Notice and Agenda of a Meeting of the Beaumont Basin Watermaster

Wednesday, August 7, 2019 at 10:00 a.m.

Meeting Location:

Beaumont Cherry Valley Water District
560 Magnolia Avenue
Beaumont, California 92223
(951) 845-9581

Watermaster Members:

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

I. Call to Order

II. Roll Call

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

City of Beaumont: _____ (Alternate: Kyle Warsinski)

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 June 25, 2019 [Page 3 of 38]

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 - Keith McCullough/Thierry Montoya, Alvarado Smith

VII. Discussion Items

A. Status Report on Water Level Monitoring throughout the Beaumont Basin through July 31, 2019 [Memorandum No. 19-16, Page 7 of 38]

Recommendation: No recommendation.

B. A Comparison of Production and Allowable Extractions through June 2019 [Memorandum No. 19-17, Page 18 of 38]

Recommendation: No recommendation - For informational purposes only.

C. Return Flow Accounting Methodology - Draft Report [Memorandum No. 19-18, Page 19 of 38]

Recommendation: That the Board reviews the Draft Report and provides comments

VIII. Topics for Future Meetings

A. Development of a methodology and policy to account for new yield from capturing local stormwater in the basin.

B. Development of a methodology and policy to account for groundwater storage losses in the basin resulting from the spreading of additional water sources.

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

D. Develop a protocol to increase the accuracy and consistency of data reported to the Watermaster.

E. Discussion of return flow credit and how it might be managed

IX. Comments from the Watermaster Committee Members

X. Announcements

A. The next regular meeting of the Beaumont Basin Watermaster is scheduled for Wednesday, October 2, 2019 at 10:00 a.m.

XI. Adjournment

DRAFT

Record of the Minutes of the Beaumont Basin Committee Meeting of the Beaumont Basin Watermaster Special Meeting Wednesday, June 25, 2019

Meeting Location:

Beaumont-Cherry Valley Water District
560 Magnolia Avenue
Beaumont, CA 92223

I. Call to Order

Chairman Arturo Vela called the meeting to order at 11:09 a.m.

II. Roll Call

City of Banning	*Arturo Vela*	*Present*
City of Beaumont	*Kyle Warsinski*	*Present*
Beaumont-Cherry Valley Water District	*Daniel Jaggers*	*Present*
South Mesa Water Company	*NONE*	
Yucaipa Valley Water District	*Joseph Zoba*	*Present*

Thierry Montoya was present representing legal counsel for the Beaumont Basin Watermaster.

Staff present were: Mark Swanson, James Bean and Erica Gonzales from BCVWD.

Members of the public who registered and / or attended were: Mike Kostelecky, and John Ohanian of Oak Valley Partners.

III. Pledge of Allegiance

Chairman Vela led the pledge of allegiance.

IV. Public Comments:

None.

V. Consent Calendar

It was moved by Member Zoba and seconded by Member Jaggers to approve the Meeting Minutes of the following dates:

1. Meeting Minutes for March 27, 2019
2. Meeting Minutes for June 5, 2019

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

VI. Reports

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

No report.

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

No report.

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

Mr. Montoya reminded that at the last meeting there was note of possible ambiguity in the Judgment, Section 3 subsection B. He said he provided an email to Board members on June 5 explaining his legal opinion that there is no ambiguity. The judgment signed by all parties allows for the imposition of potable water charges on an overlyer who is transferring rights to an appropriative party. One fee can be imposed; another fee would not be imposed per Subsection ii Importation.

VII. Discussion Items

A. Discussion and Consideration of Resolution 2019-02 Amending Section 7 of the Rules and Regulations of the Beaumont Basin Watermaster

Recommendation: That the Watermaster Committee adopt Resolution No. 2019-02.

Chair Vela reminded the Committee that this was tabled at the previous meeting. He asked for clarification on transfer and earmarked water numbers. In response, Counsel Montoya explained previous dedication of water to the Yucaipa Valley Water District. The Resolution provides that instead of tracking the water by correspondence, it would be tracked by Form 5, "Notice to Adjust Rights of an Overlying Party due to Proposed Provision of Water Service by an Appropriator." This would clear up the process and workflow of the transfer, he said. Form 5 is an existing form and should be completed and submitted back to the Watermaster.

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Montoya explained that water is designated as "earmarked" meaning subject to transfer (not transferred yet, remains an overlying right) until it is transferred (put to service); then the overlyer forgoes pumping the water that has now been transferred to the appropriator. Until the giving of service actually happens, it remains an overlying right then transfers pursuant to the agreement and to the judgment, Montoya said.

There is no time limit for the transfer as long as development is progressing, Montoya said. This can happen over time. The overlyer may need another allotment, and when the right is exhausted all the water belongs to the appropriator. If it does not all come to fruition at some point, Montoya continued, whatever remains belongs to the overlyer unless the overlyer says it is no longer needed.

In response to a question regarding the potential for double calculation, Montoya pointed to a technical process in the judgment to address waste of water.

Member Zoba noted that the recitals in the Resolution mirror the verbiage in the judgment and asked about the term "rates." Counsel Montoya explained there are two charges called out in the adjudication: the development impact fee for source of supply, and the customary charges to all customers – the rate structure developed as part of providing the water service. The development component may be passed on, but not the monthly operation component.

Member Zoba asked about the intent in removing some of the provisions. Mr. Montoya explained that the subcommittee removed provisions that were not consistent with the judgment.

It was moved by Member Zoba and seconded by Member Warsinski to adopt Resolution 2019-02.

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

VIII. Topics for Future Meetings

A. Development of a methodology and policy to account for new yield from capturing local stormwater in the basin

B. Development of a methodology and policy to account for groundwater storage losses in the basin resulting from the spreading of additional water sources

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

D. Develop a protocol to increase the accuracy and consistency of data reported to the Watermaster

E. Discussion of return flow credit and how it might be managed

IX. Comments from the Watermaster Committee Members*:*

Member Jaggers advised that BCVWD is exercising westerly wells and reducing use of easterly wells in an effort to balance the basin.

Member Warsinski noted that Pardee is completing the masking operation which will be followed by precise grading. He expects permitting for model homes in November, followed by production permits in January or February.

X. Announcements

A. The next regular meeting of the Beaumont Basin Watermaster is scheduled for Wednesday, August 7, 2019 at 10:00 a.m.

XI. Adjournment

Chairman Vela adjourned the meeting at 11:28 a.m.

Attest:

DRAFT UNTIL APPROVED

_____

Daniel Jaggers, Secretary
Beaumont Basin Watermaster

DRAFT

BEAUMONT BASIN WATERMASTER
MEMORANDUM NO. 19-16

Date: August 7, 2019

From: Hannibal Blandon, ALDA Inc.

Subject: Status Report on Water Level Monitoring throughout the Beaumont Basin through July 31, 2019

Recommendation: No recommendation.

At the present time, there are 16 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. Water levels at YVWD No. 34 were not recorded between July 2017 and July 2018 due to several reasons including faulty equipment and repeated vandalism. In mid-summer 2018 a new probe was installed and the security at this location was enhanced. Water level at this well has been very stable in the last four years increasing by two feet since August 2015 to the current elevation of 2,142 ft.

- ✓ At Oak Valley No. 5 the water level declined by seven feet since March 2018, but is showing signs of recovery and it is currently at an elevation of 2,133 ft. This elevation is two feet higher than when we started recording water levels in August 2015.

- ✓ Figure No. 3 – Two of the Noble Creek observation wells are presented in this figure representing the shallow and deep aquifers. In the shallow aquifer, the water level has increased close to 89 feet over the last two years from a low of 2,337 ft. to 2,426 ft.; over the last two months, the water level at this well increase by 5 ft. In the deep aquifer, water level has increased by 56 ft since the summer of 2016.

- ✓ 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 as it decreased two feet over the last four years.

- ✓ Figure No. 5 illustrates 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 two years, a somewhat significant and steady decline, close to 23 feet, was recorded at Banning M-8 between the summer of 2015 and the winter of 2017. The probe at Banning M-8 was removed in late January 2018 and was reinstalled this past May; since it has declined and additional 5 ft. Water level at Banning M-9 has fluctuated in a 13-foot range, between 2,134 ft and 2,147 ft. since monitoring began in the summer of 2015. Currently, water elevation is at 2,138 ft. Water level over the last six months are not depicted in the figure due to problems with the communications cable. It is likely that the communications cable would need to be replaced.

- ✓ Figure No. 6 illustrate recorded water level at BCVWD No. 2 and BCVWD No. 25. Over the last two years, the level at BCVWD No. 2 has increased by over 26 feet reaching its highest level in mid-May of this year. Since, it has declined 4 ft. Water level at BCVWD No. 25 is in sync with BCVWD No. 2 despite of pumping close to 18 hours a day and it is also close to the highest level recorded. Over the last six months, the water level at these two wells has increased by 6 ft at each well.

- ✓ Figure No. 7 depicts the recorded water level at the two newest observation wells, BCVWD No. 29 and Tukwet Canyon Well "B". BCVWD is a pumping well that is now more actively used to meet peak summer demands. Water level at this well has experienced a slight decline of 4 ft over the last two months. Tukwet B is a dedicated monitoring well in the southern portion of the basin; water level at this well has been fairly stable over the last four months; however, an anomaly occurred during the 4th of July weekend when the water level drop over 2 ft. (See Figure 7A) No explanation has been given for this occurrence. Figure 7B illustrates hourly water levels at BCVWD No. 29 and the On and Off TOU cycles used in this well. Please note how quickly the water level at this well drops and recovers.

New Monitoring Wells

During the last reporting period, no additional monitoring wells have been added.

New Equipment Installation

None during the reporting period.

