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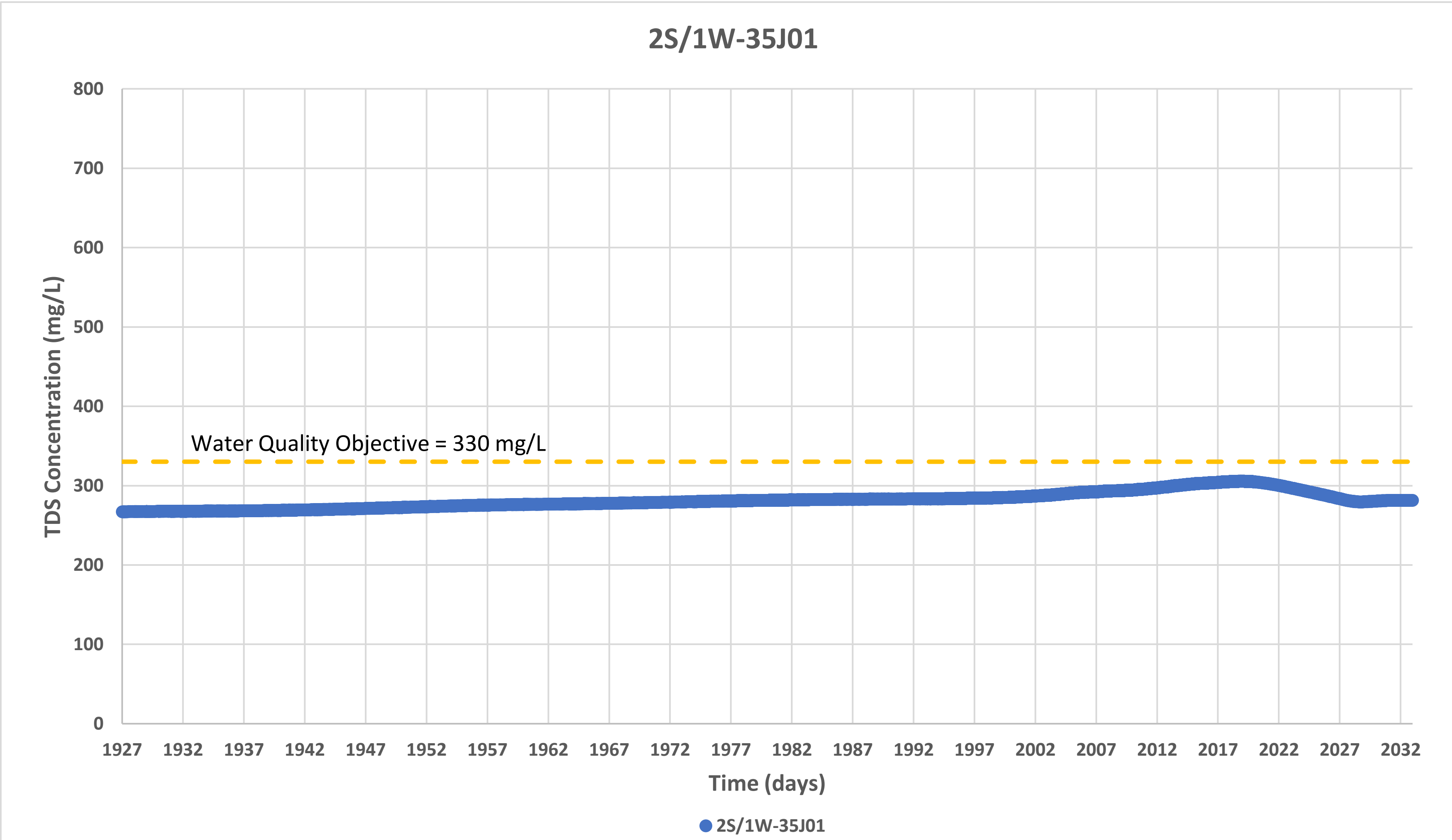

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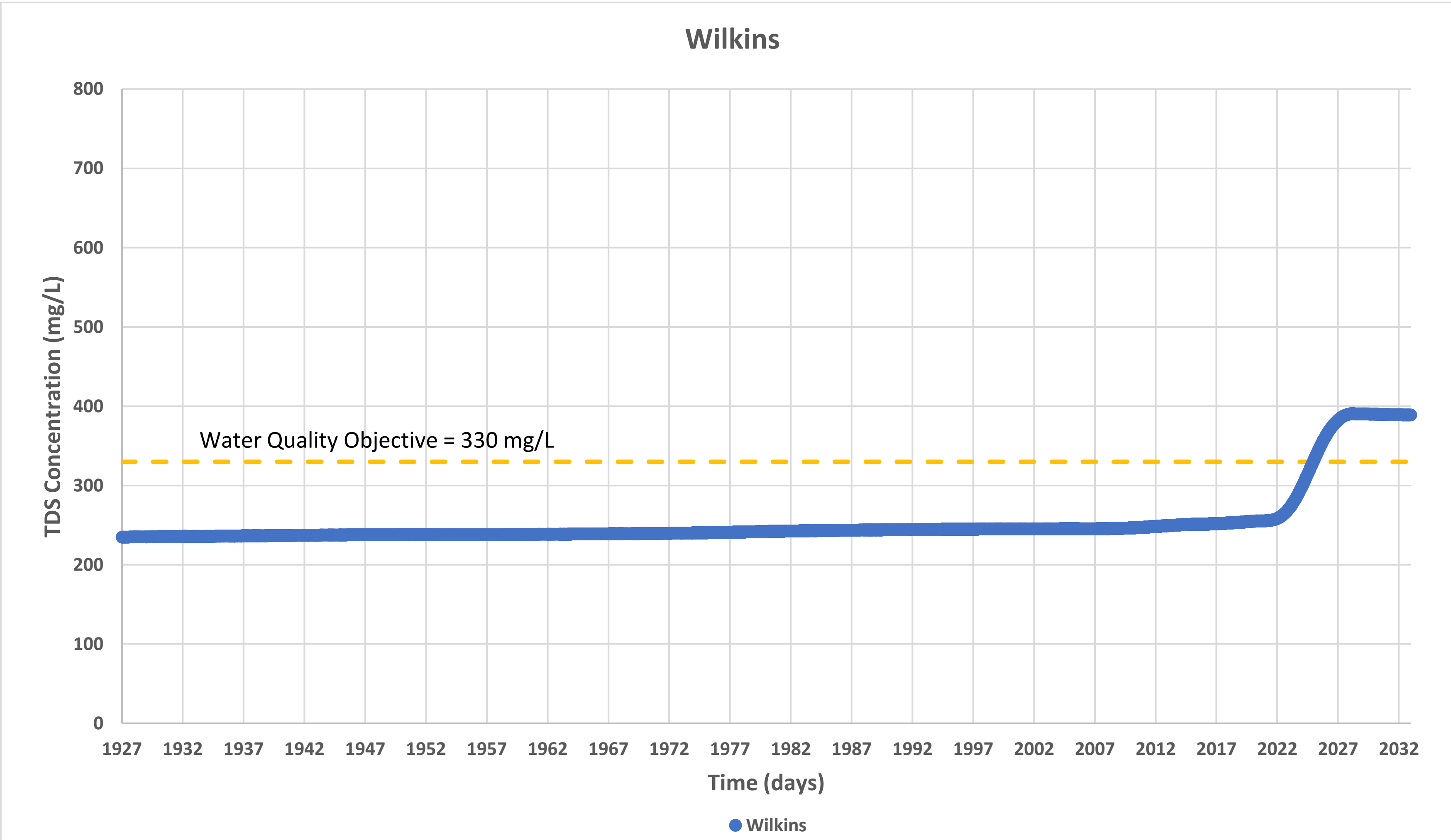

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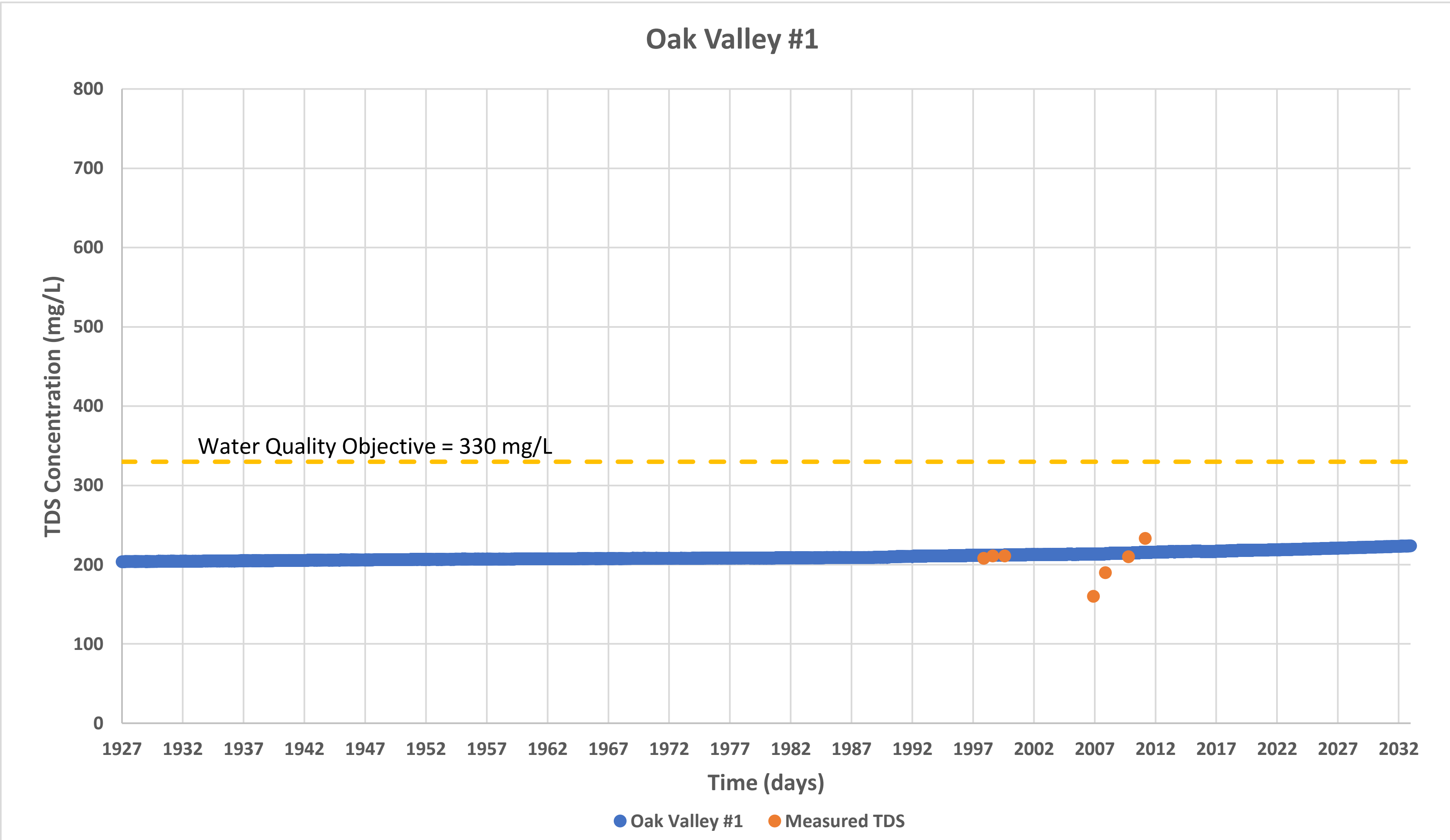

