FINAL REPORT | MAY 2022

Data Collection and Evaluation Report for Fiscal Year 2020/2021

PREPARED FOR

Chino Basin Watermaster

PREPARED BY

West Yost
Water. Engineered.

Data Collection and Evaluation Report for Fiscal Year 2020/2021

Prepared for

Chino Basin Watermaster

Project No. 941-80-21-68

May 6, 2022

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May 6, 2022

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LIST OF ACRONYMS AND ABBREVIATIONS

2018 RMPU	2018 Recharge Master Plan Update
AF	Acre-Feet
AFY	Acre-Feet Per Year
Arrowhead	Arrowhead Mountain Spring Water Company
ASR	Aquifer Storage and Recovery
CBWCD	Chino Basin Water Conservation District
CC	Carbon Canyon
Chino	City of Chino
Chino Hills	City of Chino Hills
CVM	Chino Valley Model
CVWD	Cucamonga Valley Water District
DIPAW	Deep Infiltration of Precipitation and Applied Water
DWR	Department of Water Resources
DYYP	Dry-Year Yield Program
ET	Evapotranspiration
FWC	Fontana Water Company
FY	Fiscal Year
GSWC	Golden State Water Company
JCSD	Jurupa Community Services District
MS4	Municipal Separate Storm Sewer System
MVWD	Monte Vista Water District
MZ	Management Zone
Niagara	Niagara Bottling, LLC
Norco	City of Norco
Ontario	City of Ontario
OWDS	On-Site Waste Disposal System
Pomona	City of Pomona
SARWC	Santa Ana River Water Company
SAWCo	San Antonio Water Company
SCAG	Southern California Association of Governments
SGMA	Sustainable Groundwater Management Act
SYR	Safe Yield Recalculation
UCSD	Jurupa Community Services District
Upland	City of Upland
UWMPs	Urban Water Management Plans
WVWD	West Valley Water District
WY	West Yost

CHAPTER 1
Background and Objectives

This first annual report on *Data Collection and Evaluation – Fiscal Year 2020/2021* describes and documents the required data collection and evaluation pursuant to the April 28, 2017 Court Order on the Safe Yield of the Chino Basin (2017 Court Order).[1] This chapter describes background information on the Court requirements to prepare this annual report, the scope of work of this effort, and the organization of this report.

1.1 2017 COURT ORDER REQUIREMENTS

The 2017 Court Order ordered that the Safe Yield be set to 135,000 afy for the period fiscal year (FY) 2011 through 2020 and included requirements to guide future model updates and Safe Yield recalculations (SYR) and resets. These requirements, which were later affirmed by the Court in March 2019,[2] are listed below verbatim from pages 15 through 17 of the 2017 Court Order:

- 4.3 – *Interim Correction*. In addition to the scheduled reset [of the Safe Yield effective July 1, 2020 that will continue until June 30, 2030], the Safe Yield may be reset in the event that, with the recommendation and advice of the Pools and Advisory Committee and in the exercise of prudent management discretion described in Paragraph 4.5(c), below, Watermaster recommends to the court that the Safe Yield must be changed by an amount greater (more or less) than 2.5% of the then-effective Safe Yield.
- 4.4 – *Safe Yield Reset Methodology*. The Safe Yield has been reset effective July 1, 2010 and shall be subsequently evaluated pursuant to the methodology set forth in the Reset Technical Memorandum [(WEI, 2015)[3]]. The reset will rely upon long-term hydrology and will include data from 1921 to the date of the reset evaluation. The long-term hydrology will be continuously expanded to account for new data from each year, through July 2030, as it becomes available. This methodology will thereby account for short-term climatic variations, wet and dry. Based on the best information practicably available to the Watermaster, the Reset Technical Memorandum sets forth a prudent and reasonable professional methodology to evaluate the then prevailing Safe Yield in a manner consistent with the Judgement, the Peace Agreements, and the OBMP Implementation Plan. In furtherance of the goal of maximizing the beneficial use of the waters of the Chino Basin, Watermaster, with the recommendation and advice of the Pools and Advisory Committee, may supplement the Reset Technical Memorandum's methodology to incorporate future advances in best management practices and hydrologic science as they evolve over the term of this order.
- 4.5 – *Annual Data Collection and Evaluation*. In support of its obligations to undertake the reset in accordance with the Reset Technical Memorandum and this order, Watermaster shall annually undertake the following actions:

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[1] *Orders for Watermaster's Motion Regarding* the *2015 Safe Yield Reset Agreement, Amendment of Restated Judgment, Paragraph 6,* Superior Court for the County of San Bernardino (2017). link

[2] *Order Regarding the Appeal Parties Motion*, Superior Court for the County of San Bernardino (2019). link

[3] WEI. (2015). *Methodology to Reset Safe Yield Using Long-Term Average Hydrology and Current and Projected Future Cultural Conditions.* Prepared for the Chino Basin Watermaster, August 2015.

(a) Ensure that, unless a Party to the Judgment is excluded from reporting, all production by all Parties to the Judgment is metered, reported, and reflected in Watermaster's approved Assessment Packages;

(b) Collect data concerning cultural conditions annually with cultural conditions including, but not limited to, land use, water use practices, production, and facilities for the production, generation, storage, recharge, treatment, or transmission of water;

(c) Evaluate the potential need for prudent management discretion to avoid or mitigate undesirable results including, but not limited to, subsidence, water quality degradation, and unreasonable pump lifts. Where the evaluation of available data suggests that there has been or will be a material change from existing and projected conditions or threatened undesirable results, then a more significant evaluation, including modeling, as described in the Reset Technical Memorandum, will be undertaken; and,

(d) As part of its regular budgeting process, develop a budget for the annual data collection, data evaluation, and any scheduled modeling efforts, including the methodology for the allocation of expenses among the Parties to the Judgment. Such budget development shall be consistent with section 5.4(a) of the Peace Agreement.

- 4.6 – Modeling. Watermaster shall cause the Basin Model to be updated and a model evaluation of Safe Yield, in a manner consistent with the Reset Technical Memorandum, to be initiated no later than January 1, 2024, in order to ensure that the same may be completed by June 30, 2025.
- 4.7 – Peer Review. The Pools shall be provided with reasonable opportunity, no less frequently than annually, for peer review of the collection of data and the application of data collected in regard to the activities described in Paragraphs 4.4, 4.5, and 4.6 above.

This report addresses the requirements in "4.5 – *Annual Data Collection and Evaluation*" for the period FY 2019 through 2021.

1.2 SCOPE OF THE ANNUAL DATA COLLECTION AND EVALUATION

The scope of work for the annual data collection and evaluation for FY 2022 is the following:

- **Data collection.** Annually, the Watermaster will collect the following datasets that are used to estimate the net recharge to the Basin:
  - Groundwater pumping
  - Water supply plans (from major Appropriative Pool Parties)
  - Land use
  - Data to estimate indoor and outdoor urban water use
  - Managed groundwater recharge
  - Information on regional water infrastructure (from major Appropriative Pool Parties)

  For each of the above datasets, Watermaster will collect historical data since the last recalculation of the Safe Yield (2019-21 Actual Data) and the necessary information to develop an updated projection of these datasets for the remaining period of the then current Safe Yield (2022 Projection). In this report, the 2022 Projection will span the period FY 2022-2030.

- **Data evaluation.** Watermaster will compare the 2019-21 Actual Data and the 2022 Projection to the data and assumptions that were used in the projection scenario for the 2020 Safe Yield Recalculation (2020 SYR Projection), which was documented in the *2020 Safe Yield Recalculation Report* (2020 SYR Report).[4] Specifically, we compare the following:
  - 2020 SYR Projection versus 2019-21 Actual Data (FY 2019-2021)
  - 2020 SYR Projection versus 2022 Projection (FY 2022-2030)

  These comparisons are meant to answer the two questions derived from the 2017 Court Order:

  1) *Is there a potential for undesirable results that were not identified in the 2020 SYR?* Specifically, is there a **"**potential need for prudent management discretion to avoid or mitigate undesirable results including, but not limited to, subsidence, water quality degradation, and unreasonable pump lifts"? (2017 Court Order, p. 17)
  2) *Is there a reasonable likelihood that the cumulative impact of the differences between the new datasets/projections (i.e., the 2019-21 Actual Data and the 2022 Projection) and the data and assumptions in the 2020 SYR would result in the actual Safe Yield being greater than 2.5 percent (more or less) than the current Safe Yield?* (2017 Court Order, p. 15-16). This question is evaluated over the period of the current Safe Yield, which is FY 2021-30.

  Answers to these questions are based on professional judgement, an understanding of the Chino Basin, and prior modeling investigations. An affirmative answer to either of the above questions "suggests that there has been or will be a material change from existing and projected conditions or threatened undesirable results," which would necessitate "a more significant evaluation." (2017 Court Order, p. 17). In this case, Watermaster will describe the scope of work and cost estimates of any further evaluations required because of this effort.

- **Reporting.** Watermaster will prepare an annual report to document the data collection and evaluation process and will include recommendations for improvements to subsequent annual data collection and evaluation efforts.
- **Peer review.** Watermaster will conduct multiple workshops during the execution of the data collection and evaluation to communicate the process and findings to the Parties.

1.3 REPORT ORGANIZATION

Chapters 2 through 6 in this report focus on each respective category of data collected and evaluated for this effort. These chapters describe each respective category of data in the following manner:

- Summary of the data type.
- Use of the data in the Chino Valley Model (CVM).
- A description of the data that were collected for this report and the assumptions for the development of the 2020 SYR Projection and the 2022 Projection.

[4] WEI. *2020 Safe Yield Recalculation.* Prepared for the Chino Basin Watermaster. May 2020.

- A comparison of the 2020 SYR Projection versus the 2019-21 Actual Data.
- A comparison of the 2020 SYR Projection versus an updated 2022 Projection for FY 2022-30.
- An evaluation of these comparisons to identify (i) the potential for undesirable results or (ii) the potential for a significant difference in the current expectations for net recharge during FY 2021-30 compared to the current Safe Yield for FY 2021-30.

The following chapters in this report are:

Chapter 2 – Groundwater Pumping. Chapter 2 describes the collection and evaluation of the data characterizing the groundwater pumping patterns and water supply plans in the Chino Basin.

Chapter 3 – Land Use. Chapter 3 describes the collection and evaluation of the data characterizing land uses in the Chino Basin.

Chapter 4 – Urban Outdoor Water Use. Chapter 4 describes the collection and evaluation of the data characterizing the urban outdoor water use practices in the Chino Basin.

Chapter 5 – Managed Recharge. Chapter 5 describes the collection and evaluation of managed recharge in the Chino Basin, which includes records and projections for the recharge of stormwater, imported water, and recycled water.

Chapter 6 – Regional Water Infrastructure. Chapter 6 describes the collection and evaluation of the data characterizing the regional water infrastructure in the Chino Basin.

Chapter 7 – Conclusions and Recommendations. Chapter 7 describes the cumulative assessment of all the data types evaluated in this report and the main conclusions and recommendations derived from the evaluation.

Appendix A – Water Infrastructure Maps for Major Appropriative Pool Parties. Appendix A includes maps documenting the regional water infrastructure that Watermaster received from the major Appropriative Pool Parties.

Appendix B – Metering and Reporting of Groundwater Pumping for FY 2021. Appendix B describes the wells in the Chino Basin for FY 2021, including descriptions of wells that were added or went out of service in the reporting year and information on wells that are not metered.

Appendix C – Responses to Questions and Comments on Draft Report. Appendix C documents the written questions and comments that were received on the draft report and responses to the questions and comments.

CHAPTER 2
Groundwater Pumping

Chapter 2 documents the collection and evaluation of data and information on groundwater pumping in the Chino Basin.

2.1 SUMMARY AND APPLICATION TO MODEL

Groundwater pumping is the largest discharge component of the Chino Basin water budget, comprising roughly 83 percent of the total discharge from the Chino Basin from FY 1978 through 2018. The magnitude and location of groundwater pumping can affect the groundwater levels, groundwater-flow directions, and the groundwater/surface-water interactions between the Chino Basin and the Santa Ana River and Prado Basin.

Groundwater pumping data is input into the CVM through the Well Package (McDonald et al., 1988)[1] of the groundwater model code, MODFLOW-NWT. The Well Package is used to simulate the withdrawal of groundwater from aquifers using a constant flow rate for each stress period of the model, which is monthly for the CVM.

Historical groundwater pumping data is one of several datasets used to calibrate the CVM. The CVM is calibrated over the period of July 1, 1977 through June 30, 2018 by adjusting model parameters to produce the best match between simulated and observed system responses including time series of surface water discharge and groundwater levels at wells.[2]

Projections of future groundwater pumping are used to develop the model projection scenarios that are then simulated with the CVM to estimate the future water budget of the Chino Basin, including net recharge. Groundwater pumping patterns (magnitude and location) are important to understand as they can affect groundwater levels, water budget components, and net recharge.

2.2 COLLECTION OF DATA AND INFORMATION

This section describes the sources of historical and projected groundwater pumping used in the data collection and evaluation process.

2.2.1 2019-21 Actual Data

Watermaster maintains a database of groundwater pumping data records in the Chino Basin, which was used as the 2019-21 Actual groundwater pumping.

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[1] McDonald, Michael G. and Harbaugh, Arlen W. 1988. *MODFLOW, A modular three-dimensional finite difference ground-water flow model.* Reston, Virginia: U. S. Geological Survey, 1988.

[2] More information on the calibration process of the CVM can be found in Section 6 of the 2020 SYR Report.

2.2.2 2020 SYR Projection

As part of the development of the Storage Framework Investigation in 2017, Watermaster submitted a comprehensive data request to each Appropriative Pool Party and some of the larger Overlying Non-Agricultural Pool pumpers, including:

- Arrowhead Mountain Spring Water Company (Arrowhead)
- City of Chino (Chino)
- City of Chino Hills (Chino Hills)
- City of Norco (Norco)
- City of Ontario (Ontario)
- City of Pomona (Pomona)
- City of Upland (Upland)
- Cucamonga Valley Water District (CVWD)
- Fontana Water Company (FWC)
- Golden State Water Company (GSWC)
- Jurupa Community Services District (JCSD)
- Marygold Mutual Water Company
- Monte Vista Irrigation Company
- Monte Vista Water District (MVWD)
- Niagara Bottling, LLC (Niagara)
- Santa Ana River Water Company (SARWC)
- San Antonio Water Company (SAWCo)
- San Bernardino County – Olympic Shooting Park
- West Valley Water District (WVWD)

The data request included future water supply plans, which represent the Parties' best estimates of monthly demands and associated water supplies for the planning period of FY 2019 through 2050, including projections of groundwater pumping. In 2019, Watermaster asked the Parties to provide updates to their projections in preparation of the 2020 SYR Projection. Three Parties (Chino Hills, Pomona, and MVWD) updated their pumping projections.

The data request also included a request for an updated list of active wells, well capacities, and the priority use for each well. This information was combined with the monthly water supply plans to distribute annual projected groundwater pumping to monthly projected pumping at each of the Parties' wells.

The 2020 SYR Projection of pumping for the smaller Overlying Non-Agricultural Pool Parties was estimated using historical patterns. Pumping projections for the Agricultural Pool Parties were based on a combination of historical data, projected land use changes, and projected water supply data. The projected recharge and pumping operations for the Dry-Year Yield Program (DYYP) were uncertain and therefore not included in the 2020 SYR Projection.

2.2.3 2022 Projection

In 2021, as part of the current data collection and evaluation effort, Watermaster submitted a comprehensive data request to the Appropriative Pool Parties requesting an update of their projected demands and water supply plans, monthly distributions of water supplies and demands, well information, and information on each Party's planned use of storage in the Chino Basin. All Parties that published 2020 Urban Water Management Plans (UWMPs) directed Watermaster to rely on the projected water supplies and demands documented in the 2020 UWMPs. Where projected water supplies exceeded projected demands, Watermaster relied on prior assumptions for reducing supplies to meet demands to develop the 2022 Projection.

The 2022 Projection for the Agricultural Pool and Overlying Non-Agricultural Pool pumping was developed based on the same methodology used to develop the 2020 SYR Projection.

2.3 EVALUATION

This section documents the comparison of the 2020 SYR Projection to the 2019-21 Actual Data and the 2022 Projection for groundwater pumping, including an assessment of significance of the differences between datasets.

2.3.1 2020 SYR Projection versus 2019-21 Actual Data

Figure 2-1 is a bar chart comparing the 2020 SYR Projection to the 2019-21 Actual Data for groundwater pumping by Pool, including the groundwater pumped for the DYYP. Figure 2-1 shows:

- 2019-21 Actual groundwater pumping was greater than the 2020 SYR Projection by an average of 7,400 afy. This was primarily due to the additional groundwater pumping for the DYYP in FY 2020 and 2021.
- Groundwater pumping for the DYYP was not included in the 2020 SYR Projection. 2019-21 Actual groundwater pumping for the DYYP was zero acre-feet (af) in FY 2019, about 17,400 af in FY 2020, and about 23,000 af in FY 2021.
- 2019-21 Actual groundwater pumping by the Agricultural, Overlying Non-Agricultural, and Appropriative Pools was less than the 2020 SYR Projection by about 1,200 afy, 1,600 afy, and 3,200 afy, respectively.

Figure 2-2 is a bar chart comparing 2019-21 Actual Data to the 2020 SYR Projection for groundwater pumping by MZ. Groundwater pumping is aggregated for MZ4 and MZ5. Figure 2-1 shows:

- 2019-21 Actual groundwater pumping in MZ1 was about equal to the 2020 SYR Projection.
- 2019-21 Actual groundwater pumping in MZ2 and MZ3 was greater than the 2020 SYR Projection by about 7,200 afy. This was primarily due to the additional groundwater pumping for the DYYP in FY 2020 and 2021.

Figure 2-1. Comparison of 2019-21 Actual Data versus 2020 SYR Projection for Groundwater Pumping by Pool, FY 2019-2021

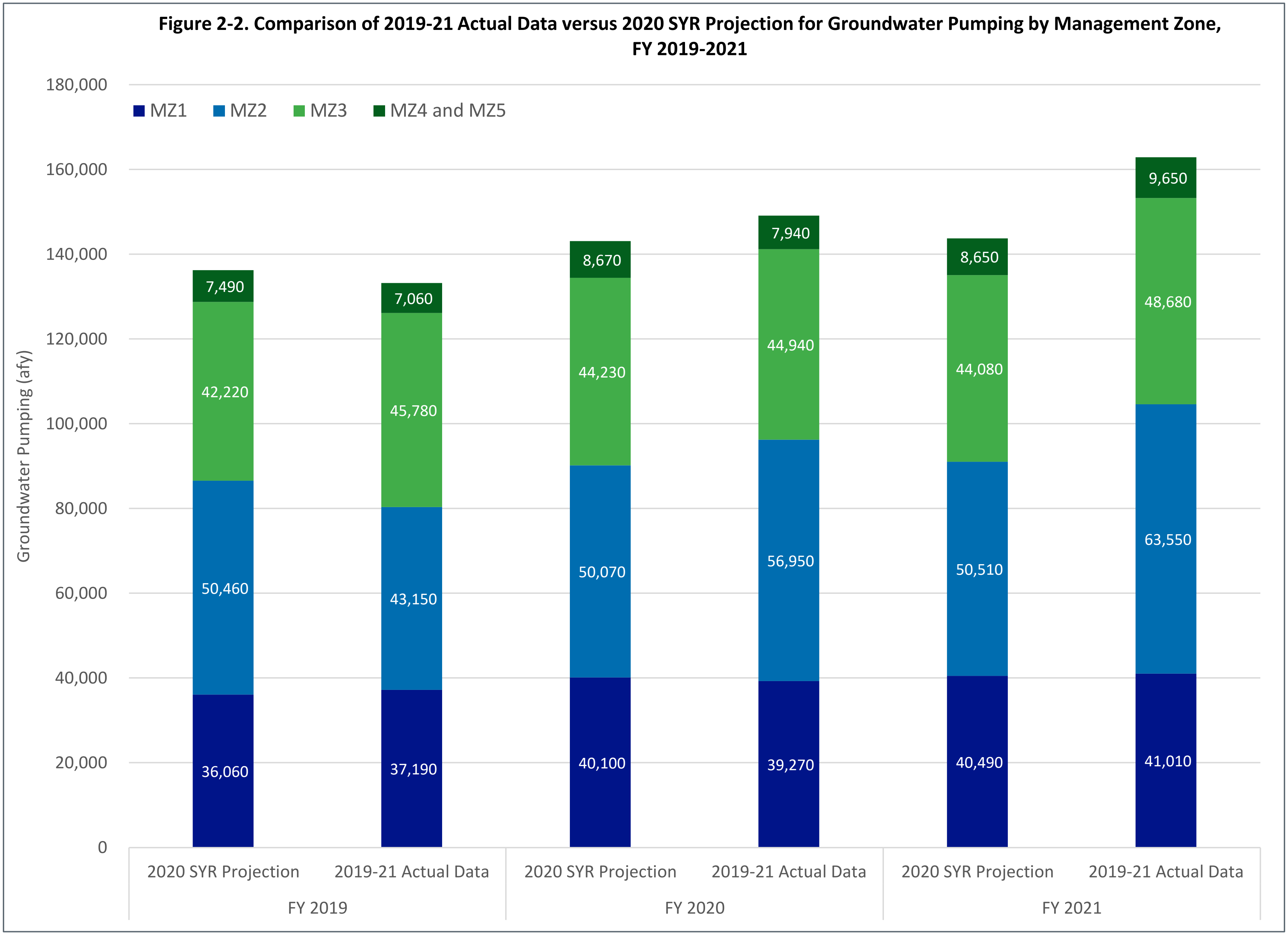


Figure 2-2. Comparison of 2019-21 Actual Data versus 2020 SYR Projection for Groundwater Pumping by Management Zone, FY 2019-2021
MZ1
MZ2
MZ3
MZ4 and MZ5
Groundwater Pumping (afy)
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
7,490
42,220
50,460
36,060
7,060
45,780
43,150
37,190
8,670
44,230
50,070
40,100
7,940
44,940
56,950
39,270
8,650
44,080
50,510
40,490
9,650
48,680
63,550
41,010
2020 SYR Projection
2019-21 Actual Data
2020 SYR Projection
2019-21 Actual Data
2020 SYR Projection
2019-21 Actual Data
FY 2019
FY 2020
FY 2021

Figures 2-3 shows the spatial differences between 2019-21 Actual groundwater pumping and the 2020 SYR Projection across the Chino Basin aggregated over a grid with half-mile square cells. Areas where 2019-21 Actual groundwater pumping was greater than the 2020 SYR Projection by more than 100 afy are shown in shades of orange and red, and areas where 2019-21 Actual groundwater pumping was less than 2020 SYR Projection by more than 100 afy are shown in shades of blue. To assess the potential for undesirable results, Figure 2-3 also shows:

- Boundaries of the Areas of Subsidence Concern.
- Locations of the areas where the 2020 SYR Projection indicated that pumping sustainability challenges would occur before FY 2050.[3]
- Locations of known groundwater contaminant plumes in the Chino Basin, based on the delineations documented in the *2020 State of the Basin Report* (WY, 2020)[4].

An examination of Figure 2-3 reveals the following:

- The areas where 2019-21 Actual groundwater pumping was greater than the 2020 SYR Projection in MZ2 are concentrated in the central-northern portion of MZ2, where pumping for the DYYP occurred.
- 2019-21 Actual groundwater pumping was greater than the 2020 SYR Projection in much of the Northwest MZ1 Area of Subsidence Concern.
- 2019-21 Actual groundwater pumping was greater than the 2020 SYR Projection in several areas projected to experience pumping sustainability challenges. These wells are primarily located in central MZ3 near the JCSD well field.
- Differences between 2019-21 Actual groundwater pumping and the 2020 SYR Projection do not indicate significant changes in the speed and trajectory of groundwater contaminant plumes.

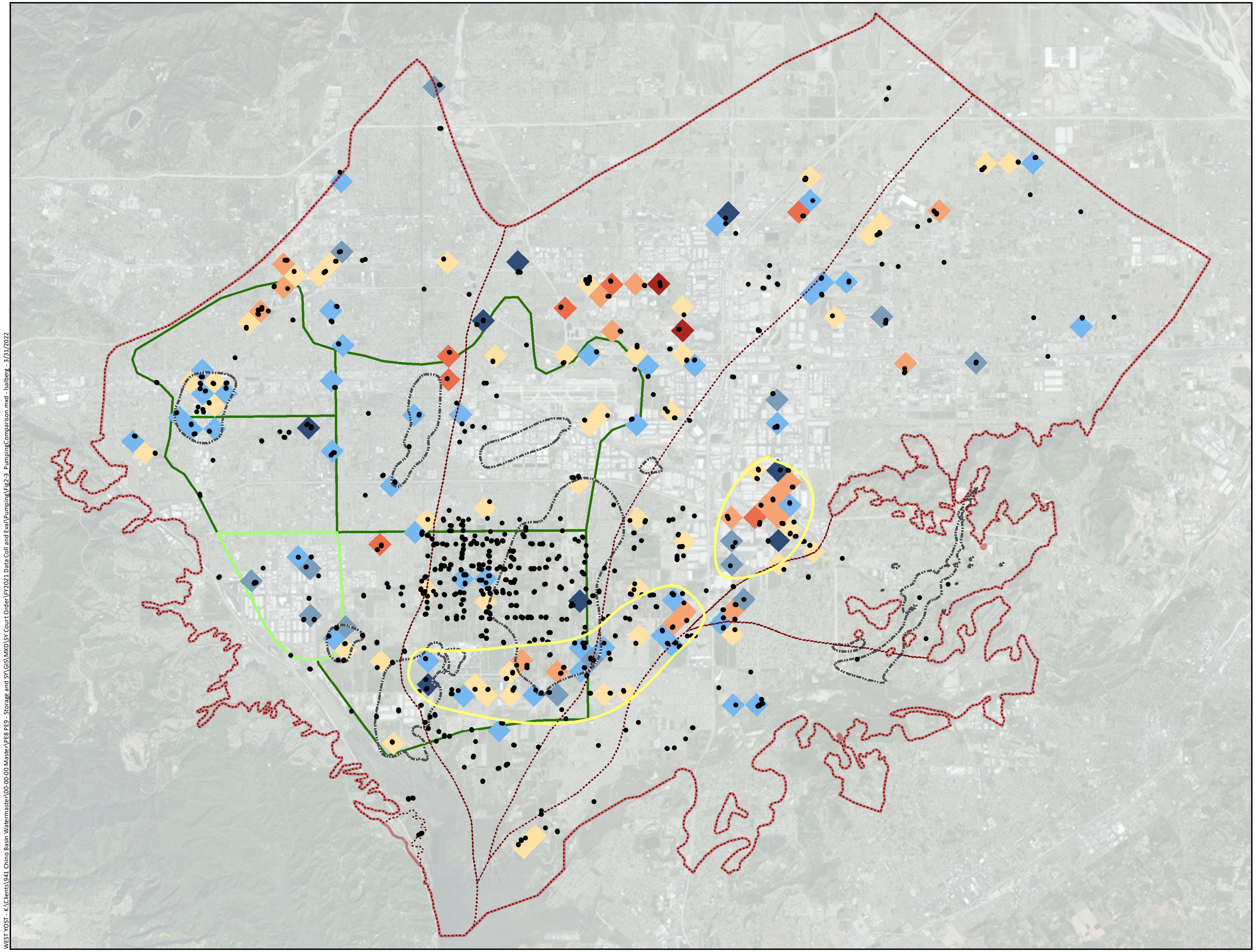
2.3.2 2020 SYR Projection versus 2022 Projection

Figure 2-4 is a bar chart comparing the 2020 SYR Projection to the 2022 Projection for groundwater pumping by Pool for FY 2025 and FY 2030. Figure 2-4 shows:

- The 2022 Projection for groundwater pumping is greater than the 2020 SYR Projection by 5,300 afy and 10,000 afy for FY 2025 and FY 2030, respectively. These differences are due to higher pumping projections provided by the Appropriative Pool Parties for the 2022 Projection.
- The 2022 Projection for groundwater pumping by the Agricultural Pool is identical to the 2020 SYR Projection. This is because the projected build-out years for the Parties overlying most of the agricultural area targeted for future development have not changed significantly from the assumptions used to develop the 2020 SYR Projection.
- The 2022 Projection for groundwater pumping by the Overlying Non-Agricultural Pool is identical to the 2020 SYR Projection. This is because the trends of the 2019-21 Actual groundwater pumping by the Overlying Non-Agricultural Pool have not changed significantly from the assumptions used to develop the 2020 SYR Projection.

[3] See Figure 7-12 of the *2020 SYR Report.*

[4] WY. *2020 State of the Basin Report*. Prepared for the Chino Basin Watermaster, June 2021.



