WEST VALLEY WATER DISTRICT
855 W. Base Line Road Rialto, CA 92376
PH: (909) 875-1804   FAX: (909) 875-1849

FINANCE COMMITTEE MEETING AGENDA

WEDNESDAY, MAY 13TH, 2020 - 1:00 PM

NOTICE IS HEREBY GIVEN that West Valley Water District has called a meeting of the Finance Committee to meet in the Administrative Conference Room, 855 W. Base Line Road, Rialto, CA 92376.

Teleconference Notice: In an effort to prevent the spread of COVID-19 (Coronavirus), and in accordance with the Governor's Executive Order N-29-20 and the order of the County of San Bernardino dated March 17, 2020, there will be no public location for attending this Committee Meeting in person. Members of the public may listen and provide public comment via telephone by calling the following number and access code: Dial: (888) 475-4499, Access Code: 807-977-6383. Public comment may also be submitted via email to nfarooqi@wvwd.org.

If you require additional assistance, please contact the Public Affairs Manager at (909) 820-3702 or email nfarooqi@wvwd.org.

BOARD OF DIRECTORS

Director Dr. Clifford Young (Chair)
Director Dr. Michael Taylor

1. CONVENE MEETING

2. PUBLIC PARTICIPATION

The public may address the Board on matters within its jurisdiction. Speakers are requested to keep their comments to no more than three (3) minutes. However, the Board of Directors is prohibited by State Law to take action on items not included on the printed agenda.

3. DISCUSSION ITEMS

A. Status Report From Clifton Larson Allen, Outside Treasurer

B. General Updates To Finance Committee

C. Status of Recruitment for Accounting Specialist (Payroll)

D. Update: Response to SCO's Draft Report

E. Status of RFP for CAFR

F. Status on FY 20-21 Budget Preparation

G. Adopt 2020 Water Facilities Master Plan and 5-Year Capital Improvement Program.

H. Consider an Agreement for Professional Services and Task Order No. 1 with GHD Inc. for Professional Engineering Services for the 16MGD Oliver P. Roemer Water Filtration Facility Expansion Project.

I. Consider a Reimbursement Agreement with the Lytle Development Company for Construction of a 30-inch Transmission Pipeline.

J. Update: Fiscal Impact of SBBA Groundwater Council Agreement

K. Update: Lytle Creek Groundwater Replenishment Program Feasibility Study

L. Update: Fiscal Impact of Rialto-Colton Basin Groundwater Council Agreement

M. Update: Fiscal Impact of Cactus Basin Water Spreading Agreement

4. ADJOURN

DECLARATION OF POSTING:

I declare under penalty of perjury, that I am employed by the West Valley Water District and posted the foregoing Finance Committee meeting Agenda at the District Offices on May 8th, 2020.

M. Mesa

Maisha Mesa, Executive Assistant

BOARD OF DIRECTORS
FINANCE COMMITTEE
STAFF REPORT

DATE: May 13, 2020

TO: Finance Committee

FROM: Clarence Mansell Jr., General Manager

SUBJECT: ADOPT 2020 WATER FACILITIES MASTER PLAN AND 5-YEAR CAPITAL IMPROVEMENT PROGRAM

BACKGROUND:

The purpose of a Water Facilities Master Plan ("Plan") is to determine the future water demands and supply requirements, and to identify the water facilities needed to produce, deliver, store and transport that supply to West Valley Water District's ("District") customers. The facilities are evaluated based on the projected highest water usage day when the District's service area is fully developed or built out. The Plan is a living document that is generally updated every five years.

The Akel Engineering Group, Inc. is the consultant that updated the Plan. In support of their planning effort, they created and calibrated a hydraulic water model of the District's distribution system utilizing existing Geographic Information System ("GIS") data provided by the District. Existing customer water demands were provided to the consultant and were geographically distributed within the model according to service addresses to enable them to perform an extended period simulation of the system.

Pipeline sizes were evaluated for their ability to convey flows, reservoirs were evaluated for storage adequacy by pressure zone and pump stations were evaluated on their ability to boost required flows. This evaluation was performed for both the existing facilities within the distribution system and for future demands to ensure that recommended facilities are sufficiently sized. Future water demands were distributed according to undeveloped areas within the District's service area, their projected land use based on the latest General Plans of the Cities and County areas and by updated water unit factors.

DISCUSSION:

Attached for your review, approval and eventual adoption is the draft 2020 Water Facilities Master Plan and 5-Year Capital Improvement Program (Exhibit A). The following are highlights of the Plan:

- The water demand projections used for ultimate build-out of the District are based on land uses from the latest General Plan Land Use maps from the Cities of Rialto, Fontana, Colton and Counties of San Bernardino and Riverside. Actual consumption data for the various land uses were extracted from District billing information and used to project future water demands. As a result, future water demands are lower than those projected in the previous Water Master Plan.

- The calculated water use rate per Equivalent Dwelling Unit (EDU) is 670 gallons per day (gpd). This usage reflects a decrease in consumption from the previous Water Master Plan, which utilized 750 gpd per EDU. Future demands are expected to decrease based upon water conservation programs employed by the District, by regional incentive programs, water conserving fixtures/appliances, Green Building Codes, new ordinances/laws, and general education of the public.

- The projected development within the District will require a large investment in new infrastructure. This study analyzes this future development and identifies the facilities needed to serve it. Residential lands are currently built to 59 percent of the proposed land use capacity, while non-residential lands are developed to 75 percent of the proposed capacity. Thus, approximately 66 percent of the overall land is built out.

- Future water supplies will include additional groundwater, State Water Project water and purchased groundwater. This will require the District to drill additional wells, expand treatment capabilities at the Oliver P. Roemer Water Filtration Facility, install wellhead treatment, and enter into additional agreements for purchased groundwater supplies.

- A 5-year and a long-term (build-out) Capital Improvement Program ("CIP") was prepared to address recommended projects to support future growth. The 5-year CIP cost summary can be found in table ES.1 and the identified projects with costs and improvement phasing can be found in Table 8.7.

The Plan will enable the District to strategize planning and budgeting efforts and to implement water system improvements that will maintain a high level of distribution reliability and efficiency for current demands, future growth, and emergency situations.