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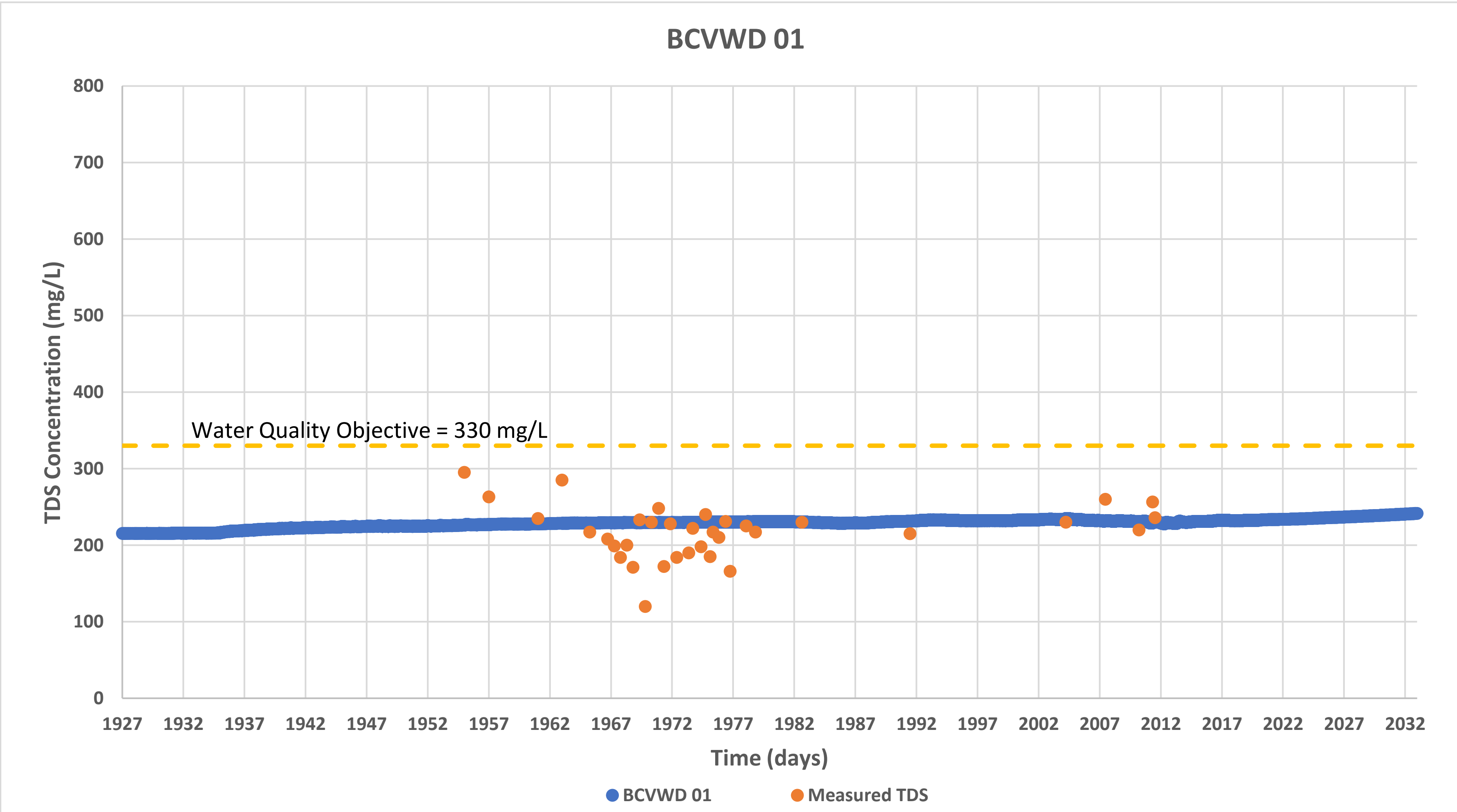

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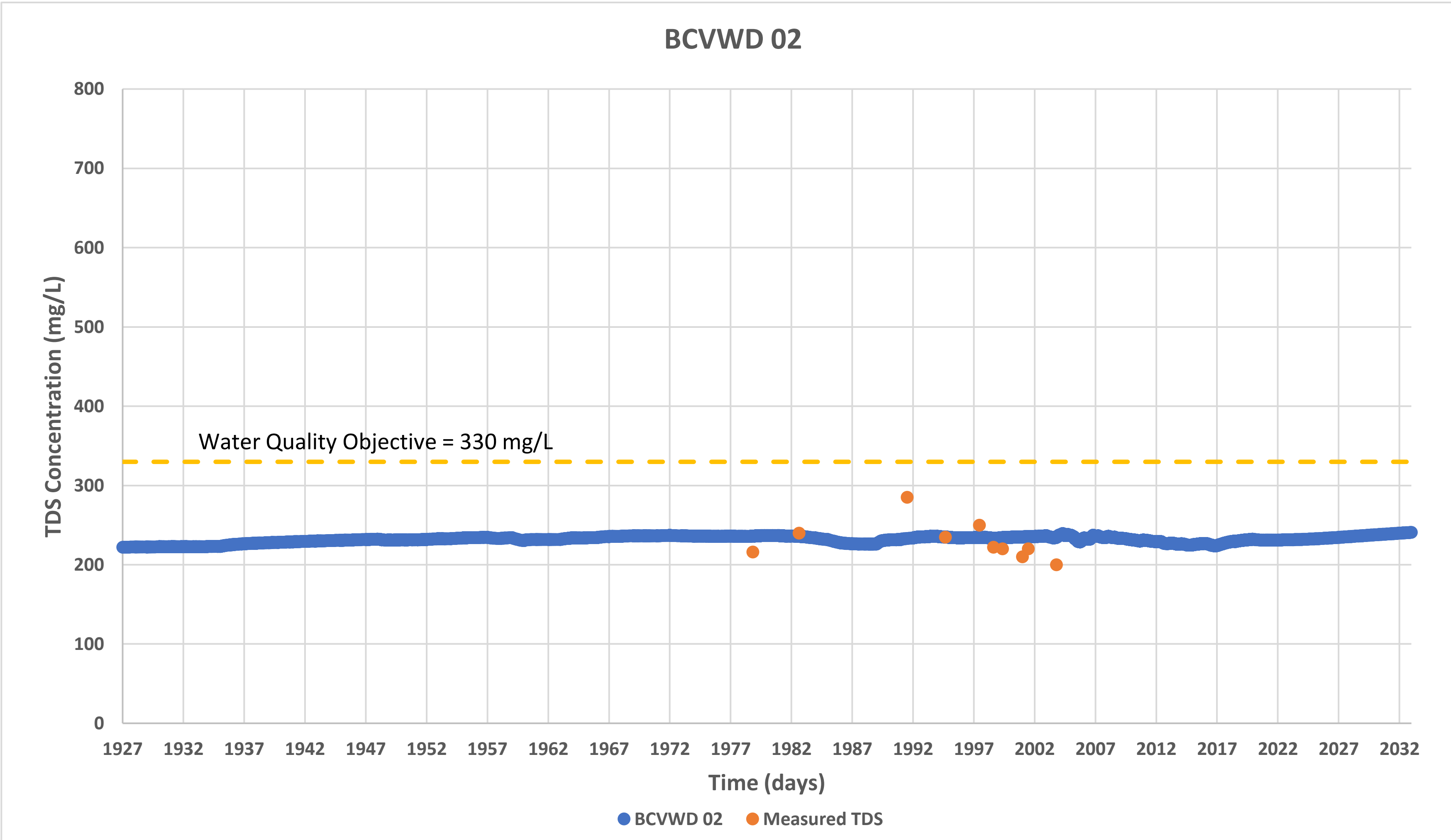

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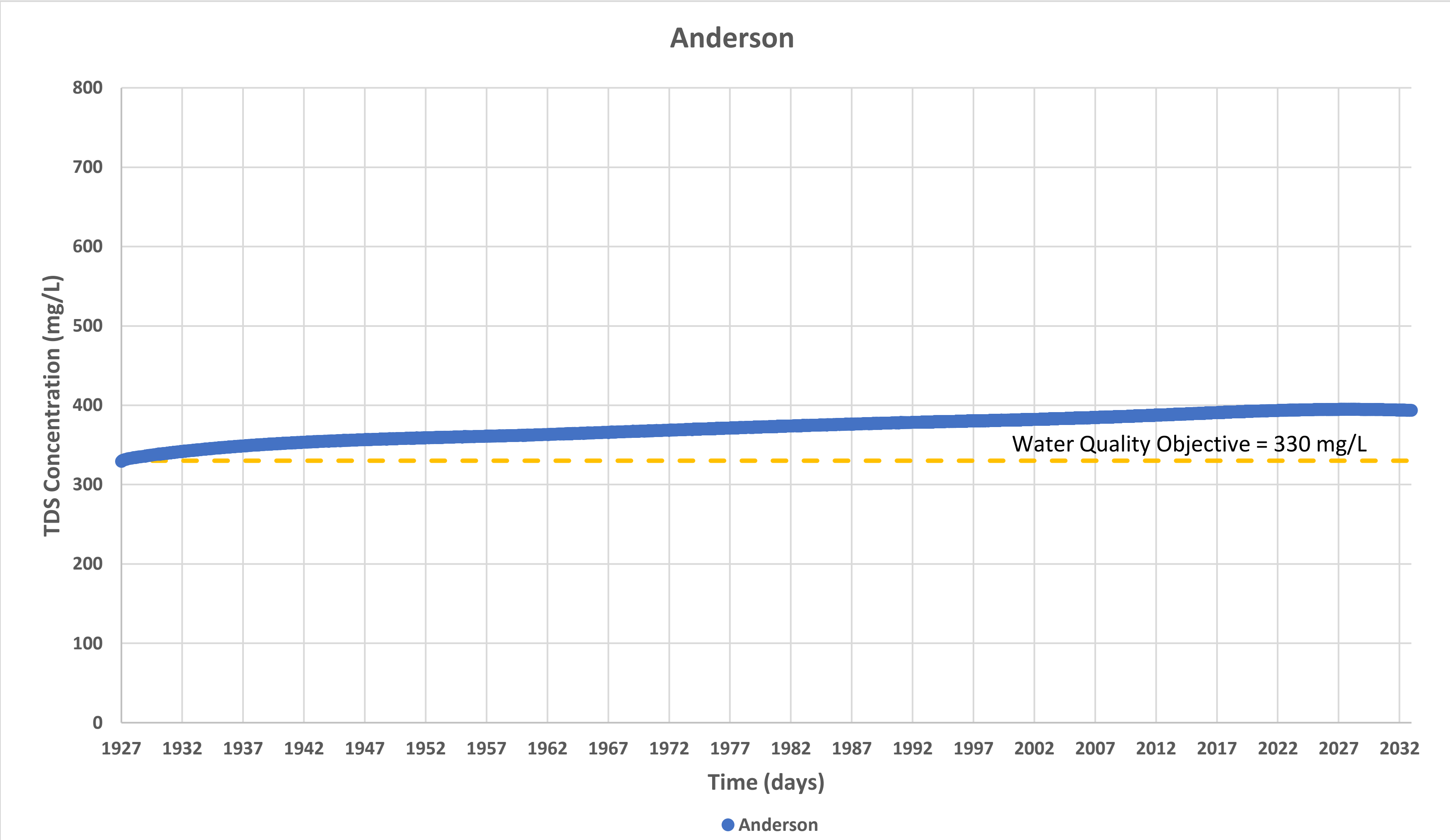