Troubleshooting Issues

The following malfunctioning issues were encountered during our August 1, 2019 field visit:

- ✓ Banning M-9 – Communications cable did not allow us to upload water level information from the probe for the second time; however, the probe continues to

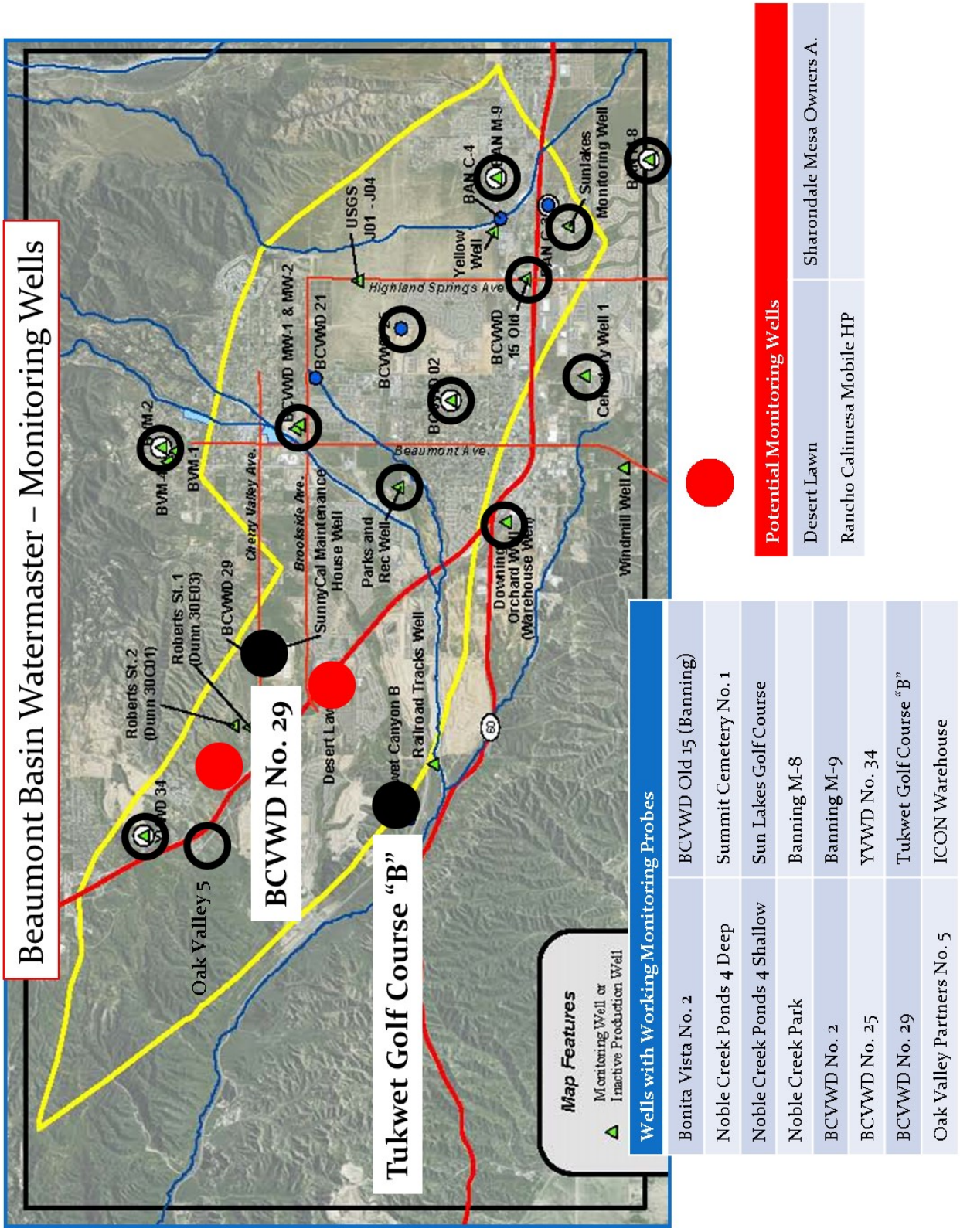
record levels on an hourly basis. A new communications cable will be ordered for this well since we have not been able to extract the data for the last four months.

New Monitoring Sites

- The property owned by the 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.

- We have approached Clearwater Operations to consider the installation of a water level probe at Sharondale Well No. 1. This company provides maintenance and operations support to Sharondale HOA. We are in the process of coordinating a field visit to assess the feasibility of installing the probe.

- At Plantation by the Lake, another potential monitoring well site, communications with owner have not be reestablished.


Beaumont Basin Watermaster – Monitoring Wells
BCVWD No. 29
Tukwet Golf Course "B"
Oak Valley 5
Roberts St. 2 (Dunn 30C01)
Roberts St. 1 (Dunn 30E03)
BCVWD 29
Cherry Valley Ave.
Brookside Ave.
SunnyCal Maintenance House Well
Parks and Rec Well
Railroad Tracks Well
Desert Lawn
Beaumont Ave.
Highland Springs Ave
BCVWD MW-1 & MW-2
BCVWD 21
USGS J01 - J04
Yellow Well
BCVWD 15 Old
Sunlakes Monitoring Well
Windmill Well
Map Features
Monitoring Well or Inactive Production Well
Wells with Working Monitoring Probes
Bonita Vista No. 2
Noble Creek Ponds 4 Deep
Noble Creek Ponds 4 Shallow
Noble Creek Park
BCVWD No. 2
BCVWD No. 25
BCVWD No. 29
Oak Valley Partners No. 5
BCVWD Old 15 (Banning)
Summit Cemetery No. 1
Sun Lakes Golf Course
Banning M-8
Banning M-9
YVWD No. 34
Tukwet Golf Course "B"
ICON Warehouse
Potential Monitoring Wells
Desert Lawn
Rancho Calimesa Mobile HP
Sharondale Mesa Owners A.

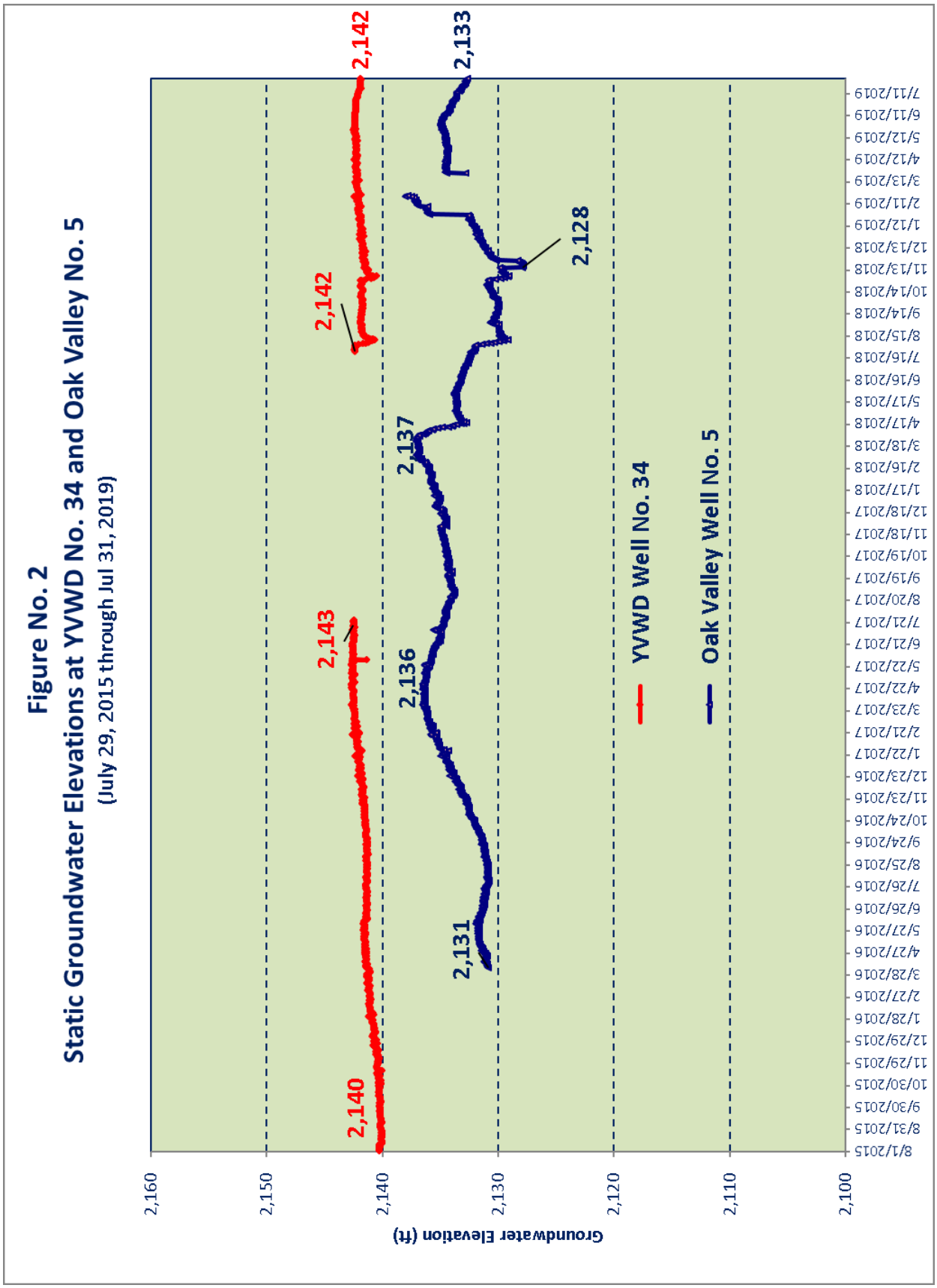


Figure No. 2
Static Groundwater Elevations at YVWD No. 34 and Oak Valley No. 5
(July 29, 2015 through Jul 31, 2019)
Groundwater Elevation (ft)
2,160
2,150
2,140
2,130
2,120
2,110
2,100
YVWD Well No. 34
Oak Valley Well No. 5
2,142
2,133
2,142
2,128
2,137
2,143
2,136
2,131
2,140
8/1/2015
8/31/2015
9/30/2015
10/30/2015
11/29/2015
12/29/2015
1/28/2016
2/27/2016
3/28/2016
4/27/2016
5/27/2016
6/26/2016
7/26/2016
8/25/2016
9/24/2016
10/24/2016
11/23/2016
12/23/2016
1/22/2017
2/21/2017
3/23/2017
4/22/2017
5/22/2017
6/21/2017
7/21/2017
8/20/2017
9/19/2017
10/19/2017
11/18/2017
12/18/2017
1/17/2018
2/16/2018
3/18/2018
4/17/2018
5/17/2018
6/16/2018
7/16/2018
8/15/2018
9/14/2018
10/14/2018
11/13/2018
12/13/2018
1/12/2019
2/11/2019
3/13/2019
4/12/2019
5/12/2019
6/11/2019
7/11/2019