Per Government Code Section 65403 the District has provided a copy of the Draft 2020 Water Facilities Master Plan and 5-year CIP to the planning agencies of each affected city and county within the District's jurisdiction for review as to its consistency with their general plan. No comments have been received.

FISCAL IMPACT:

No fiscal impact.

STAFF RECOMMENDATION:

It is recommended that the Finance Committee approve the Final Draft of the 2020 Water Facilities Master Plan and have this item considered by the full Board of Directors at a future meeting.

Respectfully Submitted,

Clarence C. Mansell Jr.

Clarence Mansell Jr, General Manager

LJ:mm

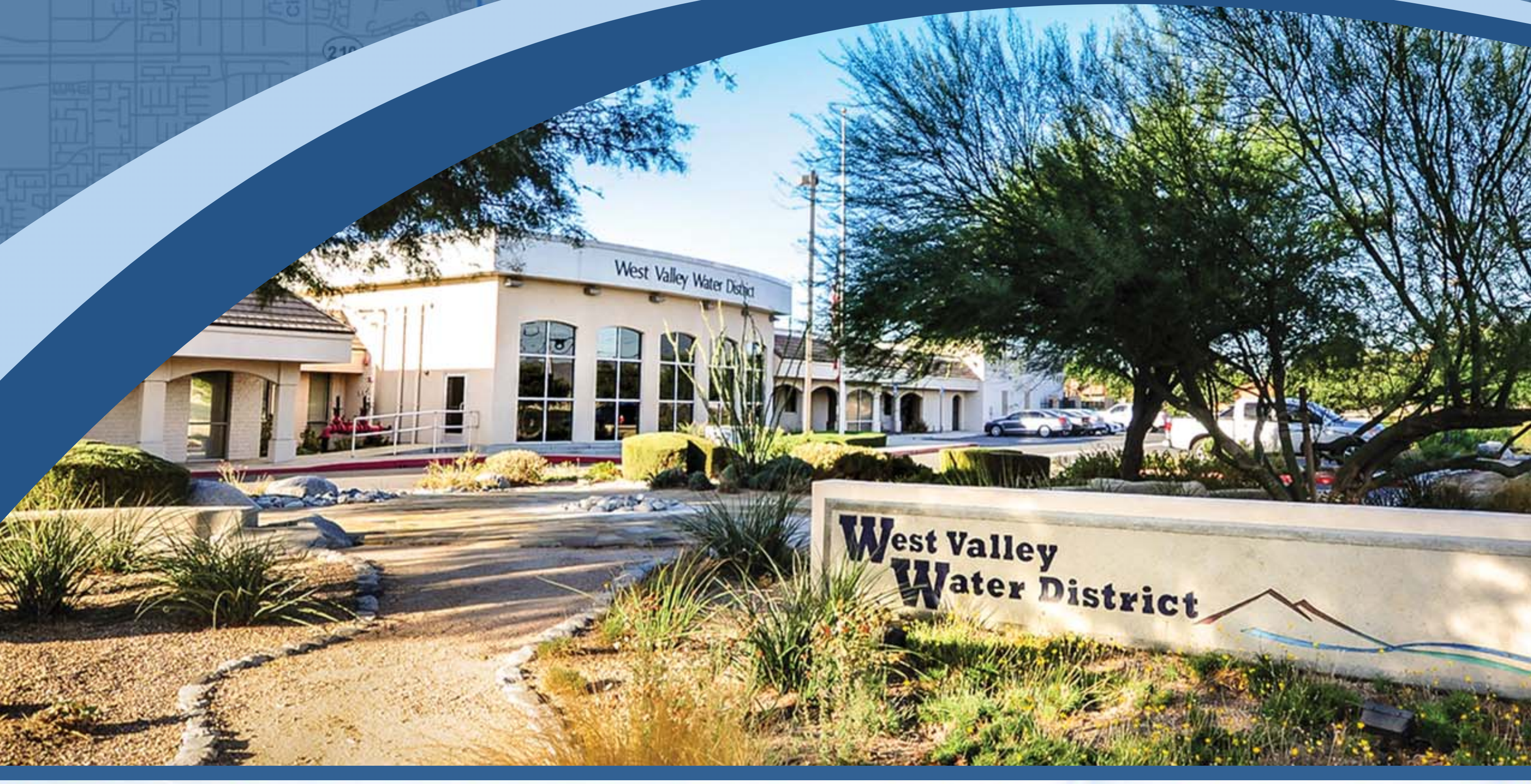
ATTACHMENT(S):

1. Exhibit A - Draft Final 2020 Water Facilities Master Plan

EXHIBIT A

West Valley Water District

FINAL DRAFT



April 2020

Water Facilities Master Plan

AKEL
ENGINEERING GROUP, INC.

WEST VALLEY WATER DISTRICT

2020

WATER FACILITIES MASTER PLAN

Final Draft (Revised)

April 2020

AKEL ENGINEERING GROUP, INC.

AKEL ENGINEERING GROUP, INC.

Smart Planning Our Water Resources

April 30, 2020

West Valley Water District
855 W. Baseline Road
Rialto, CA 92377

Attention: Linda Jadeski
Engineering Services Manager

Subject: 2020 Water Facilities Master Plan – Final Draft Report

Dear Linda:

We are pleased to submit this final draft report for the West Valley Water District Water Facilities Master Plan. This master plan is a standalone document intended to plan the orderly and phased growth of the water system. The master plan documents the following:

- Existing distribution system facilities, acceptable hydraulic performance criteria, and projected water demands
- Development and calibration of the District's GIS-based hydraulic water model.
- Capacity evaluation of the existing water system with improvements to mitigate existing deficiencies and to accommodate future growth.
- Capital Improvement Program (CIP) with an opinion of probable construction costs and suggestions for cost allocations to meet AB 1600.
- Potable water supply and regulations completed by Kleinfelder, Inc.

We extend our thanks to you, and other District staff whose courtesy and cooperation were valuable components in completing this study.

Sincerely,

AKEL ENGINEERING GROUP, INC.