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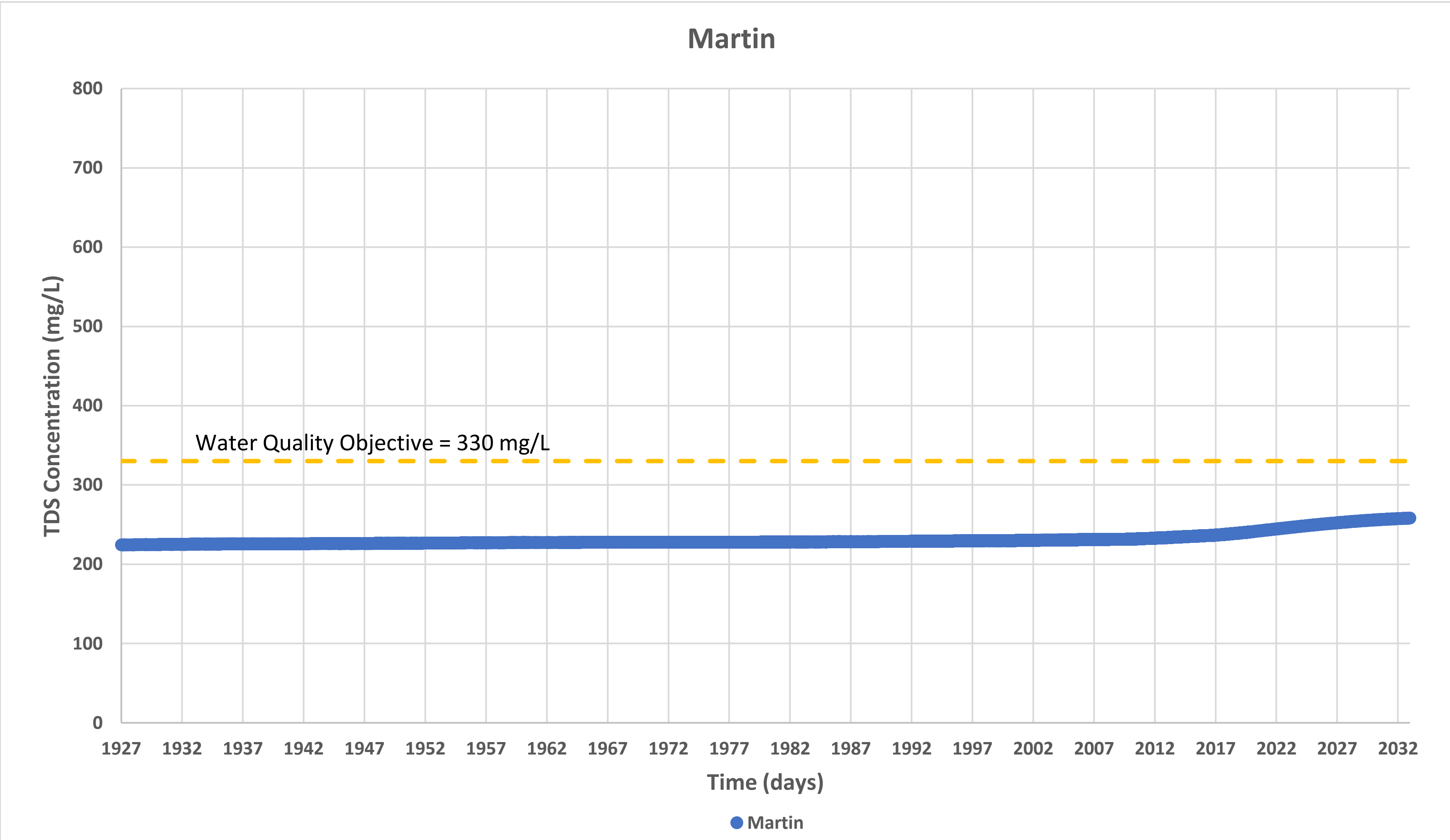

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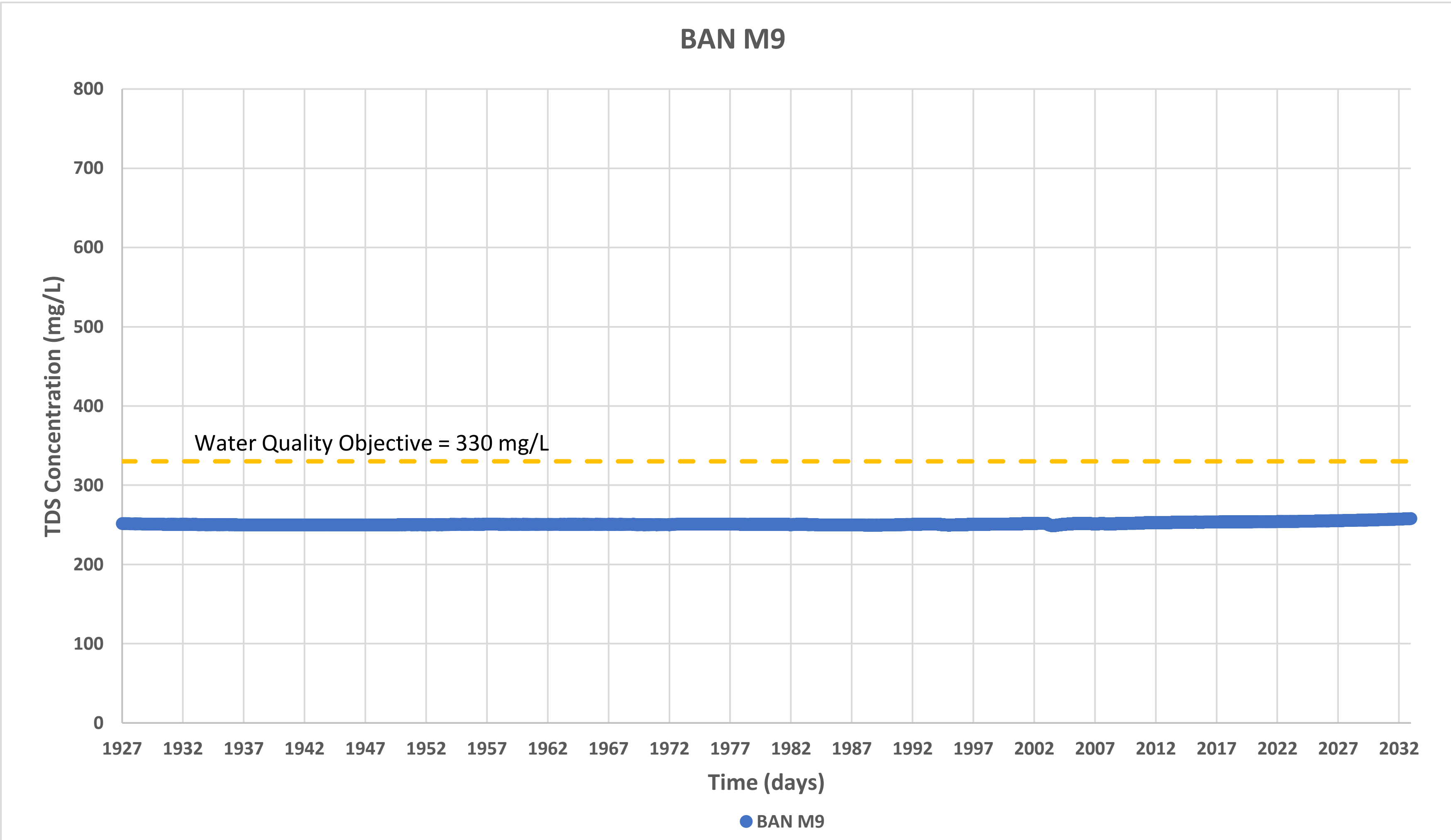

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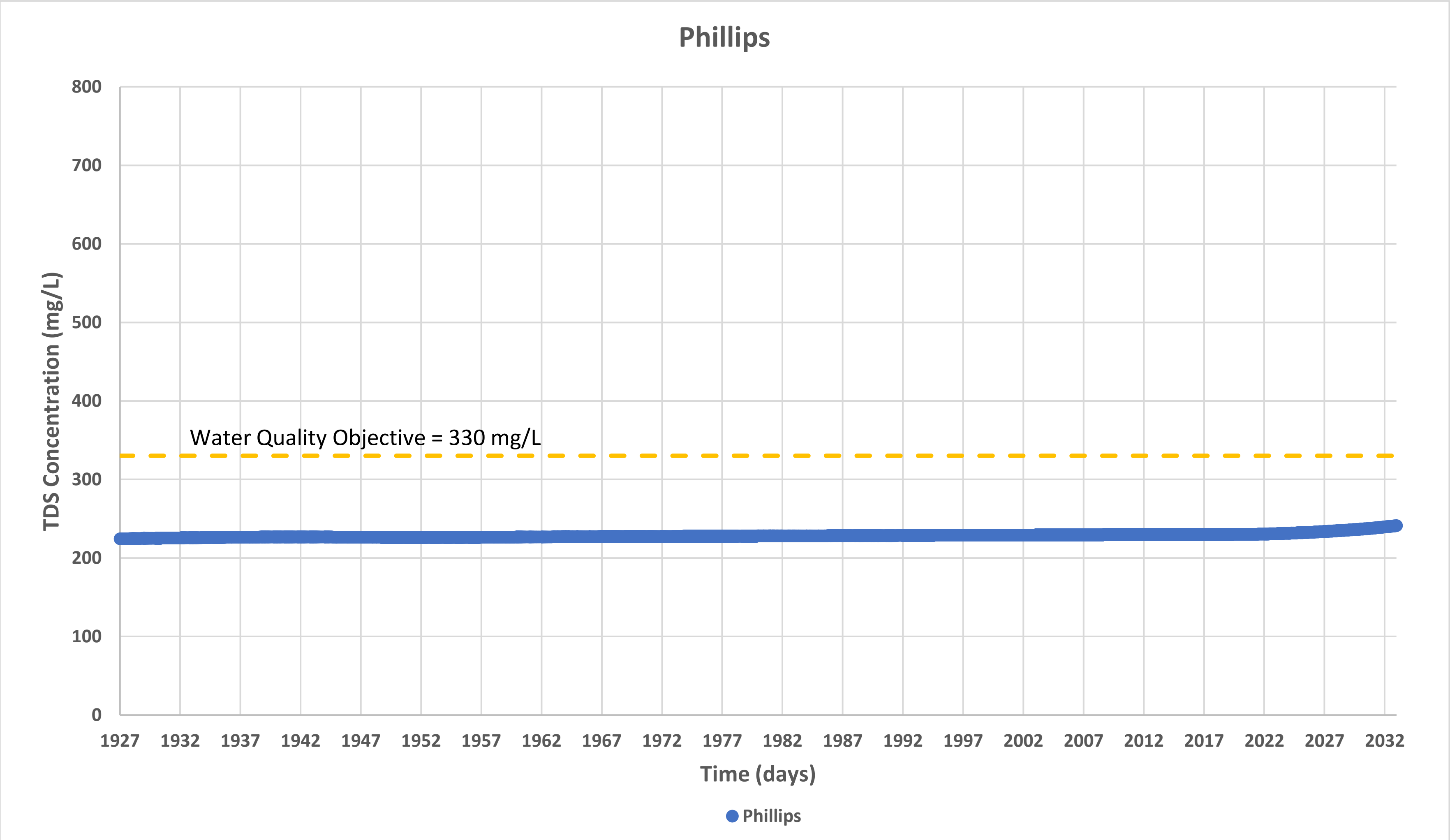

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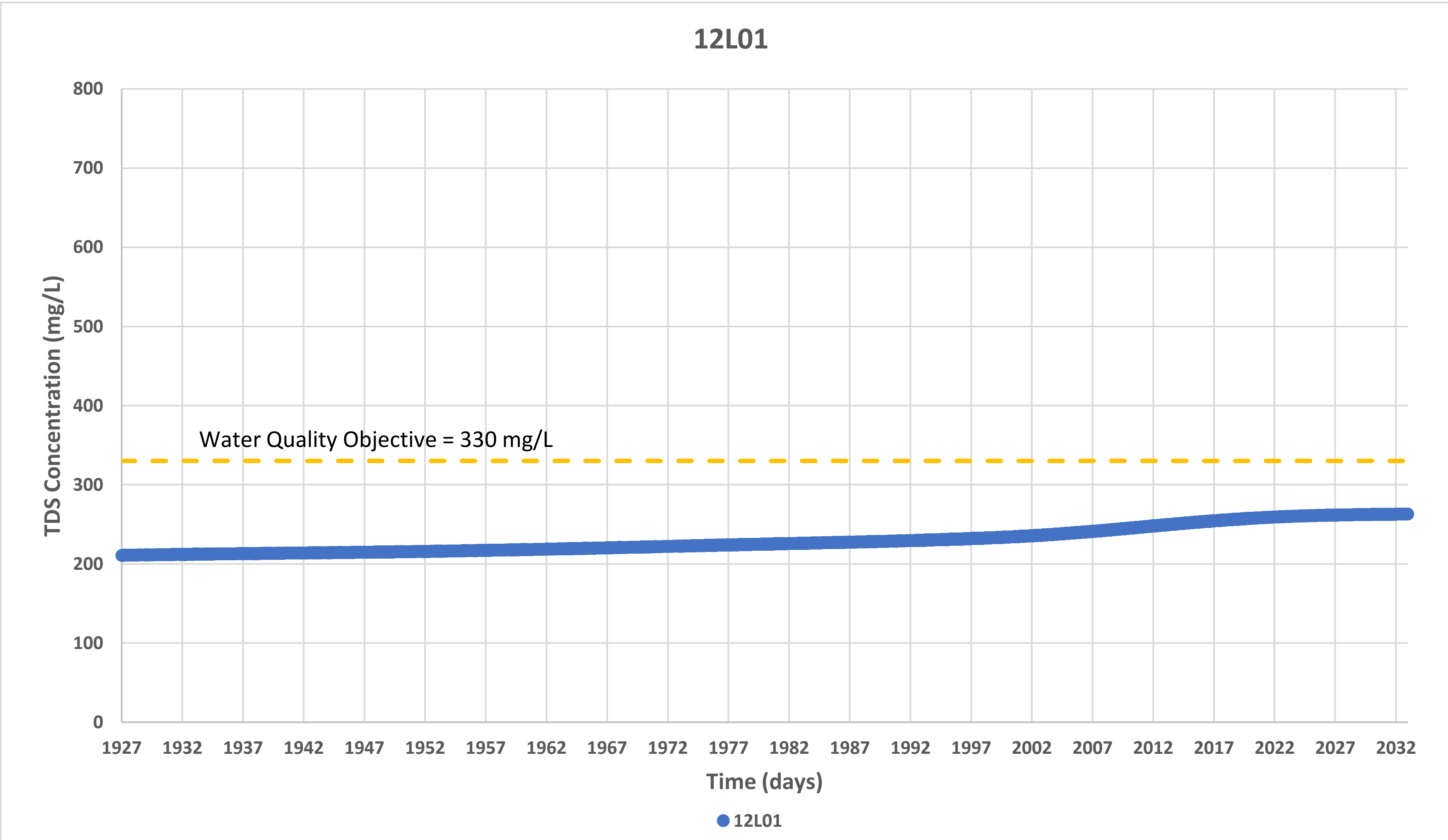