- Active Pumping Well

Difference in Groundwater Pumping
2020 Projection minus 2019-21 Actual Data (afy)

> -2,400	*2019-21 Actual Data exceeds 2020 SYR Projection*
-1,200 - -2,400	
-600 - -1,200	
-100 - -600	
-100 - 100	
100 - 600	*2019-21 Actual Data is less than 2020 SYR Projection*
600 - 1,200	
1,200 - 2,400	

Known Groundwater Contaminant Plume

Managed Area

Area of Subsidence Concern

Area projected to experience pumping sustainability challenges in the 2020 SYR Projection

OBMP Management Zones

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0 1 2 3 Miles

0 2 4 6 Km

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Chino Basin Watermaster
Data Collection and Evaluation
FY 2020/21

Comparison of Groundwater Pumping
2020 SYR Projection versus 2019-21 Actual Data
FY 2019-2021

Figure 2-3

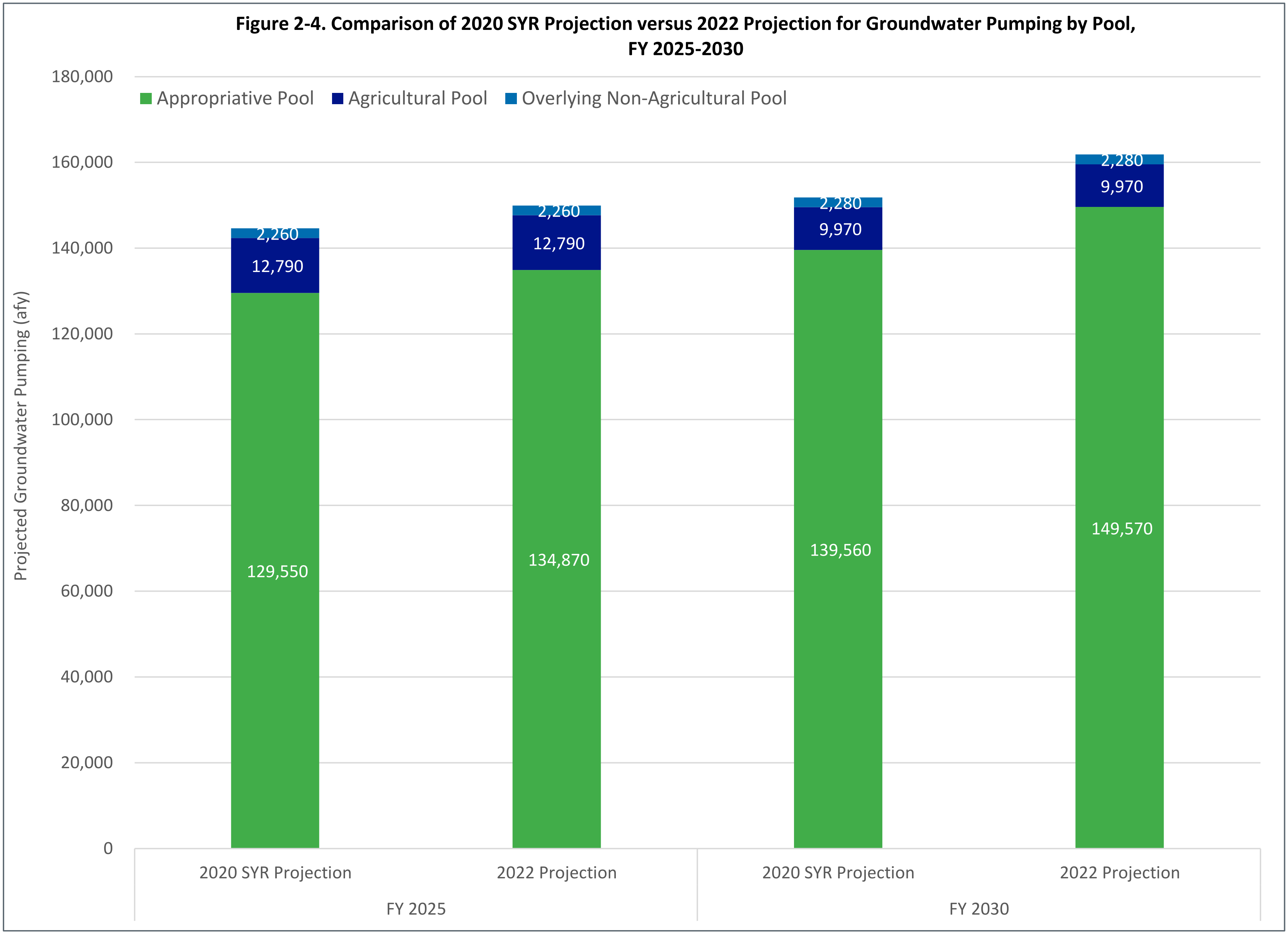


Figure 2-4. Comparison of 2020 SYR Projection versus 2022 Projection for Groundwater Pumping by Pool, FY 2025-2030
Appropriative Pool
Agricultural Pool
Overlying Non-Agricultural Pool
Projected Groundwater Pumping (afy)
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
2,260
12,790
129,550
2,260
12,790
134,870
2,280
9,970
139,560
2,280
9,970
149,570
2020 SYR Projection
2022 Projection
2020 SYR Projection
2022 Projection
FY 2025
FY 2030

Figure 2-5 is a bar chart comparing 2020 SYR Projection to the 2022 Projection for groundwater pumping by MZ for FY 2025 and FY 2030. Figure 2-5 shows:

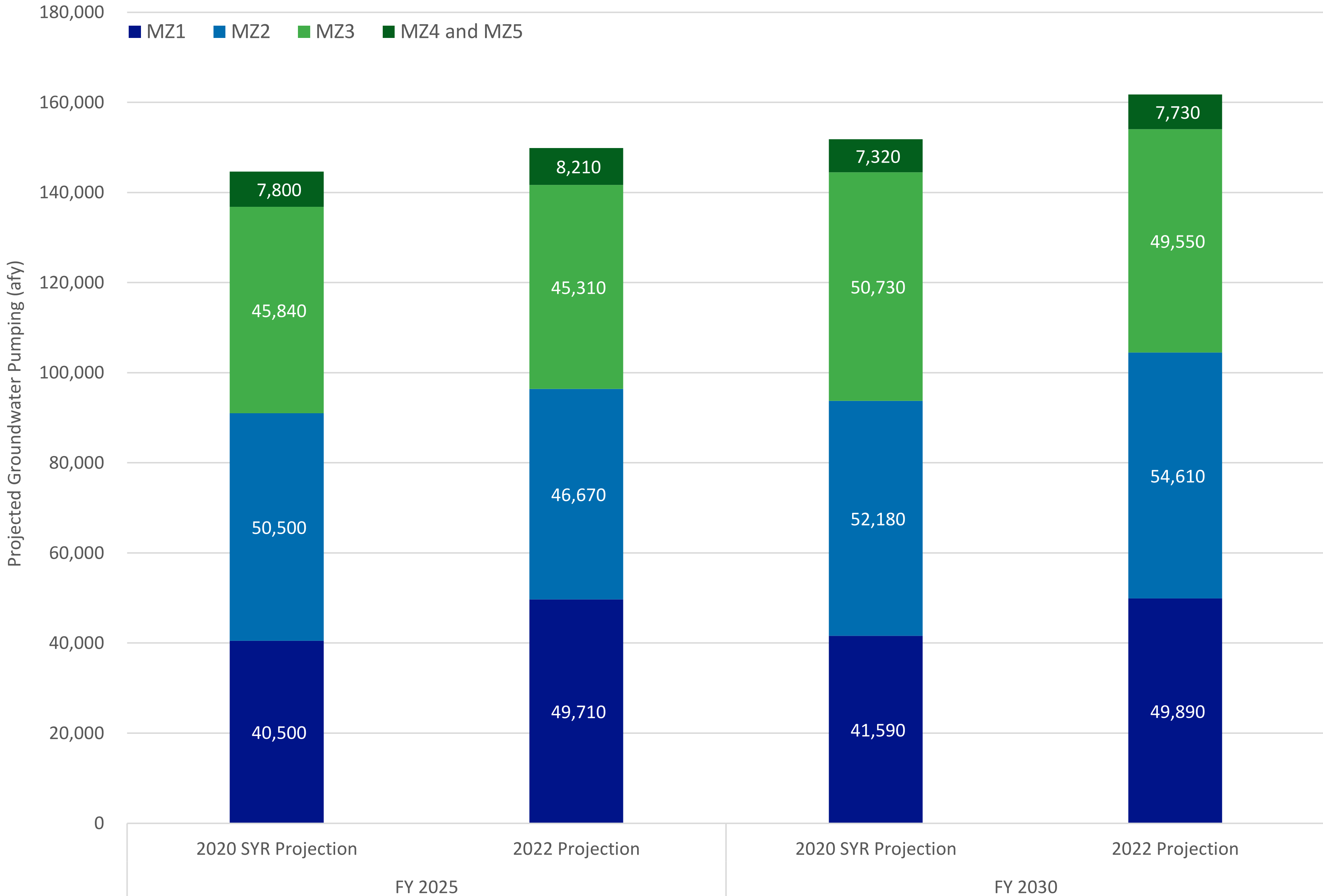
- The 2022 Projection for groundwater pumping is greater than the 2020 SYR Projection in MZ1 by 9,200 afy for FY 2025 and by 8,300 afy in FY 2030. These differences are due to higher pumping projections provided by the Appropriative Pool Parties in MZ1 for the 2022 Projection.

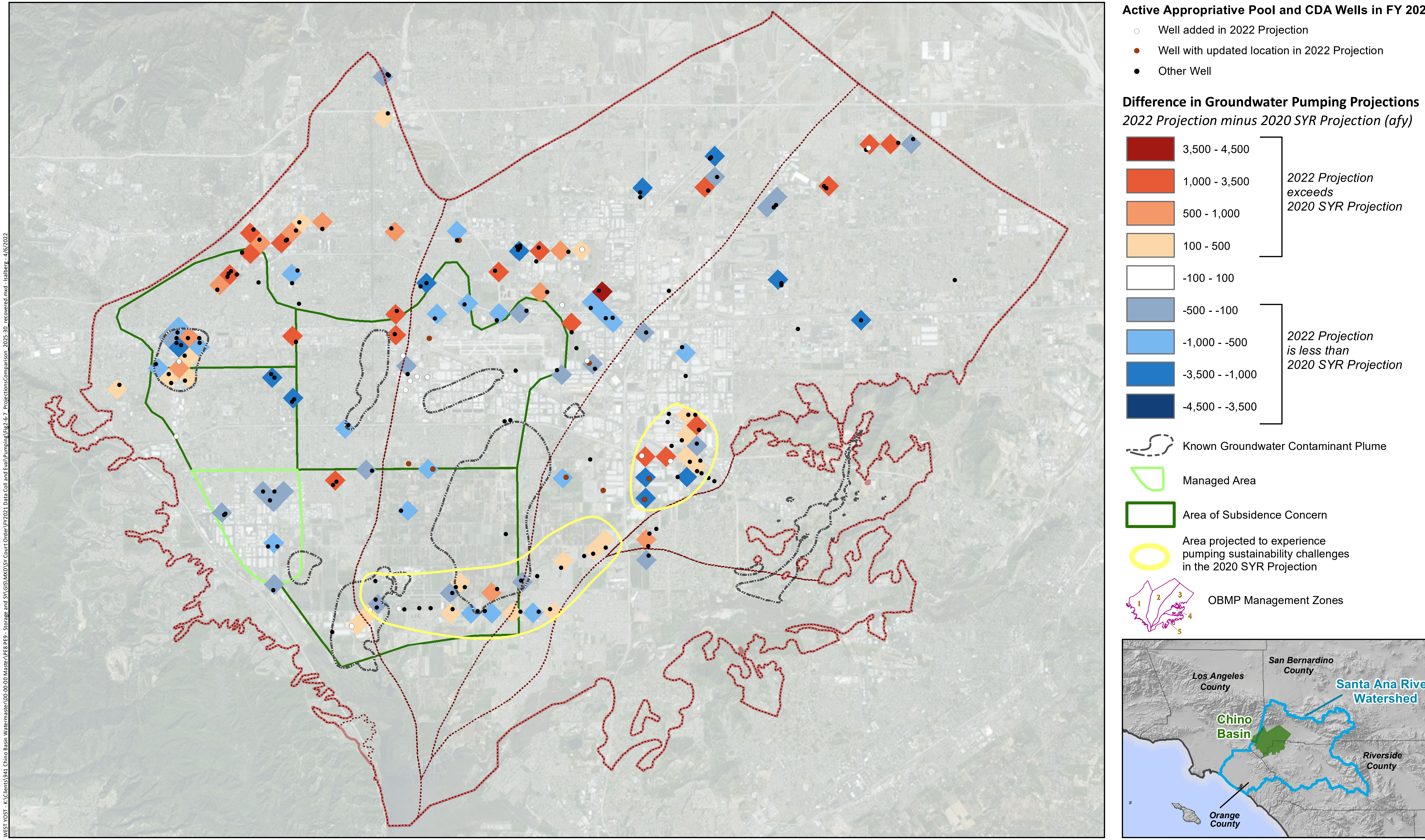
Figures 2-6 and 2-7 show the spatial differences between the 2020 SYR Projection and the 2022 Projection across the Chino Basin for FY 2025 and 2030, respectively, aggregated over a grid with half-mile square cells. Areas where the 2022 Projection for groundwater pumping is greater than the 2020 SYR Projection by more than 100 afy are shown in shades of orange and red, and areas where the 2022 Projection for groundwater pumping is less than the 2020 SYR Projection by more than 100 afy are shown in shades of blue. These figures include the same additional features as Figure 2-3 to assess the potential for new undesirable results.

An examination of Figures 2-6 and 2-7 reveals the following:

- The areas where the 2022 Projection for groundwater pumping is greater than the 2020 SYR Projection overlie the well fields of Parties that increased their pumping projections for the 2022 Projection compared to the 2020 SYR Projection. The Parties for which the 2022 Projection for groundwater pumping is greater than the 2020 SYR Projection by 1,000 afy or more in FY 2025 or FY 2030 include: JCSD, City of Ontario, City of Upland, and MVWD.
- The areas where the 2022 Projection for groundwater pumping is less than the 2020 SYR Projection overlie the well fields of Parties that decreased their pumping projections for the 2022 Projection compared to the 2020 SYR Projection. The Parties for which the 2022 Projection of groundwater pumping is less than the 2020 SYR Projection by 1,000 afy or more in FY 2025 or FY 2030 include: CVWD (FY 2025 only), Chino Hills, Chino, and FWC.
- The 2022 Projection for groundwater pumping is greater than the 2020 SYR Projection in several areas overlying the Area of Subsidence Concern in FY 2025 and FY 2030, including Northwest MZ1.
- The 2022 Projection for groundwater pumping is greater than the 2020 SYR Projection in several areas projected to experience pumping sustainability challenges in FY 2025 and FY 2030. These wells are primarily located in central MZ3 near the JCSD well field.
- Differences between the 2022 Projection and the 2020 SYR Projection for groundwater pumping do not indicate significant changes in the speed and trajectory of groundwater contaminant plumes.

Figure 2-5. Comparison of 2020 SYR Projection versus 2022 Projection for Groundwater Pumping by Management Zone, FY 2025-2030





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N

0 1 2 3 Miles

0 2 4 6 Km

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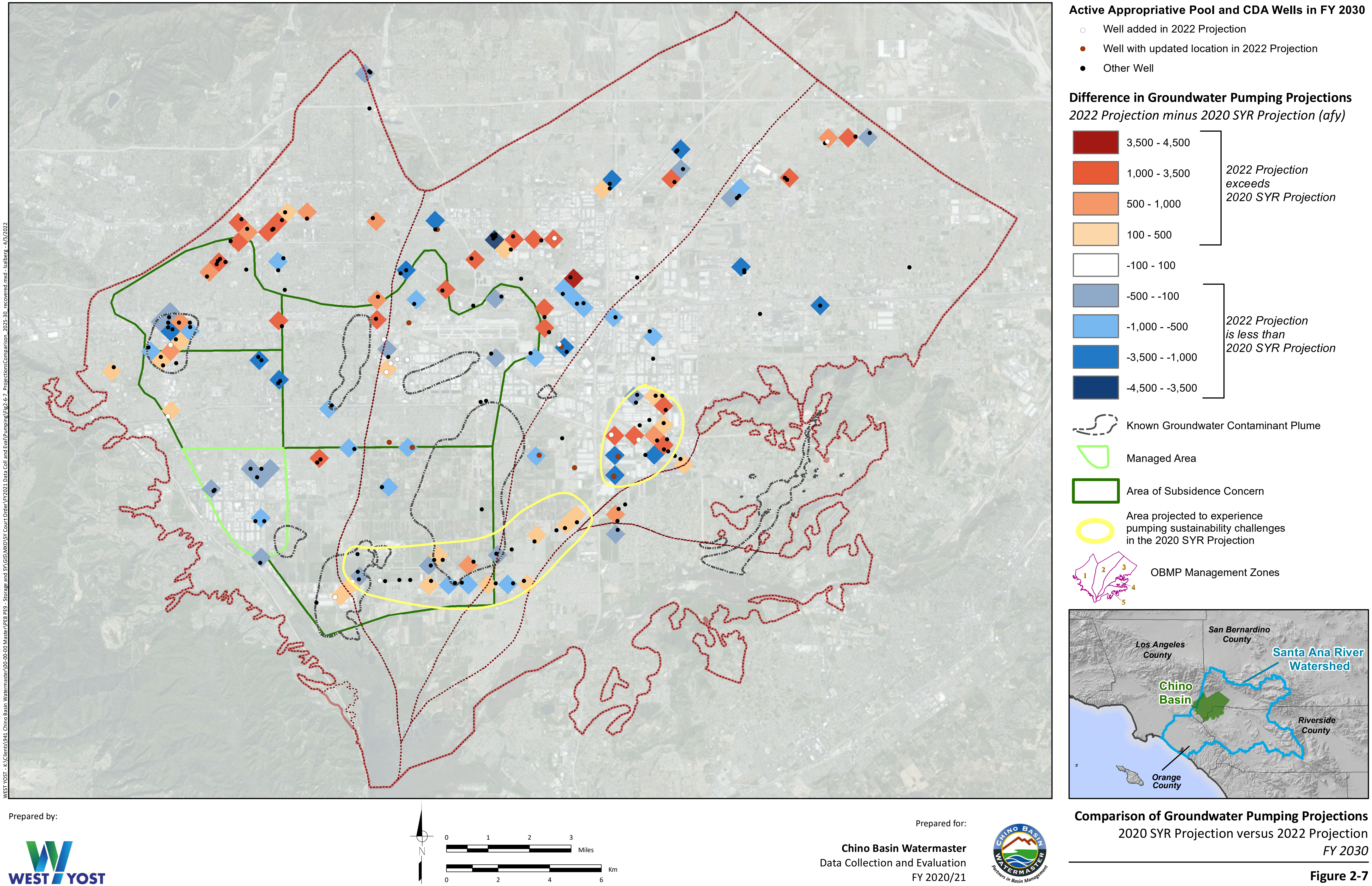
Data Collection and Evaluation
FY 2020/21

Comparison of Groundwater Pumping Projections
2020 SYR Projection versus 2022 Projection
FY 2025

Figure 2-6



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Data Collection and Evaluation
FY 2020/21

Comparison of Groundwater Pumping Projections
2020 SYR Projection versus 2022 Projection
FY 2030

Figure 2-7

2.3.3 Summary

The main observations and conclusions from this section are:

- **The 2019-21 Actual groundwater pumping was greater than assumed in the 2020 SYR Projection.** The 2019-21 Actual groundwater pumping was greater than the 2020 SYR Projection by about 7,400 afy. This difference is primarily due to the groundwater pumping for the DYYP in FY 2020 and 2021, which generally occurred in northern MZ2. However, some of the areas where the 2019-21 Actual groundwater pumping was greater than the 2020 SYR Projection overlie the Northwest MZ1 Area of Subsidence Concern and areas with projected pumping sustainability challenges. The greater 2019-21 Actual groundwater pumping in these areas may increase the risk for land subsidence or pumping sustainability challenges.
- **Differences between the 2022 Projection and the 2020 SYR Projection for groundwater pumping are not expected to have a significant effect on net recharge.** The 2022 Projection for groundwater pumping is greater than the 2020 SYR Projection in FY 2025 and FY 2030 by 5,300 afy and 10,000 afy, respectively. Greater pumping can result in lower groundwater levels, and hence, greater net recharge by altering the groundwater/surface-water interactions in the southern Chino Basin. However, the greater pumping in the 2022 Projection is not expected to result in a significantly different net recharge compared to the 2020 SYR Projection. This conclusion is supported by Watermaster's recent modeling of the Basin response, including net recharge, in the development of the Local Storage Limitation Solution (WY, 2021).[5]
- **Differences between the 2022 Projection and the 2020 SYR Projection may increase the risk of future undesirable results related to land subsidence and pumping sustainability.** The 2022 Projection for groundwater pumping is greater than the 2020 SYR Projection for groundwater pumping in MZ1 in FY 2025 and FY 2030 by 9,200 afy and 8,300 afy, respectively. Some of the areas where the 2022 Projection for groundwater pumping is greater than the 2020 SYR Projection overlie the Northwest MZ1 Area of Subsidence Concern where Watermaster is currently developing a subsidence management plan. These differences indicate the potential for an increased risk of future land subsidence. Furthermore, some of the areas where the 2022 Projection for groundwater pumping is greater than the 2020 SYR Projection overlie areas of projected pumping sustainability challenges, primarily near the JCSD well field. The differences between the 2022 Projection for groundwater pumping and the 2020 SYR Projection in this area indicate the potential for an increased risk of future pumping sustainability challenges.

  It should be noted that Watermaster currently conducts monitoring and management to address any potential land subsidence or pumping sustainability challenges through the implementation of the OBMP.

[5] WY. *Evaluation of the Local Storage Limitation Solution*. Prepared for the Chino Basin Watermaster, February 2021.

CHAPTER 3
Land Use

Chapter 3 documents the collection and evaluation of data and information on land use in the Chino Basin.

3.1 SUMMARY AND APPLICATION TO MODEL

Land use and the associated water use practices are a major driver of recharge in the Chino Basin. Patterns of land use and water use practices determine the fate of water that is applied to or falls on the ground surface via irrigation or precipitation.

Prior to human development of the Chino Basin, much of the precipitation falling on the area overlying or tributary to the Chino Basin was intercepted by vegetation or soil. This water was generally either consumed by vegetation or lost to evaporation. Overlying soils would become wet in the winter and become completely dry in the summer months. Larger, infrequent storms that produce significant runoff would result in water infiltrating in the overlying streambeds and recharging the groundwater basin.

As agriculture became the predominant land use in the Chino Basin, the return flows from irrigation became a significant component of recharge in the Chino Basin. The efficiency of irrigation practices governs the proportion of applied water used directly for plant growth versus the amount that is lost to evaporation or deep infiltration beyond the root zone. Increased irrigation efficiency results in reduced recharge to the groundwater basin.

Since the Judgment (1978), land uses have converted from undeveloped and irrigated agriculture to urban uses. Conversion to urban uses results in an increase in impervious land cover, which increases stormwater runoff and decreases the Basin's ability to capture runoff that will result in groundwater recharge. However, irrigation of outdoor urban areas remains a source of recharge to the Basin. Urban outdoor water use practices are discussed in Chapter 4.

Land use data is used in the CVM through the R4 model. The R4 model is used in the CVM to calculate the areal recharge from precipitation and irrigation, and stormwater recharge that occurs along pervious stream bottoms and in recharge basins. The R4 model is used to estimate surface water discharge (resulting from runoff or point inflows) and the deep infiltration (i.e., past the root zone) of precipitation and applied water throughout the Chino Basin watershed. This deep infiltration of precipitation and applied water (DIPAW) is used as an input to the groundwater model of the CVM.

The R4 model is calibrated based on matching model-estimated surface discharge and applied water estimates to measured data. Land use data is combined with other data, including soil type, irrigation methods, drainage patterns, and surface water routing infrastructure, to characterize the watershed. Each type of land use has an assumed proportion of impervious and pervious area. For the pervious areas that are irrigated, an irrigation efficiency is assumed based on the land use type. The R4 model calculates the applied water based on the land use type, irrigation efficiency, ET, and precipitation.

After the R4 model is calibrated to the measured discharge and applied water, the resulting time series of DIPAW across the Chino Basin is input as a component of groundwater recharge to the groundwater model of the CVM. Due to the variable distance between the bottom of the root zone (i.e., the lower boundary of the R4 model) and the Chino Basin groundwater table, a variable lag time was assigned to the DIPAW in each area before the time series are input into the groundwater model.[1] The lag time ranges from less than one year near Prado Dam and the Santa Ana River to over 30 years near the City of Upland.

3.2 COLLECTION OF DATA AND INFORMATION

This section describes the sources of historical and projected land use used in the data collection and evaluation process.

3.2.1 2019-21 Actual Data

The 2019-21 Actual Data for land use was the 2019 land use database obtained from the Southern California Association of Governments (SCAG). The 2019 SCAG is the only new land use dataset that has become available since the completion of the 2020 SYR.

3.2.2 2020 SYR Projection

In the 2020 SYR Projection, land use was estimated as follows:

- The 2017 SCAG land use database[2] was used as the basis for the assumed 2020 land use.
- Projected land use was obtained as follows:
  - Buildout years and buildout rates were estimated for each Appropriative Pool Parties' service area. Buildout years were obtained from the 2015 UWMPs and through conversations with the Parties. The land use of buildout years was assumed to be General Plan land use. The General Plan land use was obtained from the Parties.
  - Agricultural lands were converted to urban uses based on the Appropriative Pool Parties' build rates and then-current (2017) land use—this produced a projected time-history of agricultural land uses in each Appropriative Pool Parties' service area.

Figure 3-1 illustrates general land use types for 2017 and 2040, corresponding to the beginning of the planning period and assumed build-out for the 2020 SYR Projection, respectively.

3.2.3 2022 Projection

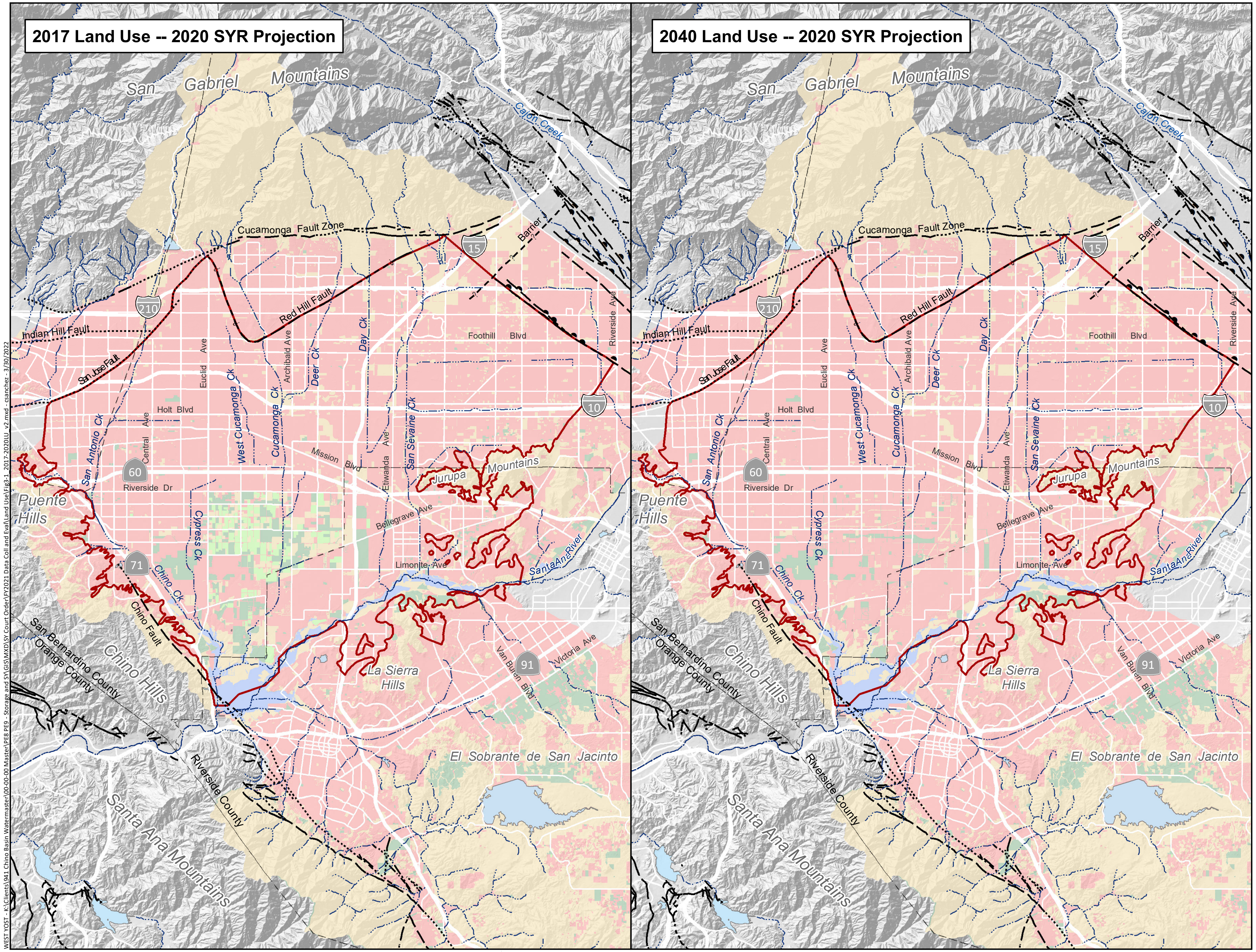
In the 2022 Projection, land use was estimated by determining buildout years for each Appropriative Pool Parties' service area. The buildout years were obtained from the 2020 UWMPs.

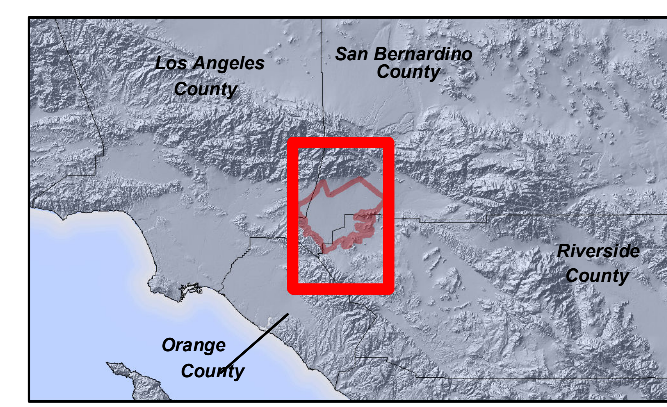
3.3 EVALUATION

This section documents the comparison of the 2020 SYR Projection to the 2019-21 Actual Data and the 2022 Projection for land use, including an assessment of significance of the differences between datasets.

[1] See Section 5.2.4.1 of the *2020 SYR Report*

[2] SCAG land use data can be accessed on the SCAG GIS portal: link





General Land Use Type

- Agriculture
- Dairy
- Urban
- Vacant
- Riparian Vegetation

Chino Basin Hydrologic Boundary

0 1 2 3 Miles

0 2 4 6 Km

Prepared by:

WEST YOST

Prepared for:

Chino Basin Watermaster
Data Collection and Evaluation
FY 2020/21

2017 and 2040 Land Use
2020 SYR Projection

Figure 3-1

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3.3.1 2020 SYR Projection versus 2019-21 Actual Data

Figure 3-2 shows a comparison of 2019-21 Actual Data for land use versus the 2020 SYR Projection. The figure also compares the assumed imperviousness for each data set. Review of this figure shows that for the 2020 SYR Projection, land use was projected to have more urban development compared to the 2019-21 Actual Data. In other words, the 2020 SYR assumed urban development would occur faster than it occurred.

Greater urban development increases the imperviousness of the watershed, which results in less DIPAW. It should be noted, however, that the differences in area by major land use category are less than three percent and these differences result in a less than one percent difference in imperviousness. Additionally, these differences are likely overestimated because the 2019-21 Actual Data is based on 2019 land use.

Furthermore, the differences in the amount of DIPAW due to differences in land use are less significant in the near term due to the lag time to the groundwater table. The travel time of DIPAW between the root zone and the groundwater table varies across the basin; travel time generally increases from south to north as the depth to groundwater increases. In the areas where most of the land use conversions are occurring – City of Chino, City of Ontario, and JCSD – the estimated travel time is about 5 to 15 years. Therefore, any impacts on DIPAW due to land use changes in these areas take 5 to 15 years to affect the net recharge of the Chino Basin.