Tony Akel, P.E.
Principal

Enclosure: Report

7433 N. FIRST STREET, SUITE 103 • FRESNO, CALIFORNIA 93720 • (559) 436-0600 • FAX (559) 436-0622
www.akeleng.com

Acknowledgements

Board of Directors

Mr. Channing Hawkins, President

Mr. Kyle Crowther, Vice President

Mr. Michael Taylor

Dr. Clifford O. Young, Sr.

Mr. Greg Young

District Staff

Mr. Clarence Mansell, Jr, General Manager

Ms. Linda Jadeski, Engineering Services Manager

Ms. Joanne Chan, Operations Manager

Mr. Joe Schaack, Production Supervisor

Other District Engineering and Operations Staff

West Valley Water District
Water Facilities Master Plan

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Appendices

EXECUTIVE SUMMARY

The purpose of this Water Facilities Master Plan is to determine the future water demands and supply requirements for West Valley Water District (District) and to identify the water facilities needed to produce, deliver, store and transport this supply to its customers. The facilities are based on the projected highest water usage day, when the District is fully developed.

This executive summary presents a brief background of the District's water distribution system, the planning area characteristics, the system performance and design criteria, the hydraulic model, and a capital improvement program. A hydraulic model of the District's existing water distribution system was created and used to evaluate the capacity adequacy of the existing distribution system and to recommend improvements to mitigate existing deficiencies, as well as servicing future growth.

The highlights of this Water Facilities Master Plan are listed as follows:

1. The water demand projections used for ultimate build-out of the District are based on land uses from the latest General Plan Land Use maps from the Cities of Rialto, Fontana, Colton and Counties of San Bernardino and Riverside. Actual consumption data for the various land uses were extracted from District billing information and used to project future water demands. As a result, future water demands are lower than those projected in the previous Water Master Plan.
2. The calculated water use rate per Equivalent Dwelling Unit (EDU) is 670 gallons per day (gpd). This usage reflects a decrease in consumption from the previous Water Master Plan, which utilized 750 gpd per EDU. Future demands are expected to decrease based upon water conservation programs employed by the District, by regional incentive programs, water conserving fixtures/appliances, Green Building Codes, new ordinances/laws, and general education of the public.
3. The projected development within the District will require a large investment in new infrastructure. This study analyzes this future development and identifies the facilities needed to serve it. Residential lands are currently built to 59 percent of the proposed land use capacity, while non-residential lands are developed to 75 percent of the proposed capacity. Thus, approximately 66 percent of the overall land use plan is built out.
4. Future water supplies will include additional groundwater, State Water Project (SWP) water and purchased groundwater. This will require the District to drill additional wells, expand treatment capabilities at the Oliver P. Roemer Water Filtration Facility (WFF), install wellhead treatment, and enter into additional agreements for purchased groundwater supplies.

5. To meet the ultimate peak day water demands, the District will have to expand treatment capabilities at the Oliver P. Roemer Water Filtration Facility (WFF) to maximize the use of State Water Project (SWP) water, drill new wells in the Bunker Hill groundwater basin and construct the reservoirs and pump stations needed to support these wells. The following 5-year Capital Improvement Projects are recommended:
    - Construct the expansion of the Oliver P. Roemer Water Filtration Facility.
    - Drilling four new wells in the Bunker Hill Basin.
    - Install wellhead treatment or create blending plans for existing wells.
    - Construct Reservoir R8-3.
    - Construct Booster Pump Station 4-3, 7-2 and a new Bunker Hill pump station.
    - Construct new transmission pipelines and replace aging pipelines.
    - Acquire property for needed facilities.

ES.1 STUDY OBJECTIVES

The District recognizes the importance of planning, developing, and financing the District's water system infrastructure. As such, District staff initiated an update to the Water Facilities Master Plan, most recently completed in 2012. This master plan included the following tasks:

- Summarizing the District's existing domestic water system facilities
- Documenting growth planning assumptions and known future developments
- Updating the domestic water system performance criteria
- Projecting future domestic water demands
- Creating and calibrating a new hydraulic model using Geographic Information Systems (GIS) data
- Evaluating the domestic water facilities to meet existing and projected demand requirements and fire flows
- Evaluating the existing groundwater conditions
- Performing a capacity analysis for major distribution mains
- Performing a fire flow analysis
- Recommending a capital improvement program (CIP) with an opinion of probable costs for 5-year and buildout growth
- Performing a capacity allocation analysis for cost sharing purposes

ES.2 STUDY AREA

The District provides domestic water service to customers throughout southwestern San Bernardino County and a small portion of northern Riverside County, as part of the greater San Bernardino-Riverside-Ontario metropolitan area. The service area, approximately 50 miles east of downtown Los Angeles, is generally bounded by U.S. Forest Service land to the north and Riverside County to the south, with the cities of San Bernardino and Colton serving as the eastern boundaries and the City of Fontana as the western boundary (**Figure ES.1**). The District Sphere of Influence encompass 18,076 acres, serving over 80,000 residents.

ES.3 SYSTEM PERFORMANCE AND DESIGN CRITERIA

This report documents the District's performance and design criteria that were used for evaluating the domestic water system. The system performance and design criteria are used to establish guidelines for determining future water demands, evaluating existing domestic water facilities, and for sizing future facilities. Chapter 3 discusses the system performance and design criteria for the domestic water system.