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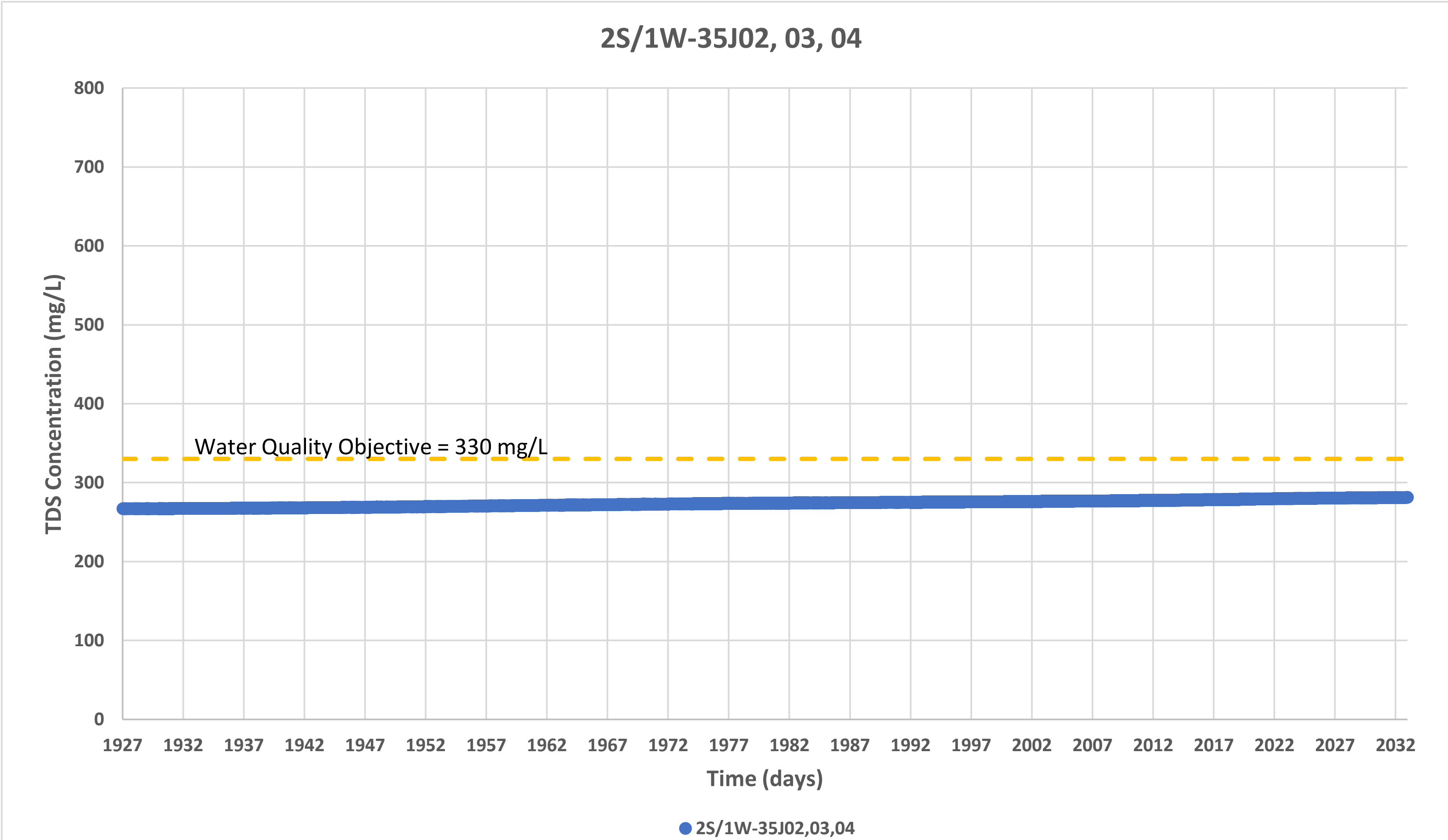

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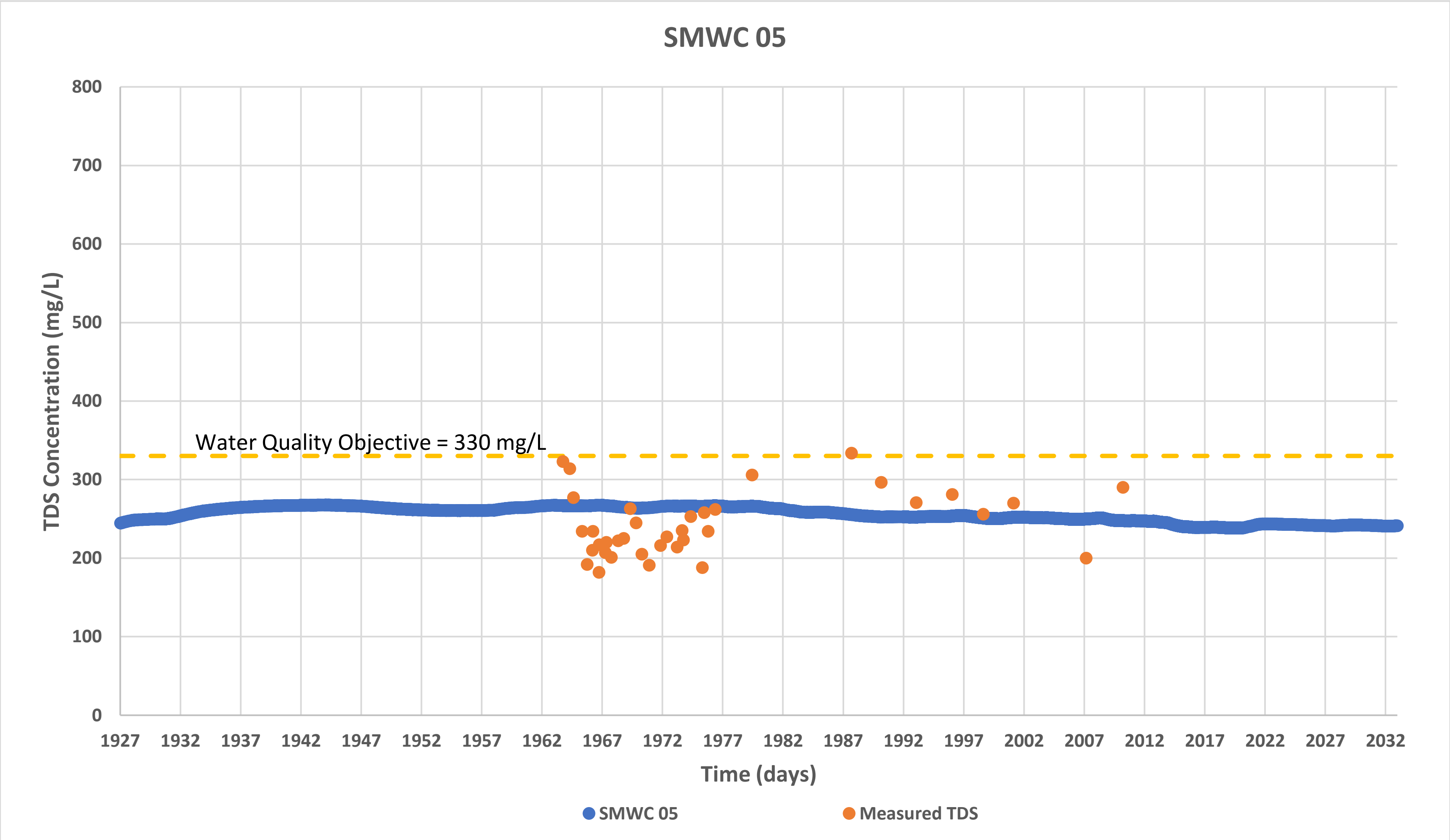

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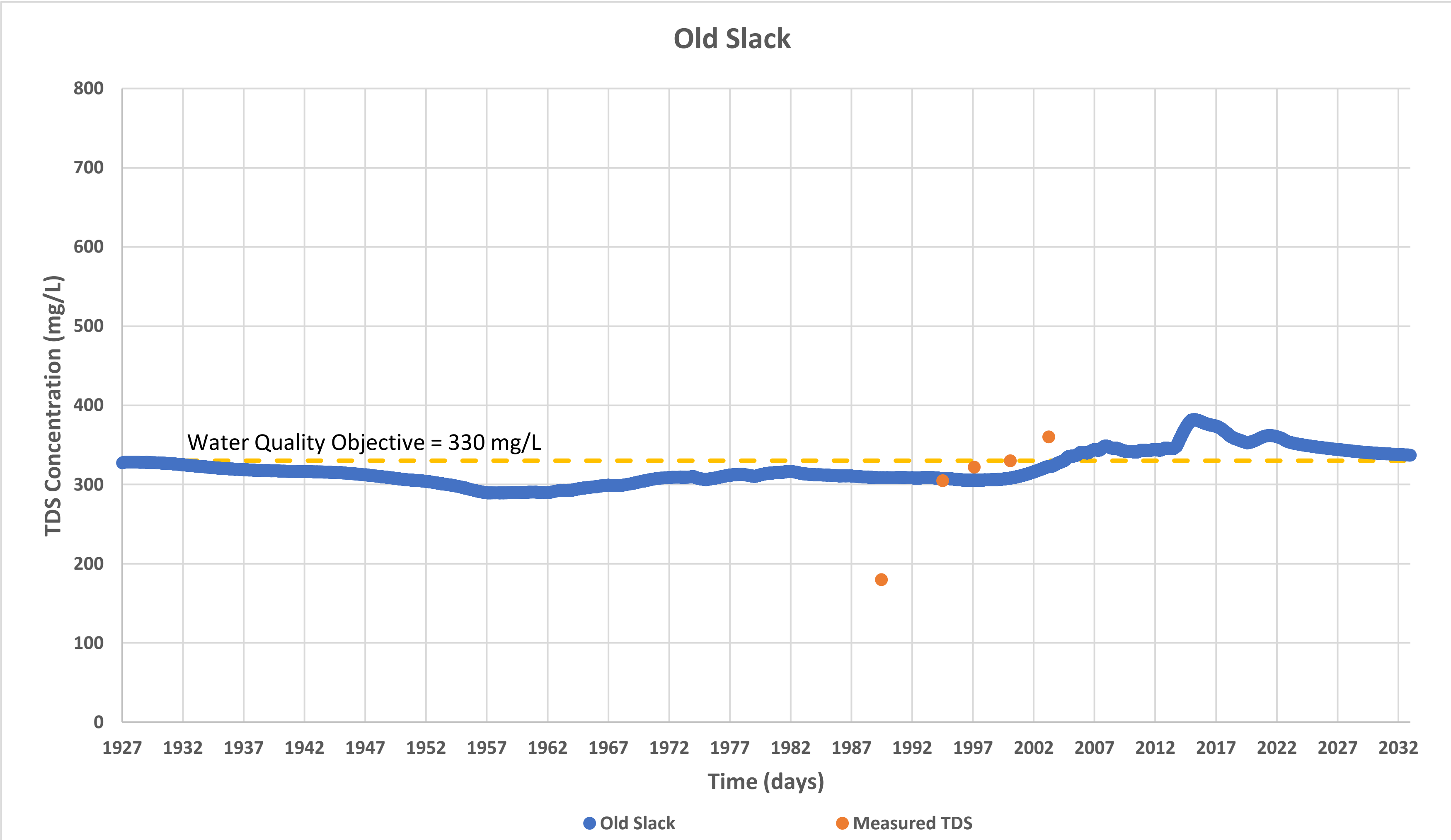