3.3.2 2020 SYR Projection versus 2022 Projection

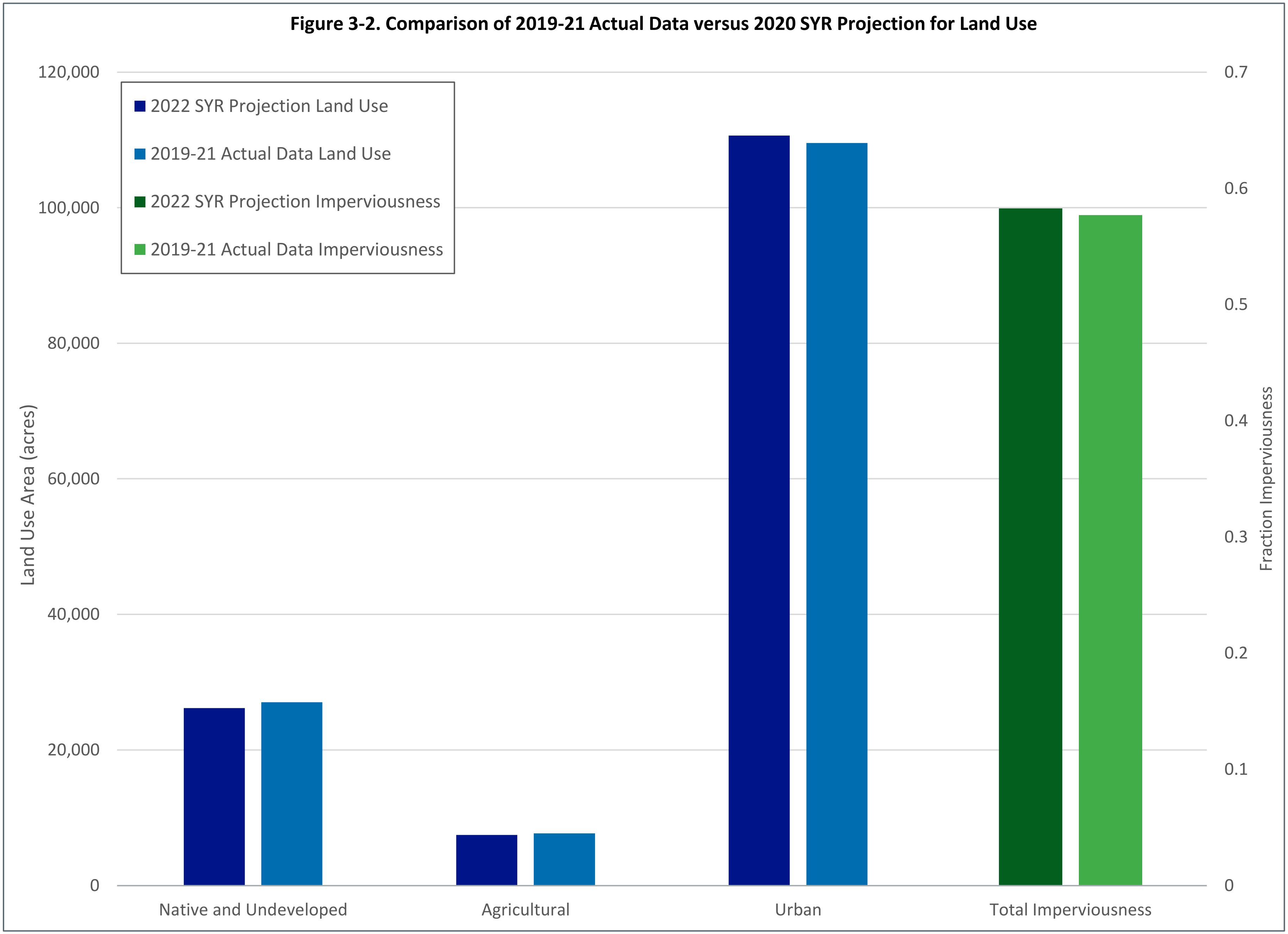
As described above, the 2020 SYR based future land use projections on General Plan land use data and buildout years. There are only three Parties whose service area has agricultural land that will be developed in the future: the City of Chino, City of Ontario, and JCSD. The table below compares the buildout years as assumed in the 2020 SYR Projection and the 2022 Projection.

Table 3-1. Comparison of Buildout Year Projections for Parties with Projected Development

Party	2020 SYR Buildout Year	2022 Projection Buildout Year
City of Ontario	2040	2040
City of Chino	2040	2040
JCSD	2039	2035

Source: Agency 2015 and 2020 UWMPs

As shown in Table 3-1, the only agency that updated its buildout year is JCSD. According to JCSD's 2020 UWMP, buildout within its service area will occur in 2035, which is four years earlier than what was assumed in the 2020 SYR Projection. This change in the anticipated rate of development is negligible and not expected to have a significant impact on the Chino Basin.



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Data Collection and Evaluation
Last Revised: 03-30-22

3.3.3 Summary

The main observation and conclusion from this section is:

- **Differences in land use are not expected to have a significant effect on net recharge or increased the risk of new undesirable results.** The 2020 SYR Projection indicated a more rapid increase in urban development than the 2019-21 Actual land use. However, the differences between the 2020 SYR Projection and the 2019-21 Actual land use are minor, and the 2019-21 Actual land use is based on 2019 land use, which means that the differences are likely overestimated. The 2022 Projection is not significantly different than the 2020 SYR Projection for land use. Any departure from the 2020 SYR Projection of DIPAW due to differences between the Actual Data or the 2022 Projection of land use would take at least 5 to 10 years to affect the net recharge of the Basin. Therefore, the 2022 Projection for land use is not expected to result in a significantly different net recharge or threaten new undesirable results compared to the 2020 SYR Projection.

CHAPTER 4
Urban Outdoor Water Use

Chapter 4 documents the collection and evaluation of data and information on outdoor urban water use practices in the Chino Basin.

4.1 SUMMARY AND APPLICATION TO MODEL

Urban outdoor water use and the fate of these waters after use are a major driver of recharge in the Chino Basin. Pervious areas in the urban landscape are usually either covered with vegetation that is irrigated (e.g., lawns) or are unplanted and not irrigated. The soil underlying irrigated vegetation is continually moist, allowing some of the irrigation water and precipitation to infiltrate past the root zone to recharge the underlying groundwater basin. Changes in urban irrigation practices in response to climate, water conservation mandates, or other drivers affect the rates and volumes of infiltration of irrigation and precipitation past the root zone. An overview of the role of urban outdoor water use and irrigation practices in the Chino Basin and its simulation in the CVM is described in Chapter 3.1.

Urban outdoor water use is included in the CVM through the R4 model which calculates the DIPAW. The R4 model estimates applied water based on soil type, vegetation type, irrigation method, precipitation, and ET. The R4 model calculates the soil moisture available for use by vegetation and determines the need for applied water to irrigate the vegetation, and some of the applied water and precipitation infiltrates past the root zone, resulting in DIPAW. The R4 model is calibrated to match urban outdoor water use patterns in areas where there are sufficient data to estimate urban outdoor water use. The urban outdoor water use in the R4 model was calibrated based on data covering the areas tributary to IEUA's major wastewater treatment plants (sewersheds) from FY 1991 through 2018.

For the 2020 SYR, the R4 model was calibrated by comparing estimated actual potable urban outdoor water use with the model-simulated applied water on residential, commercial, and industrial land uses. Recycled water applied for irrigation was not considered in the calibration because it has historically been a small portion of the irrigation water applied to these land uses.[1] Land uses such as parks, golf courses, and schools were excluded from the calibration, as they are generally irrigated with recycled water.

Projections of future urban outdoor water use using the R4 model rely on projections of future precipitation, ET, land use, and irrigation behavior. Trends in urban outdoor water use are important to understand as they can affect DIPAW, which affects groundwater levels and the water budget including net recharge.

4.2 COLLECTION OF DATA AND INFORMATION

This section describes the sources of historical and projected urban outdoor water use used in the data collection and evaluation process.

[1] Based on the IEUA recycled water meter database, the volume of recycled water that was reused in the areas of model calibration ranged from about 3,000 to 5,000 afy since FY 2016, which is less than six percent of the annual potable urban outdoor water use estimates.

4.2.1 2019-21 Actual Data

Estimates for urban outdoor water use are derived from data collected from IEUA's two major sewersheds that cover most of the Chino Basin, which are the RP1/RP4 and Carbon Canyon (CC)/RP5 sewersheds. The methodology to derive estimates of urban outdoor water use is:

1. Obtain monthly potable water supplies to the sewershed from IEUA and/or the Party overlying the sewershed.
2. Obtain annual estimates of the potable water delivery losses from each Party.
3. Obtain monthly sewage inflow to the wastewater treatment plants from IEUA.
4. Estimate the monthly dry-weather discharge using available discharge estimates from the USGS gage on Cucamonga Creek.
5. Estimate the monthly discharge from on-site waste disposal systems (OWDS) overlying the sewersheds.
6. Calculate the monthly urban irrigation demand (outdoor water use). This is estimated as the total potable supply to the sewershed (1 minus 2) minus the sum of sewage inflow to the plants (3), dry-weather discharge (4), and OWDS discharge (5).

4.2.2 2020 SYR Projection

In the 2020 SYR, projected urban outdoor water use was estimated with the R4 model based on the calibrated parameters and the following assumptions:

- **Average expected-value hydrology adjusted for climate change.** The Safe Yield Reset methodology calls for the use of the "long-term historical record of precipitation falling on current and projected future land uses to estimate the long-term average net recharge to the Basin." Future precipitation and evapotranspiration (ET) datasets used in the R4 model are based on the period of FY 1950 through 2011, which were adjusted for future climate conditions based on the method recommended by the California Department of Water Resources (DWR) for use in groundwater models to simulate future water budgets pursuant to the Sustainable Groundwater Management Act (SGMA) (DWR, 2018).[2,3]
- **The impact of current and future urban outdoor water use conservation legislation was not included.** On April 1, 2015, Governor Jerry Brown released Executive Order B-29-15, which mandated a statewide reduction in urban potable water usage of 25 percent through February 2016. Additionally, in 2018, the California legislature passed, and the Governor signed two pieces of legislation (AB 1668 & SB 606), collectively known as "Making Conservation a California Way of Life," to establish new water efficiency standards for purveyors in response to the California drought. The legislation requires water suppliers to meet agency-specific urban water use objectives beginning in 2027. Details on the implementation of this legislation were insufficient at the time to include in the 2020 SYR Projection. The 2020 SYR Projection assumed that outdoor water use patterns for legacy

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[2] More detail on the development of future hydrology can be found in Section 7 of the 2020 SYR Report.

[3] DWR. Resource Guide - DWR-provided Climate Change Data and Guidance for Use During Groundwater Sustainability Plan Development. 2018.

urban areas would reflect recent historical patterns. Areas projected for future development would implement more efficient outdoor water use consistent with the guidance provided in the DWR's 2015 Model Water Efficient Landscape Ordinance.[4]

4.2.3 2022 Projection

The 2022 Projection for urban outdoor water use was developed by reexamining the assumptions used to develop the 2020 SYR Projection. Any new information regarding the assumptions for the future patterns of urban outdoor water use, including the status of water conservation legislation, was obtained to determine whether or how the 2020 SYR Projection should be updated to develop the 2022 Projection.

4.3 EVALUATION

This section documents the comparison of the 2020 SYR Projection to the 2019-21 Actual Data and the 2022 Projection for urban outdoor water use, including an assessment of significance of the differences between datasets.

4.3.1 2020 SYR Projection versus 2019-21 Actual Data

Figure 4-1 compares the 2019-21 Actual Data to the 2020 SYR Projection urban outdoor water use. The 2020 SYR Projection urban outdoor water use exceeds the 2019-21 Actual Data for urban outdoor water use by 16,500 afy. Therefore, while the 2020 SYR Projection does not include the impact of the current and future urban outdoor water use conservation legislation, the 2019-21 Actual Data demonstrates that the reduction in urban outdoor water use observed after Executive Order B-29-15 in 2015 has continued through 2021.

4.3.2 2020 SYR Projection versus 2022 Projection

In October 2021, after the 2020 SYR Projection was developed, the DWR proposed a provisional method to calculate agency-specific water efficiency objectives to implement the 2018 legislation. At the time this report was published, the State Water Resources Control Board has not approved the DWR's provisional method, and the effects of the 2018 legislation on water use in the Chino Basin remains unclear. Therefore, the new information is insufficient to develop the 2022 Projection for urban outdoor water use.

4.3.3 Summary

The main observations and conclusions from this section are:

- **The 2019-21 Actual urban outdoor water use was less than assumed in the 2020 SYR Projection.** The 2020 SYR Projection urban outdoor water use exceeds the 2019-21 Actual Data urban outdoor water use by 16,500 afy. The fact that the 2019-21 Actual Data was less than the 2020 SYR Projection for urban outdoor water use would likely result in less DIPAW and net recharge compared to the 2020 SYR Projection. The timing of this reduction in net recharge depends on the travel time between the root zone and the groundwater table, which ranges from less than one year to over 30 years in the Chino Basin. Therefore, any

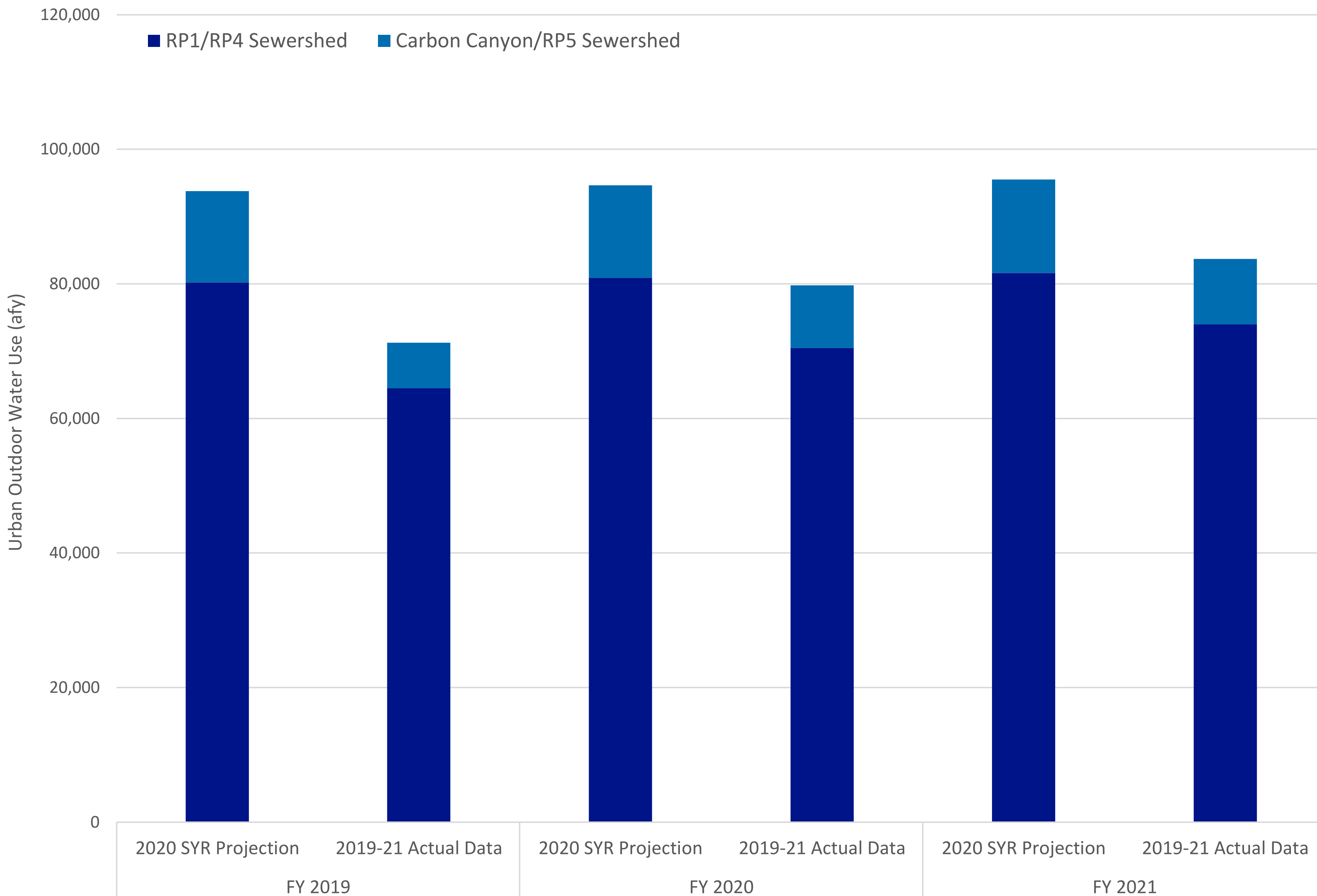
[4] DWR. *Model Water Efficient Landscape Ordinance*. Accessed March 25, 2022.

departure from the 2020 SYR Projection of DIPAW due to differences between the 2019-21 Actual Data and 2020 SYR Projection for urban outdoor water use would take several years to measurably affect the net recharge of the Basin.[5]

- **Future outdoor urban water use is likely to be less than the 2020 SYR Projection.** The current information regarding the implementation of water conservation legislation and practices in California is insufficient to develop a 2022 Projection for urban outdoor water use. However, based on the available information and the 2019-21 Actual Data, it is likely that future patterns of urban outdoor water use will be less than the 2020 SYR Projection, which would result in less net recharge than the 2020 SYR Projection. Any departure from the 2020 SYR Projection of DIPAW due to differences between the 2022 Projection and 2020 SYR Projection for urban outdoor water use would take several years to measurably affect the net recharge of the Basin.

[5] See Section 7 and Figure 7-4 of the 2020 SYR Report. The 2020 SYR Projection for the discharge of DIPAW to the vadose zone (dashed green line in Figure 7-4) is greater than the estimated discharge from the vadose zone to the saturated zone at the beginning of the 2020 SYR projection (beginning of the dotted blue line in Figure 7-4). The estimated discharge from the vadose zone to the saturated zone (dotted blue line in Figure 7-4) increases gradually throughout the 2020 SYR Projection period, asymptotically reaching the discharge of DIPAW to the vadose zone. This demonstrates the lag between changes of DIPAW at the surface and changes in discharge to the saturated zone that affect net recharge.

Figure 4-1. Comparison of 2019-21 Actual Data versus 2020 SYR Projection for Urban Outdoor Water Use, FY 2019-2021



CHAPTER 5
Managed Recharge

Chapter 5 documents the collection and evaluation of data and information on managed recharge in the Chino Basin.

5.1 SUMMARY AND APPLICATION TO MODEL

Managed recharge (also known as managed aquifer recharge) is the intentional recharge of water in the Chino Basin. Through the implementation of OBMP Program Element 2 (Develop and Implement Comprehensive Recharge Program), Watermaster has collaborated with the Parties and local agencies to enhance managed recharge.

The types of water recharged in the Chino Basin include stormwater and supplemental water. Stormwater is the runoff generated from rainfall within the Chino Basin watershed, some of which can be routed to recharge facilities within the Chino Basin. Stormwater recharge varies from year to year, and the volume of recharge is dependent on precipitation, which is highly variable, and the capacity and operation of the recharge facilities. Supplemental water includes recycled water and water that originates from outside the Chino Basin (i.e., imported water from the State Water Project). Supplemental water recharge also is highly variable and is dependent on the water-supply plans of the Parties and the capacity and operation of the recharge facilities.

Managed recharge occurs in the Chino Basin via spreading of surface water at recharge basins, injection at aquifer storage and recovery (ASR) facilities, infiltration at Municipal Separate Storm Sewer System (MS4) facilities, and in-lieu recharge, which are all documented in detail in the 2018 Recharge Master Plan Update (2018 RMPU).[1] Each method for managed recharge is listed below, including a description of how of these recharge terms are input to the CVM:

1. **Recharge Basins.** Recharge basins are the flood control and conservation basins that the IEUA, Chino Basin Water Conservation District (CBWCD), and the San Bernardino County Flood Control District own and operate. Recharge at these basins is input to the CVM as a specified inflow at the model cells corresponding to the recharge basins. Figure 5-1 shows the locations of the recharge basins in the Chino Basin where managed recharge occurs.
2. **Aquifer Storage and Recovery (ASR) Facilities.** ASR facilities are wells that are equipped for the injection of surface water and extraction of groundwater. Data for the injection and extraction of water from the ASR facilities is input into the CVM as a specified inflow at the location of the ASR well. Figure 5-1 shows the locations of the current and future ASR facilities in the Chino Basin.
3. **MS4 Facilities.** MS4 facilities include facilities to capture stormwater runoff in an urban area. Los Angeles, San Bernardino, and Riverside Counties, and/or the cities within these counties, have MS4 facilities in the Chino Basin. A reconnaissance-level study completed during the development of the 2018 RMPU estimated that there were 114 known MS4 facilities that have been constructed in the Chino Basin through FY 2016 that included infiltration features that would contribute to new stormwater recharge in the Chino Basin. The data that has been collected on the performance and maintenance of the MS4 facilities has been insufficient to quantify the historical or projected contribution of these facilities to new recharge in the Chino Basin. The CVM does not explicitly account for recharge at these facilities.

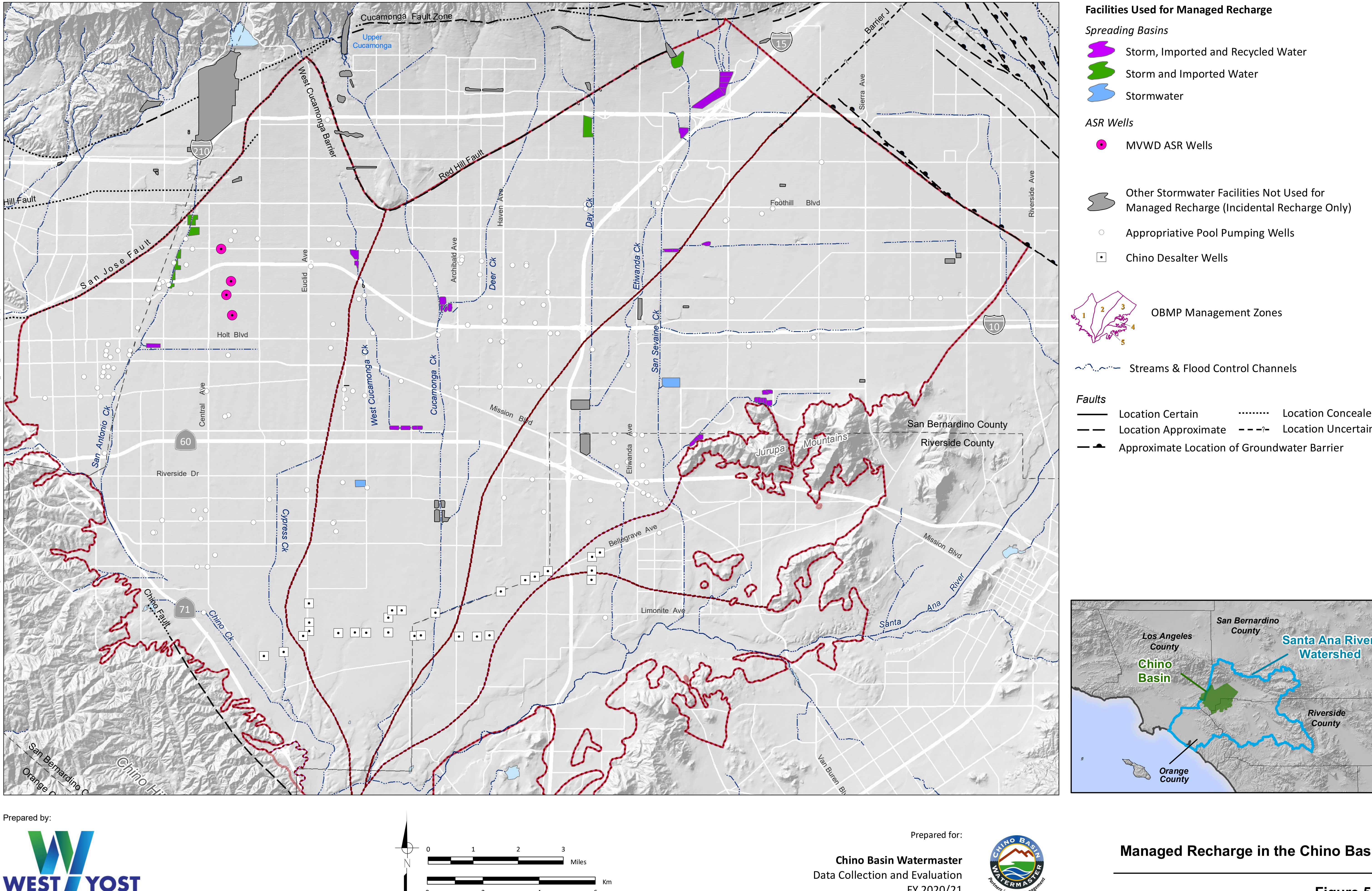
[1] WEI. 2018 Recharge Master Plan Update. Prepared for the Chino Basin Watermaster. September 2018.

4. **In-lieu Recharge.** In-lieu recharge can occur when a Party with pumping rights in the Chino Basin uses supplemental water for direct use in lieu of pumping Chino Basin groundwater. The ability of a Party to conduct in-lieu recharge depends on the extent of a Party's access to treatment and conveyance facilities for imported water. In-lieu recharge is reflected in a Party's water supply plan and is not a direct input into the CVM.

Historical data on managed recharge is one of several input datasets in the CVM calibration scenario. The CVM's R4 surface water model is calibrated to match the IEUA's estimates of stormwater recharge at recharge basins. The CVM's groundwater model is calibrated over the period of July 1, 1977 through June 30, 2018 by adjusting model parameters to produce the best match between simulated and observed system responses, including the time series of surface water discharge into the Prado Dam reservoir and groundwater levels at wells.[2]

Projections of future managed recharge are used to develop the model projection scenarios, that are then simulated with the CVM to estimate the future water budget of the Chino Basin, including net recharge. Managed recharge patterns (magnitude and location) are important to understand as they can affect groundwater levels, water budget components, and net recharge.

[2] More information on the calibration process of the CVM can be found in Section 6 of the 2020 SYR Report.



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Prepared by:

WEST YOST

Prepared for:

Chino Basin Watermaster
Data Collection and Evaluation
FY 2020/21

Managed Recharge in the Chino Basin

Figure 5-1

5.2 COLLECTION OF DATA AND INFORMATION

This section describes the sources of historical and projected managed recharge used in the data collection and evaluation process.

5.2.1 Stormwater Recharge

5.2.1.1 2019-21 Actual Data

Stormwater recharge is metered at each recharge basin by IEUA. The IEUA provides Watermaster the daily and monthly measurements of stormwater diverted to each recharge basin. Watermaster maintains these data in a database.

5.2.1.2 2020 SYR Projection

In the 2020 SYR Projection, stormwater recharge at recharge basins was estimated with the R4 model based on the following assumptions:

- **Average expected-value hydrology adjusted for climate change.** The Safe Yield Reset methodology calls for the use of the "long-term historical record of precipitation falling on current and projected future land uses to estimate the long-term average net recharge to the Basin." Future precipitation and ET datasets used in the R4 model are based on the period of FY 1950 through 2011, which were adjusted for future climate conditions based on the method recommended by the DWR for use in groundwater models to simulate future water budgets pursuant to the SGMA (DWR, 2018).[3]
- **2013 RMPU projects would be fully operational by FY 2023.** During the development of the 2020 SYR Projection, design, and construction of the approved recharge enhancement projects in the 2013 RMPU were underway. The assumptions in the 2020 SYR Projection were that all approved 2013 RMPU projects would be completed by FY 2023, at which point the expected stormwater recharge increases by the volumes estimated for each project.

5.2.1.3 2022 Projection

The 2022 Projection was developed by reexamining the assumptions used to develop the 2020 SYR Projection. Any new information regarding the assumptions for the future hydrology and recharge projects was obtained to determine whether or how the 2020 SYR Projection should be updated to develop the 2022 Projection.

5.2.2 Recycled Water Recharge

5.2.2.1 2019-21 Actual Data

Recycled water recharge is metered at each recharge basin by the IEUA. The IEUA provides Watermaster the daily and monthly measurements of recycled water delivered to each recharge basin, adjusted for evaporation losses. Watermaster maintains these data in a database.

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[3] More detail on the development of future hydrology can be found in Section 7 of the 2020 SYR Report.

5.2.2.2 2020 SYR Projection

The IEUA provided projections of future annual recycled water recharge at each recharge basin. The IEUA projections were reduced for the 2020 SYR Projection to be more consistent with the recent history of recycled water recharge that occurred prior to FY 2019.

5.2.2.3 2022 Projection

The IEUA provided updated recycled water recharge projections in 2022. The IEUA projections were not modified for the 2022 Projection.

5.2.3 Imported Water Recharge

5.2.3.1 2019-21 Actual Data

Imported water recharge is metered at each recharge basin by the IEUA. The IEUA provides Watermaster the daily and monthly measurements of imported water delivered to each recharge basin, adjusted for evaporation losses. Volumes of imported water injected into ASR wells in the Chino Basin are reported to Watermaster quarterly by the well owners and are not subject to evaporation losses. Watermaster maintains these data in a database.

5.2.3.2 2020 SYR Projection

For the 2020 SYR Projection, estimates of future imported water recharge were based on the following:

- **Storage and Recovery Programs.** The only active Storage and Recovery Program in the Chino Basin is the DYYP. This program involves the recharge of imported water in the Chino Basin for later extraction via Chino Basin wells. At the end of the calibration period (June 30, 2018), the DYYP had a balance of about 41,380 af. The future operations of the DYYP were uncertain beyond the calibration period, so no recharge for the DYYP was included in the 2020 SYR Projection.
- **Peace II Agreement requirements.** Pursuant to the Peace II Agreement, 6,500 afy of supplemental water must be recharged in MZ1 through 2030. The 2020 SYR Projection assumed that "this obligation will be satisfied through the recharge of imported water for the [DYYP] that has already occurred and recycled water recharge planned to occur in MZ1 through 2030." (2020 SYR Report).
- **Replenishment obligations.** Imported water was assumed to be recharged in the future to satisfy the replenishment obligations of the Parties. To estimate the volume of replenishment obligations and managed storage,[4] Watermaster compared estimates of future pumping to future pumping rights, as summarized below.[5]
    - Projections of future pumping rights were based on the Safe Yield (through FY 2020), projected average net recharge (for each decade after FY 2020), Reoperation water, and projected recycled water recharge.

[4] Managed storage, as used herein, refers to water stored by the Parties and other entities, and includes Carryover, Local Storage, and Supplemental Water held in storage accounts by the Parties, and Storage and Recovery Programs.

[5] More detail on the methods to calculate the replenishment obligation can be found in Section 7.3.1.2 of the 2020 SYR Report.

- If projected pumping was greater than projected pumping rights, the difference was the replenishment obligation. It was assumed that the replenishment obligation would be satisfied with 80 percent coming from managed storage and the remaining 20 percent comping from wet-water (i.e., imported water) recharge.

- **Projected imported water recharge at ASR wells.** No imported water is assumed to be recharged via ASR wells in the 2020 SYR.

The projected imported water recharge was allocated to specific recharge basins based on the recommendation in the 2018 RMPU (WEI, 2018), which stated the following:

> *"WEI's recommendation to Watermaster regarding the location and magnitude of supplemental water recharge for replenishment has been to maximize recharge to MZ1 up to its spreading capacity, then to maximize recharge in MZ3 up to its recharge capacity, and then to recharge in MZ2. This strategy was developed during the [2013] safe yield recalculation and subsequently reevaluated in the Storage Framework investigation. Given that the long-term land subsidence management plan for Northwest MZ1 has not yet been completed and there are no projected recharge-related pumping substantiality challenges that can be practically mitigated through recharge, the existing strategy and the facilities on which it relies are sufficient at least until the next RMPU occurs in 2023. This includes continuing the recharge of 6,500 afy of supplemental water in MZ1 until the next RMPU occurs in 2023."*

5.2.3.3 2022 Projection

For the 2022 Projection, estimates of future imported water recharge were based on the following:

- **Storage and Recovery Programs.** The only active Storage and Recovery Program remains the DYYP, which had a balance of 22,929 af at the end of FY 2021. The future operations of the DYYP remain uncertain, so no recharge for the DYYP was included in the 2022 Projection.
- **Peace II Agreement requirements.** There have been no changes to the Peace II Agreement requirements, thus 6,500 afy of supplemental water must continue to be recharged in MZ1 through 2030. It is still assumed that "this obligation will be satisfied through the recharge of imported water for the [DYYP] that has already occurred and recycled water recharge planned to occur in MZ1 through 2030."
- **Replenishment obligations.** The 2022 Projection for managed storage and the replenishment obligations were developed using the same methodology as for the 2020 SYR Projection but updated with the 2022 Projection for groundwater pumping and recycled water recharge. In 2021, Watermaster submitted a comprehensive data request to the Appropriative Pool Parties asking for information on their projected water demands and supply plans, well information, and how they anticipate using their respective stored water accounts to offset overproduction. The Parties' responses indicated that they would meet between 50 and 100 percent of their replenishment obligations through their stored water accounts. Several Parties indicated significant uncertainty in these estimates, hence, the assumption that 20 percent of replenishment obligations will be met with imported water recharge remains the same as in the 2020 SYR Projection.