ES.4 EXISTING WATER SYSTEM OVERVIEW

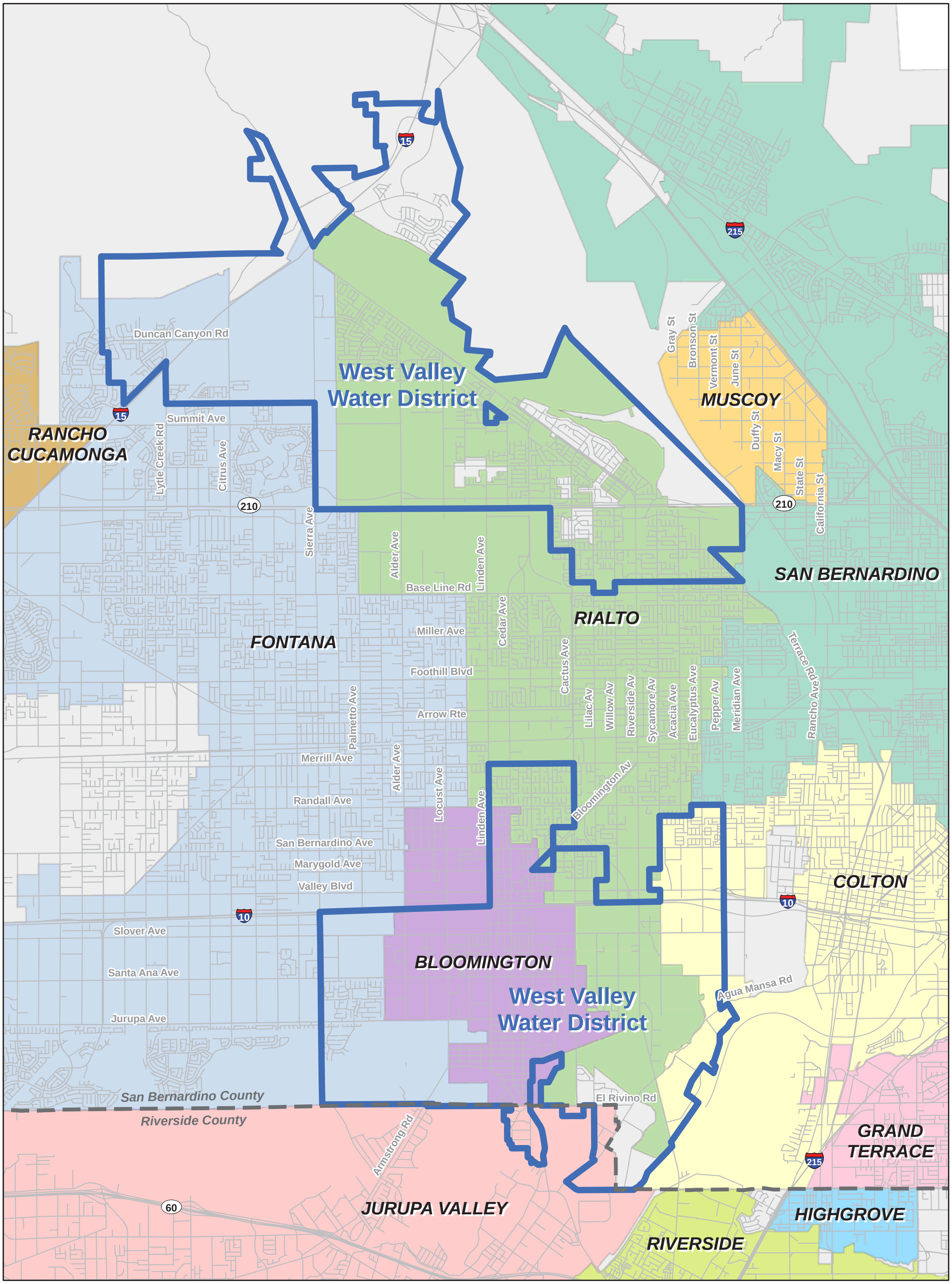
The District utilizes multiple sources of drinking water supply to serve its existing customers. The water distribution system is generally divided into two sections, commonly referred to as the North System and the South System. The existing water distribution is shown graphically on **Figure ES.2**, with a general color coding for the distribution mains as well as labeling the existing booster stations, valve stations, storage reservoirs, and supply facilities. Booster stations and valve stations are used to convey water between the District's multiple pressure zones, with storage tanks providing additional water supply for operational and emergency purposes.

ES.5 EXISTING AND FUTURE DOMESTIC WATER DEMANDS

The existing water demands used for this master plan were based on the District's water billing consumption records and adjusted to match the annual production records and account for system loss. Additionally, future demands were developed based on known development expected to occur within the next five years as well as the expected buildout development identified by the counties of San Bernardino and Riverside.

ES.6 WATER SUPPLY PLANNING

In order to meet the existing domestic water demands the District utilizes several sources of supply, including groundwater and treated surface water. The District's existing wells extract groundwater from one of the following groundwater basins: Lytle Creek Basin, Bunker Hill Basin, Rialto-Colton Basin, Chino Basin, and Riverside-Arlington Basin. The District also treats the following two sources of surface water at the Oliver P. Roemer Water Filtration Facility (Roemer Water Filtration Facility): Lytle Creek and State Water Project.



Legend

- WVWD Service Area
- County Boundaries
- Street Centerlines

City Boundaries

- Bloomington
- Colton
- Fontana
- Grand Terrace
- Highgrove
- Jurupa Valley
- Muscoy
- Rancho Cucamonga
- Rialto
- Riverside
- San Bernardino
- Unincorporated Area

PRELIMINARY

AKEL ENGINEERING GROUP, INC.