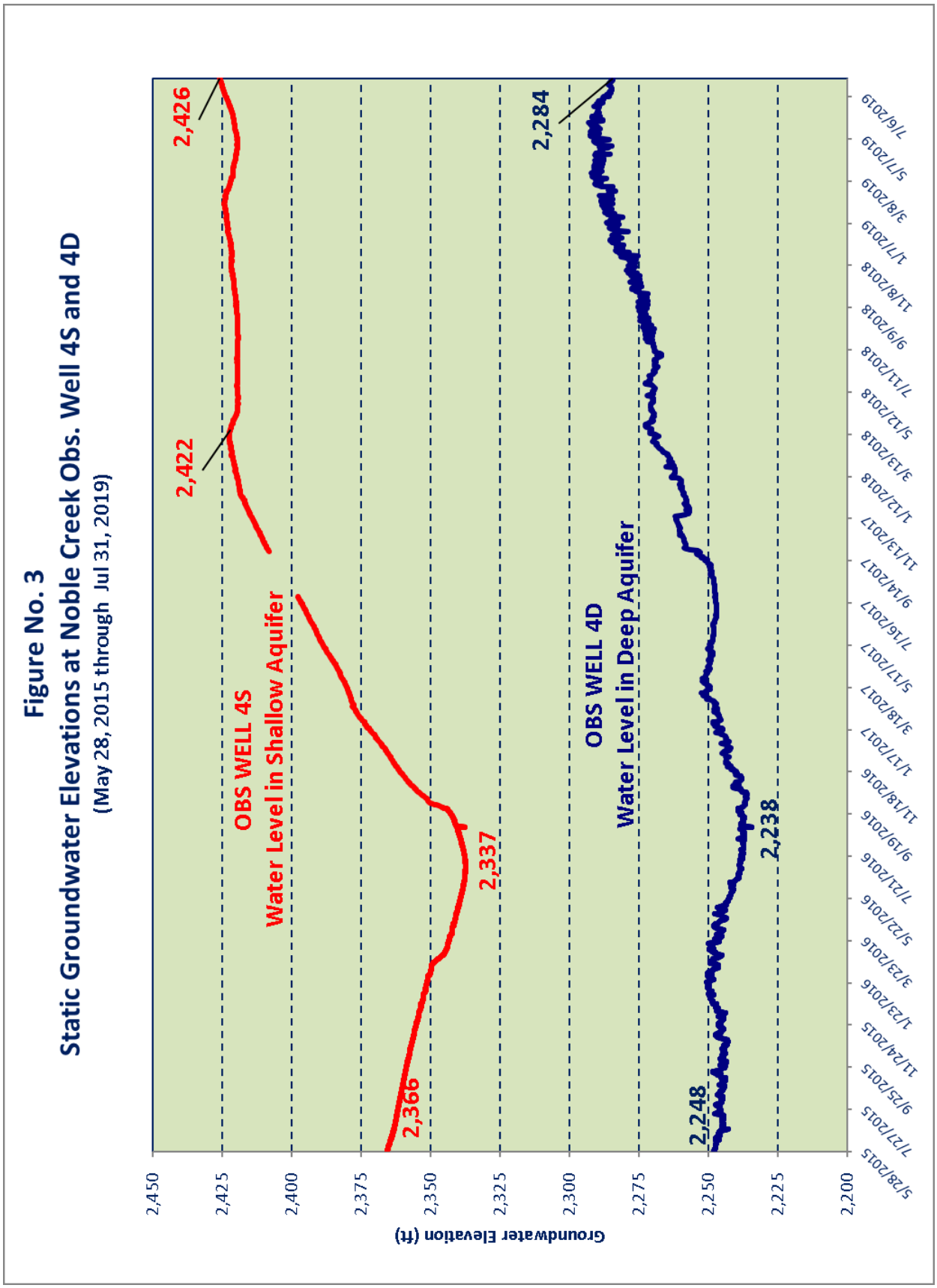


Figure No. 3
Static Groundwater Elevations at Noble Creek Obs. Well 4S and 4D
(May 28, 2015 through Jul 31, 2019)
OBS WELL 4S
Water Level in Shallow Aquifer
OBS WELL 4D
Water Level in Deep Aquifer
2,426
2,422
2,366
2,337
2,284
2,248
2,238
Groundwater Elevation (ft)
2,450
2,425
2,400
2,375
2,350
2,325
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

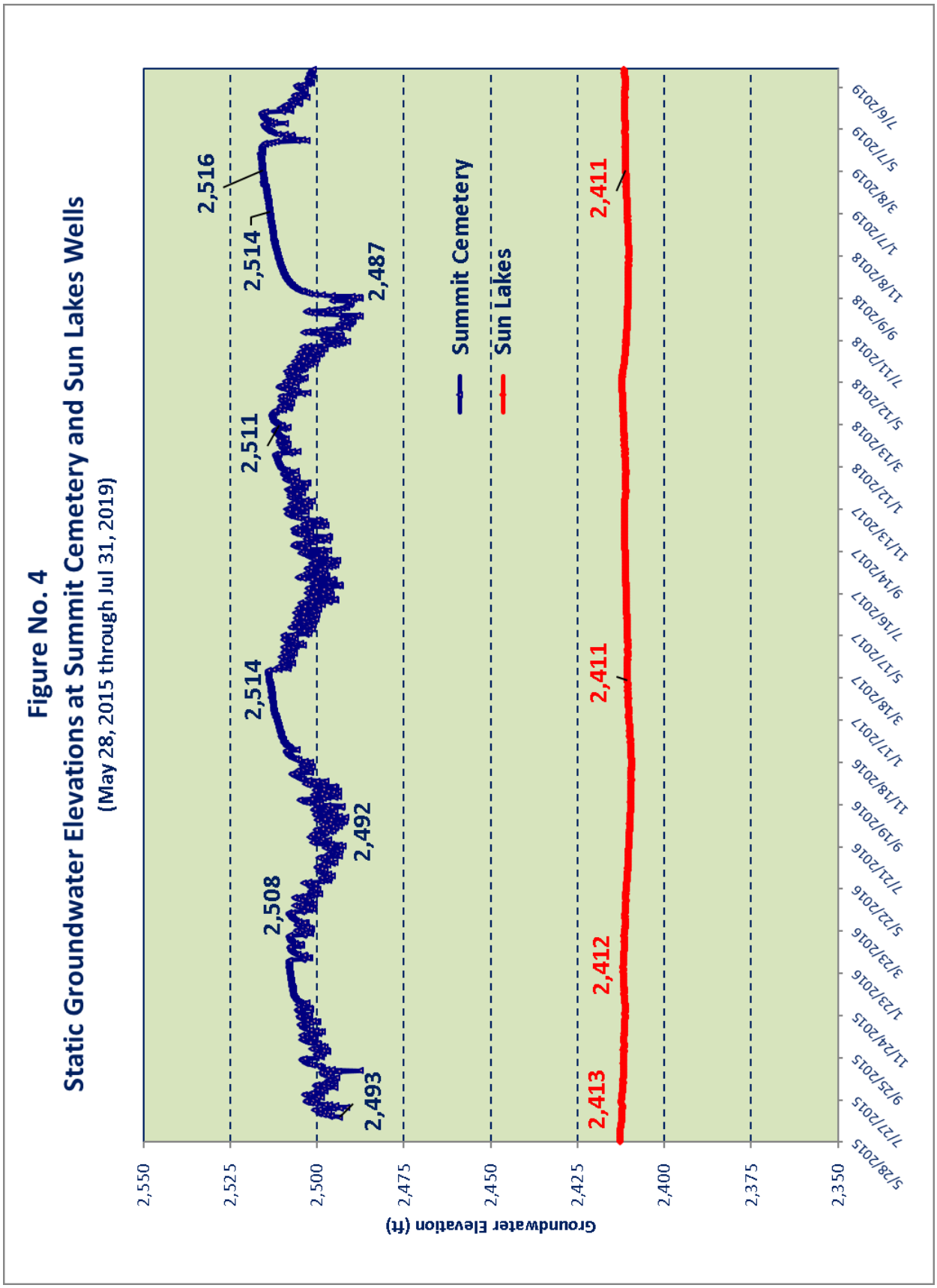


Figure No. 4
Static Groundwater Elevations at Summit Cemetery and Sun Lakes Wells
(May 28, 2015 through Jul 31, 2019)
Summit Cemetery
Sun Lakes
Groundwater Elevation (ft)
2,550
2,525
2,500
2,475
2,450
2,425
2,400
2,375
2,350
2,516
2,514
2,487
2,511
2,514
2,508
2,492
2,493
2,411
2,411
2,412
2,413
5/28/2015
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
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1/7/2019
3/8/2019
5/7/2019
7/6/2019