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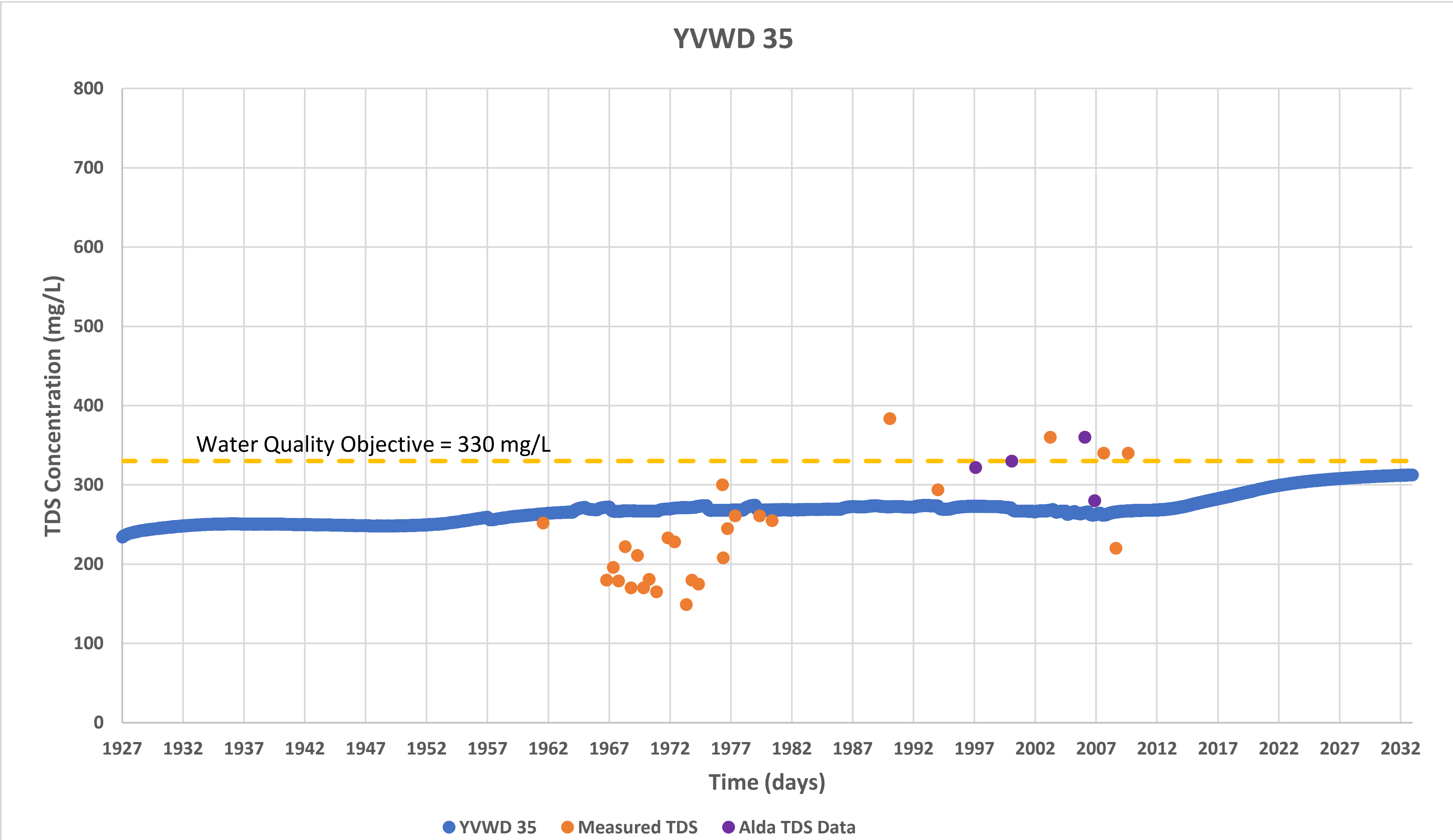

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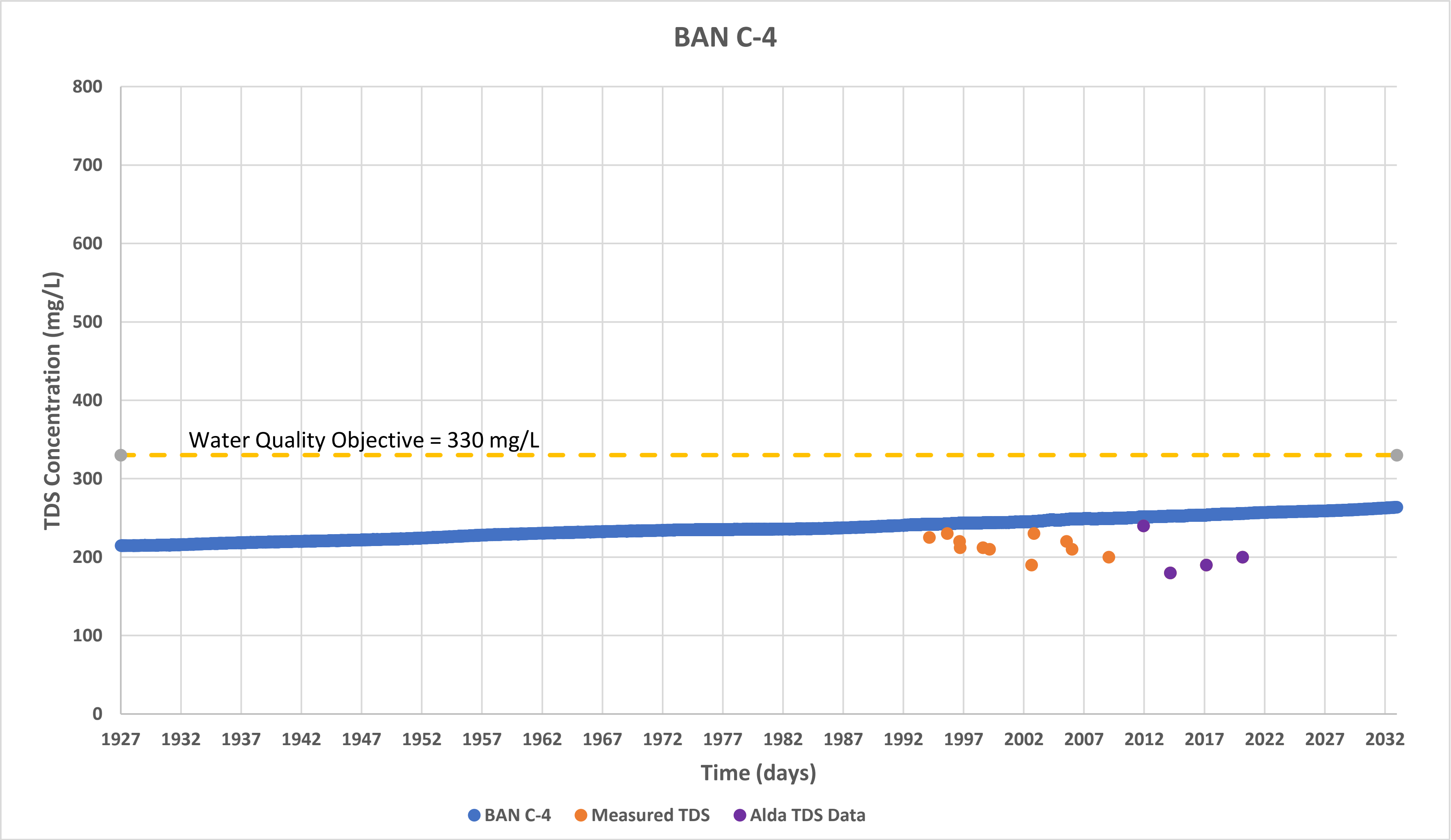

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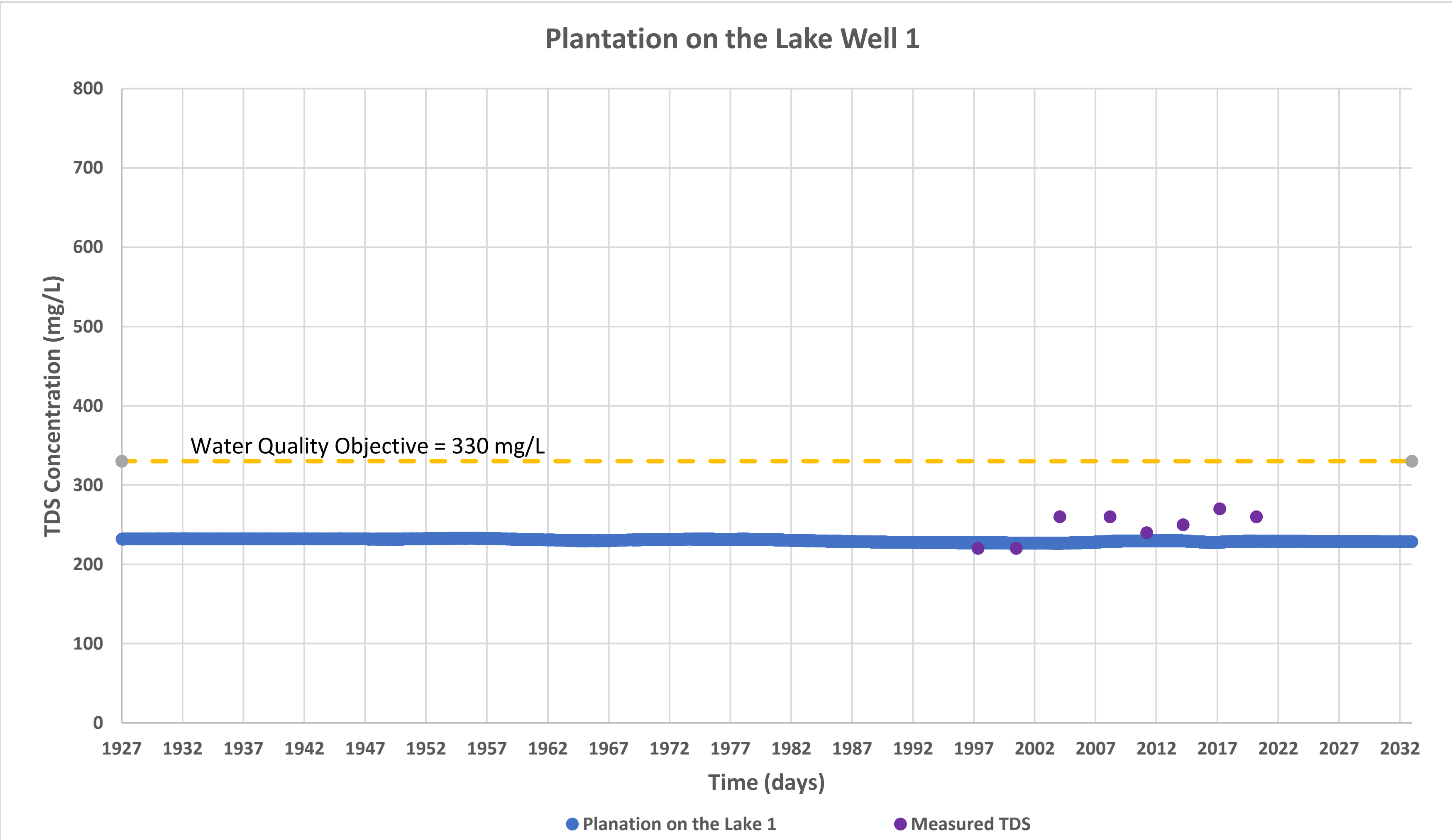