Updated: September 29, 2017

0 0.25 0.5 1 Mile

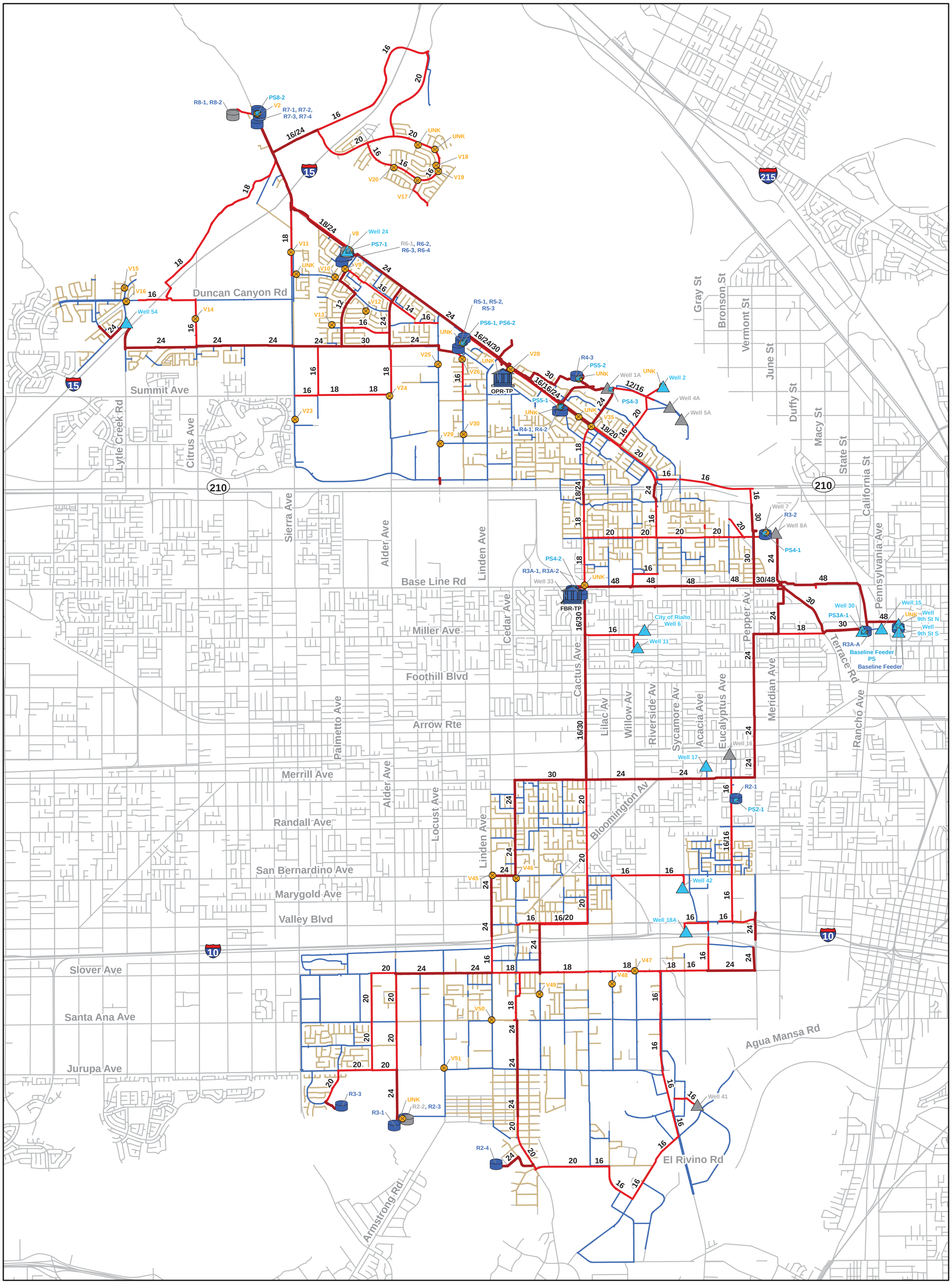
N W E S

File Path: P:\xGIS\GIS_Projects\West Valley WD\WVWD_ES-1_SA-Cities_092917.mxd

ES.1
WVWD Service Area and Surrounding Cities

Water Facilities Master Plan
West Valley Water District

West Valley Water District



Legend

Existing System

- WTP
- Tanks
- Inactive Tanks
- Active Wells
- Inactive Wells
- Pumps
- Valves

Pipes by Diameter

- 8" and Smaller
- 10" - 12"
- 16" - 20"
- 24" - 48"
- Street Centerlines

PRELIMINARY

Updated: March 13, 2019

0 0.25 0.5 1 Mile

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AKEL ENGINEERING GROUP, INC.

ES.2 Existing Water Distribution System

Water Facilities Master Plan
West Valley Water District

West Valley Water District

In order to meet the growing demand requirements of the District service area and provide additional water supply reliability, the existing water supply capacity will require expansion; this expansion is planned to include the rehabilitation of existing groundwater wells, the construction of new groundwater wells, and the expansion of the Roemer Water Filtration Facility.

ES.7 HYDRAULIC MODEL DEVELOPMENT

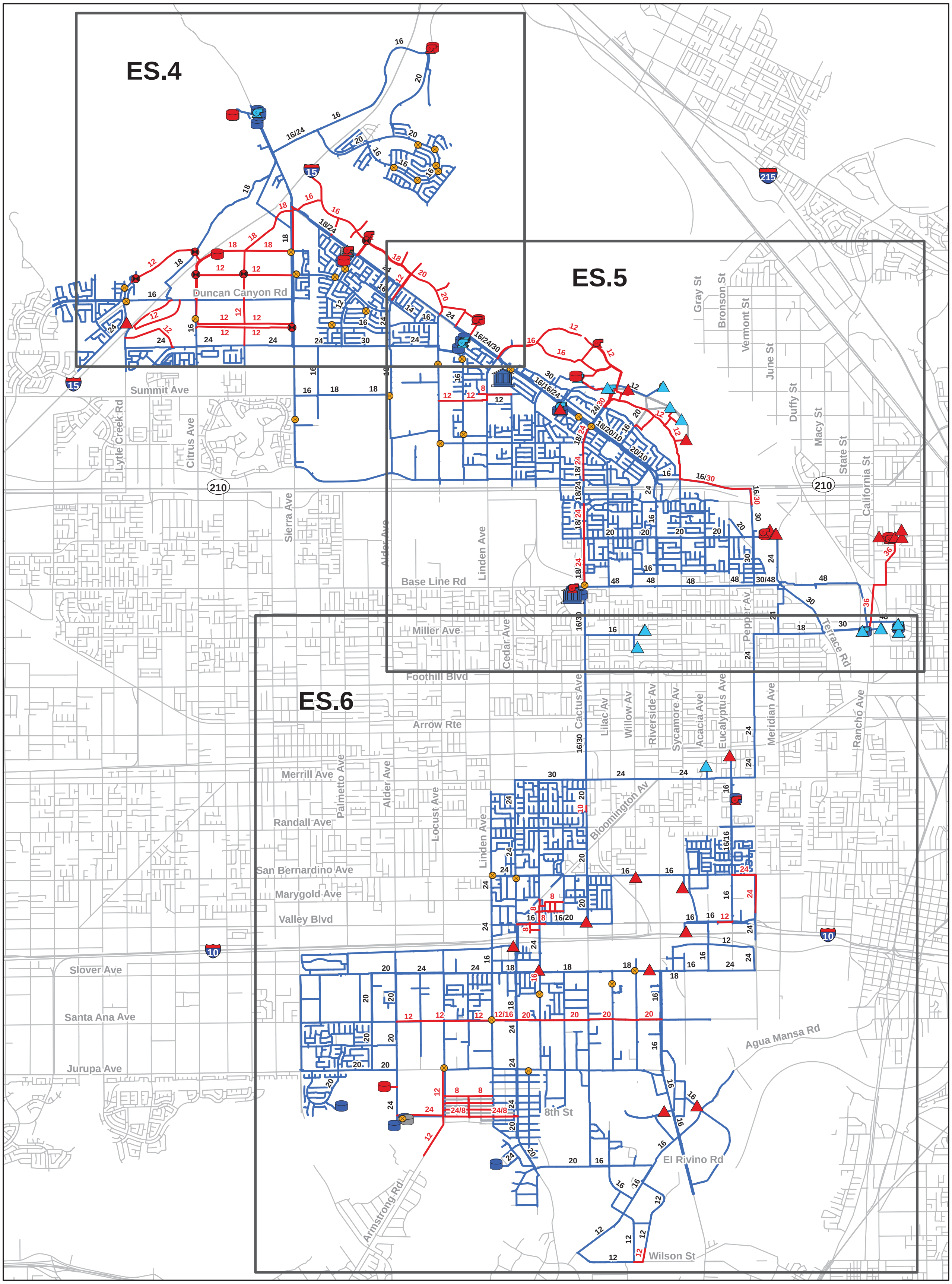
Hydraulic network analysis has become an effective and powerful tool in many aspects of water distribution planning, design, operation, management, emergency response planning, system reliability analysis, fire flow analysis, and water quality evaluations. As a part of this master plan a new hydraulic model was developed for the District's water distribution system, combining information on the physical characteristics of the water system (pipelines, groundwater wells, valves, booster stations, and storage reservoirs) and operational characteristics (how they operate). The hydraulic model development process included a thorough verification and calibration process with District staff to ensure the water model was consistent with the existing water distribution system and provided results consistent with real-world conditions.