— The volume of future replenishment obligations was estimated using the same method as the 2020 SYR Projection, except the future groundwater pumping was based on the 2022 Projection.

- **Projected imported water recharge at ASR wells.** The Parties indicated that no imported water should be assumed to be recharged via ASR wells in the 2022 Projection.

5.3 EVALUATION

This section documents the comparison of the 2020 SYR Projection to the 2019-21 Actual Data and the 2022 Projection for managed recharge and an assessment of significance of the differences between datasets. Figure 5-2 is a chart that compares the 2019-21 Actual Data, 2020 SYR Projection, and the 2022 Projection for managed recharge for FY 2019-2030.

5.3.1 Stormwater Recharge

5.3.1.1 2020 SYR Projection versus 2019-21 Actual Data

2019-21 Actual stormwater recharge was sometimes greater than and sometimes less than stormwater recharge in the 2020 SYR Projection, which is to be expected given the variation in precipitation from year to year. 2019-21 Actual stormwater recharge was less than the 2020 SYR Projection by an average of 1,200 afy.

5.3.1.2 2020 SYR Projection versus 2022 Projection

The 2022 Projection of stormwater recharge is identical to the 2020 SYR Projection. Since the development of the 2020 SYR Projection, there is no updated information that would necessitate a change in the data or methods used to develop the long-term hydrology used in the 2020 SYR Projection. All 2013 RMPU projects are expected to be completed by FY 2023, and there are no expected additional stormwater recharge projects planned for construction through FY 2030.

5.3.2 Recycled Water Recharge

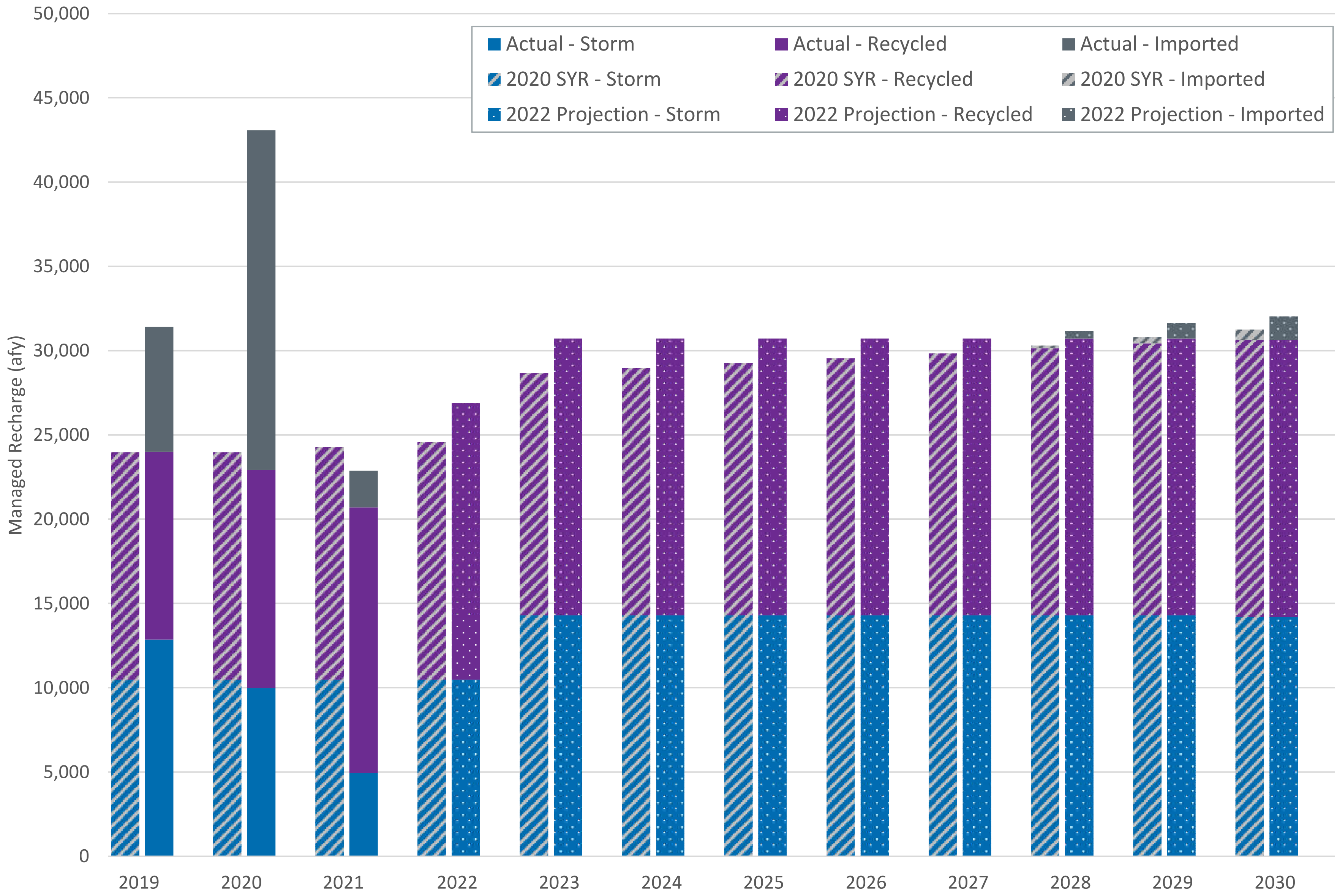
5.3.2.1 2020 SYR Projection versus 2019-21 Actual Data

2019-21 Actual recycled water recharge was less than the 2020 SYR Projection by an average of about 300 afy.

5.3.2.2 2020 SYR Projection versus 2022 Projection

The 2022 Projection for recycled water recharge is greater than the 2020 SYR Projection by an average of 1,170 afy through FY 2030.

Figure 5-2. Comparison of 2019-21 Actual Data and Projected Managed Recharge in the Chino Basin, FY 2019-2030



5.3.3 Imported Water Recharge

5.3.3.1 2020 SYR Projection versus 2019-21 Actual Data

2019-21 Actual imported water recharge was greater than the 2020 SYR Projection by an average of 9,900 afy. This is almost entirely due to the imported water recharge for the DYYP.

5.3.3.2 2020 SYR Projection versus 2022 Projection

The 2022 Projection for imported water recharge during FY 2028-30 is greater than the 2020 SYR Projection by an average of 540 afy. This is due to the higher pumping projections in the 2022 Projection that result in a replenishment obligation that is partially satisfied with imported water recharge.

5.3.4 Summary

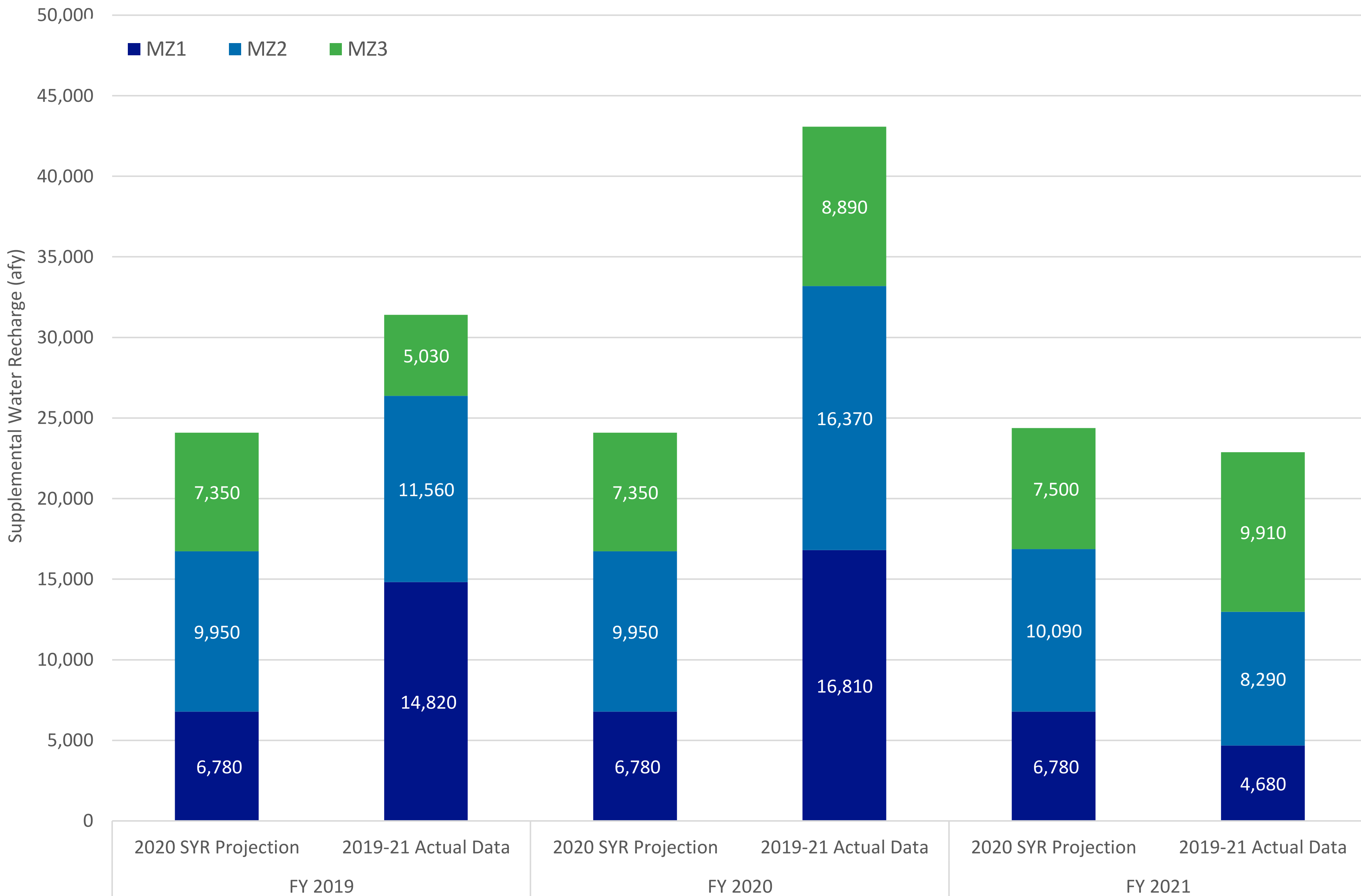
The main observations and conclusions from this section are:

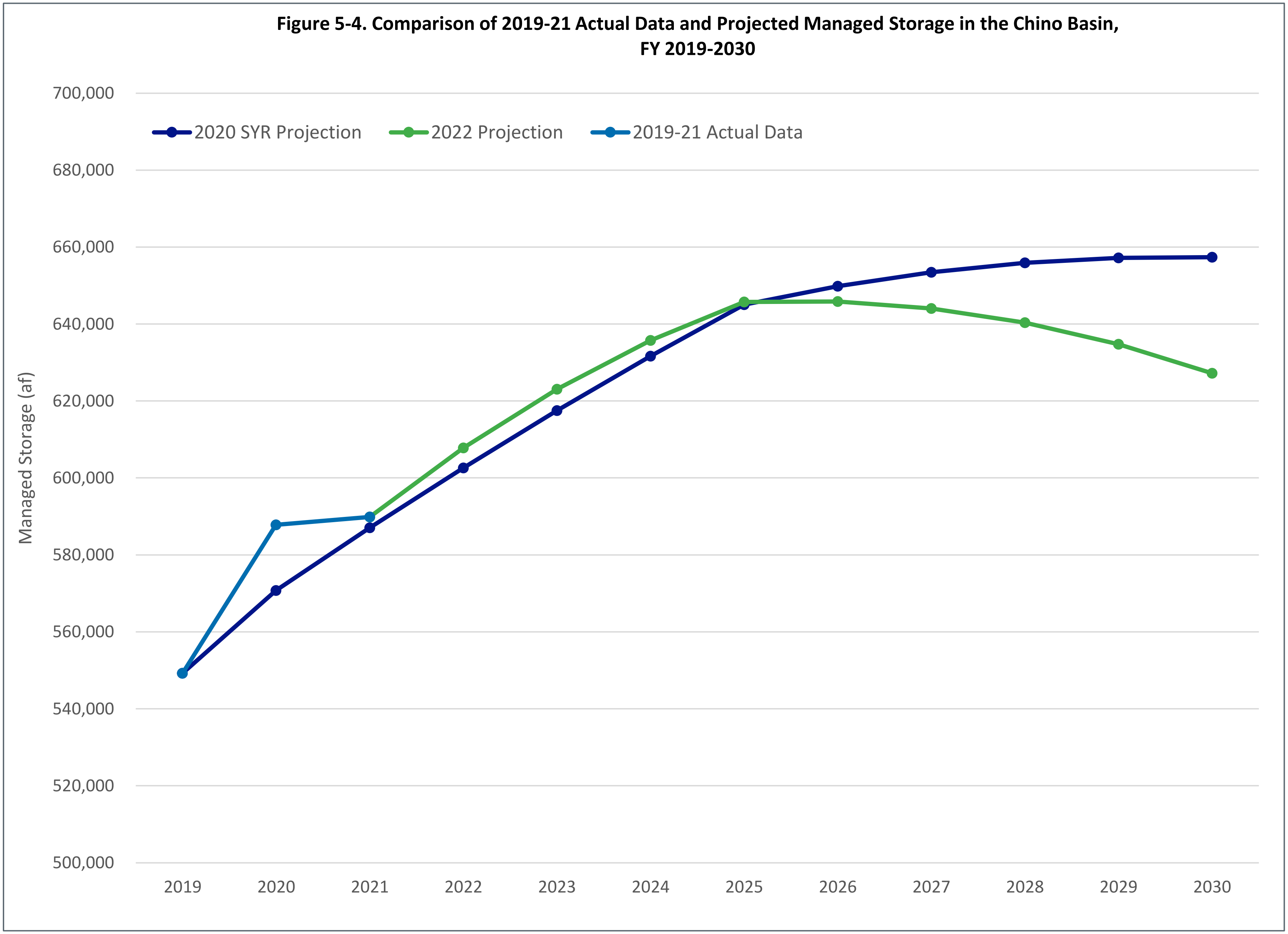
- **The 2019-21 Actual managed recharge in MZ1 was greater than assumed in the 2020 SYR Projection.** Figure 5-3 compares the 2019-21 Actual Data for managed recharge to the 2020 SYR Projection by MZ. The 2019-21 Actual Data for managed recharge was greater than the 2020 SYR Projection by an average of about 8,300 afy, including 5,300 afy in MZ1. This was largely due to the imported water recharged for the DYYP. The facilities for managed recharge in MZ1 are all located in the northwest portion of MZ1, where persistent land subsidence has been occurring for decades and the Watermaster is currently developing a subsidence management plan. The greater volumes of managed recharge in MZ1 can help support groundwater levels in this area and help mitigate the occurrence of land subsidence.
- **The 2019-21 Actual stormwater recharge was less than assumed in the 2020 SYR Projection.** 2019-21 Actual stormwater recharge in the Chino Basin was less than the 2020 SYR Projection by about 1,200 afy. Differences between actual and projected stormwater recharge are to be expected because (i) precipitation and runoff are highly variable and (ii) the projections are based on long-term expected average hydrology adjusted for climate change. Over longer time periods, actual stormwater recharge should become approximately equal to the projections.
- **Differences in managed storage are not expected to have a significant effect on net recharge.** Managed recharge and groundwater pumping are components in the calculation of managed storage. Managed storage can affect groundwater levels and the net recharge in the Chino Basin. For example, higher managed storage can result in higher groundwater levels, and hence, lower net recharge because of the groundwater/surface-water interactions in the southern Chino Basin. Figure 5-4 compares the 2020 SYR Projection for managed storage to the 2019-21 Actual Data and the 2022 Projection for managed storage through FY 2030. The 2019-21 Actual Data was collected from Watermaster Assessment Packages. The differences between the 2020 SYR Projection for managed storage and the 2022 Projection for managed storage are not significant through FY 2030. Therefore, the 2022 Projection for managed storage is not expected to result in a significantly different net recharge compared to the 2020 SYR Projection. This

conclusion is supported by Watermaster's recent modeling of the Basin response, including net recharge, in the development of the Local Storage Limitation Solution (WY, 2021).[6]

[6] WY. *Evaluation of the Local Storage Limitation Solution*. Prepared for the Chino Basin Watermaster, February 2021.

Figure 5-3. Comparison of 2019-21 Actual Data versus 2020 SYR Projection for Managed Recharge by Management Zone, FY 2019-2021





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CHAPTER 6
Regional Water Infrastructure

Chapter 6 documents the collection and evaluation of data and information on regional water infrastructure in the Chino Basin.

6.1 SUMMARY AND APPLICATION TO MODEL

As the overlying land uses and water use practices in the Chino Basin have converted from mainly agricultural to mainly urban since the Judgment, the water-supply agencies have constructed a complex network of infrastructure to utilize a diverse set of water supplies to meet demands. In addition to pumping from the Chino Basin, the Watermaster Parties (generally in the Appropriative Pool) develop and use groundwater from surrounding basins, local surface water, imported water from the Metropolitan Water District of Southern California or other entities, and recycled water. As the availability, cost, and quality of these supplies fluctuate, each agency decides how to serve their dynamic demands. The patterns in groundwater pumping that result from these decisions affect the response of the Chino Basin and the interaction of the Chino Basin groundwater with its boundaries, including the Santa Ana River and adjacent groundwater basins.

In addition to the urbanization of the land use in the Chino Basin, infrastructure was built to convey stormwater runoff rapidly, safely, and efficiently away from agricultural and urban areas. This further reduced the areal recharge in the Chino Basin. Since the late 1990s, efforts of the Watermaster and Chino Basin stakeholders to develop and implement Recharge Master Plans have helped offset the reduced recharge in the Chino Basin while maintaining flood-control capacity.

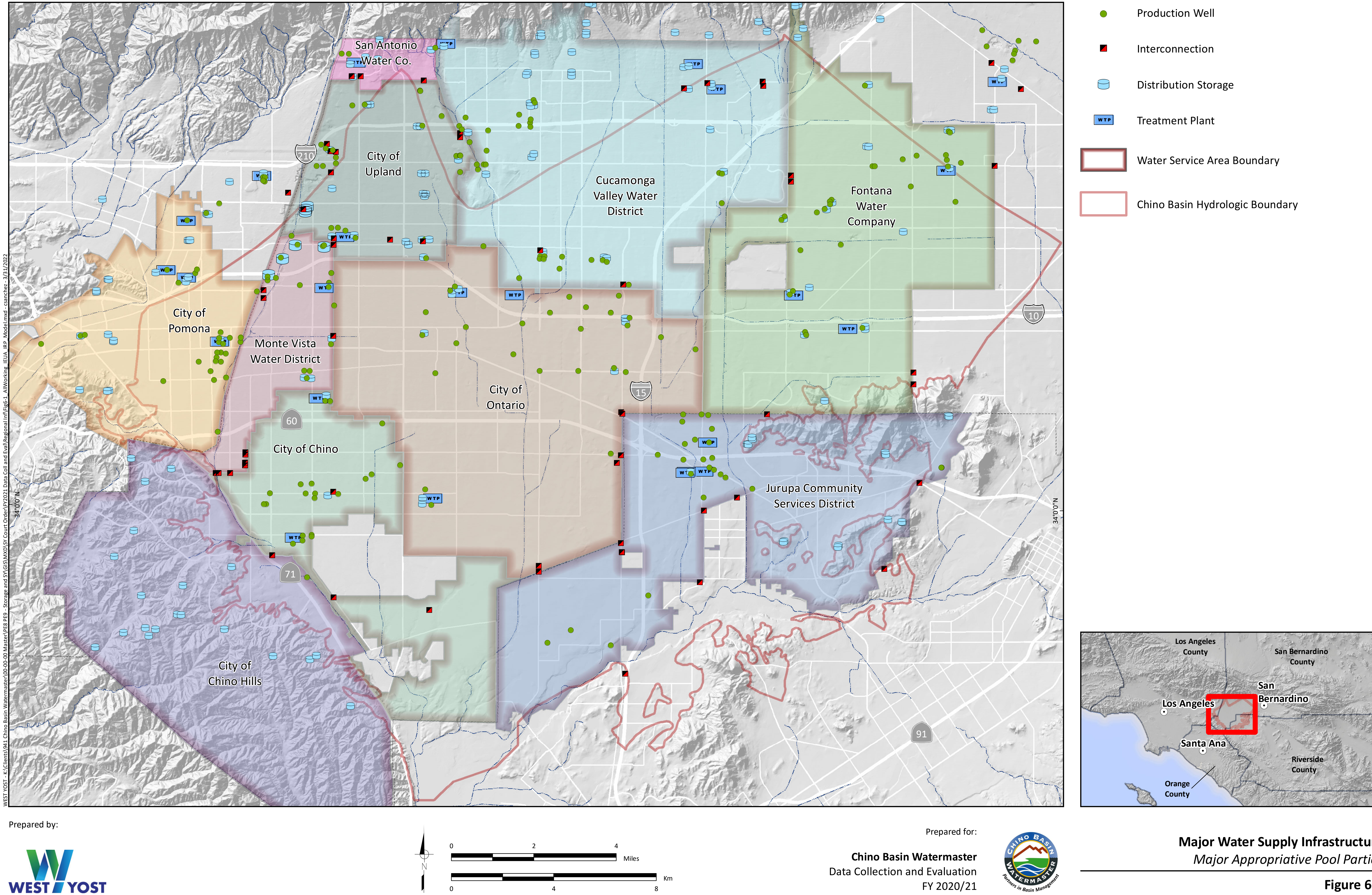
Regional infrastructure is not directly used in the groundwater model. The impacts on net recharge and Safe Yield from regional water infrastructure is mostly captured in groundwater pumping and urban outdoor water use (Chapters 2 and 4, respectively). However, an understanding of the existing and planned regional infrastructure can further provide context on behavioral changes related to water use that could impact the water use assumptions for future scenarios.

6.2 COLLECTION OF DATA AND INFORMATION

This section describes the sources of historical and projected regional water infrastructure information used in the data collection and evaluation process.

6.2.1 2019-21 Actual Data

Watermaster maintains a database of production wells in the Chino Basin. As part of Watermaster's comprehensive data request to the Parties for this annual data collection and evaluation effort, Watermaster requested updated information on current water infrastructure from the major Appropriative Pool Parties. This data request included existing well information and information regarding current treatment, storage, production, and conveyance facilities in the Chino Basin. Figure 6-1 shows the current water infrastructure for the major Appropriative Pool Parties in the Chino Basin. More detailed maps of current water infrastructure for 10 of the major Appropriative Pool Parties are included in Appendix A.



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WEST YOST

Prepared for:

Chino Basin Watermaster
Data Collection and Evaluation
FY 2020/21

Major Water Supply Infrastructure
Major Appropriative Pool Parties

Figure 6-1

6.2.2 2020 SYR Projection

The development of the 2020 SYR Projection included a data request to the Appropriative Pool Parties that requested projected water supply plans, current and planned well information, and information regarding future treatment and conveyance facilities.

6.2.3 2022 Projection

As part of the data request to the Appropriative Pool Parties for this data collection and evaluation effort, Watermaster requested any updated information regarding future treatment and conveyance facilities.

6.3 EVALUATION

This section documents the comparison of the 2020 SYR Projection to the 2019-21 Actual Data and the 2022 Projection regional water infrastructure, including an assessment of significance of the differences between datasets.

6.3.1 2020 SYR Projection versus 2019-21 Actual Data

There were no major differences between the regional water infrastructure information used in the 2020 SYR Projection and the 2019-21 Actual Data for regional water infrastructure.

6.3.2 2020 SYR Projection versus 2022 Projection

The information collected for the 2020 SYR Projection and the 2022 Projection both include plans for future facilities to increase the capacity for treatment and conveyance of groundwater and supplemental water in the Chino Basin, consistent with the projected increases in pumping and water supplies in the Chino Basin.

6.3.3 Summary

The main observation and conclusion from this section is:

- **Differences in regional infrastructure are not expected to have a significant effect on net recharge or increase the risk of new undesirable results.** Comparing the 2020 SYR Projection of regional water infrastructure to the 2019-21 Actual Data and the 2022 Projection for regional water infrastructure, there were no significant differences in assumptions that would suggest the potential for behavioral changes related to water use. Therefore, the 2019-21 Actual Data and 2022 Projection for regional water infrastructure are not expected to result in a significantly different net recharge or threaten new undesirable results compared to the 2020 SYR Projection.

CHAPTER 7
Conclusions and Recommendations

Chapter 7 documents conclusions of the cumulative evaluation of the data collected for this report and recommendations for further evaluation and future years.

7.1 CONCLUSIONS AND RECOMMENDATIONS

Table 7-1 summarizes the conclusions from the evaluation of the 2019-21 Actual Data and 2022 Projection compared to the 2020 SYR Projection.

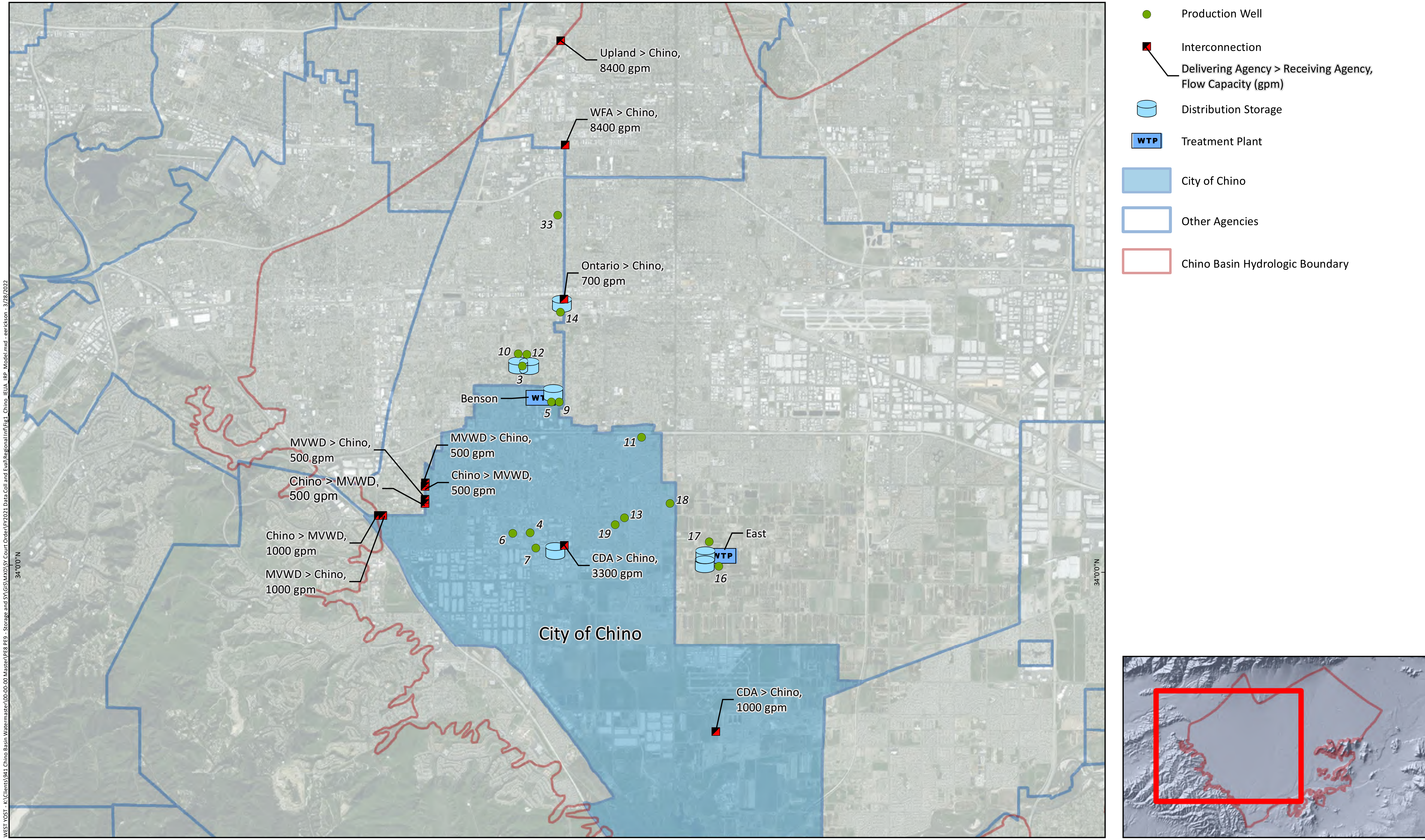
The recommendations resulting from this FY 2020/2021 Annual Report are:

- **Through Watermaster's existing programs, address the potential for new undesirable results resulting from the 2019-21 Actual Data and 2022 Projection for groundwater pumping exceeding the 2020 SYR Projection.** The comparison of the 2020 SYR Projection to the 2019-21 Actual Data and the 2022 Projection for groundwater pumping indicated the increased risk for new land subsidence and pumping sustainability. We recommend the following actions to address this:
  - Complete and implement a subsidence management plan for MZ1. This process is already underway as part of Watermaster's Ground-Level Monitoring Program. The continued development of a subsidence management plan should include a more precise evaluation of the potential impacts of future pumping to inform mitigation measures that allow continued pumping from MZ1 without increasing the risk of land subsidence.
  - Collaborate with the JCSD and the other Parties with pumping wells in areas where the evaluation of the 2022 Projection indicated an increased risk for pumping sustainability challenges. Watermaster currently develops and implements a comprehensive recharge program, a goal of which is to enhance the yield of the Basin and address pumping sustainability challenges. The forthcoming update of the Recharge Master Plan will begin in FY 2023 and should be used to further examine the extent of increased risk of pumping sustainability challenges and develop a plan to address the risk if necessary.
- **Reduce the frequency of the evaluation of changes in land use.** For preparation of future annual reports, actual land use data should be acquired annually, if available. If new data are not available for actual land use, the evaluation of changes in land use can be omitted from a future report.
- **Include the newly collected information on outdoor urban water use practices in the forthcoming model update and reevaluation of the Safe Yield.** The 2019-21 Actual Data and the new information regarding the potential implementation of water conservation mandates indicate that outdoor urban water use has been (2019-21) and will be (2022 and beyond) less than assumed in the 2020 SYR Projection. Watermaster will begin updating the CVM in FY 2023 to reevaluate the Safe Yield by June 30, 2025, as required by the 2017 Court Order. We recommend incorporating the data collected in this year's annual effort and future efforts into the new projections that will be developed to reevaluate the Safe Yield.
- **Obtain 20-year operating plans that forecast near- and long-term plans for pumping and use of managed storage.** In February 2022, the Watermaster Board directed Watermaster staff to work with the Parties to obtain 20-year operating plans that forecast near- and long-term plans for pumping and use of managed storage. This recommendation was included in the scope and budget for the data collection and evaluation effort in FY 2023.