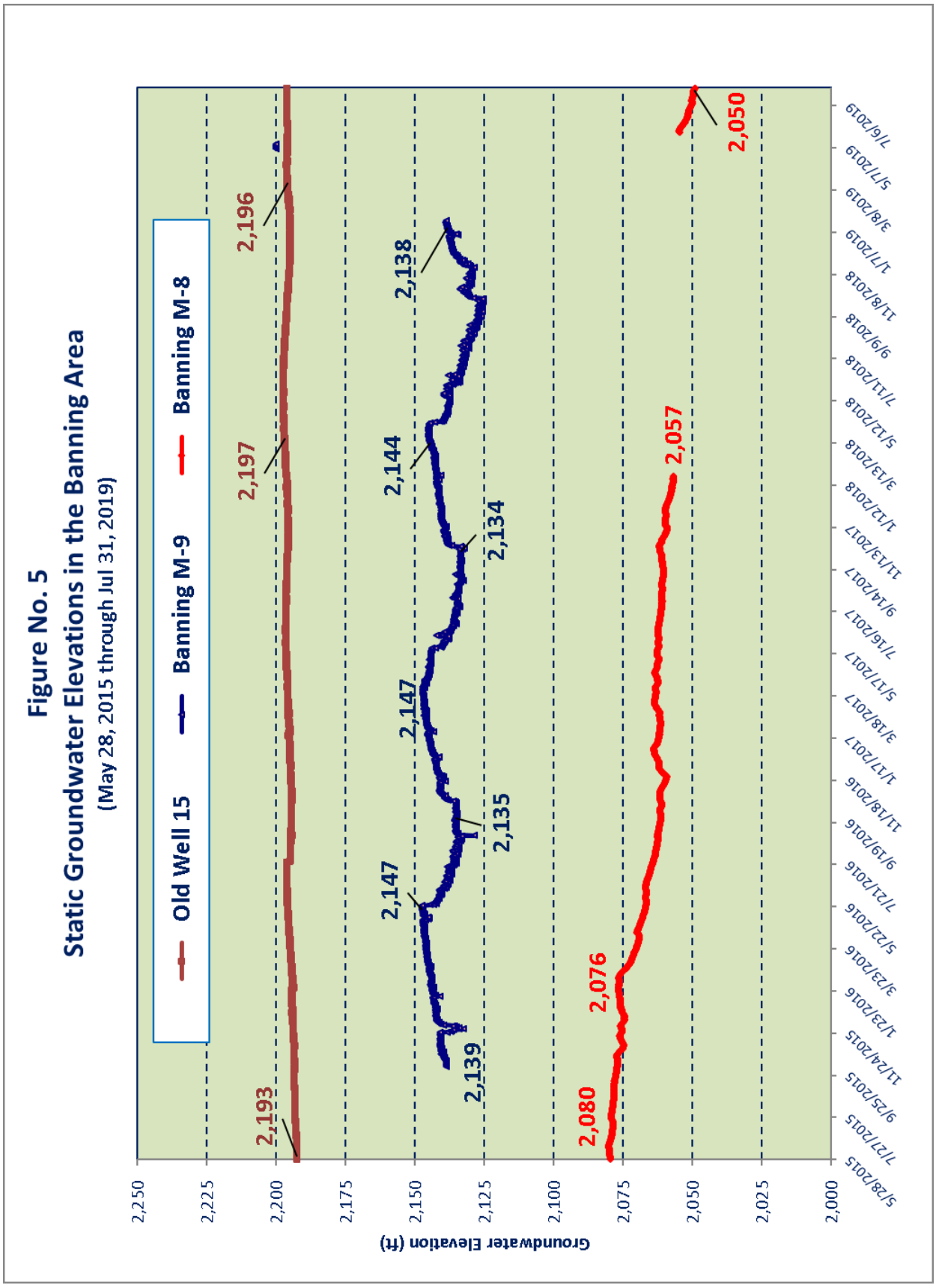
Figure No. 5
Static Groundwater Elevations in the Banning Area
(May 28, 2015 through Jul 31, 2019)
Old Well 15
Banning M-9
Banning M-8
Groundwater Elevation (ft)
2,250
2,225
2,200
2,175
2,150
2,125
2,100
2,075
2,050
2,025
2,000
2,193
2,196
2,197
2,147
2,139
2,147
2,135
2,144
2,134
2,138
2,080
2,076
2,057
2,050
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
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1/7/2019
3/8/2019
5/7/2019
7/6/2019

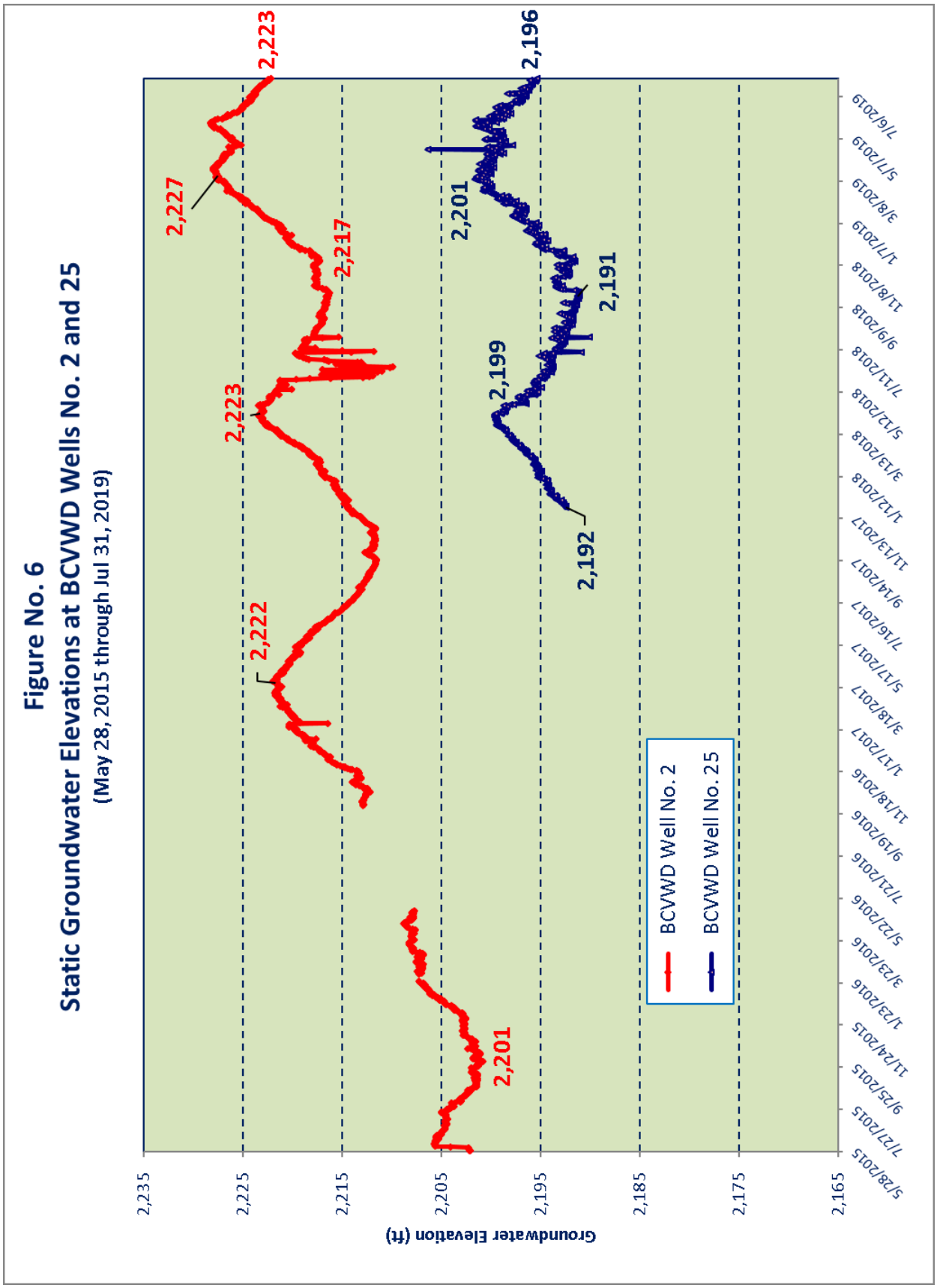
Figure No. 6
Static Groundwater Elevations at BCVWD Wells No. 2 and 25
(May 28, 2015 through Jul 31, 2019)
Groundwater Elevation (ft)
2,235
2,225
2,215
2,205
2,195
2,185
2,175
2,165
BCVWD Well No. 2
BCVWD Well No. 25
2,223
2,227
2,217
2,223
2,222
2,201
2,196
2,201
2,199
2,191
2,192
5/28/2015
7/27/2015
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
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7/6/2019

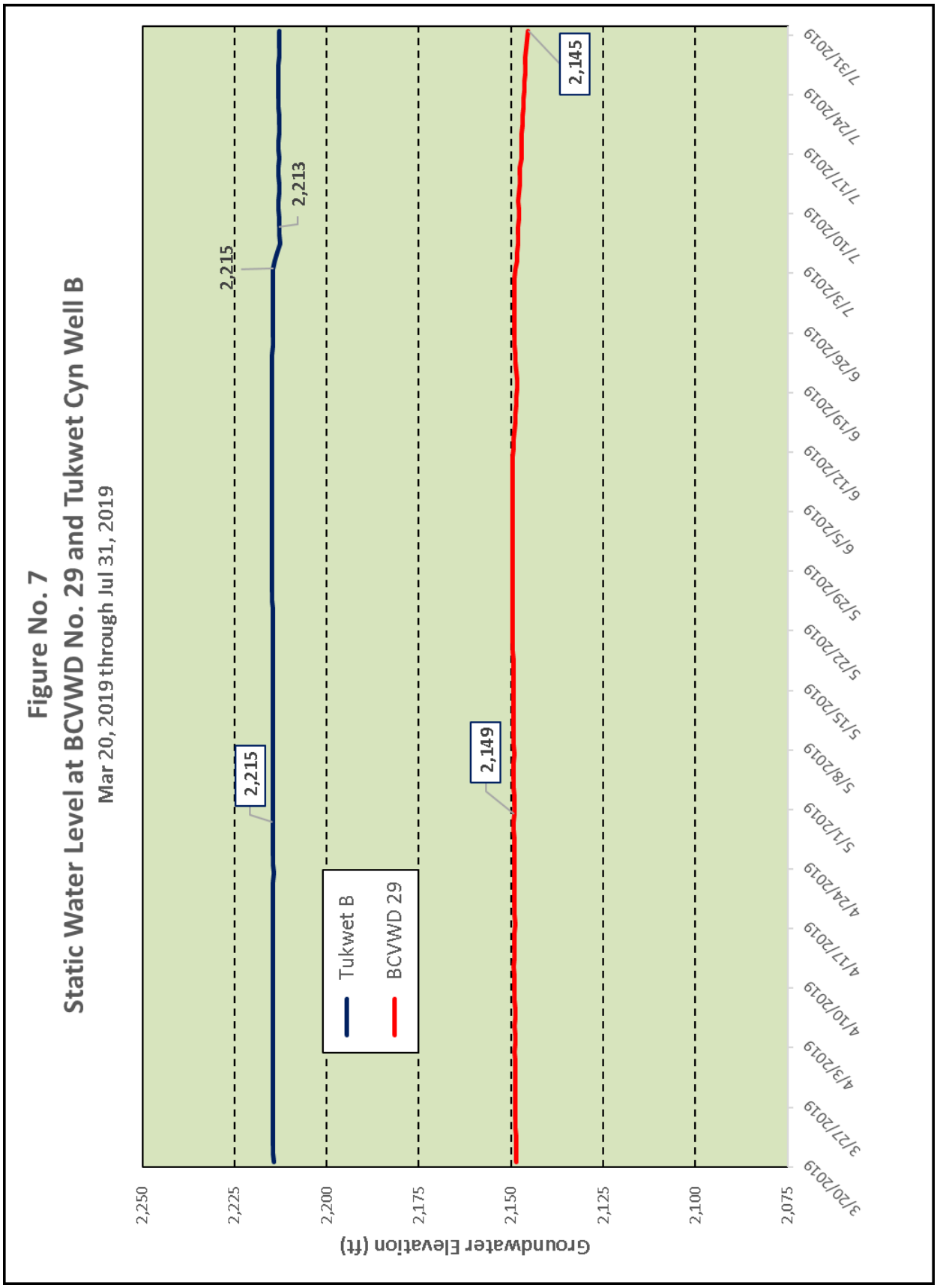
Figure No. 7
Static Water Level at BCVWD No. 29 and Tukwet Cyn Well B
Mar 20, 2019 through Jul 31, 2019
Groundwater Elevation (ft)
2,250
2,225
2,200
2,175
2,150
2,125
2,100
2,075
3/20/2019
3/27/2019
4/3/2019
4/10/2019
4/17/2019
4/24/2019
5/1/2019
5/8/2019
5/15/2019
5/22/2019
5/29/2019
6/5/2019
6/12/2019
6/19/2019
6/26/2019
7/3/2019
7/10/2019
7/17/2019
7/24/2019
7/31/2019
2,215
2,213
2,215
2,145
2,149
Tukwet B
BCVWD 29