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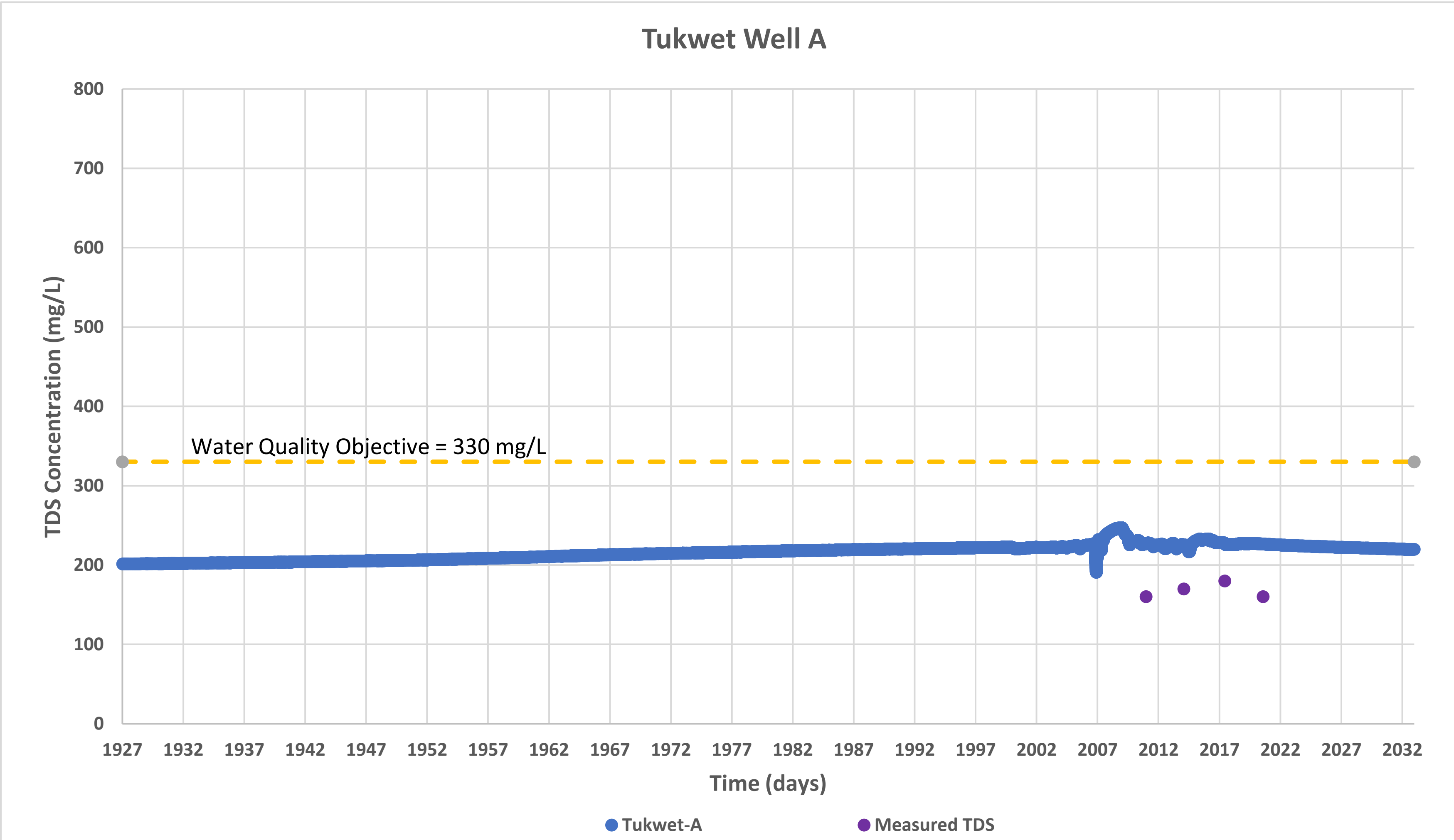

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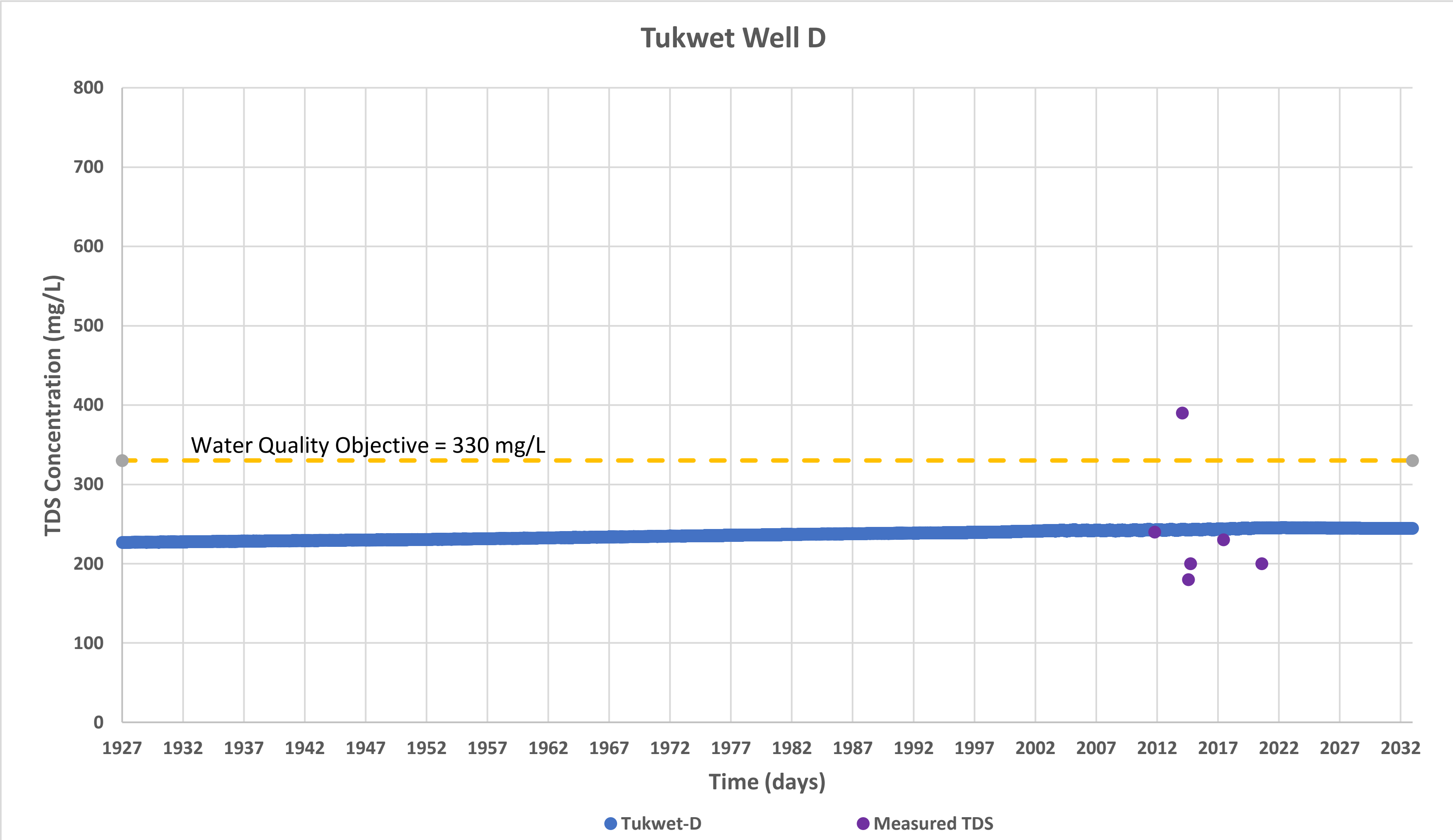

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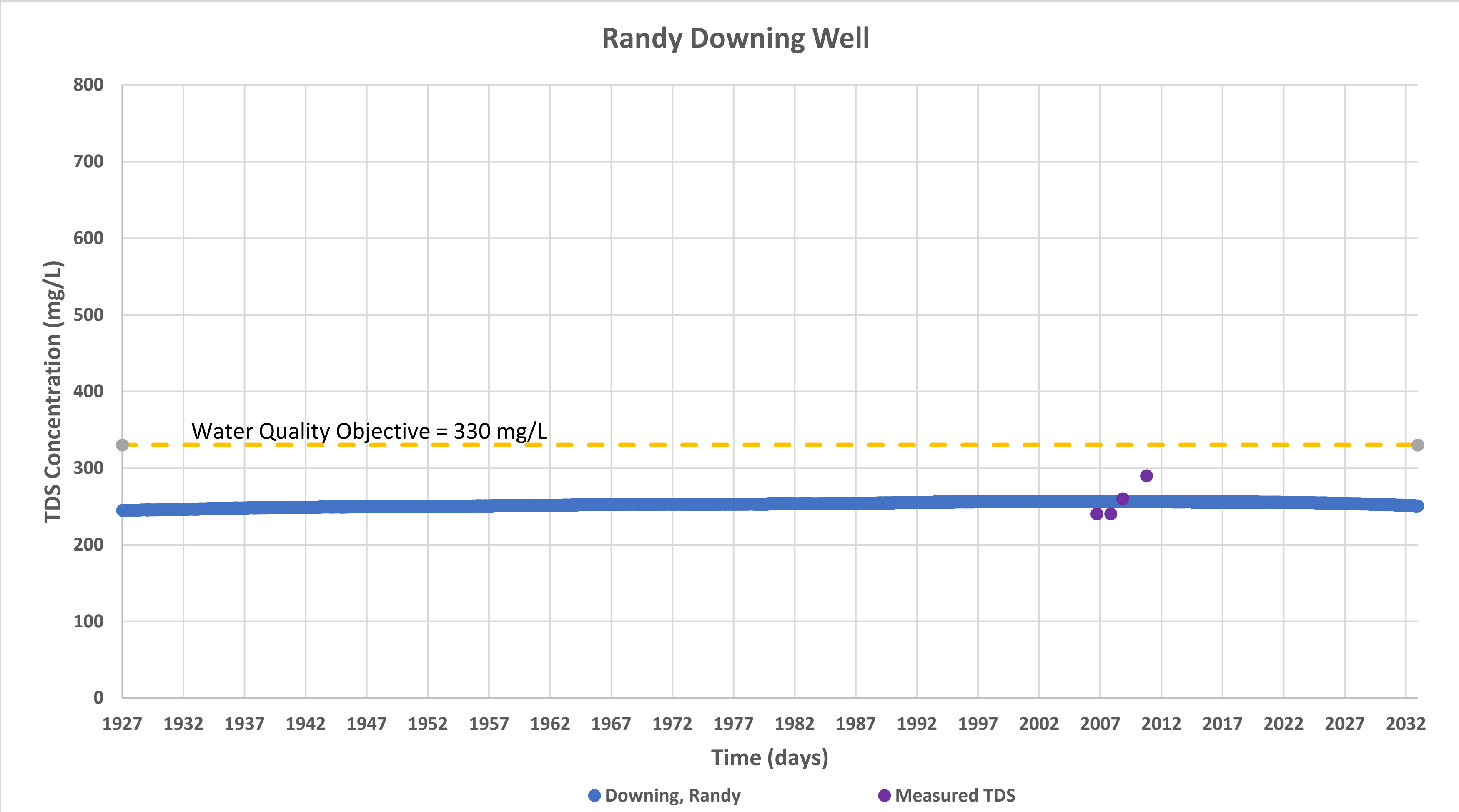

BEAUMONT BASIN WATERMASTER
MEMORANDUM NO. 21-27

Date:	June 2, 2021
From:	Hannibal Blandon, ALDA Inc.
Subject:	2020 Consolidated Annual Report and Engineering Report - Presentation of Comments Received on Draft Report
Recommendation:	That the Watermaster Committee Consider Approving the 2020 Annual Report after Comments Received on the Draft Report are Presented and Discussed.