Table 7-1. Summary of Observations and Conclusions		
Cultural Condition (Chapter)	**Main Findings**	**Main Conclusions**
Groundwater Pumping (2)	The 2019-21 Actual Data was greater than the 2020 SYR Projection of groundwater pumping for FY 2019 through FY 2021 by about 7,400 afy. Some of the areas where 2019-21 Actual Data were greater than the 2020 SYR Projection overlie the Northwest MZ1 Area of Subsidence Concern and areas with projected pumping sustainability challenges.	The greater groundwater pumping in the 2019-21 Actual Data compared to the 2020 SYR Projection in the Northwest MZ1 Area of Subsidence Concern and the JCSD well field may increase the risk for land subsidence or pumping sustainability challenges.
	The 2022 Projection for groundwater pumping is greater than the 2020 SYR Projection in FY 2025 and FY 2030 by 5,300 afy and 10,000 afy, respectively.	The greater pumping in the 2022 Projection is not expected to result in a significantly different net recharge compared to the 2020 SYR Projection.
	Some of the areas where the 2022 Projection for groundwater pumping is greater than the 2020 SYR Projection overlie the Northwest MZ1 Area of Subsidence Concern where Watermaster is currently developing a subsidence management plan. Furthermore, some of the areas where the 2022 Projection for groundwater pumping is greater than the 2020 SYR Projection overlie areas of projected pumping sustainability challenges, primarily near the JCSD well field.	The differences between the 2022 Projection for groundwater pumping and the 2020 SYR Projection in the Northwest MZ1 Area of Subsidence Concern and the JCSD well field indicate the potential for an increased risk of future land subsidence and pumping sustainability challenges.
Land Use (3)	The differences between the 2019-21 Actual Data and the 2020 SYR Projection for land use are minor. The 2022 Projection is not significantly different than the 2020 SYR Projection for land use.	Differences in land use between the 2019-21 Actual Data, the 2020 SYR Projection, and the 2022 Projection are not expected to have a significant effect on net recharge or increased the risk of new undesirable results.
Urban Outdoor Water Use (4)	The 2020 SYR Projection exceeds the 2019-21 Actual Data for urban outdoor water use by 16,500 afy.	The lower urban outdoor water use in the 2019-21 Actual Data compared to the 2020 SYR Projection would likely result in less net recharge compared to the 2020 SYR Projection. This difference would take several years to measurably affect the net recharge of the Basin.
	Based on the available information on future patterns of urban outdoor water use and the 2019-21 Actual Data, it is likely that future patterns of urban outdoor water use will be less than the 2020 SYR Projection.	The 2022 Projections for future patterns of urban outdoor water use are likely to result in less net recharge than the 2020 SYR Projection.
Managed Recharge (5)	2019-21 Actual Data was less than the 2020 SYR Projection for managed recharge in the Chino Basin by about 5,300 afy.	The greater volumes of managed recharge in the 2019-21 Actual Data compared to the 2020 SYR Projection in MZ1 can help support groundwater levels in this area and help mitigate the occurrence of land subsidence.
	2019-21 Actual Data was less than the 2020 SYR Projection for stormwater recharge in the Chino Basin by about 1,200 afy.	Differences in stormwater recharge between the 2019-21 Actual Data and the 2020 SYR Projection are to be expected because (i) precipitation and runoff are highly variable and (ii) the projections are based on long-term expected average hydrology adjusted for climate change. Over longer time periods, actual stormwater recharge should become approximately equal to the projections.
	The differences between the 2020 SYR Projection and the 2022 Projection for managed storage are not significant.	The 2022 Projection for managed storage is not expected to result in a significantly different net recharge compared to the 2020 SYR Projection.
Regional Water Infrastructure (6)	By comparing the 2020 SYR Projection of regional water infrastructure to the 2019-21 Actual Data and the 2022 Projection for regional water infrastructure, there were no significant differences in assumptions that would suggest the potential for behavioral changes related to water use.	Differences in regional infrastructure between the 2019-21 Actual Data, the 2020 SYR Projection, and the 2022 Projection are not expected to have a significant effect on net recharge or increase the risk of new undesirable results.
Cumulative Impact		**The 2019-21 Actual Data and 2022 Projection for groundwater pumping indicate the potential for undesirable results related to increased risk of new land subsidence and pumping sustainability challenges that were not identified in the 2020 SYR.**
		The 2019-21 Actual Data for urban outdoor water use and the information on the implementation of future conservation legislation indicate the potential for less net recharge and Safe Yield compared to the 2020 SYR.

Appendix A

Water Infrastructure Maps for Major Appropriative Pool Parties, FY 2021



Prepared by:

WEST YOST

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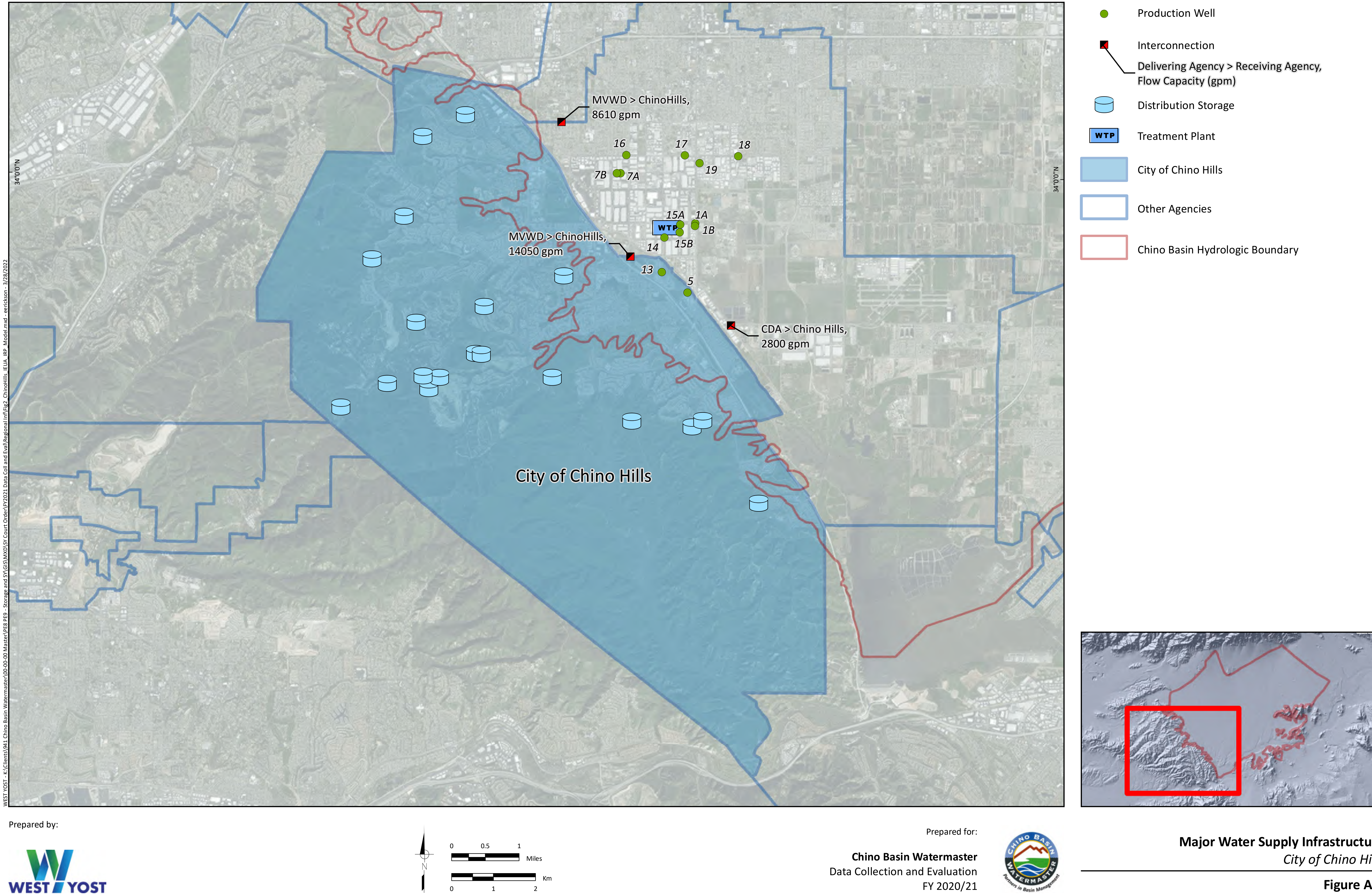
Prepared for:

Chino Basin Watermaster
Data Collection and Evaluation
FY 2020/21

Major Water Supply Infrastructure
City of Chino

Figure A-1



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WEST YOST

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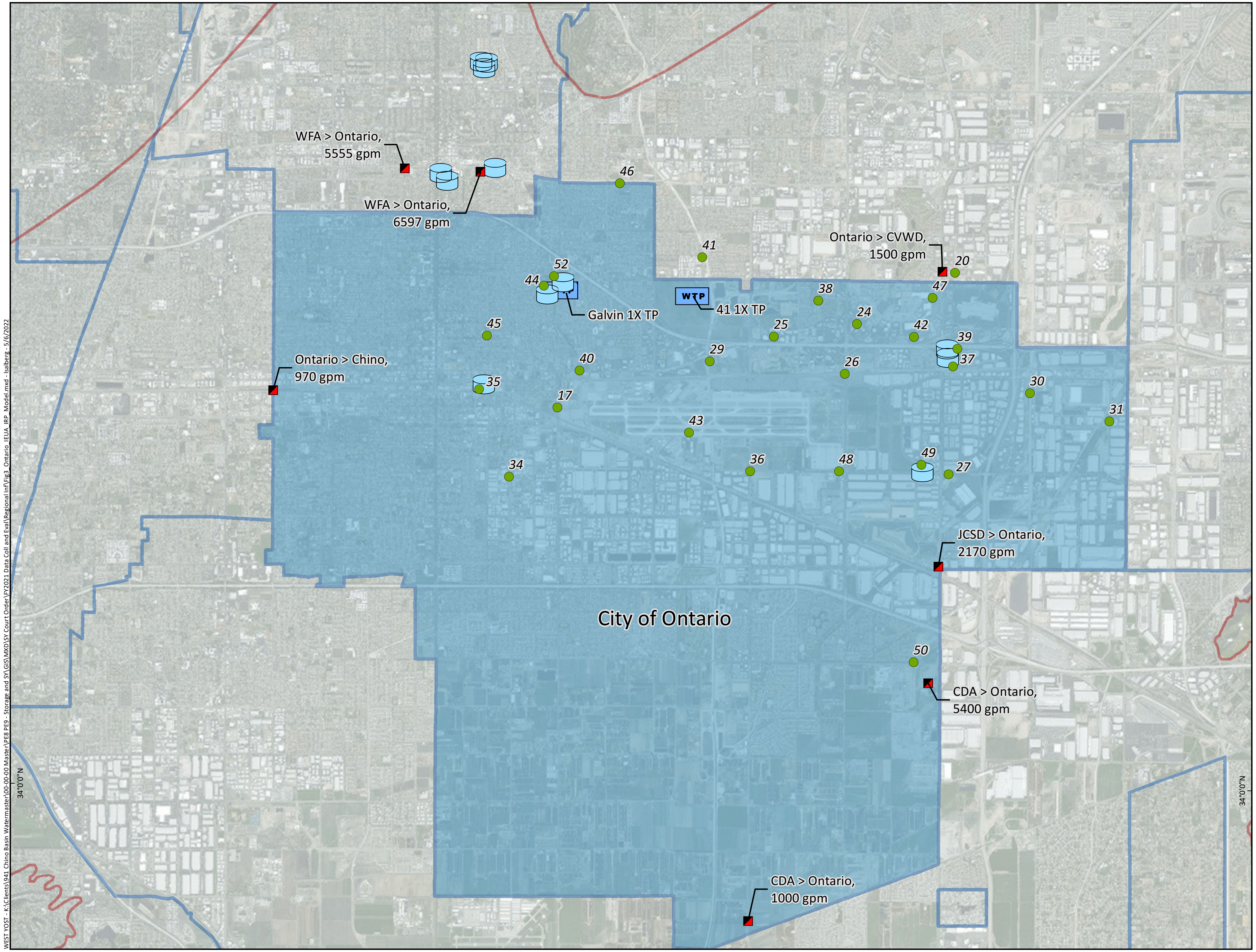
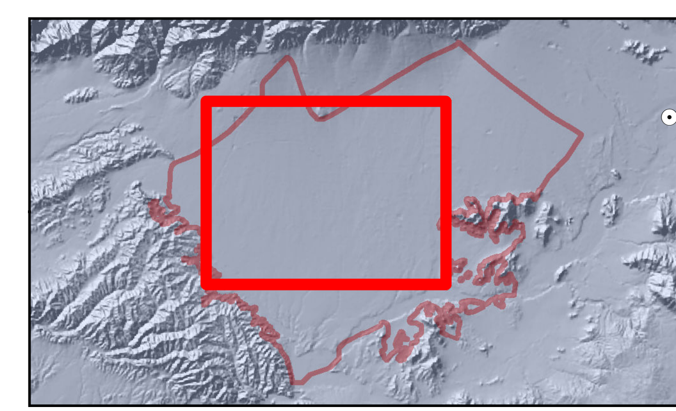
Chino Basin Watermaster
Data Collection and Evaluation
FY 2020/21

Major Water Supply Infrastructure
City of Chino Hills

Figure A-2





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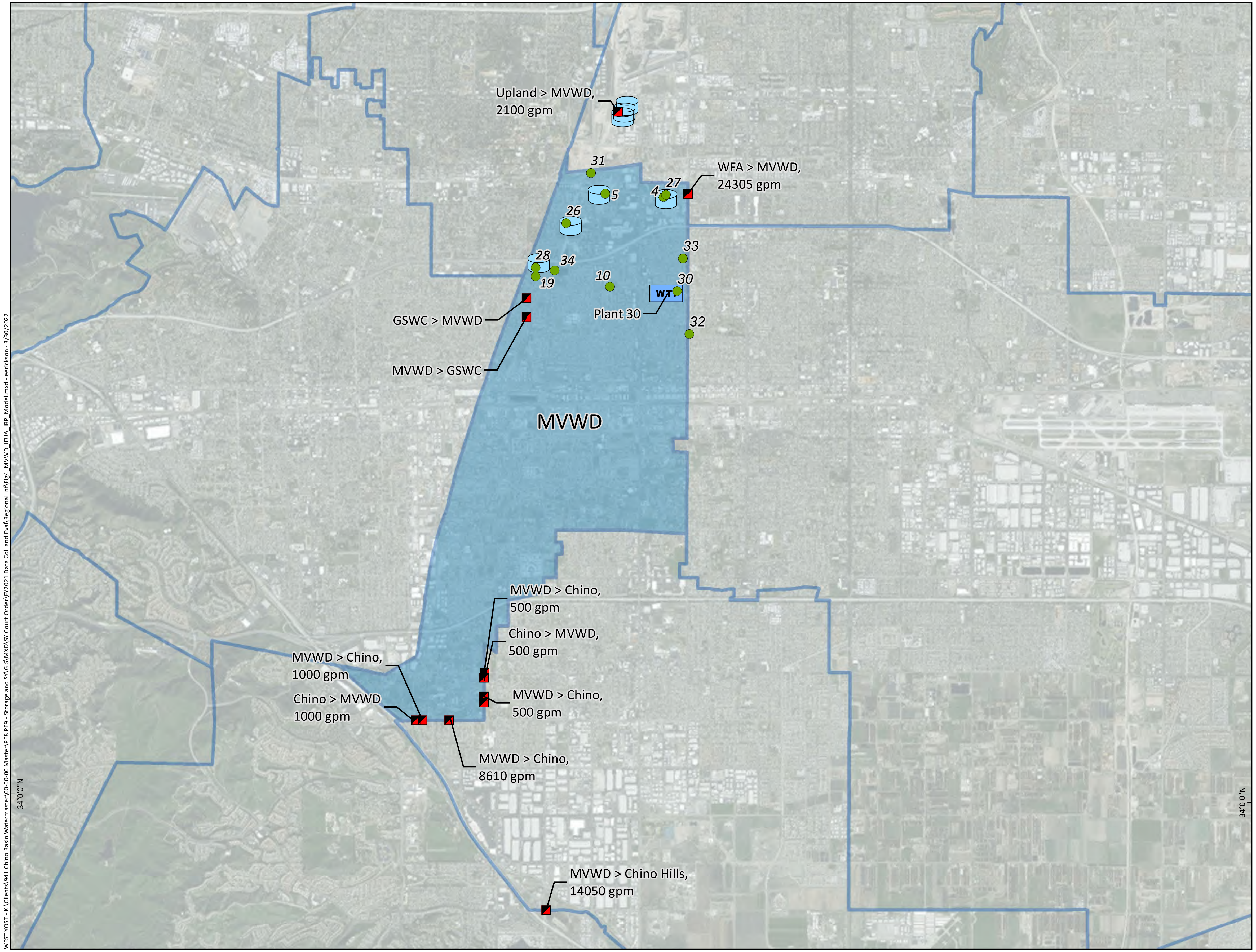
Chino Basin Watermaster
Data Collection and Evaluation
FY 2020/21

Major Water Infrastructure
City of Ontario

Figure A-3



Production Well

Interconnection

Delivering Agency > Receiving Agency, Flow Capacity (gpm)

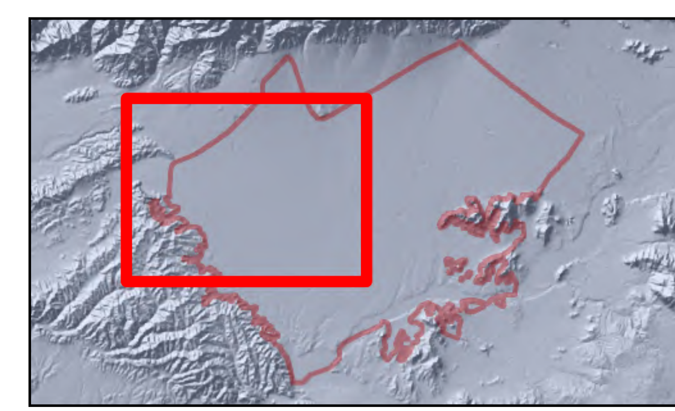
Distribution Storage

WTP Treatment Plant

MVWD

Other Agencies

Chino Basin Hydrologic Boundary



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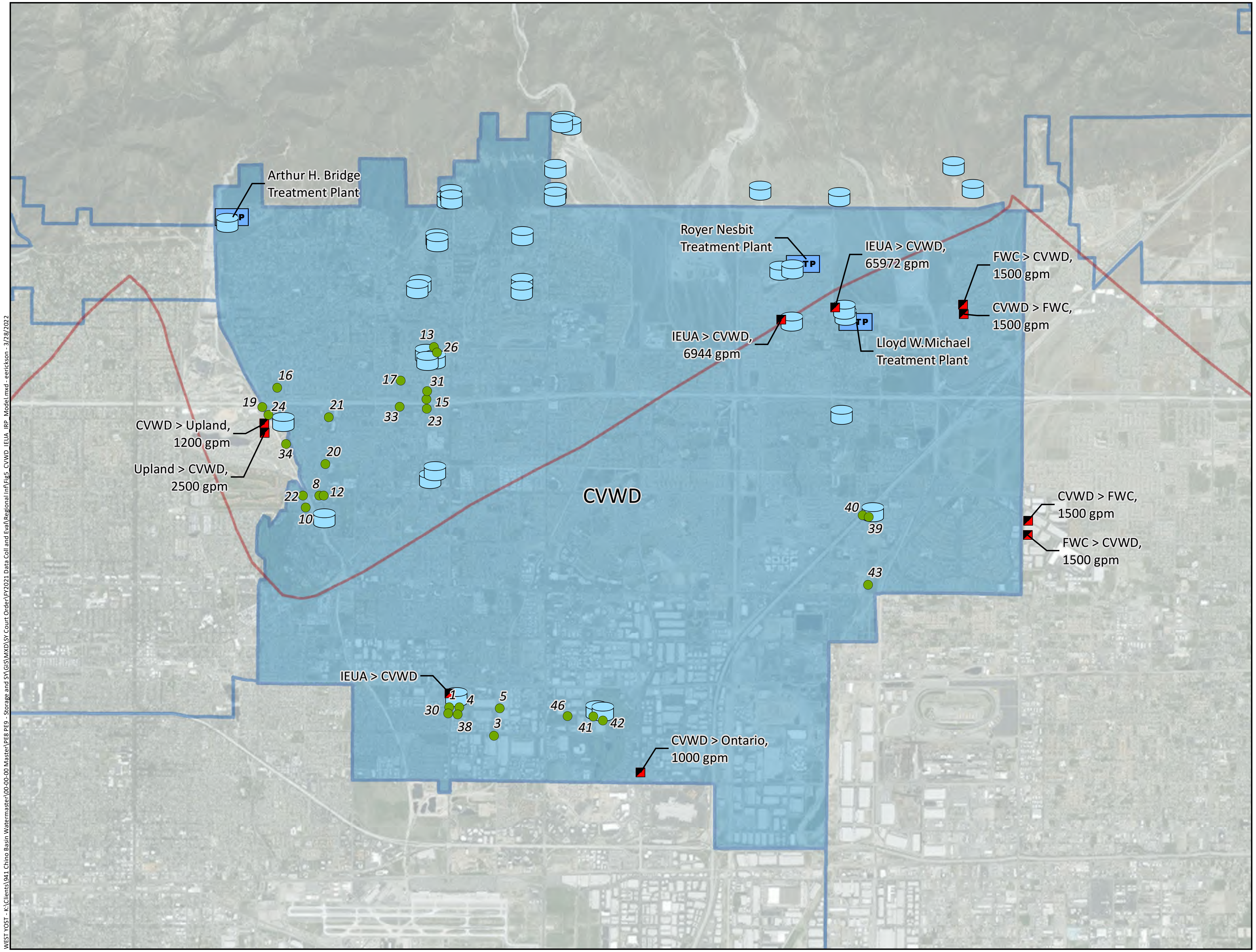
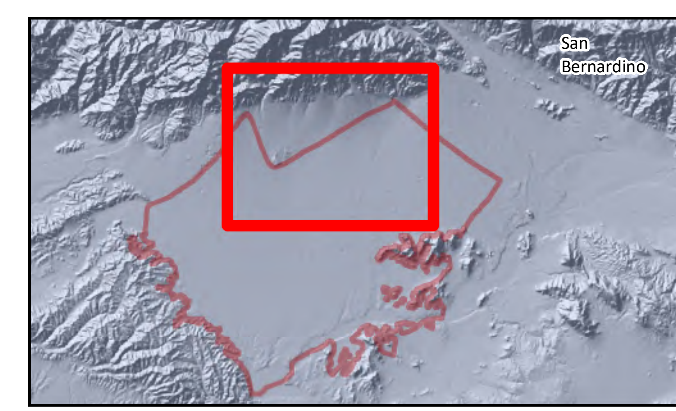
Prepared for:

Chino Basin Watermaster
Data Collection and Evaluation
FY 2020/21

Major Water Supply Infrastructure
Monte Vista Water District (MVWD)

Figure A-4





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Prepared by:

WEST YOST

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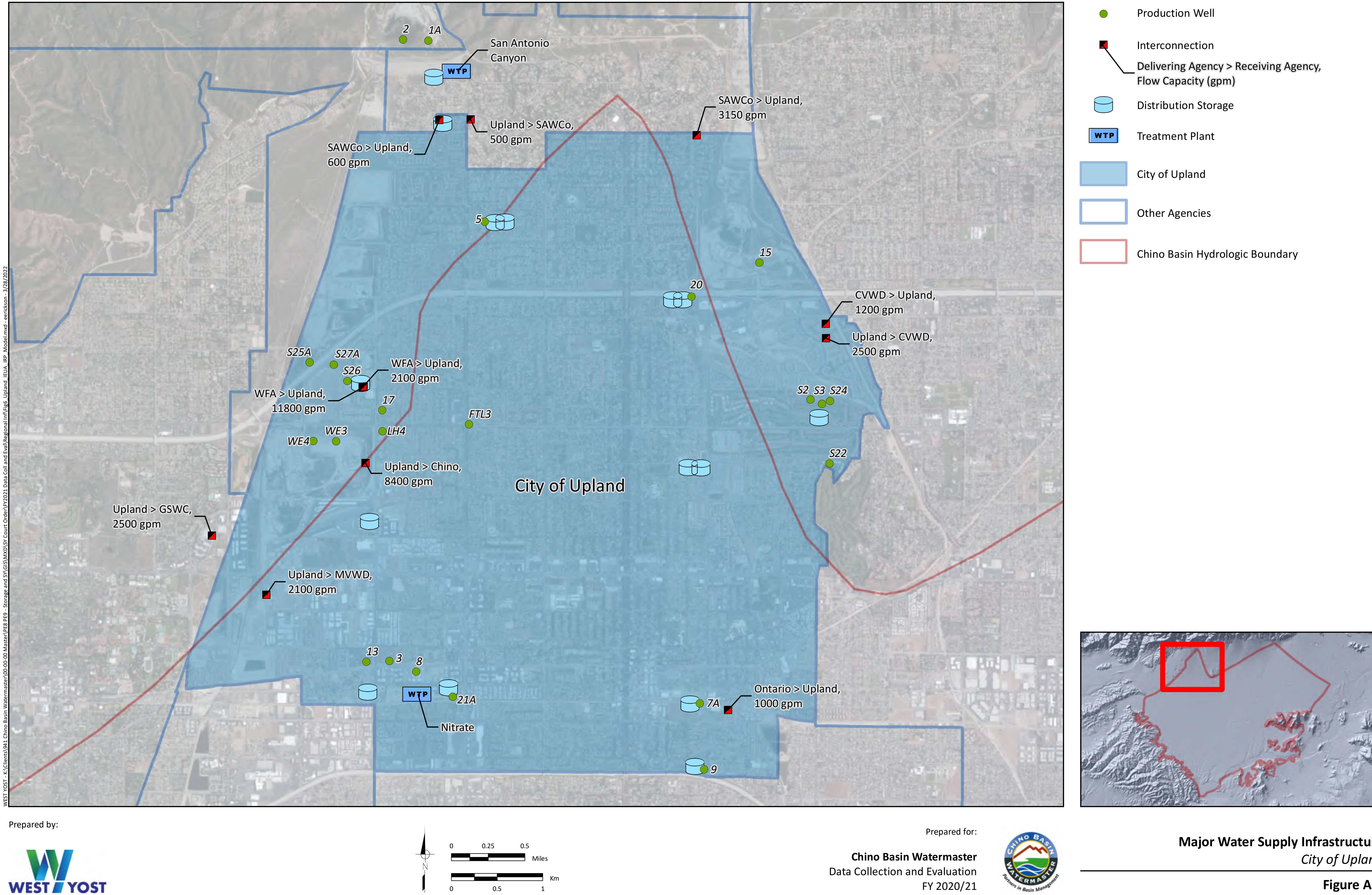
Prepared for:

Chino Basin Watermaster
Data Collection and Evaluation
FY 2020/21

Major Water Supply Infrastructure
Cucamonga Valley Water District (CVWD)

Figure A-5



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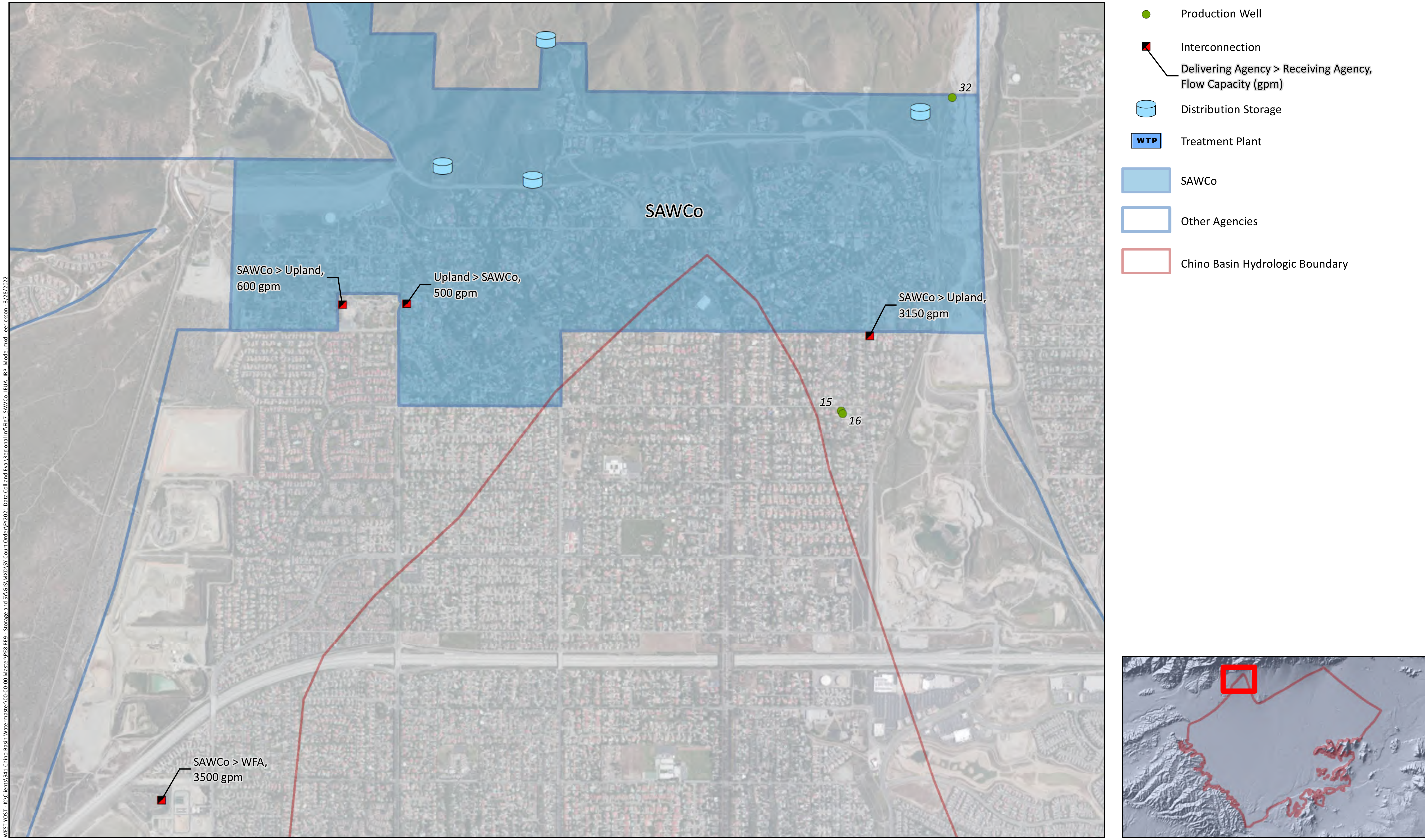
WEST YOST

Prepared for:

Chino Basin Watermaster
Data Collection and Evaluation
FY 2020/21

Major Water Supply Infrastructure
City of Upland

Figure A-6



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WEST YOST

Prepared for:

Chino Basin Watermaster
Data Collection and Evaluation
FY 2020/21

Major Water Supply Infrastructure
San Antonio Water Company (SAWCo)