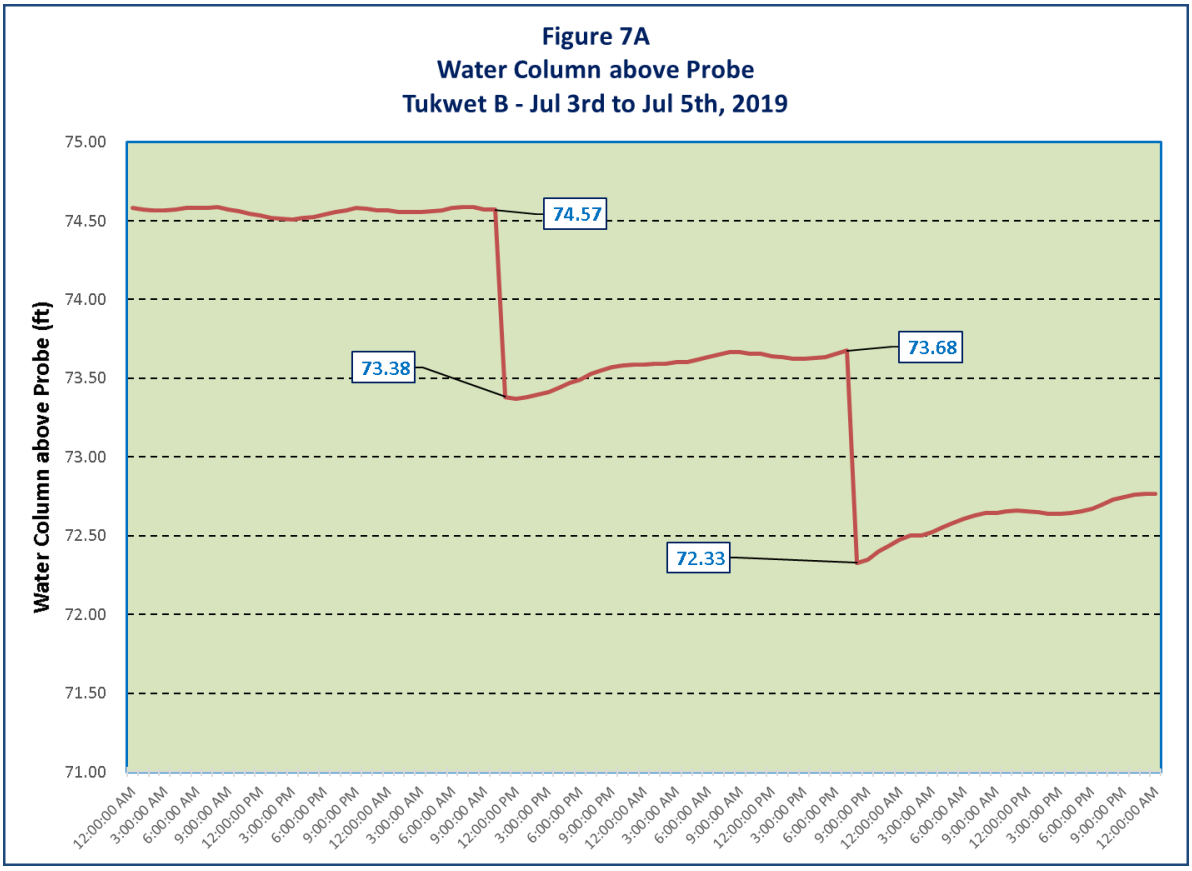
Figure 7A
Water Column above Probe
Tukwet B - Jul 3rd to Jul 5th, 2019
Water Column above Probe (ft)
75.00
74.50
74.00
73.50
73.00
72.50
72.00
71.50
71.00
74.57
73.38
73.68
72.33

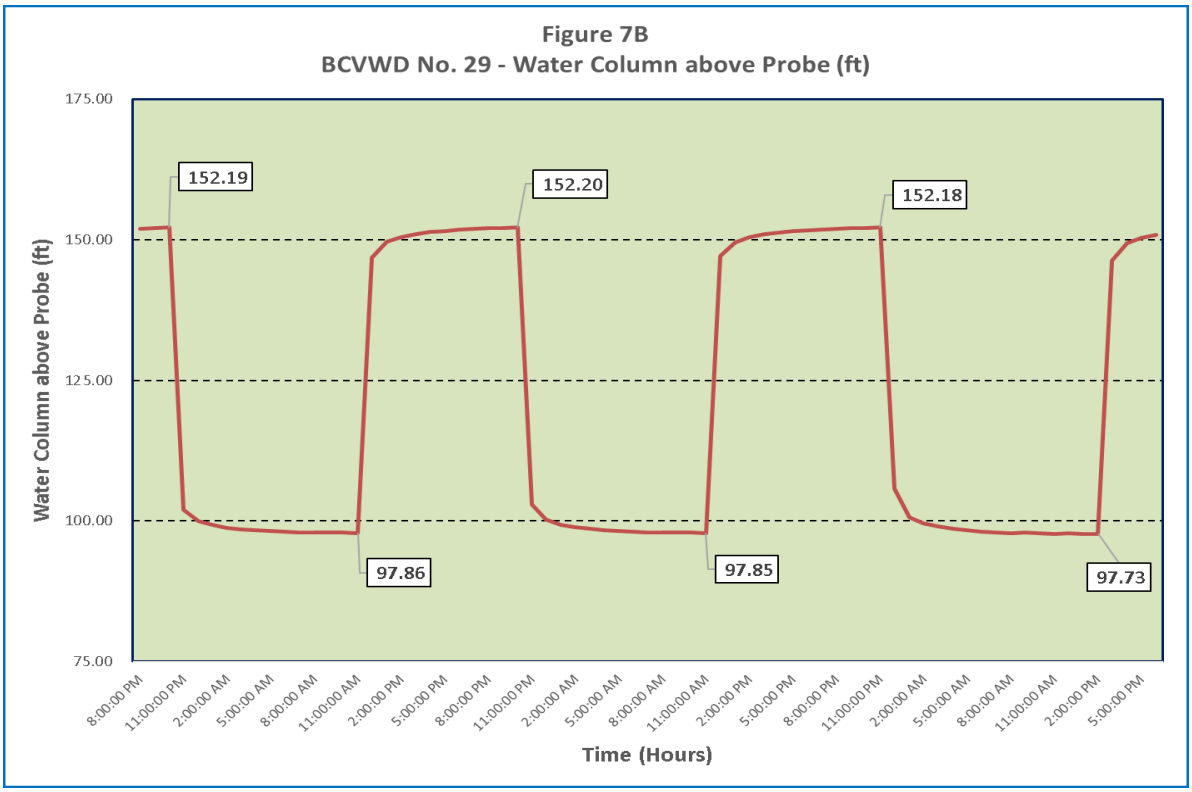
Figure 7B
BCVWD No. 29 - Water Column above Probe (ft)
Water Column above Probe (ft)
175.00
150.00
125.00
100.00
75.00
152.19
152.20
152.18
97.86
97.85
97.73
Time (Hours)

BEAUMONT BASIN WATERMASTER
MEMORANDUM NO. 19-17

Date: August 7, 2019

From: Hannibal Blandon, ALDA Inc.

Subject: A Comparison of Production and Allowable Extractions through June 2019

Recommendation: No recommendation - For informational purposes only.

The purpose of this Technical Memorandum is to present a comparison of production rights from the basin against actual production by Appropriators. Production rights consist of the sum of Unused Production by Overlying Users from 2014 transferred to Appropriators for 2019 and Imported Water Spreading. This sum is compared against actual production through June 2019. It should be noted that 2019 is the first year in which the Transfer of Overlying Rights were derived from the current basin safe yield of 6,700 ac-ft/yr.

During the first six months of the year a total of 5,304 ac-ft of water were produced from the basin by the Appropriators while 6,153 ac-ft of imported water were spread at the Noble Creek spreading grounds. Unused production by Overlying users for 2014 was estimated at 4,481 ac-ft. The table below presents the above comparison for all Appropriators; all numbers shown in ac-ft, except as noted.