ES.8 EXISTING SYSTEM EVALUATION

The District's master plan included a hydraulic evaluation of the District's existing water distribution system. This hydraulic evaluation included analyzing the system-wide pressures under various demand conditions comparing the existing storage capacity, booster station capacity, and supply capacity to the required amounts based on the master plan performance criteria. The District's existing system is generally able to meet the system performance criteria under existing conditions. Improvements will be recommended to mitigate the deficiencies identified as part of the evaluation.

ES.9 CAPITAL IMPROVEMENT PROGRAM

The Capital Improvement Program includes improvements consistent with ongoing projects planned by the District as well as improvements recommended for mitigating existing system deficiencies and servicing future growth. **Figure ES.3** through **Figure ES.6** document the recommended improvements. For budgeting purposes, the District included a 5-year improvement prioritization plan, and which is summarized in **Table ES.1**. A more detailed cost summary for the 5-year plan, as well as the buildout improvements, are documented in Chapter 8. As shown on **Table ES.1**, the total cost over the 5-year horizon is approximately 159.1 million dollars.



Legend

System Improvements	Existing System	
Tanks	WTP	Inactive Tanks
Wells	Tanks	Abandoned Pipes
Pumps	Wells	Street Centerlines
Valves	Pumps	
Pipes	Valves	
	Pipes	

PRELIMINARY

ES.3 Future Improvements Keymap

Water Facilities Master Plan
West Valley Water District

West Valley Water District

AKEL ENGINEERING GROUP, INC.