Figure A-7

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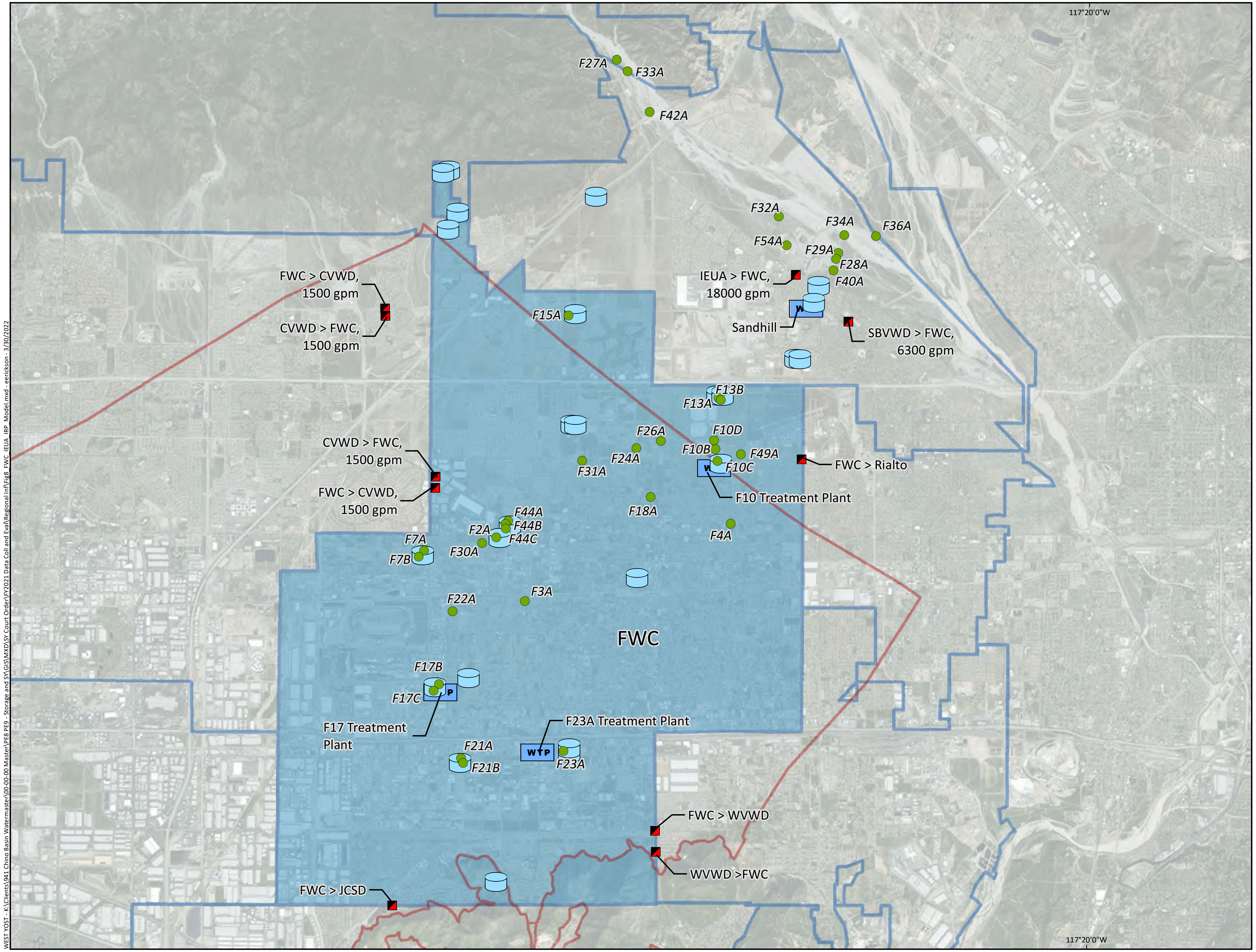


Production Well

Interconnection

Delivering Agency > Receiving Agency, Flow Capacity (gpm)

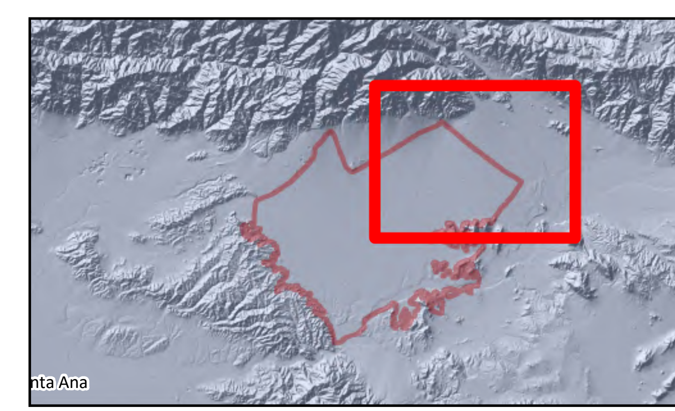
Distribution Storage

WTP Treatment Plant

FWC

Other Agencies

Chino Basin Hydrologic Boundary



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WEST YOST

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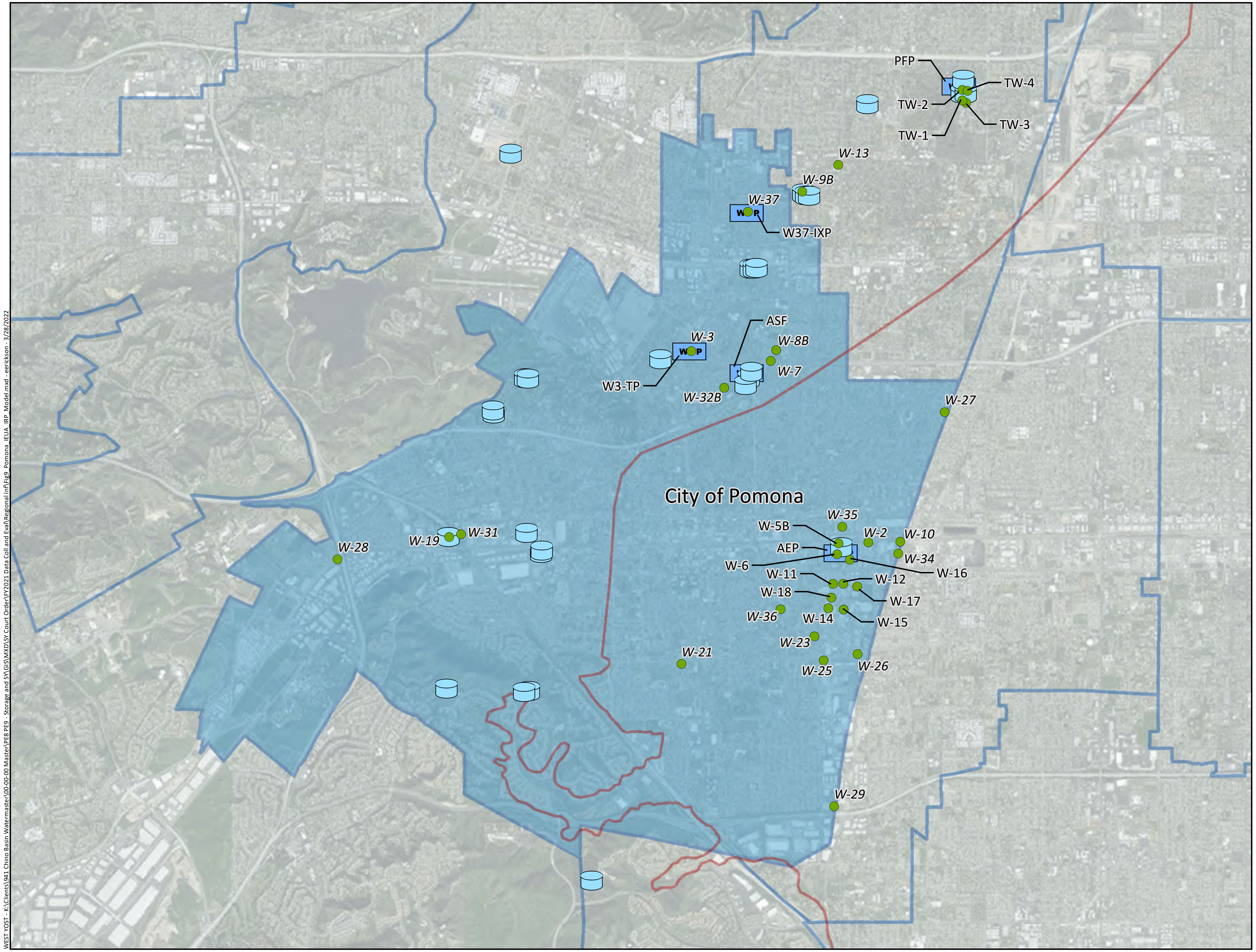
Prepared for:

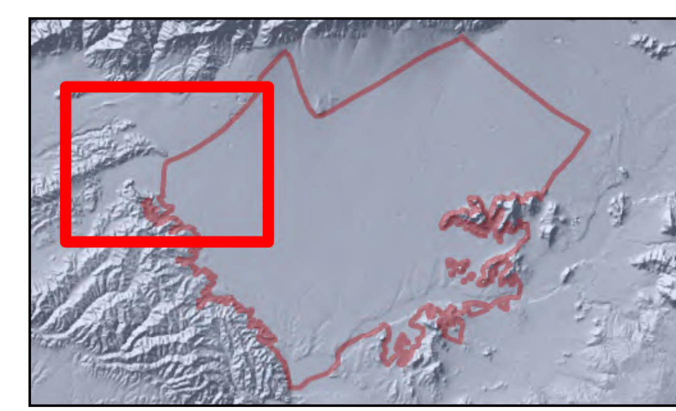
Chino Basin Watermaster
Data Collection and Evaluation
FY 2020/21

Major Water Supply Infrastructure
Fontana Water Company (FWC)

Figure A-8



Production Well
Distribution Storage
Treatment Plant
City of Pomona
Other Agencies
Chino Basin Watermaster



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WEST YOST

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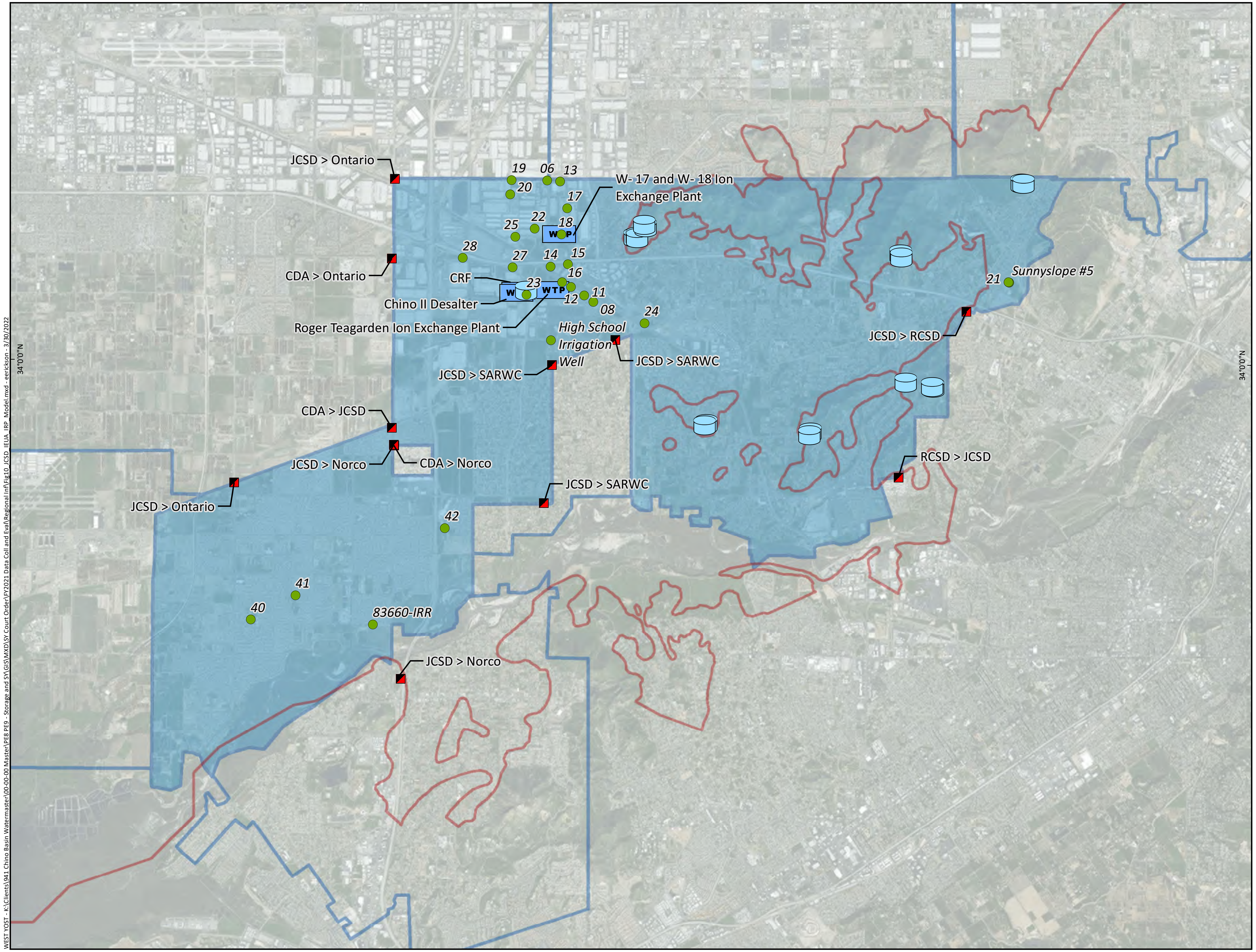
Prepared for:

Chino Basin Watermaster
Data Collection and Evaluation
FY 2020/21

Major Water Supply Infrastructure
City of Pomona

Figure A-9



Production Well

Interconnection

Delivering Agency > Receiving Agency

Distribution Storage

WTP Treatment Plant

JCSD

Other Agencies

Chino Basin Hydrologic Boundary

WEST YOST - K:\Clients\941 Chino Basin Watermaster\00-00-00 Master\PE8 PE9 - Storage and SY\GIS\MXD\SY Court Order\FY2021 Data Coll and Eval\Regional Inf\Fig10_JCSD_IEUA_IRP_Model.mxd - eerickson - 3/30/2022

Prepared by:

WEST YOST

N

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Prepared for:

Chino Basin Watermaster
Data Collection and Evaluation
FY 2020/21

Major Water Supply Infrastructure
Jurupa Community Service Water District (JCSD)

Figure A-10

Appendix B

Metering and Reporting of Groundwater Pumping for FY 2021

APPENDIX B
Metering and Reporting of Groundwater Pumping

Appendix B responds to the requirement of the 2017 Court Order that Watermaster must "[e]nsure that, unless a Party to the Judgment is excluded from reporting, all production by all Parties to the Judgment is metered, reported, and reflected in Watermaster's approved Assessment Packages." (2017 Court Order, p. 16). This chapter characterizes the wells in the Chino Basin for FY 2021, including descriptions of wells that were added or went out of service in the reporting year and information on wells that are not metered.

CHINO BASIN PRODUCTION WELLS IN FY 2021

Watermaster staff maintains a database of wells and groundwater pumping data, which is updated on a quarterly basis. Metered pumping data are collected from all Chino Basin Parties who pump more than 10 afy (a Minimal Producer as defined in the Judgment pumps less than 10 afy[1]). In some cases, metered pumping data are unavailable due to lack of access to the meter, a broken meter, or for other reasons. For wells where no metered data are available, Watermaster staff applies a water duty method to estimate the quarterly pumping. The water duty method is based on such factors as: irrigated area; crop type; irrigation efficiency; livestock populations; number of domestic users; or other factors. The water duty method is currently being refined and documented and will be included in a future report.

Figure B-1 shows all active pumping wells in the Chino Basin during FY 2021. These wells are symbolized by meter status, wells owned Minimal Producers, and whether the well was brought online or decommissioned in FY 2021. There were 481 wells that were active during FY 2021, as summarized below in Table B-1:

Table B-1. Summary of Pumping Wells in the Chino Basin in FY 2021

Well Category	Number of Wells Meeting Criteria in FY 2021	Total FY 2021 Production
Well Status		
Active for entire year	470	162,428
Brought online in FY 2021	2	506
Decommissioned in FY 2021	9	2
Meter Status		
Metered	346	157,448
Unmetered, Non-Minimal Producer	89	5,326
Minimal Producer	46	162
Total	**481**	**162,936**

Table B-2 includes a comprehensive list of the active wells in Watermaster's database for FY 2021.

[1] Chino Basin Judgment Section I.4.j

Table B-2. Pumping Wells in the Chino Basin in FY 2021										
CBWM Well ID	Name	Owner	Pool	Latitude	Longitude	New in FY 2021	Abandoned/ Destroyed in FY 2021	Metered/ Estimated	Minimal Producer	FY 2021 Production
0600496	Well 1	BlueTriton Brands, Inc.	3	34.04610	-117.52873	N	N	Metered	N	0.0
0600923	Well 2	BlueTriton Brands, Inc.	3	34.04583	-117.52581	N	N	Metered	N	271.3
0600487	01B	Chino Hills, City Of	3	33.98964	-117.68942	N	N	Metered	N	0.0
0600488	15B	Chino Hills, City Of	3	33.98977	-117.69319	N	N	Metered	N	0.0
0600489	16	Chino Hills, City Of	3	34.00489	-117.70742	N	N	Metered	N	0.0
0600499	17	Chino Hills, City Of	3	34.00528	-117.69218	N	N	Metered	N	0.0
0600500	19	Chino Hills, City Of	3	34.00249	-117.68788	N	N	Metered	N	0.0
0600674	27 (MVWD/CH)	Chino Hills, City Of	3	34.09203	-117.68536	N	N	Metered	N	935.9
0600675	26 (MVWD/CH)	Chino Hills, City Of	3	34.08751	-117.70307	N	N	Metered	N	2681.5
0600684	28 (MVWD/CH)	Chino Hills, City Of	3	34.08101	-117.70866	N	N	Metered	N	1982.0
0600689	05	Chino Hills, City Of	3	33.97513	-117.69114	N	N	Metered	N	0.0
0601029	30 (MVWD/CH)	Chino Hills, City Of	3	34.07740	-117.68286	N	N	Metered	N	69.7
0601068	32 (MVWD/CH)	Chino Hills, City Of	3	34.07082	-117.68053	N	N	Metered	N	0.5
0601072	33 (MVWD/CH)	Chino Hills, City Of	3	34.08178	-117.68112	N	N	Metered	N	0.0
0601104	34 (MVWD/CH)	Chino Hills, City Of	3	34.08047	-117.70530	N	N	Metered	N	0.0
3601357	04 (MVWD/CH)	Chino Hills, City Of	3	34.09192	-117.68471	N	N	Metered	N	72.5
3601911	01A	Chino Hills, City Of	3	33.98984	-117.68945	N	N	Metered	N	0.0
3601916	07A	Chino Hills, City Of	3	34.00071	-117.70984	N	N	Metered	N	0.0
3601917	07B	Chino Hills, City Of	3	34.00075	-117.71050	N	N	Metered	N	0.0
0600417	11	Chino, City Of	3	34.02990	-117.66045	N	N	Metered	N	0.0
0600467	12	Chino, City Of	3	34.04712	-117.69159	N	N	Metered	N	0.0
0600478	13	Chino, City Of	3	34.01168	-117.66540	N	N	Metered	N	2071.0
0600482	14	Chino, City Of	3	34.05802	-117.68165	N	N	Metered	N	0.0
0601026	16	Chino, City Of	3	34.00153	-117.64018	N	N	Metered	N	0.0
0601183	18	Chino, City Of	3	34.01473	-117.65118	N	N	Metered	N	37.3
0601194	19	Chino, City Of	3	34.01027	-117.66711	N	N	Metered	N	671.6
3601618	04	Chino, City Of	3	34.00815	-117.69029	N	N	Metered	N	0.0
3601752	05	Chino, City Of	3	34.03868	-117.68144	N	N	Metered	N	750.2
3602105	06	Chino, City Of	3	34.00812	-117.69461	N	N	Metered	N	0.0
3602666	09	Chino, City Of	3	34.03823	-117.68287	N	N	Metered	N	2557.3
3602680	10	Chino, City Of	3	34.04650	-117.68991	N	N	Metered	N	45.5
0600479	30	Cucamonga Valley Water District	3	34.08913	-117.59315	N	N	Metered	N	2740.5
0600680	38	Cucamonga Valley Water District	3	34.08908	-117.59183	N	N	Metered	N	1799.8
0600905	39	Cucamonga Valley Water District	3	34.11819	-117.51669	N	N	Metered	N	2868.4
0600906	40	Cucamonga Valley Water District	3	34.11882	-117.51485	N	N	Metered	N	1003.6
0600907	41	Cucamonga Valley Water District	3	34.08814	-117.56687	N	N	Metered	N	3039.8
0600908	42	Cucamonga Valley Water District	3	34.08775	-117.56541	N	N	Metered	N	2363.8
0601033	43	Cucamonga Valley Water District	3	34.10775	-117.51630	N	N	Metered	N	3726.2
0601143	46	Cucamonga Valley Water District	3	34.08749	-117.57181	N	N	Metered	N	3590.9
3600475	04	Cucamonga Valley Water District	3	34.09005	-117.59178	N	N	Metered	N	182.0
3601174	01	Cucamonga Valley Water District	3	34.08816	-117.59241	N	N	Metered	N	1158.8
3601373	03	Cucamonga Valley Water District	3	34.08448	-117.58492	N	N	Metered	N	764.3
3602000	05	Cucamonga Valley Water District	3	34.08881	-117.58426	N	N	Metered	N	2987.7
0300258	Chino I #06	Desalter Authority	3	33.96790	-117.60924	N	N	Metered	N	288.4
0300259	Chino I #07	Desalter Authority	3	33.96823	-117.60689	N	N	Metered	N	206.3
0300454	Chino I #13	Desalter Authority	3	33.96769	-117.59213	N	N	Metered	N	881.9
0300455	Chino I #14	Desalter Authority	3	33.96773	-117.58522	N	N	Metered	N	2716.7
0300456	Chino I #15	Desalter Authority	3	33.96839	-117.58024	N	N	Metered	N	3005.9
0300457	Chino II #01	Desalter Authority	3	33.98256	-117.57614	N	N	Metered	N	2463.7
0300458	Chino II #04	Desalter Authority	3	33.98917	-117.55785	N	N	Metered	N	2653.4
0300460	Chino II #06	Desalter Authority	3	33.99355	-117.54086	N	N	Metered	N	1646.4
0300461	Chino II #07	Desalter Authority	3	33.98931	-117.54111	N	N	Metered	N	1485.1
0300462	Chino II #08	Desalter Authority	3	33.98639	-117.54091	N	N	Metered	N	1675.8
0300463	Chino II #09A	Desalter Authority	3	33.99515	-117.53782	N	N	Metered	N	2535.4

Table B-2. Pumping Wells in the Chino Basin in FY 2021

CBWM Well ID	Name	Owner	Pool	Latitude	Longitude	New in FY 2021	Abandoned/ Destroyed in FY 2021	Metered/ Estimated	Minimal Producer	FY 2021 Production
0300590	Chino II #10	Desalter Authority	3	33.97958	-117.58559	N	N	Metered	N	2975.4
0600648	Chino I #01	Desalter Authority	3	33.97821	-117.65016	N	N	Metered	N	0.0
0600649	Chino I #02	Desalter Authority	3	33.97209	-117.65005	N	N	Metered	N	0.0
0600650	Chino I #03	Desalter Authority	3	33.96940	-117.65003	N	N	Metered	N	0.0
0600651	Chino I #04	Desalter Authority	3	33.96877	-117.63872	N	N	Metered	N	0.1
0600652	Chino I #05	Desalter Authority	3	33.96894	-117.61948	N	N	Metered	N	1878.5
0600653	Chino I #08	Desalter Authority	3	33.97392	-117.61962	N	N	Metered	N	1240.3
0600654	Chino I #09	Desalter Authority	3	33.97621	-117.61804	N	N	Metered	N	1751.9
0600655	Chino I #10	Desalter Authority	3	33.97624	-117.61441	N	N	Metered	N	1277.5
0600656	Chino I #11	Desalter Authority	3	33.97557	-117.60145	N	N	Metered	N	1613.7
0600925	Chino II #02	Desalter Authority	3	33.98616	-117.56675	N	N	Metered	N	1994.6
0600926	Chino II #03	Desalter Authority	3	33.98738	-117.56299	N	N	Metered	N	2670.5
0601108	Chino I #16	Desalter Authority	3	33.96121	-117.66746	N	N	Metered	N	264.4
0601121	Chino I #17	Desalter Authority	3	33.96285	-117.65982	N	N	Metered	N	0.0
0601145	Chino I #20	Desalter Authority	3	33.96889	-117.63306	N	N	Metered	N	598.9
0601146	Chino I #21	Desalter Authority	3	33.96889	-117.62806	N	N	Metered	N	339.4
0601197	Chino II #11	Desalter Authority	3	33.97792	-117.59291	N	N	Metered	N	3991.7
0600486	F17B	Fontana Water Company	3	34.07699	-117.48725	N	N	Metered	N	368.2
0600490	F07A	Fontana Water Company	3	34.10260	-117.48924	N	N	Metered	N	1608.1
0600492	F23A	Fontana Water Company	3	34.06468	-117.45567	N	N	Metered	N	1066.7
0600502	F24A	Fontana Water Company	3	34.12319	-117.43991	N	N	Metered	N	174.3
0600504	F26A	Fontana Water Company	3	34.12465	-117.43399	N	N	Metered	N	2683.8
0600512	F04A	Fontana Water Company	3	34.10855	-117.41798	N	Y	Metered	N	0.0
0600562	F17C	Fontana Water Company	3	34.07616	-117.48746	N	N	Metered	N	338.0
0600696	F44A	Fontana Water Company	3	34.10828	-117.46915	N	N	Metered	N	2664.7
0600697	F44B	Fontana Water Company	3	34.10816	-117.46922	N	N	Metered	N	0.0
0600698	F44C	Fontana Water Company	3	34.10883	-117.46989	N	N	Metered	N	2097.7
0601035	F07B	Fontana Water Company	3	34.10219	-117.48997	N	N	Metered	N	959.1
0601181	F21B	Fontana Water Company	3	34.06179	-117.48052	N	N	Metered	N	964.0
3600572	F03A	Fontana Water Company	3	34.09409	-117.46655	N	Y	Metered	N	0.0
3600584	F31A	Fontana Water Company	3	34.12111	-117.45265	N	N	Metered	N	640.9
3600587	F18A	Fontana Water Company	3	34.11372	-117.43622	N	Y	Metered	N	0.0
0601182	2	Golden State Water Company	3	34.08100	-117.70764	N	N	Metered	N	1074.4
3601764	1	Golden State Water Company	3	34.08138	-117.70753	N	N	Metered	N	0.0
0300114	HighSchool	Jurupa Community Services District	3	34.00392	-117.52367	N	N	Metered	N	128.0
0300188	W11	Jurupa Community Services District	3	34.01214	-117.51647	N	N	Metered	N	3.1
0300190	W12	Jurupa Community Services District	3	34.01372	-117.51934	N	N	Metered	N	296.3
0300200	W13	Jurupa Community Services District	3	34.03299	-117.52184	N	N	Metered	N	0.0
0300202	W15	Jurupa Community Services District	3	34.01785	-117.52005	N	N	Metered	N	224.6
0300204	W14	Jurupa Community Services District	3	34.01740	-117.52386	N	N	Metered	N	1687.7
0300205	W16	Jurupa Community Services District	3	34.01454	-117.52128	N	N	Metered	N	811.1
0300206	W24 (GA 6)	Jurupa Community Services District	3	34.00682	-117.50299	N	N	Metered	N	0.0
0300207	W17	Jurupa Community Services District	3	34.02814	-117.52025	N	N	Metered	N	0.0
0300208	W18	Jurupa Community Services District	3	34.02334	-117.52146	N	N	Metered	N	0.0
0300262	W40	Jurupa Community Services District	3	33.95696	-117.57962	N	N	Metered	N	72.0
0300263	W41	Jurupa Community Services District	3	33.95245	-117.58939	N	N	Metered	N	15.5
0300264	W22	Jurupa Community Services District	3	34.02435	-117.52742	N	N	Metered	N	3179.6
0300267	W23	Jurupa Community Services District	3	34.01221	-117.52910	N	N	Metered	N	0.0
0300268	W25	Jurupa Community Services District	3	34.02153	-117.53196	N	N	Metered	N	3004.0
0300269	W42	Jurupa Community Services District	3	33.96936	-117.54593	N	N	Metered	N	20.5
0300582	W27	Jurupa Community Services District	3	34.01725	-117.53225	N	N	Metered	N	115.6
0300583	W28	Jurupa Community Services District	3	34.01898	-117.54329	N	N	Metered	N	0.0
3300194	IRR	Jurupa Community Services District	3	33.95165	-117.56255	N	Y	Metered	N	0.0
3301743	W06	Jurupa Community Services District	3	34.03321	-117.52472	N	N	Metered	N	731.3

Table B-2. Pumping Wells in the Chino Basin in FY 2021

CBWM Well ID	Name	Owner	Pool	Latitude	Longitude	New in FY 2021	Abandoned/ Destroyed in FY 2021	Metered/ Estimated	Minimal Producer	FY 2021 Production
3301895	W08	Jurupa Community Services District	3	34.01097	-117.51439	N	N	Metered	N	178.4
3302030	W19	Jurupa Community Services District	3	34.03322	-117.53251	N	N	Metered	N	693.3
3302031	W20	Jurupa Community Services District	3	34.03060	-117.53283	N	N	Metered	N	0.0
0601091	6	Marygold Mutual Water Company	3	34.07743	-117.41788	N	N	Metered	N	829.2
0601092	7	Marygold Mutual Water Company	3	34.07734	-117.41792	N	N	Metered	N	11.7
3600194	3	Marygold Mutual Water Company	3	34.07748	-117.41796	N	N	Metered	N	0.0
3600195	2	Marygold Mutual Water Company	3	34.07746	-117.43509	N	N	Metered	N	0.0
3600196	4	Marygold Mutual Water Company	3	34.07754	-117.40667	N	N	Metered	N	0.0
0600415	19	Monte Vista Water District	3	34.07947	-117.70883	N	N	Metered	N	1509.7
0601071	31	Monte Vista Water District	3	34.09534	-117.69883	N	N	Metered	N	1505.8
3601358	05	Monte Vista Water District	3	34.09214	-117.69618	N	N	Metered	N	1445.4
3601359	06	Monte Vista Water District	3	34.08698	-117.69828	N	N	Metered	N	0.0
3601362	09	Monte Vista Water District	3	34.07719	-117.68274	N	N	Metered	N	0.0
3601363	10	Monte Vista Water District	3	34.07781	-117.69670	N	N	Metered	N	0.0
0600683	Concours #1	Niagara Bottling, LLC	3	34.07409	-117.53185	N	N	Metered	N	0.0
0600909	Concours #2	Niagara Bottling, LLC	3	34.07410	-117.53225	N	N	Metered	N	656.6
0600910	Philadelphia #1	Niagara Bottling, LLC	3	34.03126	-117.59779	N	N	Metered	N	332.1
0601034	Philadelphia #2	Niagara Bottling, LLC	3	34.03132	-117.59588	N	N	Metered	N	763.0
0300172	09 W	Norco, City Of	3	33.98458	-117.55773	N	N	Metered	N	0.0
0300173	10 E	Norco, City Of	3	33.98460	-117.55490	N	N	Metered	N	0.0
0300199	11 M	Norco, City Of	3	33.98459	-117.55629	N	N	Metered	N	0.0
3302115	06	Norco, City Of	3	33.95433	-117.55863	N	Y	Metered	N	0.0
0600420	ELEC/IRR	Ontario, City Of	3	34.01880	-117.56272	N	N	Metered	N	0.0
0600453	29	Ontario, City Of	3	34.06498	-117.60088	N	N	Metered	N	995.6
0600454	30	Ontario, City Of	3	34.06047	-117.54113	N	N	Metered	N	496.3
0600455	31	Ontario, City Of	3	34.05553	-117.52732	N	N	Metered	N	0.6
0600476	34	Ontario, City Of	3	34.04714	-117.63707	N	N	Metered	N	0.0
0600493	35	Ontario, City Of	3	34.06049	-117.64231	N	N	Metered	N	2260.8
0600494	36	Ontario, City Of	3	34.04808	-117.59369	N	N	Metered	N	830.4
0600551	37	Ontario, City Of	3	34.06563	-117.55756	N	N	Metered	N	338.8
0600585	38	Ontario, City Of	3	34.07412	-117.58091	N	N	Metered	N	1567.6
0600690	39	Ontario, City Of	3	34.06678	-117.55580	N	N	Metered	N	0.0
0600920	41	Ontario, City Of	3	34.08042	-117.60208	N	N	Metered	N	3600.9
0600922	40	Ontario, City Of	3	34.06408	-117.62501	N	N	Metered	N	1340.0
0600956	50	Ontario, City Of	3	34.01861	-117.56416	N	N	Metered	N	0.0
0601011	42	Ontario, City Of	3	34.07001	-117.56065	N	N	Metered	N	0.0
0601012	43	Ontario, City Of	3	34.06140	-117.57978	N	N	Metered	N	0.0
0601013	44	Ontario, City Of	3	34.07620	-117.63090	N	N	Metered	N	815.3
0601014	45	Ontario, City Of	3	34.06861	-117.64156	N	N	Metered	N	3088.6
0601015	46	Ontario, City Of	3	34.09188	-117.61700	N	N	Metered	N	163.8
0601016	47	Ontario, City Of	3	34.07502	-117.56038	N	N	Metered	N	4156.0
0601017	48	Ontario, City Of	3	34.04907	-117.57501	N	N	Metered	N	0.0
0601018	49	Ontario, City Of	3	34.04928	-117.56161	N	N	Metered	N	444.7
0601019	51	Ontario, City Of	3	34.05670	-117.56641	N	N	Metered	N	0.0
0601099	52	Ontario, City Of	3	34.07776	-117.62941	N	N	Metered	N	337.9
3600010	25	Ontario, City Of	3	34.06819	-117.58953	N	N	Metered	N	0.0
3600012	26	Ontario, City Of	3	34.06290	-117.57604	N	N	Metered	N	0.0
3601777	09	Ontario, City Of	3	34.08678	-117.65033	N	N	Metered	N	0.0
3601778	11	Ontario, City Of	3	34.05527	-117.62481	N	N	Metered	N	0.0
3601952	27	Ontario, City Of	3	34.04786	-117.55677	N	N	Metered	N	0.0
3602051	15	Ontario, City Of	3	34.05028	-117.67009	N	N	Metered	N	0.0
3602107	17	Ontario, City Of	3	34.05902	-117.62932	N	N	Metered	N	0.0
3602267	20	Ontario, City Of	3	34.07894	-117.55863	N	N	Metered	N	1227.6
3602457	24	Ontario, City Of	3	34.06951	-117.57521	N	N	Metered	N	85.9