	City of Banning	Beaumont Cherry Valley Water District	South Mesa Mutual Water Company	Yucaipa Valley Water District	Total
Transfer of Overlying Rights from 2014	1,408	1,905	559	609	**4,481**
Imported Water	125	6,028	0	0	**6,153**
Total	**1,533**	**7,933**	**559**	**609**	**10,634**
Production	827	4,352	125	0	5,304
% of Total	53.9%	54.9%	22.4%	0.0%	49.8%

BEAUMONT BASIN WATERMASTER
MEMORANDUM NO. 19-18

Date: August 7, 2019

From: Thomas Harder, Thomas Harder and Associates

Subject: Return Flow Accounting Methodology - Draft Report

Recommendation: That the Board reviews the Draft Report and provides comments

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The purpose of this Technical Memorandum is to present the results of the Return Flow Accounting Methodology draft report for consideration by the Board.

In October 2018, the Beaumont Basin Watermaster Board directed the ALDA Team to develop a methodology to estimate return flow from applied water within each Appropriator's respective service areas within the Beaumont Basin adjudicated boundary. A draft report has been prepared summarizing the results of the investigation (See attached). A formal presentation will be given at the regularly scheduled Board meeting; the presentation will include:

- An accounting methodology for water delivered to customers in the Beaumont Basin adjudicated area.
- Assumptions as to how much water delivered to customers is applied for outdoor use.
- Assumptions as to how much of the water applied to outdoor use becomes return flow.
- Methodology for addressing parcels within Appropriator service areas that overlap and extend across the Beaumont Basin adjudication boundary.
- A methodology to account for the return flow lag time between the time of application at the surface and the arrival of the return flow at the groundwater.
- Estimates of return flow, by Appropriator, for 2017 using the updated methodology.

Technical Memorandum

DRAFT

To:	Mr. Hannibal Blandon Alda, Inc.
From:	Thomas Harder, P.G., CH.G. Thomas Harder & Co.
Date:	29-Jul-19
Re:	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 zones 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. The Beaumont Basin Watermaster Board 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 water use, and account for

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

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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.

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 or construction.
4. Estimate the indoor and outdoor water use by account, according to the account type classification.
5. For sewered and landscape 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 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[2] 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 2017, a total of approximately 15,700 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 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 four categories: sewered, unsewered, landscape, and construction. Sewered areas include high density residential and urban commercial 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 3). 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 3, there are small pockets of unsewered parcels in the Beaumont area 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).

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

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.

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 City of Beaumont Wastewater Treatment Plant No. 1 (see Figure 2). In 2017, the City of Beaumont reported 3,663 acre-ft of inflow to the treatment plant (see Table 1). The only sources of water to the treatment plant are from water accounts within the sewered area of BCVWD. During that same year (2017), the BCVWD delivered 7,217 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 (3,663 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 (3,554 acre-ft) is assumed to be used outdoors. This results in 51 percent indoor use and 49 percent outdoor use (see Table 1).

It is noted that this methodology does not account for water losses in the sewer system. Any losses associated with pipeline leaks could reduce the proportion of assumed outdoor water use. Since pipeline leaks would be assumed to become groundwater recharge, not accounting for pipeline losses may result in underestimates of return flow. Pipeline losses can be incorporated into the methodology if knowledge of pipeline losses is known.

2.4.2 Water Use in Unsewered Areas

Based on 2017 water delivery records, the average delivered water per account per year in the unsewered area is 0.94 acre-ft/account/yr (see Table 2). In contrast, the average delivered water per account in the sewered area is 0.48 acre-ft/account/yr. 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 (0.24 acre-ft/account/yr). The balance between the average delivered water per account (0.94 acre-ft/account/yr) and the indoor water use (0.24 acre-ft/account/yr) is assumed to be outdoor water use in the unsewered area (0.70 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 completely outdoors. The total volume of water used for landscape irrigation in the Beaumont Basin adjudicated area in 2017 was 1,621 acre-ft.

2.4.4 Construction Water Use

All 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 in 2017 was less than 0.5 acre-ft.

2.5 Applying the Return Flow Factor by Account Type

2.5.1 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, 49 percent of delivered water was assumed to be used outdoors as per Section 2.4.1 of this Technical Memorandum. 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 Table 3).

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 3 and 4. 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.

2.5.2 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.

2.5.3 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.

2.5.4 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 in 2017 was less than 0.5 acre-ft and is negligible in the overall return flow estimate in the Beaumont Basin adjudicated area.

3. Estimates of Return Flow by Appropriator for 2017

Application of the return flow methodology outlined in this Technical Memorandum to the water delivery records of BCVWD, City of Banning, and YVWD for 2017 results in the return flow values shown in Tables 3 and 4. The total return flow in 2017 for all accounts within the Appropriator service areas of the adjudicated Beaumont Basin is estimated to be 1,789 acre-ft. Of this, 1,445 acre-ft occurred in BCVWD, 310 acre-ft in the City of Banning, and 34 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.

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). 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 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. 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 2017:

- BCVWD – 1,445 acre-ft
- Banning – 310 acre-ft
- YVWD – 34 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 2017 is shown in Table 6. A return flow lag time schedule would need to be applied to each annual estimate of Appropriator return flow.

Beaumont Basin Watermaster
Return Flow Accounting Methodology
for the Beaumont Basin

Table 1
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Basis for Estimates of Indoor and Outdoor Water Use

A	B	C[2]	D[3]
Inflow to Wastewater Treatment Plant[1] (2017) (acre-ft)	BCVWD Water Delivered within the City of Beaumont Sewered Area (2017) (acre-ft)	Percent of Water Used Indoors	Percent of Water Used Outdoors
3,663	7,217	51%	49%

Notes:
[1] City of Beaumont Wastewater Treatment Plant No.1
[2] C = A / B
[3] D = 1 - (A / B)

Beaumont Basin Watermaster
Return Flow Accounting Methodology
for the Beaumont Basin

Table 2
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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)
7,217	15,069	0.48	51%	49%	0.24	0.23

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)
1,935	2,062	0.94	26%	74%	0.24	0.70

Note:

* 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 Basin Watermaster
Return Flow Accounting Methodology
for the Beaumont Basin

Table 3
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Return Flow by Type Inside Beaumont Basin Adjudicated Area for 2017

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%	-

Beaumont Cherry Valley Water District

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	5,457	2,783	0	2,674	668	668
Unsewered	1,060	276	276	784	196	472
Landscape	1,218	0	N/A[4]	1,218	305	305
Construction	1	0	N/A	1	0	0
Total	**7,735**	**3,059**	**276**	**4,677**	**1,169**	**1,445**

City of Banning

Account Type	Total Water Delivered (ac-ft)	Indoor Use		Outdoor Use		Return Flow (ac-ft)
		Total Delivered	Infiltration	Total Delivered	Infiltration	
Sewered	1,822	929	0	893	223	223
Unsewered	0	0	0	0	0	0
Landscape	349	0	N/A	349	87	87
Construction	1	0	N/A	1	0	0
Total	**2,171**	**929**	**0**	**1,242**	**310**	**310**

Yucaipa Valley Water District

Account Type	Total Water Delivered (ac-ft)	Indoor Use		Outdoor Use		Return Flow (ac-ft)
		Total Delivered	Infiltration	Total Delivered	Infiltration	
Sewered	166	84	0	81	20	20
Unsewered	0	0	0	0	0	0
Landscape	54	0	N/A	54	13	13
Construction	0	0	N/A	0	0	0
Total	**219**	**84**	**0**	**135**	**34**	**34**

Grand Total **1,789**

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

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1 of 1

29-Jul-19

Beaumont Basin Watermaster
Return Flow Accounting Methodology
for the Beaumont Basin

Table 4
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2017 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	11,180	7,735	1,445
Banning	6,510	2,171	310
YVWD	301	219	34
Total	**17,991**	**10,125**	**1,789**

Notes:
[1] This number only accounts for the water delivery accounts given near the adjudication boundary.

Beaumont Basin Watermaster
Return Flow Accounting Methodology
for the Beaumont Basin

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

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Table 6
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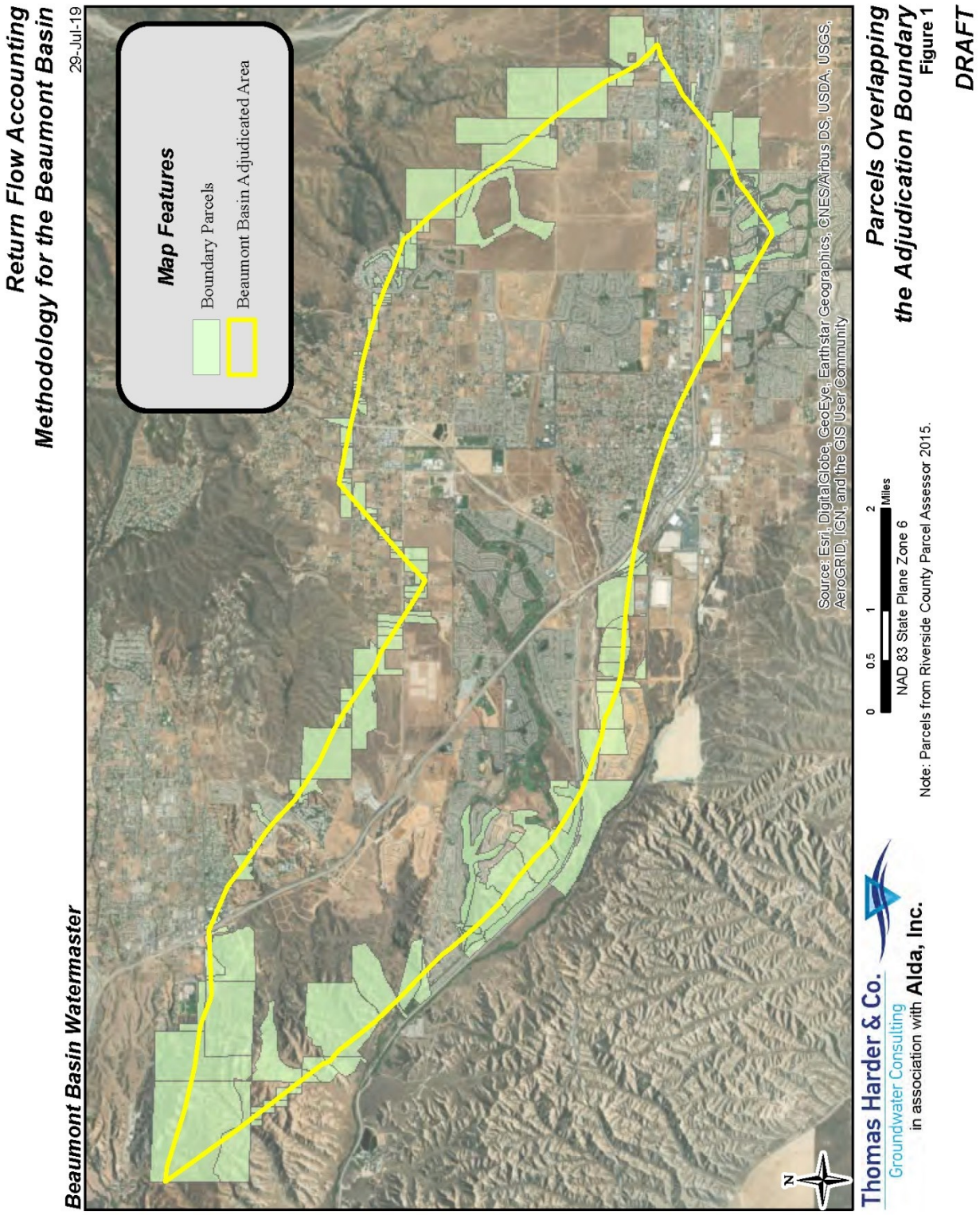
Return Flow Lag Time by Appropriator Inside Beaumont Basin Adjudicated Area for 2017