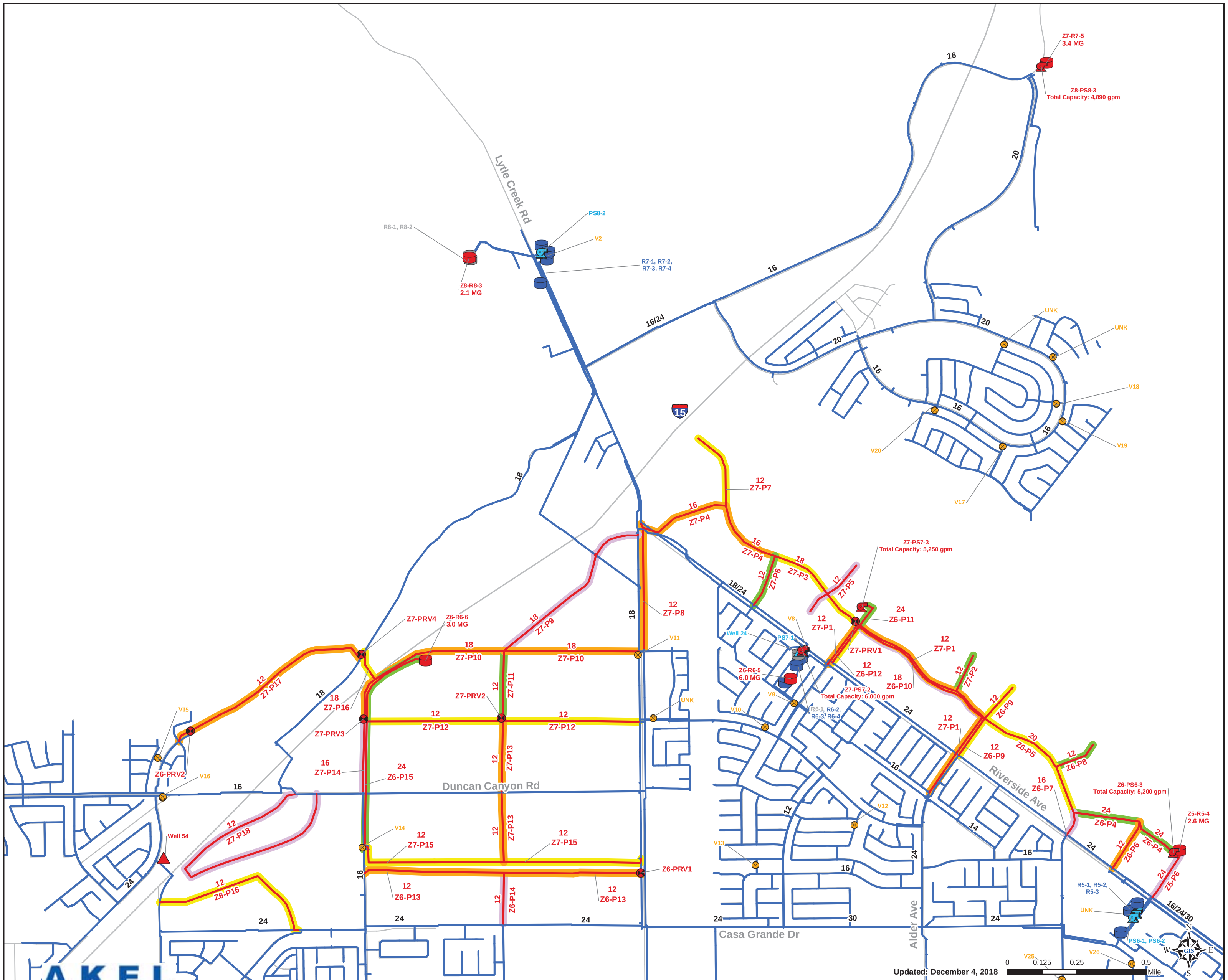
Updated: December 4, 2018

0 0.25 0.5 1 Mile

N W E S

File Path: P:\xGIS\GIS_Projects\West Valley WD\WVWD_ES-3_FutureImprovements_Keymap_120418.mxd

Packet P



Legend

System Improvements

- Tanks
- Wells
- Pumps
- Valves
- Pipes

Existing System

- WTP
- Tanks
- Wells
- Pumps
- Valves
- Pipes
- Inactive Tanks
- Abandoned Pipes
- Street Centerlines

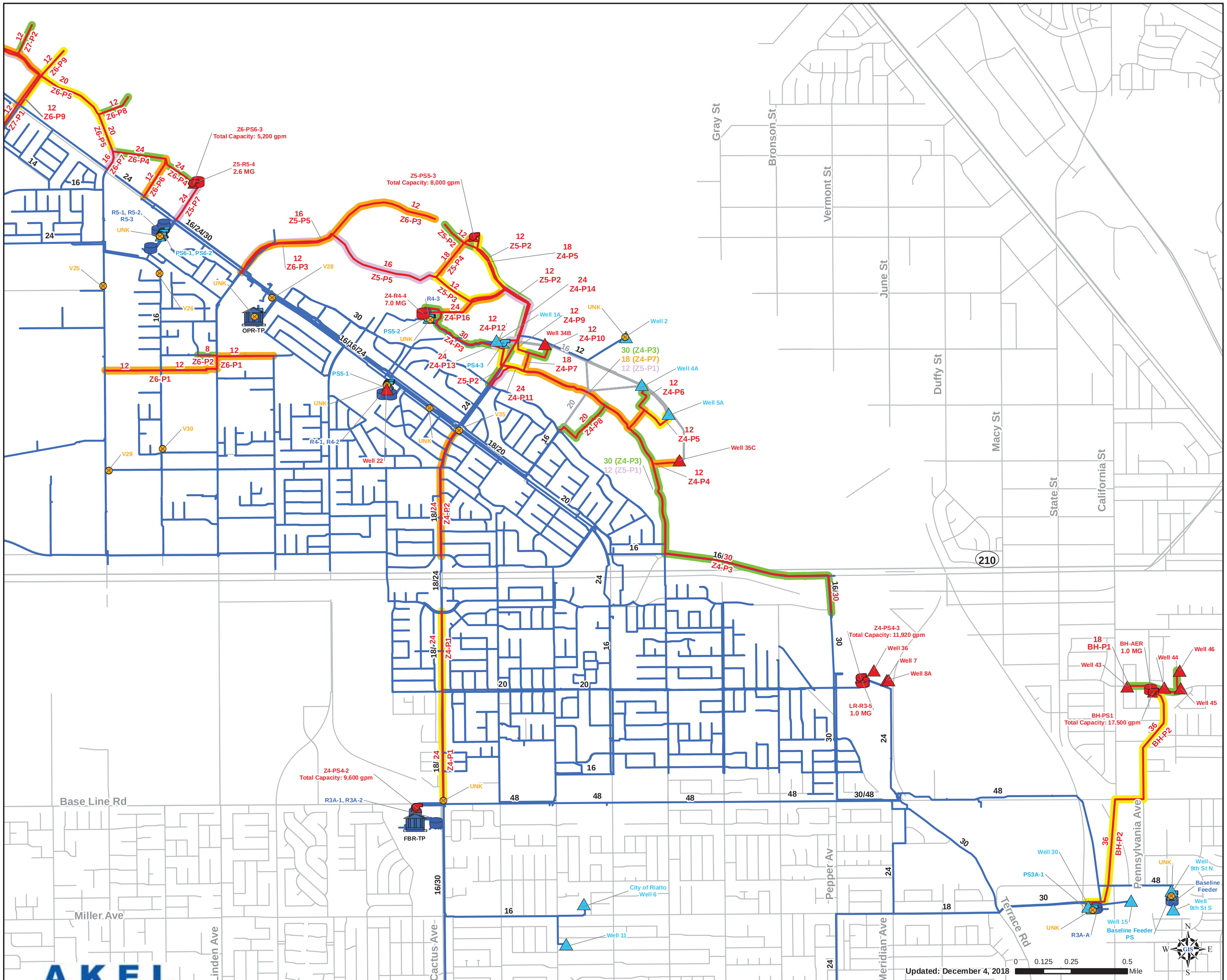
Note:
Pipe highlighting indicates limits of individual segments as identified in the CIP table.