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CBWM Well ID	Name	Owner	Pool	Latitude	Longitude	New in FY 2021	Abandoned/ Destroyed in FY 2021	Metered/ Estimated	Minimal Producer	FY 2021 Production
1901715	06	Pomona, City Of	3	34.05767	-117.72935	N	N	Metered	N	414.5
1901719	10	Pomona, City Of	3	34.05938	-117.71993	N	N	Metered	N	1174.1
1901722	14	Pomona, City Of	3	34.05093	-117.73063	N	N	Metered	N	0.0
1901723	15	Pomona, City Of	3	34.05081	-117.72825	N	N	Metered	N	0.4
1901724	16	Pomona, City Of	3	34.05707	-117.72751	N	N	Metered	N	893.1
1901725	17	Pomona, City Of	3	34.05364	-117.72629	N	N	Metered	N	735.1
1901726	18	Pomona, City Of	3	34.05227	-117.73018	N	N	Metered	N	0.0
1902804	21	Pomona, City Of	3	34.04384	-117.75269	N	N	Metered	N	6.2
1902875	23	Pomona, City Of	3	34.04742	-117.73269	N	N	Metered	N	479.8
1903016	02	Pomona, City Of	3	34.05926	-117.72471	N	N	Metered	N	1957.0
1903063	25	Pomona, City Of	3	34.04444	-117.73130	N	N	Metered	N	643.9
1903079	26	Pomona, City Of	3	34.04525	-117.72620	N	N	Metered	N	245.1
1903113	27	Pomona, City Of	3	34.07560	-117.71319	N	N	Metered	N	1216.9
1903126	29	Pomona, City Of	3	34.02615	-117.72956	N	N	Metered	N	0.0
1903156	30	Pomona, City Of	3	34.06670	-117.71703	N	N	Metered	N	0.0
1904001	34	Pomona, City Of	3	34.05784	-117.72029	N	N	Metered	N	360.8
1904002	35	Pomona, City Of	3	34.06122	-117.72865	N	N	Metered	N	0.0
1904003	36	Pomona, City Of	3	34.05075	-117.73778	N	N	Metered	N	256.4
1904004	05B	Pomona, City Of	3	34.05903	-117.72909	N	N	Metered	N	808.9
0600589	San Antonio 16	San Antonio Water Company	3	34.14668	-117.64440	N	N	Metered	N	675.4
3601561	12	San Antonio Water Company	3	34.08508	-117.63447	N	N	Metered	N	0.0
3601563	15	San Antonio Water Company	3	34.14681	-117.64465	N	N	Metered	N	1.1
0600468	SS2	San Bernardino, County of (Shooting Park)	3	33.93701	-117.65645	N	N	Metered	N	17.2
0600469	SS1	San Bernardino, County of (Shooting Park)	3	33.93714	-117.65644	N	N	Metered	N	0.0
3300973	03	Santa Ana River Water Company	3	34.00181	-117.51507	N	N	Metered	N	0.0
3301945	01A	Santa Ana River Water Company	3	33.97421	-117.53566	N	N	Metered	N	0.0
3302078	03A	Santa Ana River Water Company	3	34.00160	-117.51502	N	N	Metered	N	0.0
0600598	07A	Upland, City Of	3	34.09555	-117.64335	N	N	Metered	N	1371.9
0600659	20	Upland, City Of	3	34.13393	-117.64412	N	N	Metered	N	439.5
0601070	21A	Upland, City Of	3	34.09586	-117.67202	N	N	Metered	N	0.0
3600180	03	Upland, City Of	3	34.09789	-117.67977	N	N	Metered	N	0.0
3600359	08	Upland, City Of	3	34.09501	-117.68130	N	N	Metered	N	365.8
0600524	#37	West Valley Water District	3	34.06611	-117.43007	N	N	Metered	N	0.0
1902353	Alt 2	9W Halo Western OpCo L.P.	2	34.06136	-117.74483	N	N	Metered	N	28.5
0600660	INFIELD WELL	California Speedway Corporation	2	34.09037	-117.50017	N	N	Metered	N	339.5
3601364	1-Race track Use	California Speedway Corporation	2	34.09143	-117.50989	N	N	Metered	N	48.8
3601159	Deep Well No. 3	California Steel Industries, Inc.	2	34.08019	-117.50580	Y	N	Metered	N	504.6
3601365	2	California Steel Industries, Inc.	2	34.08623	-117.50984	N	N	Metered	N	797.2
3601719		CalMat Co.	2	34.09710	-117.69936	N	N	Metered	N	0.0
0600677	EW-2	General Electric Company	2	34.05179	-117.65214	N	N	Metered	N	132.9
0600931	EW-1	General Electric Company	2	34.04235	-117.65573	N	N	Metered	N	867.5
0601093	IW-01	General Electric Company	2	34.03826	-117.63689	N	N	Metered	N	5.7
0601101	IW-02	General Electric Company	2	34.03831	-117.63518	N	N	Metered	N	6.2
0601103	IW-03	General Electric Company	2	34.03755	-117.63519	N	N	Metered	N	5.9
0601021	DOM	Riboli Family and San Antonio Winery, Inc.	2	34.02386	-117.55918	N	N	Metered	N	43.2
3600555	1	TAMCO	2	34.09498	-117.52832	N	N	Metered	N	15.3
0601067	0	Alene Potter C/O Patricia A Kelley	1	34.04412	-117.70779	N	N	Metered	N	18.5
0601032		Anna P Tsai	1	34.04505	-117.69954	N	N	Metered	N	34.7
3602597	Dairy/Dom	Aphessetche Family Rev Trust	1	33.96326	-117.64685	N	N	Metered	N	11.4
3600239	IRR	Artevel of California LLC C/O Astor & Phillips	1	34.00393	-117.65034	N	N	Metered	N	38.9
3601625	Dairy/Dom	Artevel of California LLC C/O Astor & Phillips	1	34.00395	-117.65013	N	N	Metered	N	41.3
3602480	DAIRY	Artevel of California LLC C/O Astor & Phillips	1	34.00617	-117.64667	N	N	Metered	N	18.9
0600444	DOM	Bachoc Family Limited Partnership PS	1	34.01151	-117.61903	N	N	Metered	N	0.0
0600033	Dairy	Bar Ja Investments	1	33.99505	-117.62748	N	N	Metered	N	83.6

Table B-2. Pumping Wells in the Chino Basin in FY 2021

CBWM Well ID	Name	Owner	Pool	Latitude	Longitude	New in FY 2021	Abandoned/ Destroyed in FY 2021	Metered/ Estimated	Minimal Producer	FY 2021 Production
0600272	Dairy/Dom	Bekendam Family Trust C/O Henry Bekendam Trustee	1	34.01815	-117.61471	N	N	Metered	N	21.3
0600372	Dairy/Dom	Bosma Dairy South PS	1	33.99861	-117.57739	N	N	Metered	N	6.6
0600010	Calves	Case & Betty Zwart	1	34.00737	-117.64453	N	N	Metered	N	0.7
3602532	ANIMALS	Case & Betty Zwart	1	34.00924	-117.64344	N	N	Metered	N	2.0
0600519	DAIRY	Cay A K Coral Trust C/O Kathleen R De Groot	1	34.01347	-117.64714	N	N	Metered	N	242.7
0600054	Dairy/Dom	City of Ontario	1	33.99480	-117.57627	N	N	Metered	N	0.0
0600154	DOM	City of Ontario	1	33.99220	-117.58558	N	N	Metered	N	0.3
3600340	03	College Park Community Association C/O First Service Residential	1	33.99842	-117.67191	N	N	Metered	N	206.9
0600200	Dairy/Dom	County of San Bernardino	1	33.99157	-117.63923	N	N	Metered	N	19.8
0600223	Dairy	County of San Bernardino	1	34.00209	-117.63619	N	N	Metered	N	24.3
0601128		County of San Bernardino	1	33.92863	-117.65204	N	N	Metered	N	133.6
3600460	IRR - 50 HP	County of San Bernardino	1	33.99206	-117.63699	N	N	Metered	N	4.2
3602603	IRR/DOM	County of San Bernardino	1	34.00479	-117.63587	N	N	Metered	N	38.7
0600246	IRR - 2	Crosspoint Christian Reformed Church	1	34.00100	-117.65847	N	N	Metered	N	110.1
0600503	DOM-#1 West	Da Costa Family PTSHP C/O Mario D Costa	1	34.00657	-117.61741	N	N	Metered	N	0.0
0600136	Dairy/Dom	DeHann	1	34.00654	-117.60748	N	N	Metered	N	64.1
0600148	DOM	Dlazevedo Ents LP	1	33.99404	-117.63658	N	N	Metered	N	21.0
0600463	Dairy	Dyt Family Trust	1	33.97707	-117.59404	N	N	Metered	N	12.6
0600391	Lake Dischg	El Prado Golf Course	1	33.95548	-117.66207	N	N	Metered	N	647.5
0600540	DAIRY/DOM	Evangeline M Fernandes	1	34.00747	-117.64100	N	N	Metered	N	5.6
0600202	IRR	Fernandes Family Trust SEP SHA/Fernandes SEP Shre & Rose	1	34.00619	-117.62226	N	N	Metered	N	0.0
0600404	DOM	Fred De Boer Dairy	1	34.02089	-117.60251	N	N	Metered	N	55.4
0601022	Bldg A East	Fuji Natural Food Inc	1	34.01256	-117.55937	N	N	Metered	N	230.3
0601023	Bldg A West	Fuji Natural Food Inc	1	34.01255	-117.55999	N	N	Metered	N	122.0
0601024	Bldg B North	Fuji Natural Food Inc	1	34.00979	-117.56133	N	N	Metered	N	138.1
0601025	Bldg B South	Fuji Natural Food Inc	1	34.00895	-117.56133	N	N	Metered	N	106.7
0600447	Dairy	Gastelluberry Jean/Gastelluberry Catherine	1	34.00705	-117.62009	N	N	Metered	N	0.0
0600226	Dairy/Dom	George & Dolores Borba	1	33.98798	-117.62873	N	N	Metered	N	25.1
0600104	DOM	GH Dairy	1	34.00728	-117.63118	N	N	Metered	N	54.6
0600147	DOM	GH Dairy	1	33.99888	-117.62990	N	N	Metered	N	120.2
0600921		GH Dairy	1	33.92715	-117.61528	N	N	Metered	N	264.7
0300250	#2-IRR	Goose Creek Golf Club	1	33.96752	-117.53173	N	N	Metered	N	0.0
0300581		Goose Creek Golf Club	1	33.96650	-117.53158	N	N	Metered	N	54.3
0600122	Dairy/Dom	Henri & Michel Minaberry	1	33.99187	-117.61403	N	N	Metered	N	96.0
0600613	DOM/Dairy	Henri & Michel Minaberry	1	33.99189	-117.61279	N	N	Metered	N	38.0
0600201	Dom/Irr	Hogg Brothers	1	34.01440	-117.62503	N	N	Metered	N	30.5
3601399	IRR	Inland Pacific Development LLC	1	34.01377	-117.63191	N	N	Metered	N	25.5
0601031		James Borba	1	34.00293	-117.63051	N	N	Metered	N	8.2
0300571		James Borba & Mark Korte	1	33.98405	-117.56467	N	N	Metered	N	4.6
3300749	E/IRR-road	James Borba & Mark Korte	1	33.98426	-117.56181	N	N	Metered	N	0.2
3301443	E/Dairy-submersible	James Borba & Mark Korte	1	33.98332	-117.56055	N	N	Metered	N	0.3
0600358	DOM	Jane Devries et al.	1	34.00419	-117.62753	N	N	Metered	N	9.8
0600230	Dairy	Jean & Catherine Gastelluberry	1	34.00967	-117.61989	N	N	Metered	N	2.5
0600616	Dairy/Dom	Jean & Catherine Gastelluberry	1	34.00829	-117.62755	N	N	Metered	N	6.6
3600427	GH #1	JGJ Joint Ventures et al.	1	33.99197	-117.62131	N	N	Metered	N	188.0
3602565	Half&Half	JGJ Joint Ventures et al.	1	33.99155	-117.62771	N	N	Metered	N	12.1
0600019	Dairy/Barn	Johanna Swager C/O Bernard Te Velde - Trustee	1	33.99893	-117.62061	N	N	Metered	N	102.1
3602535	Dairy-in garage	John & Henriette Duits	1	34.01165	-117.63734	N	N	Metered	N	13.6
0600171	main well	JRJ Ranch/Price C/O Ron Vander Weerd	1	33.96117	-117.65040	N	N	Metered	N	46.6
3601824	IRR - 2	Kaiser Foundation Health Plan Inc	1	34.00419	-117.72278	N	N	Metered	N	191.6
0600924	0	Kellogg Supply Inc	1	34.00652	-117.61726	N	N	Metered	N	114.0
0600400	GAS/ BCKUP	L & F Properties North PS	1	34.02034	-117.57237	N	N	Metered	N	0.0
3602609	out of svs	Lennar Homes of California Inc	1	33.96958	-117.64093	N	N	Metered	N	0.0
0600013	Dairy	LMF Development LLC et al.	1	34.00227	-117.64512	N	N	Metered	N	32.4

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0600446	Dairy/Dom	Loyola Properties et al.	1	34.00707	-117.64330	N	N	Metered	N	43.5
3600502	BARN #2	Loyola Properties et al.	1	33.96093	-117.62303	N	N	Metered	N	53.6
3602608	Dairy #2	Loyola Properties I PS C/O Natalie Sorhouet	1	33.99506	-117.56867	N	N	Metered	N	4.4
0600027	Dry-Dom	Martin & Elizabeth De Hoog	1	33.99899	-117.62475	N	N	Metered	N	58.0
0600103	Dom	Martin Bangma Family Trust et al.	1	34.00630	-117.61298	N	N	Metered	N	17.6
0600216	Irr/Dy	Martin Vander Laan	1	34.01139	-117.62760	N	N	Metered	N	2.9
3300833	BEHIND OFFICE	McCabe Chris Trust	1	33.99158	-117.54508	N	N	Metered	N	106.7
3300834	#3-WINEVILLE	McCabe Chris Trust	1	33.98882	-117.54510	N	N	Metered	N	882.9
0600026	DOM	Michael & Mary De Hoog	1	33.99913	-117.62270	N	N	Metered	N	141.1
3600446	Dom	Michael Bidart el al.	1	34.02059	-117.64360	N	N	Metered	N	7.1
3600900	Alf-Jun-Sep	Michael Bidart el al.	1	34.01525	-117.63713	N	N	Metered	N	87.6
3602043	Dairy/Dom	Michael Bidart el al.	1	34.01742	-117.64163	N	N	Metered	N	141.3
0600532		Miguel & Graciela Gomez	1	34.00043	-117.60222	N	N	Metered	N	8.6
3600629	Dom/IRR	Miguel & Graciela Gomez	1	34.02099	-117.63835	N	N	Metered	N	20.3
0600327		Miguel Mercado	1	34.01896	-117.64094	N	N	Metered	N	10.7
0600345	DOM	Nederend Family Partnership	1	34.00588	-117.63743	N	N	Metered	N	23.1
0600049	IRR/Dom	Ontario Christian School Association	1	34.03377	-117.66508	N	N	Metered	N	66.4
0300231	CMG/PTI/J&A	Orange County Flood Control District	1	33.93402	-117.60962	N	N	Metered	N	0.1
0600664	DOM	Orange County Water District	1	33.92586	-117.61697	N	N	Metered	N	0.0
3300863	IRR-50AC/ALF	Orange County Water District	1	33.92524	-117.61776	N	N	Metered	N	272.7
0600679		ORL Bickmore Holdings LLC C/O Oakville Capital ET LLC	1	33.96956	-117.64104	N	N	Metered	N	0.3
0600301	Dairy/Dom	Parente Real Estate Investment Management PS C/O Mary Borba Parente	1	34.00605	-117.60060	N	N	Metered	N	2.6
3600162	Dairy/Dom - 6	Parente Real Estate Investment Management PS C/O Mary Borba Parente	1	33.99957	-117.61169	N	N	Metered	N	15.8
3600437	3-IRR	Parente Real Estate Investment Management PS C/O Mary Borba Parente	1	34.02088	-117.64923	N	N	Metered	N	184.7
0600622	Dairy/Dom	Perry L Kruckenberg	1	34.01383	-117.61227	N	N	Metered	N	0.0
0600559	Nursery/crops	Petronella & Johanna Michelle Lekkerkerker	1	34.01440	-117.62690	N	N	Metered	N	21.0
0600130	DOM	Pietersma Family Trust	1	33.99824	-117.59090	N	N	Metered	N	96.1
0600544	DAIRY/DOM	Pine Avenue LLC	1	33.95737	-117.64363	N	N	Metered	N	0.8
0600542	DOM	Pine Sterling Properties LLC	1	33.95852	-117.64558	N	N	Metered	N	18.8
3600423	Dairy-in shed	Pocamo LLC C/O Borba Childrens Holding Trust	1	33.99194	-117.63026	N	N	Metered	N	109.4
1902981	IRR	Pomona Cemetery Association	1	34.04045	-117.74535	N	N	Metered	N	165.1
0600188	Dairy/Dom	Reitsma Family Partnership	1	34.01347	-117.62990	N	N	Metered	N	5.3
3600811	IRR	Richard Bartell (Trust)	1	34.01612	-117.64904	N	N	Metered	N	13.1
0600002	Dom TV3	Richland Communities et al.	1	34.01368	-117.60876	N	N	Metered	N	101.5
0600116	IRR	Richland Communities et al.	1	33.99828	-117.64952	N	N	Metered	N	9.3
0600212	IRR	Richland Communities et al.	1	33.95720	-117.64182	N	N	Metered	N	28.8
0600214	Dairy/IRR	Richland Communities et al.	1	33.95894	-117.63394	N	N	Metered	N	7.2
0600337	Dairy/Dom	Richland Communities et al.	1	33.99836	-117.56970	N	N	Metered	N	6.0
0600397	Dairy	Richland Communities et al.	1	33.99848	-117.57382	N	N	Metered	N	152.6
0600432	Dairy/Dom	Richland Communities et al.	1	33.99122	-117.57807	N	N	Metered	N	15.5
0600472	DOM-2 homes	Richland Communities et al.	1	33.99905	-117.55943	N	N	Metered	N	2.1
3601205	IRR	Richland Communities et al.	1	34.00984	-117.59344	N	N	Metered	N	88.3
3601212	Irr-400' E/Bon View	Riverside Drive Holdings LLC	1	34.02082	-117.63495	N	N	Metered	N	0.0
3602078	IRR	Riverside Drive Holdings LLC	1	34.02030	-117.63684	N	N	Metered	N	0.0
0600632	IRR	Robert & Yang K Barth	1	34.01554	-117.59471	N	N	Metered	N	44.2
0600263	Dairy	Rodger & Jonnie Camping	1	34.00999	-117.62769	N	N	Metered	N	4.9
0600531	HOUSE	Rodriguez Antonio/Rodgriquez Suzanne C/O Antonio & Suzanne Rodriguez Trustees	1	34.00711	-117.64376	N	N	Metered	N	0.0
0600036	Dom	Ronald & Kristine Family Trust	1	33.99248	-117.63921	N	N	Metered	N	5.7
0600634	8Ac/Nursery	Ronald & Kristine Family Trust	1	33.99303	-117.64996	N	N	Metered	N	19.1
0600176	DAIRY-640C	Rudy Haringa	1	34.01337	-117.64251	N	N	Metered	N	86.1
0600418	IRR-25P	Rudy Haringa	1	34.01365	-117.64391	N	N	Metered	N	56.1
0600429	DAIRY-400C	Rudy Haringa	1	33.98596	-117.62865	N	N	Metered	N	38.6
3600050	IRR-5P	Rudy Haringa	1	33.98660	-117.63018	N	N	Metered	N	16.3
0600102	Dairy/Dom	Schaefer Avenue Property LLC	1	34.00630	-117.61169	N	N	Metered	N	7.9

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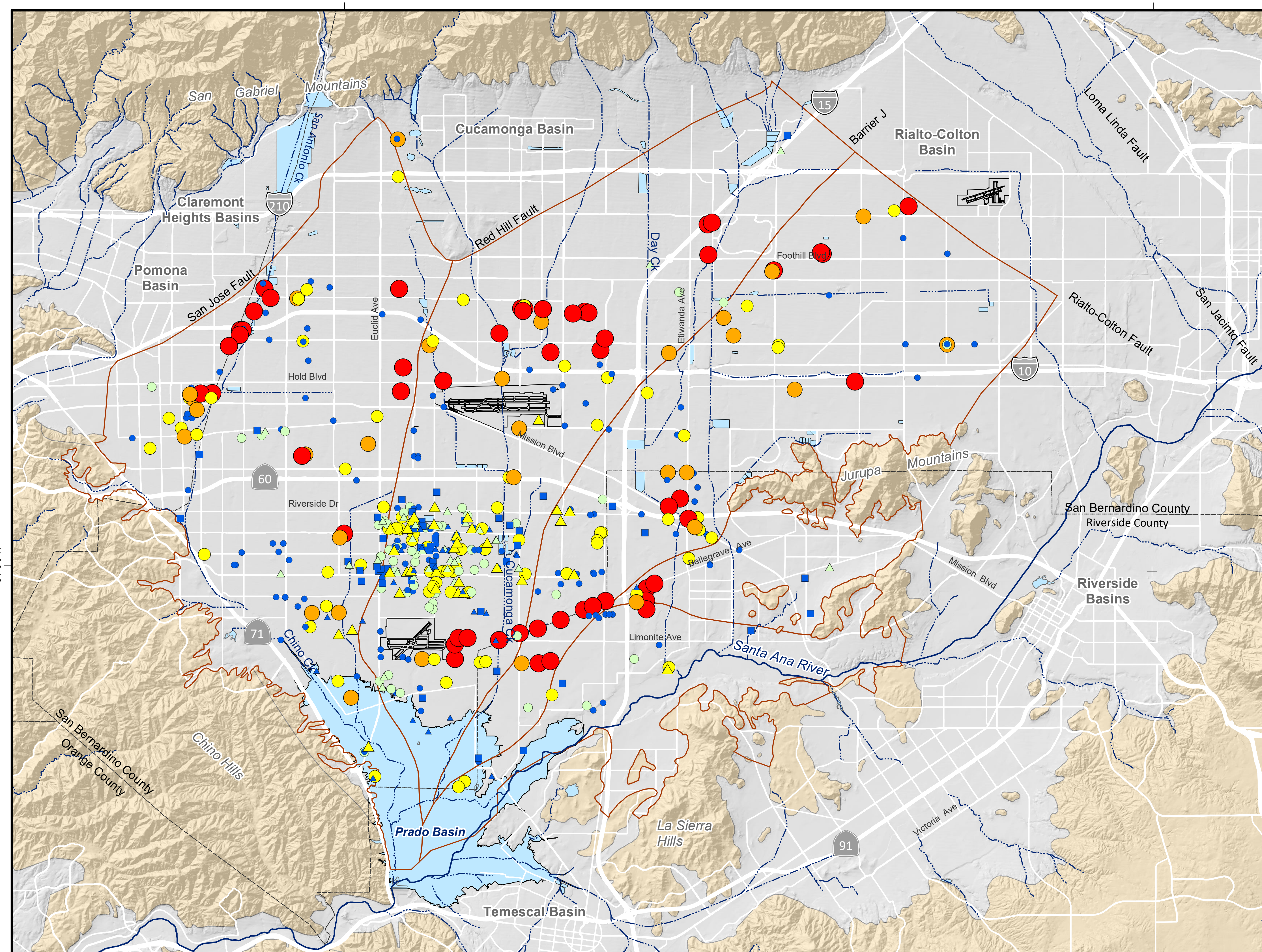
0600225	DAIRY	Schaefer Avenue Property LLC C/O Jake L & Anna De Groot	1	34.00633	-117.60993	N	N	Metered	N	0.0
3601320	IRR	SLV LC Center LLC TC/HCW LC Center LLC	1	33.99873	-117.56291	N	N	Metered	N	0.0
3602556	Dairy/Dom	SLV LC Center LLC TC/HCW LC Center LLC	1	33.99845	-117.56263	N	N	Metered	N	0.0
3600975	CWW	Southwood Limited et al.	1	34.02073	-117.61686	N	N	Metered	N	37.4
0600692	CIM 15	State of California CIM	1	33.97967	-117.67903	N	N	Metered	N	79.5
0600694	CIM 16	State of California CIM	1	33.98687	-117.67242	N	N	Metered	N	117.1
3600345	10--Field 14	State of California CIM	1	33.98465	-117.66732	N	N	Metered	N	676.6
3601827	01A	State of California CIM	1	33.98447	-117.67845	N	N	Metered	N	903.8
3602461	11A	State of California CIM	1	33.98659	-117.68427	N	N	Metered	N	3.0
3601246	1	State of California Institute for Women	1	33.95121	-117.63338	N	N	Metered	N	0.0
0600691	CIM 14	State of California Prison Grounds	1	33.97967	-117.68103	N	N	Metered	N	0.0
3600339	01	State of California Prison Grounds	1	33.98921	-117.68155	N	N	Metered	N	0.0
3600432	DAIRY-640C	Struikmans Family Partnership	1	33.99911	-117.61810	N	N	Metered	N	43.5
0600575		Thomas Mushegain C/O Richarge D Mushegain Trustee	1	34.01509	-117.64775	N	N	Metered	N	33.9
0600115	DOM	Trilogy Inspirada LLC/Legacy Inspirada LLC	1	33.99658	-117.64966	N	N	Metered	N	0.0
0600208	DOM	Veenendaal Investment Co PS	1	34.00949	-117.63742	N	N	Metered	N	60.6
0600179	DOM	Via Chianti Holdings LLC	1	34.00167	-117.60776	N	N	Metered	N	33.0
0600192	Dairy/Dom	Whitegold Ventures LP	1	33.99372	-117.62862	N	N	Metered	N	122.0
0300249	DOM-New	William R Cramer	1	33.96562	-117.53263	N	N	Metered	N	1.9
3300195	D-1	William Van Leeuwen	1	33.95330	-117.56524	N	N	Metered	N	32.1
0600232	Dairy-in shed	Yen-Chu Chang et al.	1	33.99873	-117.64429	N	N	Metered	N	22.1
3601400	Dairy	Yen-Chu Chang et al.	1	34.01195	-117.63677	N	N	Metered	N	115.2
0600194	irr/3 ac misc plnts	A & L Briano Investment Company PS	1	34.01360	-117.63941	N	N	Estimated	N	76.8
3602540	Dairy/Dom	Bar Ja Investments	1	33.99901	-117.62735	N	N	Estimated	N	75.0
0600341	IRR	Bollema C/O Harold J Bollema Trustee	1	34.00668	-117.62396	N	N	Estimated	N	30.0
0600342	Dairy/Dom	Bollema C/O Harold J Bollema Trustee	1	34.00624	-117.62490	N	N	Estimated	N	0.0
3602491	DAIRY	Borba, Joseph & Doleen Administrative Tr	1	33.99184	-117.61837	N	N	Estimated	N	79.0
0600003	Dairy	Bosma Dairy South PS	1	34.00053	-117.62773	N	N	Estimated	N	3.6
3602604	IRR	Cay A K Coral Trust C/O Kathleen R De Groot	1	34.01368	-117.64627	N	N	Estimated	N	90.0
0600628	Dairy	Chino Holding Co LLC C/O Lewis Management Co	1	33.94894	-117.62133	N	Y	Estimated	N	1.1
0601124		City of Ontario	1	33.99627	-117.59223	N	N	Estimated	N	89.1
0600459	Dairy - 1	Coelho C/O Shirley Marks & Joann Gougen Co-Trustees	1	34.00225	-117.61896	N	N	Estimated	N	74.8
0600460	IRR - 2	Coelho C/O Shirley Marks & Joann Gougen Co-Trustees	1	34.00305	-117.61863	N	N	Estimated	N	37.4
0600470	PARKS DEPT 2	County of San Bernardino	1	33.93900	-117.65477	N	N	Estimated	N	384.4
0601127		County of San Bernardino	1	33.92810	-117.65288	N	N	Estimated	N	1.9
3602214	IRR	County of San Bernardino	1	33.99514	-117.64492	N	N	Estimated	N	0.9
3602602	Dairy	County of San Bernardino	1	34.00624	-117.63318	N	N	Estimated	N	20.1
0600247	Dairy - 3	Crosspoint Christian Reformed Church	1	34.00273	-117.65149	N	N	Estimated	N	27.0
0600193	DOM	Diazevedo Ents LP	1	33.99719	-117.63662	N	N	Estimated	N	44.5
0601149		Dusa, Angela D Rev Tr	1	34.01671	-117.57642	N	N	Estimated	N	122.5
0600695		Ernest De Groot, Estate of C/O Charles De Groot Trustee	1	33.99887	-117.63947	N	N	Estimated	N	107.5
3600324	IRR 2	Ernest De Groot, Estate of C/O Charles De Groot Trustee	1	33.99924	-117.63792	N	N	Estimated	N	67.8
0601170	West Irr	Everett J Delaura Living Trust	1	34.00989	-117.60302	N	N	Estimated	N	13.6
0601171	East Irr	Everett J Delaura Living Trust	1	34.00989	-117.60280	N	N	Estimated	N	13.6
0600661	DAIRY	Fernandes Family Trust	1	34.00610	-117.62235	N	N	Estimated	N	3.6
3600406	Dairy/Dom	GH Dairy	1	33.99925	-117.63653	N	N	Estimated	N	3.6
0600233	Dairy	Golden Ontario Holdings LLC	1	33.99863	-117.64337	N	N	Estimated	N	19.1
0600461	Dairy/Dom-North	Heims Pride Dairy	1	34.01155	-117.61986	N	N	Estimated	N	6.3
0600189	Dairy/Dom	Henri & Michel Minaberry	1	33.98530	-117.61171	N	N	Estimated	N	6.2
3602209	1 hse 11 ac nursery	Henry Donkers	1	33.99988	-117.63050	N	N	Estimated	N	25.2
0601122	PT IRR	Hogg Brothers	1	34.01572	-117.61535	N	N	Estimated	N	40.5
0600183	DOM	Inland Harbor Com LLC	1	34.00619	-117.64189	N	N	Estimated	N	5.4
0600462	Office Bldg	Intex Properties Inland Empire Corp	1	34.14371	-117.48665	N	N	Estimated	N	15.9
0600150	IRR	Jane Devries et al.	1	34.00302	-117.62157	N	N	Estimated	N	36.1