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	43	0	0
17 Years	139	0	34
24 Years	255	207	0
30 Years	659	60	0
37 Years	196	43	0
44 Years	148	0	0
No Flow	0	0	0
Total	**1,445**	**310**	**34**
		Grand Total	**1,789**


Return Flow Accounting Methodology for the Beaumont Basin
29-Jul-19
Beaumont Basin Watermaster
Map Features
Boundary Parcels
Beaumont Basin Adjudicated Area
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
0 0.5 1 2 Miles
NAD 83 State Plane Zone 6
Note: Parcels from Riverside County Parcel Assessor 2015.
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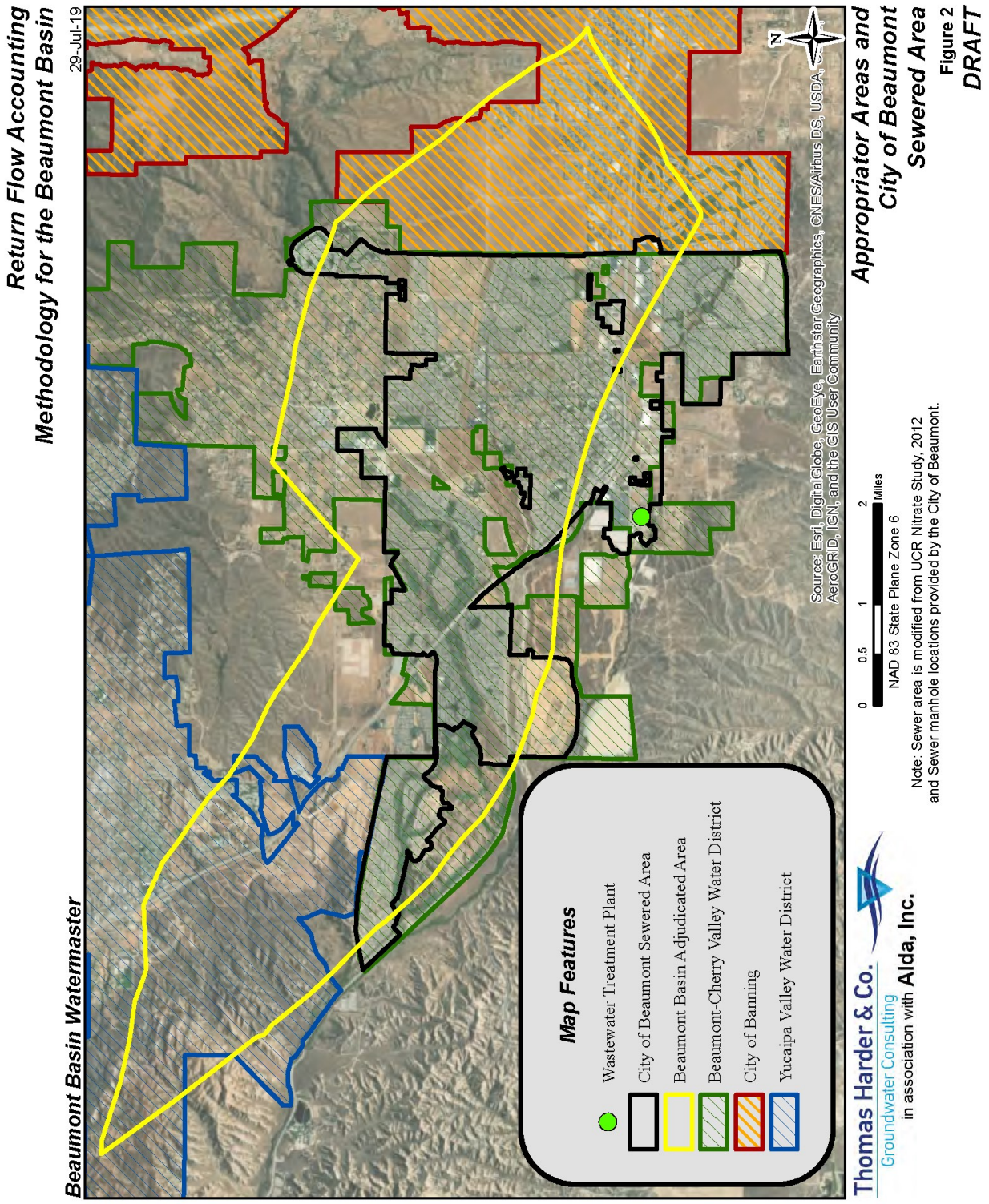
Parcels Overlapping the Adjudication Boundary
Figure 1
DRAFT