At the April 7th, 2021, a draft of the 2020 Consolidated Annual Report and Engineering Report was presented. A formal presentation documenting the findings and recommendations was made. Members of the Watermaster Committee had the opportunity to ask questions during the presentation and requested that comments be submitted in writing and presented at the June 2021 regular meeting.

We received written comments from the City of Banning, BCVWD, and the YVWD. SMWC and the City of Beaumont indicated that they did not have any comments on the report. Comments received have been summarized and are attached. Minor editorial comments have not been included in this discussion.

A formal presentation will be made at the June 2nd, 2021 meeting to address the comments received and to discuss any other issues that the members of the Watermaster Committee may have. Please find attached a summary of the comments received along with our corresponding answers.

Should members of the Watermaster Committee be satisfied that all important comments have been addressed properly, we recommend that the Watermaster Committee approves the Draft of the 2020 Consolidated Annual Report and Engineering Report and a Final version produced. The Final version of the report will incorporate all comments received in writing and additional comments discussed during the meeting.

The Draft 2020 Consolidated Annual Report is available online from the "Documents & Publications" section of the Beaumont Basin Watermaster website (www.beaumontbasinwatermaster.org)

Beaumont Basin Watermaster

2020 Consolidated Annual Report and Engineering Report – Response to Comments

Presented at the Regular Watermaster meeting on Jun 2nd, 2021

Comments by the City of Banning

Comments by Chairman Vela were received on May 13, 2021 via email. Response to Mr. Vela's comments were provided the next day on May 14, 2021 via email. A copy of the email is attached.

In one of the comments, Chairman Vela wanted to include a concluding sentence at the end of Section 3.4.2 indicating Watermaster Committee's decision rather than sending the reader to read the meeting minutes. (e.g. "In conclusion, on XXDATEXX 4 of 5 watermaster members agreed that ….".

Response:

While we initially agreed with the suggestion, after further consideration, we concluded that the Watermaster Committee never voted on the approval of YVWD's Form 5. Instead, the committee voted on the approval of the 2018 Annual Report and the 2019 Annual Report with a 4 to 1 approval vote in both cases.

We recommended modifying the last sentence in the second to last paragraph of Section 3.4.2 to read as follows:

"The Issue was extensively discussed at that meeting and throughout the various meetings in 2020 between legal counsel and members of the Watermaster Committee without reaching an agreement."

Comments by BCVWD

Comments by Watermaster Committee member Jaggers were received on May 17, 2021 via email. Response to Mr. Jaggers' comments was provided the same day via email, which is attached.

The main comment received from Mr. Jaggers is related to the use of the term Recycled Water in Section 3.3.2 (Recycled Water Recharge) of the report. He indicated that water treated at the City of Beaumont wastewater treatment plant is tertiary treated only. This treated water is not Title 22 complaint and it cannot be considered as Recycled Water at this time.

Response:

We agree with Mr. Jaggers' comment and are making the following changes

1.- Section 3.3.2 has been retitled as "Treated Wastewater Recharge"

2.- A brief paragraph has been added immediately after the section title. It reads as follows:

"The City of Beaumont owns and operates the Beaumont Wastewater Treatment Plant. The Plant was originally designed and permitted to discharge up to 4.0 mgd of tertiary

Beaumont Basin Watermaster
2020 Consolidated Annual Report and Engineering Report – Response to Comments
Presented at the Regular Watermaster meeting on Jun 2nd, 2021

treated wastewater; current capacity is 6.0 mgd. Discharges from this plant are not permitted for recycled water use at this time".

3.- The term "Recycled Water" has been replaced by the term "Treated Wastewater" or "Tertiary Treated Wastewater" throughout the report.

Comments by YVWD

On May 25, 2021, Mr. Zoba submitted a three-page letter documenting his objection to the report in two particular areas. A copy of this letter is attached.

1.- Section 3.4.2 – Tranfers of Overlying Rights for Service by an Appropriator – fails to account for the transfer of all original 1,806 / revised 1,398.90 ac-ft of OVP's overlying water rights to YVWD, notification of which was provided to the Watermaster on November 20, 2019 under a Form 5. He further indicates that in 2020 YVWD supplied 215.5 ac-ft of drinking and recycled water to OVP for the Oak Valley Project.

2.- Pursuant to Watermaster Rule 7.3, the 2020 Annual Report improperly includes allocation of unused Overlying Water Rights under Section 3.4.3 (Allocation of Unused Overlying Water) and, Table 3-7 of the report.

Response

Based on consultation with Legal Counsel Montoya, these two issues are legal issues and are pending before the court. These issues can only be discussed in closed section with BBW Board members.

Comments by SMWC

On an Email dated May 18, 2021, Mr. Armstrong, SMWC's General Manager, indicated that SMWC did not have any comments on the report.

Comments by the City of Beaumont

On an Email dated May 27, 2021, Mr. Hart, Public Works Director for the City of Beaumont, indicated that he did not have any comments.

Re: BBWM - 2020 Draft Annual Report Comments

From: Anibal Blandon (blandona@aldaengineering.com)

To: avela@banningca.gov

Date: Thursday, May 27, 2021, 2:46 PM PDT

Mr. Vela:

To summarize our text exchange earlier today regarding the inclusion of a concluding sentence at the end of Section 3.4.2, you wanted to include a sentence documenting that Form 5, submitted by YVWD, was not approved. I indicated that the Board voted on the approval of the 2018 Annual Report and the 2019 Annual Report, with both of them approved on a 4 to 1 vote, but the Board never voted on the approval of YVWD's form 5.

There was extensive discussion regarding the submittal of Form 5 by YVWD at the December 2019 meeting and at most regular and special meetings in 2020, but the approval of YVWD's Form 5 was not voted on.

The last sentence of the second to last paragraph in Section 3.4.2 will be modified to read as follows:

"The Issue was extensively discussed at that meeting and throughout the various meetings in 2020 between legal counsel and members of the Watermaster Committee without reaching an agreement."

You indicated that would work for you.

Best Regards

Hannibal Blandon
ALDA Inc.
909-587-9916

On Wednesday, May 26, 2021, 8:59:51 PM PDT, Anibal Blandon <blandona@aldaengineering.com> wrote:

Mr. Vela:

After additional consideration, I think that your suggestion to include a concluding sentence at the end of Section 3.4.2 "Transfer of Overlying Rights for Service by an Appropriator" of the 2020 Consolidated Annual Report and Engineering Report does not fit the narrative of this section.

The purpose of this section is to document transfers of Overlying Rights for Service by an Appropriator; at this time this section is limited to discussing transfers from OVP to YVWD. While I agree that we are sending the reader to chase meeting minutes to better understand the details of the discussions that took place, the purpose of the discussions is NOT to approve or disapprove the annual reports, but to document water transfers from one party to another and associated issues.

Documentation on the approval of the annual report is better suited for Section 2.2.3 "Items Discussed in 2020".

Should you have any questions on this matter or would like to discuss it, please call me at 909-587-9916.

Best Regards

Hannibal Blandon

ALDA Inc.
909-587-9916

On Monday, May 17, 2021, 12:16:38 PM PDT, Arturo Vela <avela@banningca.gov> wrote:

Sounds good.

Arturo Vela, P.E.
Director of Public Works/
City Engineer
Public Works Department
City of Banning
Direct Line: 951-922-3134
Direct Fax: 951-922-3141
avela@banningca.gov
99 E. Ramsey Street
Banning, CA 92220
www.banningca.gov

-----Original Message-----
From: Anibal Blandon <blandona@aldaengineering.com>
Sent: Monday, May 17, 2021 12:16 PM
To: Arturo Vela <avela@banningca.gov>
Subject: Re: BBWM - 2020 Draft Annual Report Comments

Mr. Vela:

There is one item that I would like to briefly discuss with you. I will give you a call at 1:00 PM.

It should not take very long.

Regards

Hannibal Blandon
ALDA Inc.
909-587-9916

On Monday, May 17, 2021, 12:12:01 PM PDT, Arturo Vela <avela@banningca.gov> wrote:

Hannibal,

Thank you for your response to my comments. I agree with your responses and have no further comments. A call today is not needed to discuss these comments/responses unless you have other items that need my attention.

Thanks again!

Arturo Vela, P.E.
Director of Public Works/
City Engineer
Public Works Department
City of Banning
Direct Line: 951-922-3134
Direct Fax: 951-922-3141
avela@banningca.gov
99 E. Ramsey Street
Banning, CA 92220
www.banningca.gov

-----Original Message-----
From: Anibal Blandon <blandona@aldaengineering.com>
Sent: Friday, May 14, 2021 10:45 AM
To: Arturo Vela <avela@banningca.gov>
Subject: Re: BBWM - 2020 Draft Annual Report Comments

Mr. Vela:-

Thank you for your comments; they are well appreciated.

My response to your comments is provided below.

1. Page 3-7, top of page, last sentence: delete "d" in "ceased"

Response: Spelling mistake has been addressed

2. Page 3-7, Section 3.3.3: Has the watermaster agreed to the last sentence. To me it seems definitive, but it's uncertain to me if the watermaster would agree to provide a credit for this recharge on a retroactive basis. I suggest removing this sentence, unless the watermaster has in fact agreed to this. Additionally, I'm still of the opinion that water recharge that is credited should be only that storm flow that would not have made into the basin under pre-developed conditions. I'm not sure if it's worth stating my opinion in the report; I'm just letting you know my thoughts on this issue.

Response: The Watermaster has not agreed to do anything on this issue. We concur with your opinion that the credit should be limited to water that would have not made it into the basin under pre-developed conditions. The first sentence on the paragraph indicates that any new yield would be for water not initially considered as part of the basin safe yield. Per your suggestion, we will modify the last sentence to read as follows:

For the City of Beaumont to receive credit however, Watermaster will need to develop the methodology to compute and credit the New Yield.

3. Page 3-9: I feel that we should end section 3.4.2 with a few sentences that summarizes the watermaster's decision/conclusion rather than sending the reader to read the meeting minutes. (e.g. "In conclusion, on XXDATEXX 4 of 5 watermaster members agreed that ...."

We agree with your suggestion. We will include a summary sentence indicating that 4 of 5 Watermaster Committee members voted to approve the 2018 and 2019 Annual Reports, which documented the transfers from OVP to YVWD as documented above (meaning in Section 3.4.2).

4. Hannibal, what ever happened to the return flow analysis and basin loss analysis. Should the development of policies on these issues be included in the recommendations?

Under Task 22, we are in the process of completing the Return Flow report to document the results of the TDS water quality modeling component. Mr. Harder intents to produce a copy of that report at the June meeting for the Watermaster Committee review and comment.

With regards to the Basin Loss analysis, also known as the "Beaumont Basin Storage Analysis", this study was completed in September 2018 as documented in Section 3.3 (Page 3-5) of the 2020 Annual Report. Section 3-5 (Page 3-10) of the same report indicates that storage losses were estimated under various spreading scenarios; this section further documents that Watermaster has not develop a methodology to adjust storage accounts and their corresponding losses.

This is an issue that we briefly brought up for discussion at the April 7th, 2020 meeting as part of a related agenda item (Memorandum 21-15 - A Comparison of Production and Allowable Extractions Through February 2021). We intent to bring this item for additional discussion later this year, probably at the August meeting, to begin addressing it. This is not a simple issue because of the potential economic impact it may have. This issue will require some policy decisions to implement.

Finally, the 2020 annual report, as well as in the 2019 annual report, documents the recommendation of developing a policy to account for groundwater storage losses. Please see Section 3.8 (Page 3-14) for reference to this recommendation.

5. Figure 3-4: correct spelling of "Overlying" at bottom of page.

Response: Spelling mistake has been addressed.

We hope this response addresses your comments at this time. I will follow up with a phone call on Monday at the suggested time to make sure our response to your comments is acceptable. In the meantime or any other time, please feel free to call me at the number below to discuss any Watermaster related issues.

Best regards

Hannibal Blandon
ALDA Inc.
909-587-9916
.