Table B-2. Pumping Wells in the Chino Basin in FY 2021

CBWM Well ID	Name	Owner	Pool	Latitude	Longitude	New in FY 2021	Abandoned/ Destroyed in FY 2021	Metered/ Estimated	Minimal Producer	FY 2021 Production
0600245	Dairy/Dom	Jane Devries et al.	1	34.00647	-117.62765	N	N	Estimated	N	6.6
0600067	BACKUP	Jean & Catherine Gastelluberry	1	34.00711	-117.62013	N	N	Estimated	N	86.9
3600433	#7 - IRR	JGJ Joint Ventures et al.	1	34.01970	-117.62308	N	N	Estimated	N	40.5
3600434	1-IRR	JGJ Joint Ventures et al.	1	34.02111	-117.62820	N	N	Estimated	N	242.0
0600151	Dairy	Joe Gorzeman C/O Rick Gorzeman Trustee	1	34.00228	-117.61990	N	N	Estimated	N	20.0
3600858	Dairy/Dom	Johanna Swager C/O Bernard Te Velde - Trustee	1	33.99552	-117.61982	N	N	Estimated	N	34.1
3602534	IRR-in shed	John & Henriette Duits	1	34.01029	-117.63721	N	N	Estimated	N	31.6
0600614		John Bos	1	33.95935	-117.64926	N	N	Estimated	N	49.7
0601114		Joseph A Garcia	1	33.98465	-117.60675	N	N	Estimated	N	1.8
0600275	Irr	Kenneth & Daniel Vanderham	1	34.01126	-117.61930	N	N	Estimated	N	78.7
0600276	Dairy/Dom	Kenneth & Daniel Vanderham	1	34.00906	-117.61895	N	N	Estimated	N	69.8
0600419	1500C	L & F Properties North PS	1	34.01986	-117.57267	N	N	Estimated	N	194.2
0600339	Dom	Liberty Property LP	1	33.99178	-117.61602	N	N	Estimated	N	69.6
0600191	Dairy/Dom	Louis B & Angela A Aguerre	1	34.00094	-117.66323	N	N	Estimated	N	28.8
0600158	Fire Logs	Loyola Properties et al.	1	34.01436	-117.62267	N	N	Estimated	N	9.3
0600229	Dairy/Dom	Mary Souza	1	33.96286	-117.64868	N	N	Estimated	N	10.6
0300211	DOM	McCabe Chris Trust	1	33.99390	-117.54503	N	N	Estimated	N	4.8
0300169	STN4800	Melodee Underwood & Melinda Addington	1	34.00113	-117.46579	N	N	Estimated	N	43.8
0600203	DAIRY/DOM	Michael Bidart el al.	1	34.01324	-117.60549	N	N	Estimated	N	7.3
0600370	Dairy/IRR	Miguel & Graciela Gomez	1	34.00043	-117.60246	N	N	Estimated	N	114.6
0601141	0	Orange County Flood Control District	1	33.96456	-117.67637	N	Y	Estimated	N	0.9
0600422	GH #2	Pacific Commodities LLC	1	33.99167	-117.64244	N	N	Estimated	N	159.1
3600421	Dairy/Dom	Parente Real Estate Investment Management PS C/O Mary Borba Parente	1	34.00501	-117.59461	N	N	Estimated	N	1.7
3601698	IRR/Dom	Paul B. Hofer & Sons LLC	1	34.05114	-117.58570	N	N	Estimated	N	175.5
3602077	Backup	Perry L Kruckenberg	1	34.01385	-117.61284	N	N	Estimated	N	70.0
0600508	Dairy-#2	Peter & Henrietta Bosch	1	34.00901	-117.60653	N	N	Estimated	N	69.7
3602584	Irr	Premier Investment Enterprises Inc	1	34.02039	-117.57791	N	N	Estimated	N	147.0
0600123	IRR-Flushing	Prologis-Exchange CA 2005 LLC (60%)	1	33.99209	-117.61649	N	N	Estimated	N	0.0
0601094		Rafael & Evangelina Rosalez	1	34.04656	-117.69812	N	N	Estimated	N	19.6
0600217	DOM	Reitsma Family Partnership	1	34.01513	-117.62844	N	N	Estimated	N	80.0
0601102	0	Restorative Justice Center of Inland Empire	1	34.10456	-117.54016	N	N	Estimated	N	19.3
0600006		Richland Communities et al.	1	34.00030	-117.59360	N	N	Estimated	N	19.6
0600620		Richland Communities et al.	1	33.99840	-117.57072	N	N	Estimated	N	150.1
3600127	Dom TV3	Richland Communities et al.	1	34.01345	-117.60979	N	N	Estimated	N	50.3
3602590	Chickens/Nursery	Robert A Hohberg	1	34.01493	-117.63604	N	N	Estimated	N	37.0
0600367	Nursery	Robinson Calf Ranch G P	1	33.99996	-117.62290	N	N	Estimated	N	19.6
0600481	DOM	Ron & Denise Miersma	1	33.99319	-117.62752	N	N	Estimated	N	52.6
0601112		Salvador De La Torre et al.	1	34.01755	-117.63673	N	N	Estimated	N	57.1
0600094	450 heifers 1 hse	Southwood Limited et al.	1	34.00622	-117.64480	N	N	Estimated	N	64.5
3602691	13--Field 24	State of California CIW	1	33.97890	-117.66183	N	N	Estimated	N	459.4
0600608	4	State of California Institute for Women	1	33.94794	-117.63661	N	N	Estimated	N	0.0
3600346	09	State of California Prison Grounds	1	33.97736	-117.66728	N	N	Estimated	N	214.4
3600348	07--Field 11	State of California Prison Grounds	1	33.98311	-117.67193	N	N	Estimated	N	0.0
3602332	S IRR-1	State of California Prison Grounds C/O California Institution for Women	1	33.98199	-117.65759	N	N	Estimated	N	0.0
0600129	DAIRY-640C	Struikmans Family Partnership	1	33.99550	-117.61808	N	N	Estimated	N	62.5
0601126	0	Tadashi Nakase	1	33.99790	-117.69125	N	N	Estimated	N	29.6
0300266	IRRDOM	TDC Remington Partners	1	33.97556	-117.60272	N	Y	Estimated	N	0.0
0600623	Dom	TH Miramonte Investors LLC C/O Trumark Homes	1	33.94399	-117.63020	N	N	Estimated	N	1.4
0600438	Dairy/Dom	Thomas Mushegain C/O Richarge D Mushegain Trustee	1	34.01622	-117.64947	N	N	Estimated	N	31.5
0600022	Domestic	Treto Family Trust	1	34.00705	-117.63329	N	N	Estimated	N	2.5
3601111	Dairy/Dom	Trilogy Land Holdings LLC TC/Legacy Land Partners LLC C/O Legal Department	1	34.00464	-117.59416	N	N	Estimated	N	0.0
3301536	IRR-150HP-Gas Pwr	USA 130	1	33.92910	-117.60402	N	N	Estimated	N	1.5
0600209	IRR-SCH/VYD	Vineyard Baker LLC C/O Lynn Chao	1	34.01758	-117.61473	N	N	Estimated	N	65.8
0600284	Dairy/Dom	Whitegold Ventures LP	1	34.01344	-117.63404	N	N	Estimated	N	2.5

Table B-2. Pumping Wells in the Chino Basin in FY 2021										
CBWM Well ID	Name	Owner	Pool	Latitude	Longitude	New in FY 2021	Abandoned/ Destroyed in FY 2021	Metered/ Estimated	Minimal Producer	FY 2021 Production
0600228	Dairy/Dom	Wiersma, Gladys/Otto Tr	1	34.01746	-117.64091	N	N	Estimated	N	29.5
0300052	IRR	William R Cramer	1	33.96601	-117.53215	N	N	Estimated	N	467.0
3600318	DAIRY-ESIDE-650C	Yen-Chu Chang et al.	1	33.99878	-117.64646	N	N	Estimated	N	98.0
3600978		AGS Ltd	1	34.02339	-117.64165	N	N	Estimated	Y	2.5
0600330		Albert & Michael Hindelang	1	33.99577	-117.63752	N	N	Estimated	Y	8.5
0600580	IRR	Ambrosia Farm	1	34.04676	-117.70130	N	N	Estimated	Y	2.4
0601030		Anthony Vernola & Anna Bevilacqua	1	34.02495	-117.58368	N	N	Estimated	Y	3.6
0600618	Dom	Archibald Ranch Community Church	1	34.01300	-117.59338	N	N	Estimated	Y	4.6
0600366		Arnold & Gail Bohlander	1	34.00204	-117.66365	N	N	Estimated	Y	9.8
0600120		Carlos Garcia & Agnes De Soete	1	33.99548	-117.65811	N	N	Estimated	Y	5.4
0600528	Dairy/Dom	Central Eleven LLC C/O Fen Xiao Lam	1	34.01592	-117.63334	N	N	Estimated	Y	4.1
0300161	DOM	Charlene Ann Galleano	1	34.01244	-117.54167	N	N	Estimated	Y	5.4
0601097	0	Chino Avenue LLC	1	34.01479	-117.59730	N	N	Estimated	Y	3.2
0600530	DOM	Chino Preserve Development Corp C/O Lewis Management Corp	1	33.95552	-117.63268	N	N	Estimated	Y	0.7
0810004	Dom	Cor & Nellie Verkaik	1	34.01445	-117.63299	N	N	Estimated	Y	7.2
0601150		De Vries California Properties LLC	1	33.99476	-117.64950	N	N	Estimated	Y	2.9
3600821	DAIRY	Dick & Henrietta De Groot	1	34.00628	-117.63126	N	N	Estimated	Y	3.8
0600392	20-30K Chickens	Edwin & Brook Voortman	1	34.00213	-117.62872	N	N	Estimated	Y	4.1
0600042	1 home/lndscp	Elizabeth Martha Montes C/O Laura Sossamon Trustee	1	34.01632	-117.61581	N	N	Estimated	Y	5.4
0810009		Ernesto & Guadalupe Gutierrez	1	34.01926	-117.63745	N	N	Estimated	Y	3.6
0300229	DOM	Grace & Yue Hong Chou	1	33.97922	-117.49800	N	N	Estimated	Y	1.9
0600016		Gregory/Sarah Campbell	1	34.02159	-117.55517	N	N	Estimated	Y	3.2
3602086	Crawford Cyn	Intex Properties Inland Empire Corp	1	34.14877	-117.48397	N	N	Estimated	Y	0.0
0300240		Jacqueline Sloan	1	33.96482	-117.60223	N	N	Estimated	Y	1.8
0600029		Jaime Carlos & Maricela Rodriguez	1	34.00608	-117.63028	N	N	Estimated	Y	1.8
0300011	PED5071	Jean Boggio	1	33.99730	-117.47585	N	N	Estimated	Y	1.8
0300021		Joanne Peacock et al.	1	33.93774	-117.59102	N	N	Estimated	Y	3.6
0600570		John & Gloria M Gerardi Trust C/O John Gerardi Trustee	1	33.99897	-117.65113	N	N	Estimated	Y	1.8
0600639	Dom 300 heifers	JRJ Investments PS C/O John Rodrigues Jr	1	34.00713	-117.63383	N	N	Estimated	Y	3.6
3602605		Karambir & Sukhinderjit Bhullar	1	34.01013	-117.64927	N	N	Estimated	Y	3.5
0600110	DOM	Lee & Frances Holmes C/O Jeffrey & Patsy Holmes	1	34.01021	-117.62788	N	N	Estimated	Y	1.8
0600011	DI	LMF Development LLC et al.	1	34.00044	-117.62846	N	N	Estimated	Y	5.4
0600114	Dom	LMF Development LLC et al.	1	34.01729	-117.60173	N	N	Estimated	Y	8.5
3600064	DAIRY	LMF Development LLC et al.	1	33.99976	-117.64734	N	N	Estimated	Y	4.3
0300154		Lopez Claudia Lopez & Eduardo Gutierrez	1	33.98515	-117.47363	N	N	Estimated	Y	1.8
0600402	Dom/1 house	Marion H Okumura, Estate of C/O Sally J Okumura Clanin	1	34.00749	-117.62974	N	N	Estimated	Y	1.8
0600222		Merrill Ave Ontario LLC	1	33.98533	-117.60887	N	N	Estimated	Y	3.6
0600107	Dom/Sm Nursery	Miguel & Graciela Gomez	1	34.01726	-117.65150	N	N	Estimated	Y	3.6
3601206	Dom	Ontario Cold LLC	1	34.00799	-117.59404	N	Y	Estimated	Y	0.0
0600152	MILK PROCESSING	Peauroi/Scott Stanley C/O Rene P & Susan Anne Peauroi	1	34.03838	-117.72499	N	N	Estimated	Y	0.0
0600106	dom/5 horses	Rafael Treto	1	34.01336	-117.63674	N	N	Estimated	Y	3.6
0600119	Dom	Real Estate Holdings & Management LL	1	33.99962	-117.65026	N	N	Estimated	Y	1.8
0300053	offc/lndscp	Richard & Dianne Vanloon	1	33.93514	-117.60954	N	N	Estimated	Y	1.8
0601201	0	Richard Anderson	1	34.01639	-117.73263	Y	N	Estimated	Y	1.8
0600004	DOM	Richland Communities et al.	1	34.00247	-117.59846	N	N	Estimated	Y	9.8
0600134	IRR	Roman Catholic Bishop San Bernardino Dioce	1	34.02605	-117.62738	N	N	Estimated	Y	2.8
0300033		Southwood Limited et al.	1	33.96091	-117.57527	N	N	Estimated	Y	3.6
3601097		Sybrand Vander Dussen	1	34.00048	-117.65174	N	N	Estimated	Y	2.1
0600606	DOM	Victory Baptist Church	1	33.99899	-117.65877	N	N	Estimated	Y	3.6



Active Groundwater Pumping Wells in FY 2021

Measurement Method
Symbolized by shape

- Metered
- Unmetered, Non-Minimal Producer
- Unmetered, Minimal Producer

Groundwater Production in FY 2021 (af)
Symbolized by size and color

- 0 - 10
- 10 - 50
- 50 - 500
- 500 - 1,000
- > 1,000

Geology

Water-Bearing Sediments

- Quaternary Alluvium

Consolidated Bedrock

- Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks

Hydrology

- Streams & Flood Control Channels
- Flood Control & Conservation Basins
- OBMP Management Zones

Prepared by:

WEST YOST
Water. Engineered.

Author: LS

Date: 3/31/2022

File Name: Appendix_B_GWPumpingWells.mxd

0 3 6 Miles

0 4 8 Km

Prepared for:

Chino Basin Watermaster
Data Collection and Evaluation
FY 2020/21

Active Pumping Wells in the Chino Basin by Measurement Method
FY 2021

Figure B-1

Appendix C

Responses to Questions and Comments on Draft Report

STATE OF CALIFORNIA DEPARTMENT/JOHN WOOD GROUP PLC (RICHARD REES, PG, CHG)

Comment 1

Page 1-1, Section 1.2, First Paragraph, "These requirements," ... "are listed below verbatim from pages 15 through 17 of the 2017 Court Order:" The language in the report is not the same as in the 2017 Court Order based on the following examples:

- The 2017 Court Order includes lettered subparagraphs [e.g., the third subparagraph under section 4.5 is 4.5(c)]. The report omits these letters. We suggest adding these subsection identifiers into the report because the 2017 Court Order and report both refer to subparagraph 4.5(c) in section 4.3.
- Bullet 4.4 removes four sentences from the 2017 Court Order and points back to a 2015 document that is not properly referenced in the report. We suggest including the original four sentences from the 2017 Court Order.

Response:
The text was updated, where appropriate, to address this comment.

Comment 2

Page 2-3, Section 2.3.1, second bullet, second sentence. "Actual groundwater pumping for the DYYP was about 17,400 af and 23,000 af in FY 2020 and FY 2021." For consistency with the document, DYYP pumping for FY 2019 should also be included.

Response:
The text was updated to address this comment.

Comment 3

Page 4-1, Section 4.1, first paragraph, fourth sentence. "Changes in urban irrigation practices in response to weather changes…" Would it be clearer to say "precipitation and temperature conditions" rather than weather?

Response:
The text was updated to address this comment.

Comment 4

Page 4-3, Section 4.3.1. This section describes that the actual outdoor water use is less than projected in the 2020 SYR by about 16,500 afy and that less urban outdoor water use generally leads to less deep infiltration of precipitation and applied water (DIPAW), and this can cause a reduction in net recharge. West Yost did not try to quantify the impact on net recharge for this factor, but they note in Section 4.3.3 that the impact on net recharge will be delayed by "several years" due to "the travel time between the root zone and the groundwater table." We believe it is also worth noting in your report that the 2020 Safe Yield Recalculation Final Report (2020 SYRR; Wildermuth Environmental Inc., 2020) identified a steep decline in DIPAW since the late 1990s (about 47,500 afy decline between 1998 and 2018; see Table 6-3 in the 2020 SYRR) and then projected DIPAW to increase starting in 2020 (projected increase of approximately 3,400 afy from 2019 to 2021; see Table 7-2 and Figure 7-4 in the 2020 SYRR). Although DIPAW is influenced by many variables, the continued drought and decline in outdoor water use may have eliminated the projected increase in DIPAW and resulted in an actual decline. The difference between the previously-projected increase in DIPAW and the potential decline that may have occurred due to ongoing drought and decrease in outdoor water use may approach 2.5% of the current Safe Yield. This supports the reevaluation of the Safe Yield by the June 30, 2025 deadline as stated in the conclusions of the report and may even support an acceleration of the timeline for the Safe Yield reevaluation.

Response:
We have added a reference to the DIPAW results of the 2020 SYR Report in Chapter 4.3.3. The remainder of the comment does not necessitate a response.

Comment 5

Page Section 1.2 of the report identifies two questions derived from the 2017 Court Order. These are enumerated at the top of page 1-3 of the report and provided below for reference:

1. Is there a potential for undesirable results that were not identified in the 2020 SYR? Specifically, is there a "potential need for prudent management discretion to avoid or mitigate undesirable results including, but not limited to, subsidence, water quality degradation, and unreasonable pump lifts"? (2017 Court Order, p. 17)
2. Is there a reasonable likelihood that the cumulative impact of the differences between the new datasets/projections (i.e., the 2019-21 Actual Data and the 2022 projection) and the data and assumptions in the 2020 SYR would result in the actual Safe Yield being greater than 2.5 percent (more or less) than the current Safe Yield? (2017 Court Order, p.17).

The first of these questions appears to be adequately addressed in the report, with the exception of a discussion of water quality degradation. Although the known contaminant plumes are provided in a figure in the report, we are unable to find a statement in the report regarding water quality. We believe a statement on potential water quality impacts should be added for clarity and completeness.

The second question is not addressed quantitatively; the absence of quantitative comparison in the report is a deficiency given the specific and quantitative nature of the threshold value set by the court (greater than 2.5 percent). This document is the first annual report prepared in response to the requirements of the 2017 Court Order, and therefore sets a precedent for future calculations and reporting. We recognize that the basis of Safe Yield is a 10-year average of the net recharge and that data from a single year or a few years does not account for variability that may occur over a 10-year period. However, for compliance with the 2017 Court Order, and to support sound basin management, it seems appropriate that the actual net recharge should be estimated for periods with available data (e.g., 2019-21) and compared with previous projections. Most of the information needed to calculate net recharge is provided in the report (i.e., production and supplemental recharge). The only variable missing is change in groundwater storage. Estimating change in groundwater storage should not be a burden, given that Watermaster estimates change in groundwater storage every year on a water-year basis for the Sustainable Groundwater

Management Act (SGMA) reporting. An estimate of net recharge for years for which data are available will give the information needed to evaluate trends and to quantitatively compare actual conditions with the assumptions and projections made in setting a prospective Safe Yield, as required in the 2017 Court Order.

Response:
Statements on the comparison of the 2020 SYR Projection to the 2019-21 Actual Data and the 2022 Projection regarding water quality are added to Chapter 2.3. The findings in other chapters refer to all "undesirable results," which includes water quality degradation.

Evaluating a "reasonable likelihood" as stated in the second question does not require a quantitative comparison but is based on professional judgment and experience. The forthcoming model update will allow for a more fulsome comparison of the historical net recharge to the 2020 SYR Projection net recharge. The results of this modeling effort will determine whether the Safe Yield will need to be reset.

CUCAMONGA VALLEY WATER DISTRICT (AMANDA COKER, PE)

Comment 1 – Groundwater Pumping for the Dry-Year Yield Program (DYYP)

Chapter 2 of the report includes a summary of actual groundwater pumping from 2019-2021, inclusive of groundwater pumping from storage accounts (DYYP), and compares that to the 2020 SYR projection. It is my understanding that water produced from storage is excluded from the safe yield calculation, so the DYYP pumping would not be a component of the safe yield calculation. Please let me know if this understanding is correct, and if so, it seems that the DYYP production should be presented separately and not included in the comparison to the 2020 SYR projection.

Response:
Your understanding is correct in that the volume of DYYP pumping and recharge are not included in the calculation of the Safe Yield. However, the DYYP operations affect the water budget of the Chino Basin, as documented in the *Evaluation of the Local Storage Limitation Solution* (WY, 2021).[1] These operations constitute a cultural condition that must be evaluated pursuant to the 2017 Court Order.

Comment 2 – Urban Outdoor Water Use

Chapter 4 describes the data sources used to estimate urban outdoor water use, which does not include recycled water. I suggest that recycled water used for outdoor irrigation be included in the methodology as the region has been very successful in converting large irrigation customers to recycled water service and providing recycled water service to new developments which would contribute to recharge in the basin.

Response:
The following text has been added to Chapter 4 for clarification on the process to calculate urban outdoor water use:

[1] WY. *Evaluation of the Local Storage Limitation Solution*. Prepared for the Chino Basin Watermaster, February 2021.

"For the 2020 SYR, the R4 model was calibrated by comparing estimated actual potable urban outdoor water use with the model-simulated applied water on residential, commercial, and industrial land uses. Recycled water applied for irrigation was not considered in the calibration because it has historically been a small portion of the irrigation water applied to these land uses. Land uses such as parks, golf courses, and schools were excluded from the calibration, as they are generally irrigated with recycled water."

In future reports, we will include a discussion and present data on recycled water irrigation in the Chino Basin. We will reexamine the assumptions to calibrate the R4 model's applied water estimates and potentially update the methodology in the forthcoming model update.

APPROPRIATIVE POOL (THOMAS HARDER, PG, CHG)

Comment 1 – Recommendations with Respect to the Frequency for Evaluating Land Use Changes

I agree with the Watermaster recommendation to reduce the frequency of land use evaluations in future reports. However, there is some ambiguity between what was presented in the Workshop on April 26, 2022 and what is written in the report. At the Workshop, West Yost recommended to "Reduce the frequency of the evaluation of changes in land use." The recommendation in the draft report says "*…actual land use data should be acquired annually, if available. If new data are not available for actual land use, the evaluation of changes in land use can be omitted from a future report.*" We would like clarification as to exactly what Watermaster plans to do with respect to land use evaluations and how that is anticipated to impact future budgets for generating the report. Land use is not changing significantly from year to year and, as is indicated in the report, "*Differences in land use are not expected to have a significant effect on net recharge or increased the risk of new undesirable results.*"[2] It is our recommendation that land use changes be evaluated every five years into the future.

Response:
Reducing the frequency of evaluating land use to every five years is reasonable given the relatively slow change of land use from year to year. In general, we agree with a five-year frequency of land use data evaluation.

Watermaster will determine the need for future evaluations of land use data based on future data availability and model exercises. The report purposefully omitted a specific timeline for land use evaluation to allow for flexibility in determining when an evaluation is necessary. For example, during the forthcoming model update that will be completed by the end of FY 2025, it will be helpful to document a comparison of the land use assumed in the 2020 SYR to the current land use data that will be used in the model update. Based on the work to develop this first annual report, we anticipate that re-evaluating land use for the model update will not be an onerous process and will have minimal budget impact compared to the collection and evaluation of other data. The scopes and budgets for future data collection and evaluation efforts will indicate whether land use will be evaluated.

[2] Section 3.3.3, pg. 3-6 of the draft report.

Comment 2 – Incorporation of Distribution System Losses into the Water Budget for the Model

The AP has stated in past meetings an interest in accounting for water distribution losses explicitly in the water budgets for the model analysis to reset the Chino Basin Safe Yield. I agree and recommend that the Watermaster explicitly include an estimate of system losses in the water budget. Conveyance system losses, while estimated, are more constrained than many other assumed input parameters in the model. Adding this input, which is currently missing from the water budget, would make the other less constrained aspects of the model (e.g. boundary conditions) more representative.

It is my understanding that the Watermaster has already conducted a study to estimate conveyance system losses in the Chino Basin. There are standard ways to incorporate this recharge element into the groundwater flow model. While assumptions would have to be made as to the percentage of losses that reach the groundwater and the temporal discretization and spatial distribution of that recharge, I expect the level of effort to be relatively small in the context of the overall model update.

Response:
This comment does not pertain to the annual data collection and evaluation process but suggests that system losses should be incorporated in the forthcoming model update.

In 2018, at the request of Watermaster, Wildermuth Environmental investigated the feasibility of quantifying the magnitude and location of municipal supply system losses (system losses) and potential applications in the Chino Basin groundwater model. Wildermuth Environmental concluded that it was not practical to include system losses in the Chino Basin groundwater model due to the lack of information available to quantify the magnitude and location of the system losses that reach the groundwater table. System losses are implicitly included in the model-calibrated estimates of total recharge to the Chino Basin.

Information collected by Watermaster since the 2018 study does not support a revision to the 2018 study's findings. A review of the Chino Basin Parties' 2020 UWMPs and relevant literature indicate that calculations of the volume, location, and timing of conveyance system losses are subject to high uncertainty, and there is high uncertainty in the fate of any conveyance system losses in an urban, unsaturated groundwater system.[3] Watermaster would consider including conveyance system losses in the CVM if technically defensible data were available to determine the volume, location, and timing of conveyance system losses that result in recharge.

Comment 3 – Upcoming Safe Yield Reset Workshop

Based on West Yost's scope of work in support of implementing the Safe Yield Court Order as well as follow-up workshops and phone correspondence, it is my understanding that they intend to implement the recommendation I made to conduct a predictive uncertainty analysis on the Safe Yield estimate to

[3] D'Aniello, A. (2021). Leaking pipes and the urban karst: a pipe scale numerical investigation on water leaks flow paths in the subsurface. Journal of Hydrology, 603(A): https://doi.org/10.1016/j.jhydrol.2021.126847.

"provide the basin managers a sense as to the potential variability in the estimate, for use in making decisions" (pg. 4, 2nd paragraph).[4] Watermaster's Task 1 scope of work includes (in part):

- The Consultant will define proposed approaches to apply the state-of-the-art practice to address model uncertainty in updating the Safe Yield and perform a preliminary assessment of their applicability to the Chino Basin.
- The Consultant will quantify the computational tractability of performing up to three proposed approaches to modeling uncertainty. This includes estimating the time and resources necessary to automate the creation and implementation of model ensembles, perturbing model parameters, and post-processing data for each of the proposed approaches.

We are looking forward to the workshop and your proposed approach to include uncertainty analysis into the Safe Yield Reset process.

Response:
Your understanding is correct; Watermaster plans to incorporate a predictive uncertainty analysis as part of the proposed update to the Safe Yield Reset methodology. We look forward to your participation in the peer review process.

CITY OF CHINO/GEOPENTECH (DAVE CROSLEY, PE; ERIC FORDHAM, PG, CEG, CHG)

Comment 1

All collected data and data sources used to derive inputs for the Chino Valley model (CVM) should be identified and provided in Watermaster's annual reports on Data Collection and Evaluation for Safe Yield of the Chino Basin.

Response:
The report identifies the data and data sources regarding the cultural conditions that the 2017 Court Order requires that Watermaster collect and evaluate on an annual basis. Any data or data sources that are not included in this report are outside the scope of this investigation.

Based on this comment and follow-up discussions, the intent of this request is to be able to better understand differences between the 2020 SYR Projection and the updated data (2019-21 Actual Data and 2022 Projection) at a higher resolution than what is presented in the report. This request will increase the effort and costs necessary to prepare the report, and we believe that the level of detail presented in the current report is sufficient to satisfy the objectives of the 2017 Court Order. If other Parties feel strongly about including the requested details, we will consider adding to future reports 1) the groundwater pumping comparison by well on a quarterly time scale (for Appropriative Pool Parties) and 2) the data used to derive the urban outdoor water use estimates.

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[4] TH&Co, 2020. Technical Review of the Models and Methodology Used as a Basis for the 2020 Safe Yield Reset. Letter Report Submitted to John Schatz on April 23, 2020.

Comment 2

As part of the annual data collection and evaluation process, collected and derived datasets that are direct inputs to the CVM should be statistically evaluated to better understand the characteristics of the data set, including trend and deviations from the predicted data that were used in the evaluation of the Safe Yield.

Response:
We believe that the analyses presented in the current report are sufficient to satisfy the objectives of the 2017 Court Order. We respectfully request descriptions of any additional statistical analyses that you recommend and how the analyses will be interpreted compared to the objectives of the 2017 Court Order.

Comment 3

Explanations of the methods used to derive CVM inputs from collected data should be provided.

Response:
An explanation of how the data are used in the CVM is in the first subsection of each Chapter. In response to this comment and comment 2 from the Cucamonga Valley Water District, Chapter 4 has been revised to include more detail on the calculation of urban outdoor water use.

Comment 4

The effect that varying issues such as economic growth or recession, government policies, and climate change have on CVM inputs such as land use, irrigation, etc. should be identified along with resulting deviations from predicted inputs used for Safe Yield evaluations.

Response:
The report includes a qualitative discussion of the effects of these issues on the cultural conditions and the water budget of the Chino Basin. The effects of these issues are difficult to quantify, and a more detailed explanation of the effect of these issues on the Chino Basin cultural conditions is beyond the scope of this investigation. If other Parties feel strongly about including the requested analysis and explanation, we will consider augmenting the report.

Comment 5

An estimate of system losses from regional water infrastructure should be provided and used as recharge in the CVM.

Response:
Please refer to our response to the Appropriative Pool's comment 2 above.

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