Return Flow Accounting
Methodology for the Beaumont Basin
29-Jul-19
Beaumont Basin Watermaster
Appropriator Areas and
City of Beaumont
Sewered Area
Figure 2
DRAFT
Map Features
Wastewater Treatment Plant
City of Beaumont Sewered Area
Beaumont Basin Adjudicated Area
Beaumont-Cherry Valley Water District
City of Banning
Yucaipa Valley Water District
N
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, AeroGRID, IGN, and the GIS User Community
0 0.5 1 2 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.
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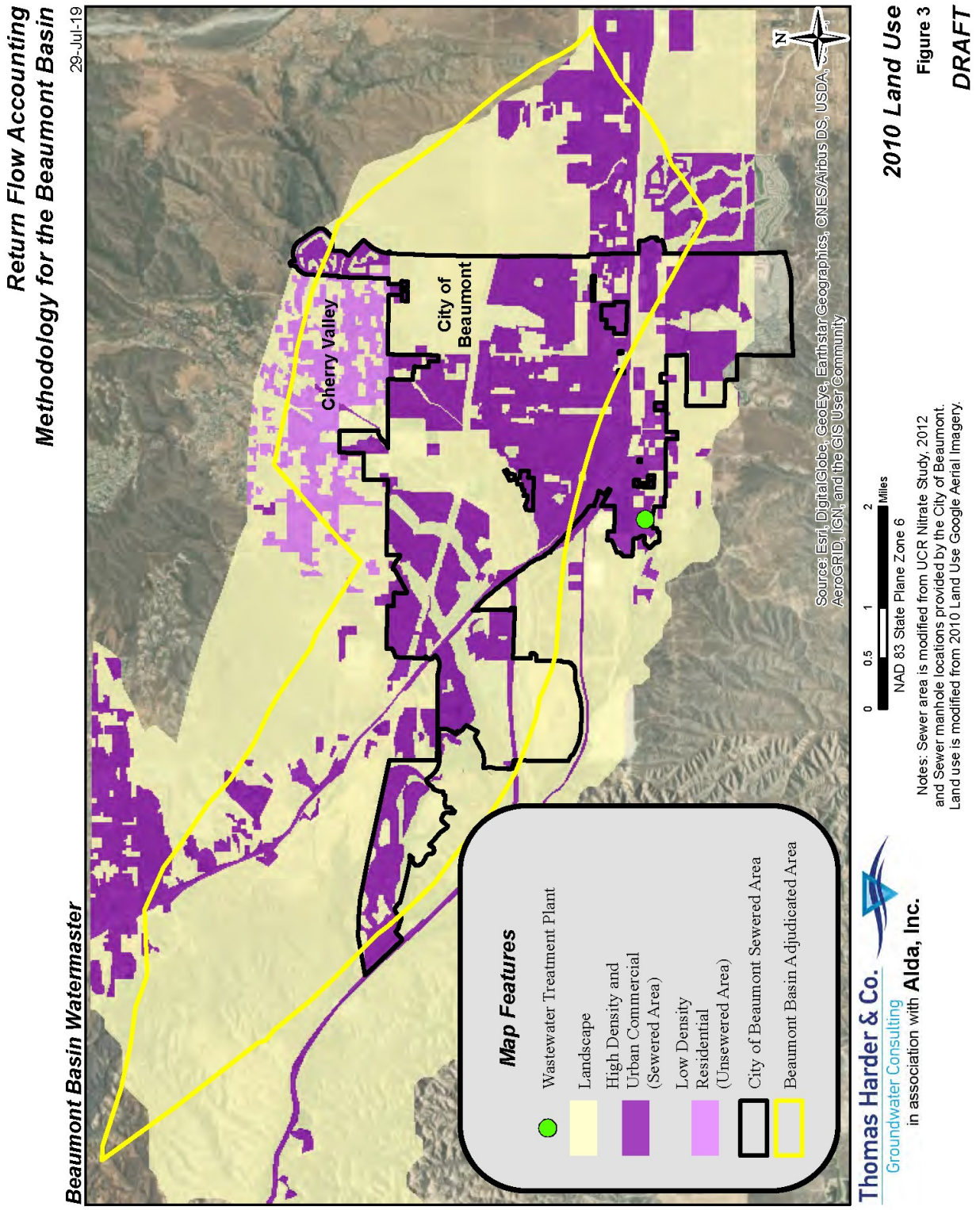
Return Flow Accounting
Methodology for the Beaumont Basin
29-Jul-19
Beaumont Basin Watermaster
Cherry Valley
City of Beaumont
Map Features
Wastewater Treatment Plant
Landscape
High Density and Urban Commercial (Sewered Area)
Low Density Residential (Unsewered Area)
City of Beaumont Sewered Area
Beaumont Basin Adjudicated Area
N
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, AeroGRID, IGN, and the GIS User Community
0 0.5 1 2 Miles
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.
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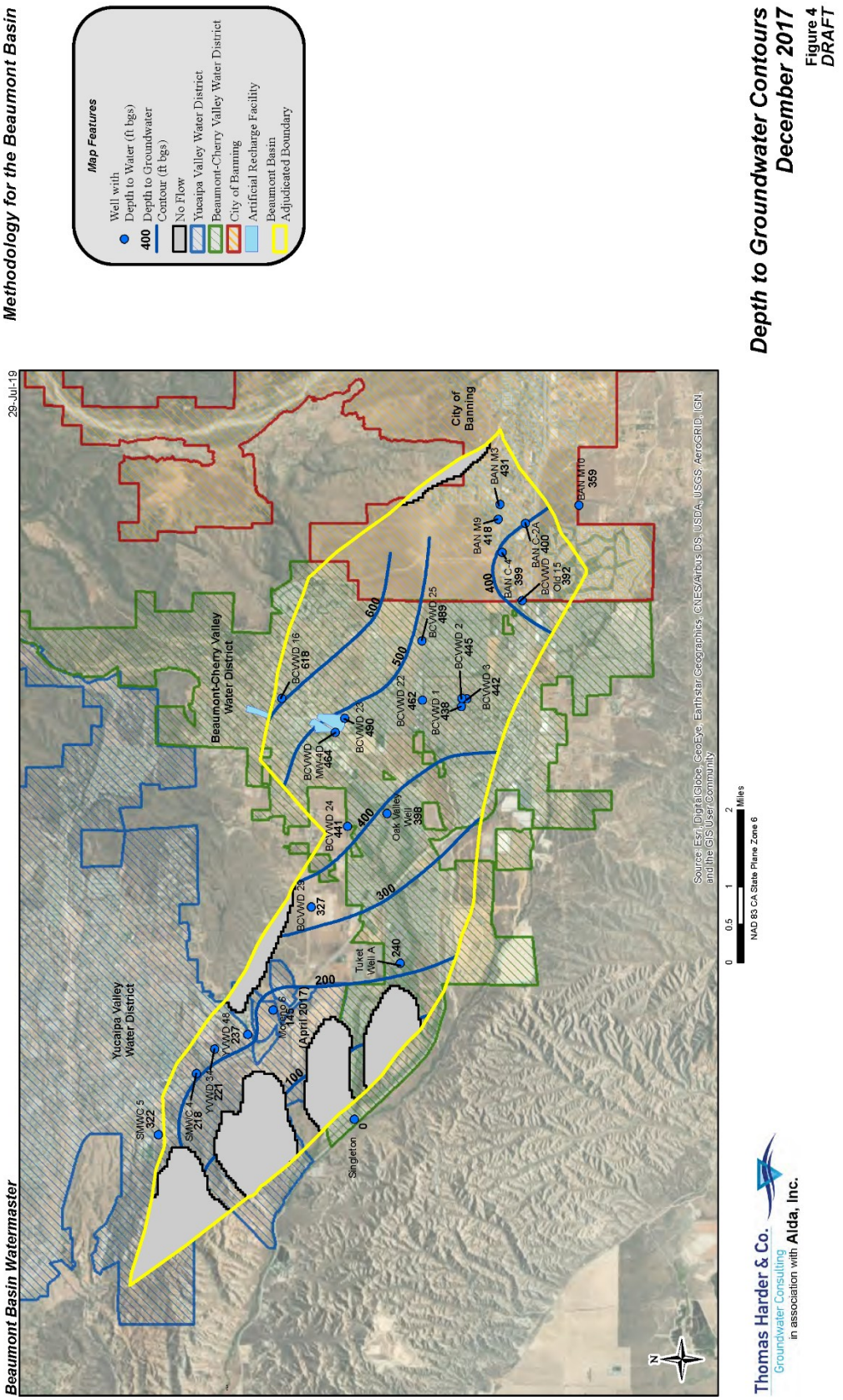
2010 Land Use
Figure 3
DRAFT


Return Flow Accounting
Methodology for the Beaumont Basin
Map Features
Well with Depth to Water (ft bgs)
Depth to Groundwater Contour (ft bgs)
No Flow
Yucaipa Valley Water District
Beaumont-Cherry Valley Water District
City of Banning
Artificial Recharge Facility
Beaumont Basin Adjudicated Boundary
Depth to Groundwater Contours
December 2017
Figure 4
DRAFT
Beaumont Basin Watermaster
29-Jul-19
Yucaipa Valley Water District
Beaumont-Cherry Valley Water District
City of Banning
SMWC 5 322
SMWC 1 218
YVWD 34 221
YVWD 48 237
Mesa 6 142
(April 2017)
Singleton 0
Tuket Well A 240
BCVWD 24 327
BCVWD 24 441
Oak Valley Well 398
BCVWD MW4D 464
BCVWD 23 480
BCVWD 16 618
BCVWD 22 462
BCVWD 1 438
BCVWD 2 445
BCVWD 3 442
BCVWD 25 489
BAN C-4 399
BCVWD OW 15 392
BAN C-2A 400
BAN M9 418
BAN M3 431
BAN M10 359
100
200
300
400
500
600
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
0 0.5 1 2 Miles
NAD 83 CA State Plane Zone 6
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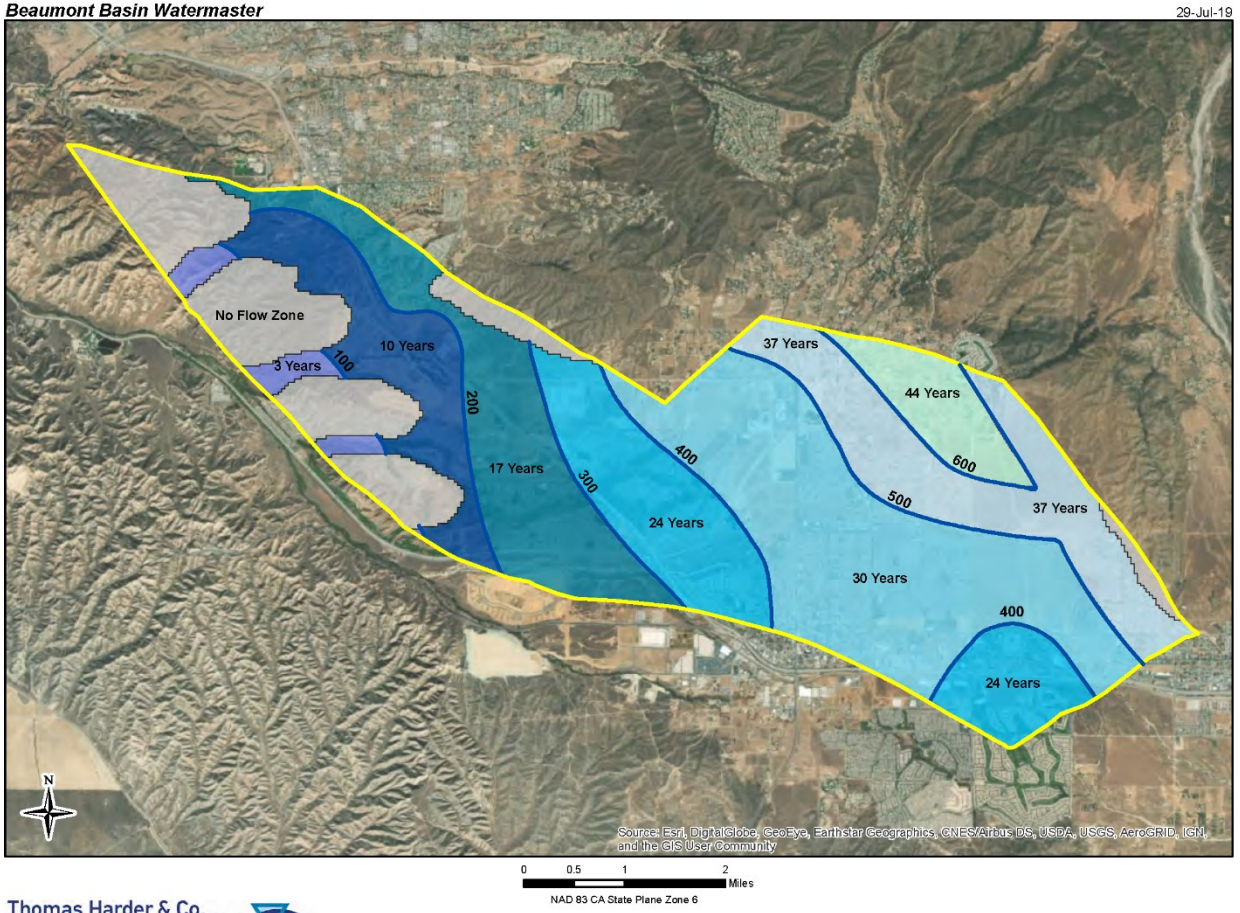
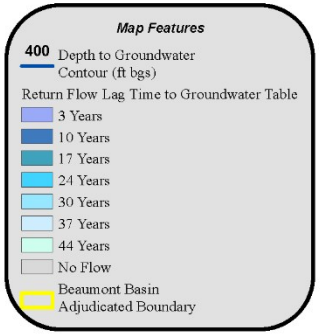
Return Flow Accounting Methodology for the Beaumont Basin





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Return Flow Lag Time Zones

Figure 5
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