On Thursday, May 13, 2021, 11:13:06 PM PDT, Arturo Vela <avela@banningca.gov> wrote:

Anibal,

Here are my comments:

1. Page 3-7, top of page, last sentence: delete "d" in "ceased"
2. Page 3-7, Section 3.3.3: Has the watermaster agreed to the last sentence. To me it seems definitive, but it's uncertain to me if the watermaster would agree to provide a credit for this recharge on a retroactive basis. I suggest removing this sentence, unless the watermaster has in fact agreed to this. Additionally, I'm still of the opinion that water recharge that is credited should be only that storm flow that would not have made into the basin under pre-developed conditions. I'm not sure if it's worth stating my opinion in the report; I'm just letting you know my thoughts on this issue.
3. Page 3-9: I feel that we should end section 3.4.2 with a few sentences that summarizes the watermaster's decision/conclusion rather than sending the reader to read the meeting minutes. (e.g. "In conclusion, on XXDATEXX 4 of 5 watermaster members agreed that ...."
4. Hannibal, what ever happened to the return flow analysis and basin loss analysis. Should the development of policies on these issues be included in the recommendations?
5. Figure 3-4: correct spelling of "Overlying" at bottom of page.

Hannibal: I've blocked off 1-1:30 on Monday in the case that you want to call me to discuss these comments. If this works for you, please send me an invite with a number to call you at or you can call me at 951-232-7288.

Thank you and good job on the report.

Arturo Vela, P.E.
Director of Public Works/
City Engineer
Public Works Department
City of Banning
Direct Line: 951-922-3134
Direct Fax: 951-922-3141
avela@banningca.gov
99 E. Ramsey Street
Banning, CA 92220
www.banningca.gov

-----Original Message-----
From: Anibal Blandon <blandona@aldaengineering.com>
Sent: Thursday, May 13, 2021 7:19 AM
To: Arturo Vela <avela@banningca.gov>; Luis Cardenas <lcardenas@banningca.gov>; Dan Jaggers <dan.jaggers@bcvwd.org>; Mark Swanson <mark.swanson@bcvwd.org>; Joseph Zoba <jzoba@yvwd.us>; Jennifer Ares <jares@yvwd.us>; Jeff Hart <jhart@beaumontca.gov>; Robert Vestal <rvestal@beaumontca.gov>; George Jorritsma <smwc@verizon.net>; David Armstrong <darmstrong@southmesawater.com>; Thierry Montoya <tmontoya@alvaradosmith.com>
Subject: Re: BBWM - 2020 Draft Annual Report Comments

All:

Just a reminder to submit your comments on the 2020 Annual Report Draft by the end of this week if possible.

Best regards

Hannibal Blandon
ALDA Inc.
909-587-9916

On Friday, April 30, 2021, 12:17:13 PM PDT, Anibal Blandon <blandona@aldaengineering.com> wrote:

All:

Just a reminder that if you have comments on the 2020 Draft Report to submit them to me by Friday May 14, 2021 (two weeks from today).

I hope all is well

Hannibal Blandon
ALDA Inc.
909-587-9916

On Thursday, April 8, 2021, 12:58:19 PM PDT, Anibal Blandon <blandona@aldaengineering.com> wrote:

All:

Per our meeting yesterday, some of you may have comments on the draft report that need to be addressed.

Could you please provide comments by Friday May 14, 2021. I will summarize the comments and address them at the June 2, 2021 regular board meeting.

In the meantime, should you have any questions on the report, please contact me at the number below.

Best regards

Hannibal Blandon
ALDA Inc.
909-587-9916

Re: BBWM 2020 Annual Report - BCVWD Review

From: Anibal Blandon (blandona@aldaengineering.com)

To: dan.jaggers@bcvwd.org

Date: Monday, May 17, 2021, 11:45 AM PDT

Mr. Jaggers:

Thank you for the comments provided; they are well appreciated.

With regards to the use of the term "Recycled Water" instead of "Tertiary Treated Wastewater" you are absolutely correct that it should be changed.

This change has already been implemented in the completion of the 2019 Final Annual Report, which is dated April 21, 2021 and sent to Mr. Zoba on the next day. This was two weeks after the Draft of the 2020 Annual Report was presented at the April 7, 2021 Regular Board Meeting. Based on comments received during the meeting, the change to "Treated Wastewaster" was incorporated in the final version of the 2019 report and will be incorporated into the final version of the 2020 report. I am attaching the Final 2019 report (excluding appendices as they are too large to e-mail) for your reference.

You may want to make the "Recycled Water" change in the regular BBWM agenda as this term continues to appear under Topics for Future Meetings.

Thank you once again for your comments.

Best Regards

Hannibal Blandon
ALDA Inc.
909-587-9916

> On Monday, May 17, 2021, 6:57:20 AM PDT, Jaggers, Dan (BCVWD) <dan.jaggers@bcvwd.org> wrote:
>
> Hannibal,
>
> Attached are BCVWD's comments for the Watermaster 2020 Annual Report. Fairly minor at this point.
>
> The areas marked with Yellow highlighter are Staff's confirming the if of listed references using the BBWM website and past reports to confirm the information.

There is red text throughout and also some clouding to be reviewed on your end for context and consideration.

Again, no real major comments from our end at the moment.

Thank you,

Dan Jaggers

Beaumont-Cherry Valley Water District

560 Magnolia Ave.

Beaumont, CA 92223

Office Phone (951) 845-9581 Ext. 217

Fax (951) 845-0159

http://www.bcvwd.org

BBWM - 2019 Consolidated Annual Report - No Appendices - April 21, 2021.pdf
8MB

Yucaipa Valley Water District
12770 Second Street • Post Office Box 730 • Yucaipa, California 92399-0730
(909) 797-5117 • Fax: (909) 797-6381 • www.yvwd.us

May 25, 2021

Via Electronic Mail

Hannibal Blandon
ALDA Engineering
5928 Vineyard Avenue
Alta Loma, California 91701

Subject: Comments on the 2020 Consolidated Annual Report and Engineering Report

Dear Mr. Blandon:

I had an opportunity to review the 2020 Consolidated Annual Report and Engineering Report ("2020 Annual Report") and provide the following comments:

1. Section 3.4.2 of the 2020 Annual Report (see page 3-8) purports to account for water transfers and adjustment of rights by and between Appropriative and Overlying Parties under section III.3 of the Amended Judgment Pursuant to Stipulation Adjudicating Groundwater Rights in the Beaumont Basin ("Stipulated Judgment"). While section 3.4.2 documents transfers of water rights between Oak Valley Partners L.P. ("OVP") and Yucaipa Valley Water District ("YVWD") in the amount of 183.05 acre-feet that occurred in 2018 and early 2019, the 2020 Annual Report fails to account for the transfer of all original 1,806 / revised 1,398.90 acre feet of OVP's overlying water rights to YVWD, notification of which was provided to the Watermaster on November 20, 2019 under a "Form 5." This failure to account for the transfer of all of OVP's overlying water rights results in other errors in the 2020 Annual Report, including the accounting for Appropriative and Overlying Party production under section 3.2, Tables 3-2E, 3-7, and 3-8.

   To effectuate a conversion of Overlying Water Rights to Appropriator's Production Rights under Section III.3 of the Stipulated Judgment, there must be (1) a request for water service by the Overlying Party, (2) an agreement by the appropriator to earmark an equivalent amount of water, (3) forbearance by the Overlying Party from using this water and (4) provision of water service by the Appropriator to the Overlying Party. Here, OVP has agreed to transfer all of its Overlying Water Rights to YVWD and has asked YVWD to provide water service to OVP for the development of its Oak Valley Project. Despite a request, earmark, forbearance and provision of water service in accordance with Section III.3, the Watermaster has refused to recognize the transfer and adjust the parties' respective water rights in its 2019 and 2020 annual reports. In 2019, YVWD supplied 63.92 acre feet ("AF") of drinking and recycled water to OVP for the Oak Valley Project. In 2020, demand more than tripled and YVWD supplied 215.5 AF of drinking water and recycled water to the Oak Valley Project. Thus, YVWD's water service to OVP has already exceeded the 180.4 AF initial transfer approved by the Watermaster. Over the next three years, YVWD will supply water to OVP in accordance with the following demands:

	Total OVP Water Demand	Percentage of Transferred Overlying Rights (%)
2018 (actual)	0.11	0.06
2019 (actual)	63.92	12.09
2020 (actual)	215.49	15.31
2021 (est.)	941.97	67.28
2022 (est.)	1,226.87	87.63
2023 (est.)	687.84	48.10

Thus, YVWD has been supplying OVP with water since 2018 and expects a significant increases in demand this year as the construction of the Oak Valley Projection ramps up and water is needed for construction grading. By next year, YVWD anticipates that it will supply an equivalent of nearly 90 percent of the transferred water to OVP for the Oak Valley Project. Subsequent to the completion of the construction of the Oak Valley Project, YVWD anticipates supplying potable and recycled water to OVP for the residential and commercial developments within the Oak Valley Project in amounts that exceed the Overlying Water Rights transferred as described in the November 20, 2019 Form 5.

By approving a 2020 Annual Report that does not account for the transfer of water documented in the November 20, 2019 Form 5. The Beaumont Basin Watermaster will be in violation its duties under the Stipulated Judgment, including section VI.5.W of the Stipulated Judgment which requires the Watermaster to account for the transfer of water rights from an Overlying Party to an Appropriator. For this reason, I intend to object to the approval of the 2020 Annual Report.

2. I also intend to object to the approval of the 2020 Annual Report for the separate reason that, pursuant to Watermaster Rule 7.3, it improperly includes allocation of unused Overlying Water Rights under section 3.4.3 and, Table 3-7 in the 2020 Annual Report. The reasons for my objection generally are set forth in Beaumont Basin Watermaster Memorandum No 21-09, which is incorporated herein by reference, and in my remarks made at the February 3, 2021 Watermaster meeting. As generally described in Memorandum No 21-09, because the water reallocated under Rule 7.3 is accumulating in the Appropriator storage accounts and therefore artificially augments on paper the actual groundwater available in the Basin, it is contrary to the Physical Solution and there would be adverse consequences to the Basin and those who rely on its water if the Appropriators deplete the groundwater based on artificially enlarged storage accounts. Furthermore, Rule 7.3 is inconsistent with the Stipulated Judgment's provisions regarding storage in the Basin. Under the Stipulated Judgment, *only* "Supplemental Water" may be "Stored Water" in the Basin. (Section I.3.Y.) Supplemental Water is defined under the Stipulated Judgment as water imported into the Basin and recycled water. (Section I.3.Z.) Overlying Water Rights apply only to water that is native to the Basin, which is categorically not Supplemental Water, and so unused Overlying Water Rights cannot be Stored Water. Furthermore, the Stipulated Judgment sets forth limitations on the Appropriator's Production Rights and such production rights do not include unused Overlying Water Rights. (Section I.3.B) Additionally, by creating a rule that effectively seizes overlying water for the benefit of the Appropriators, Rule 7.3 impedes the Overlying Parties' right to

transfer their water rights to appropriators under Section III.3 of the Stipulated Judgment and the Watermaster has cited Rule 7.3 as a basis for not recognizing the transfer of water rights from OVP to YVWD (as described above). Finally, Rule 7.3 undermines the objectives of the Stipulated Judgment by hindering the beneficial use of Basin water. To address the improper accounting of unused overlying water moving forward, I have proposed the adoption of Resolution 2021-01 at the February 3 meeting. Resolution 2021-01, however was rejected by a vote of 4-1.

Sincerely,

Joseph B. Zoba
General Manager

Re: BBWM - 2020 Annual Report - Comments

From: darmstrong@southmesawater.com (darmstrong@southmesawater.com)

To: blandona@aldaengineering.com; smwc@verizon.net

Date: Tuesday, May 18, 2021, 8:32 AM PDT

Hannibal,

South Mesa Water Company has no comments on the 2020 Annual Report.

Dave

David A. Armstrong

General Manager

darmstrong@southmesawater.com

South Mesa Water Co.
391 W. Ave. L
Calimesa, Ca. 92320
909-795-2401

Re: BBWM Data Request - Agenda Item

From: Anibal Blandon (blandona@aldaengineering.com)

To: jhart@beaumontca.gov

Date: Thursday, May 27, 2021, 1:04 PM PDT

Mr. Hart:

Ok.

Thank you for your prompt response.

Hannibal Blandon
ALDA Inc.
909-587-9916

> On Thursday, May 27, 2021, 11:32:54 AM PDT, Jeff Hart <jhart@beaumontca.gov> wrote:
>
> I do not have any additional comments to the 2020 draft report.
>
> Jeff