PRELIMINARY

ES.4
Future Improvements

Water Facilities Master Plan
West Valley Water District

West Valley Water District



Legend

System Improvements

- Tanks
- Wells
- Pumps
- Valves
- Pipes

Existing System

- WTP
- Tanks
- Wells
- Pumps
- Valves
- Pipes
- Inactive Tanks
- Abandoned Pipes
- Street Centerlines

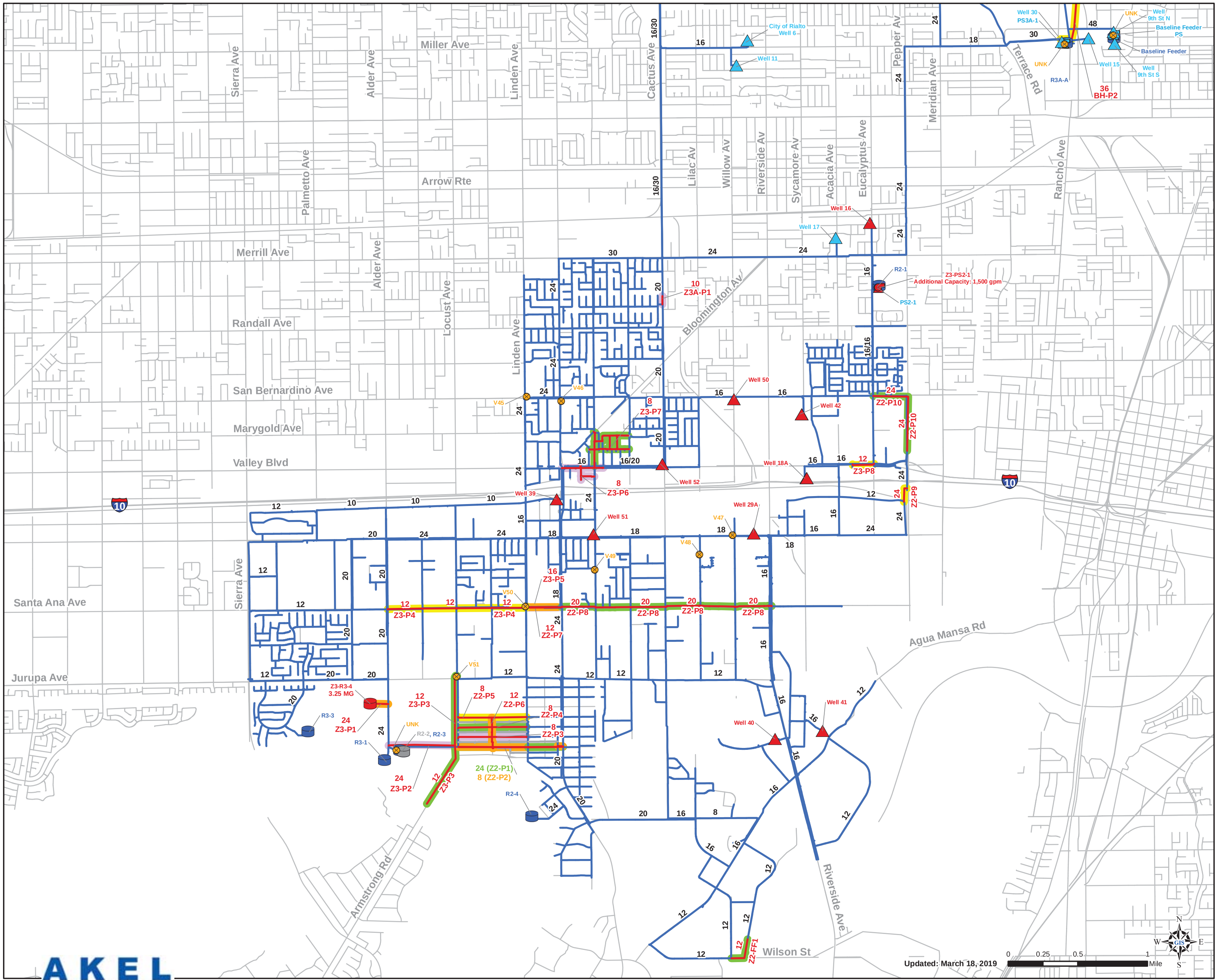
Note:
Pipe highlighting indicates limits of individual segments as identified in the CIP table.

PRELIMINARY

ES.5
Future Improvements

Water Facilities Master Plan
West Valley Water District

West Valley Water District



Legend

System Improvements

- Tanks
- Wells
- Pumps
- Valves
- Pipes

Existing System

- WTP
- Tanks
- Wells
- Pumps
- Valves
- Pipes
- Inactive Tanks
- Abandoned Pipes
- Street Centerlines

Note:
Pipe highlighting indicates limits of individual segments as identified in the CIP table.

PRELIMINARY

ES.6
Future Improvements

Water Facilities Master Plan
West Valley Water District

West Valley Water District

AKEL ENGINEERING GROUP, INC.

Packet P

Table ES.5 5-Year CIP Summary

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Fiscal Year	Existing Users		Future Users		Combined Project Costs	
	Fiscal Year Total ($)	Cumulative Total ($)	Fiscal Year Total ($)	Cumulative Total ($)	Fiscal Year Total ($)	Cumulative Total ($)
2019/20	$14,163,200	$14,163,200	$80,106,920	$80,106,920	$94,270,120	$94,270,120
2020/21	$1,766,000	$15,929,200	$25,858,000	$105,964,920	$27,624,000	$121,894,120
2021/22	$5,364,500	$21,293,700	$3,523,000	$109,487,920	$8,887,500	$130,781,620
2022/23	$6,001,000	$27,294,700	$7,073,000	$116,560,920	$13,074,000	$143,855,620
2023/24	$0	$27,294,700	$6,469,000	$123,029,920	$6,469,000	$150,324,620
Total Improvement Cost		**$27,294,700**		**$123,029,920**		**$150,324,620**

AKEL ENGINEERING GROUP, INC.

4/30/2020

CHAPTER 1 - INTRODUCTION

This chapter provides a brief background of the District's domestic water system, the need for this master plan, and the objectives of the study. Abbreviations and definitions are also provided in this chapter.

1.1 BACKGROUND

The West Valley Water District (District) provides domestic water service to customers throughout southwestern San Bernardino County and a small portion of northern Riverside County, as part of the greater San Bernardino-Riverside-Ontario metropolitan area. The service area, approximately 50 miles east of downtown Los Angeles, generally includes the cities of Fontana, Rialto, Colton, Jurupa Valley, Bloomington, and other unincorporated areas of San Bernardino County (**Figure 1.1**). The District provides potable water service to more than 80,000 residents, as well as a myriad of commercial, industrial, and institutional establishments. The District operates a domestic water distribution system that consists of 21 groundwater wells, 25 separate storage reservoirs across eight pressure zones, for a total storage over 72 million gallons (MG), and over 375 miles of transmission and distribution pipelines.

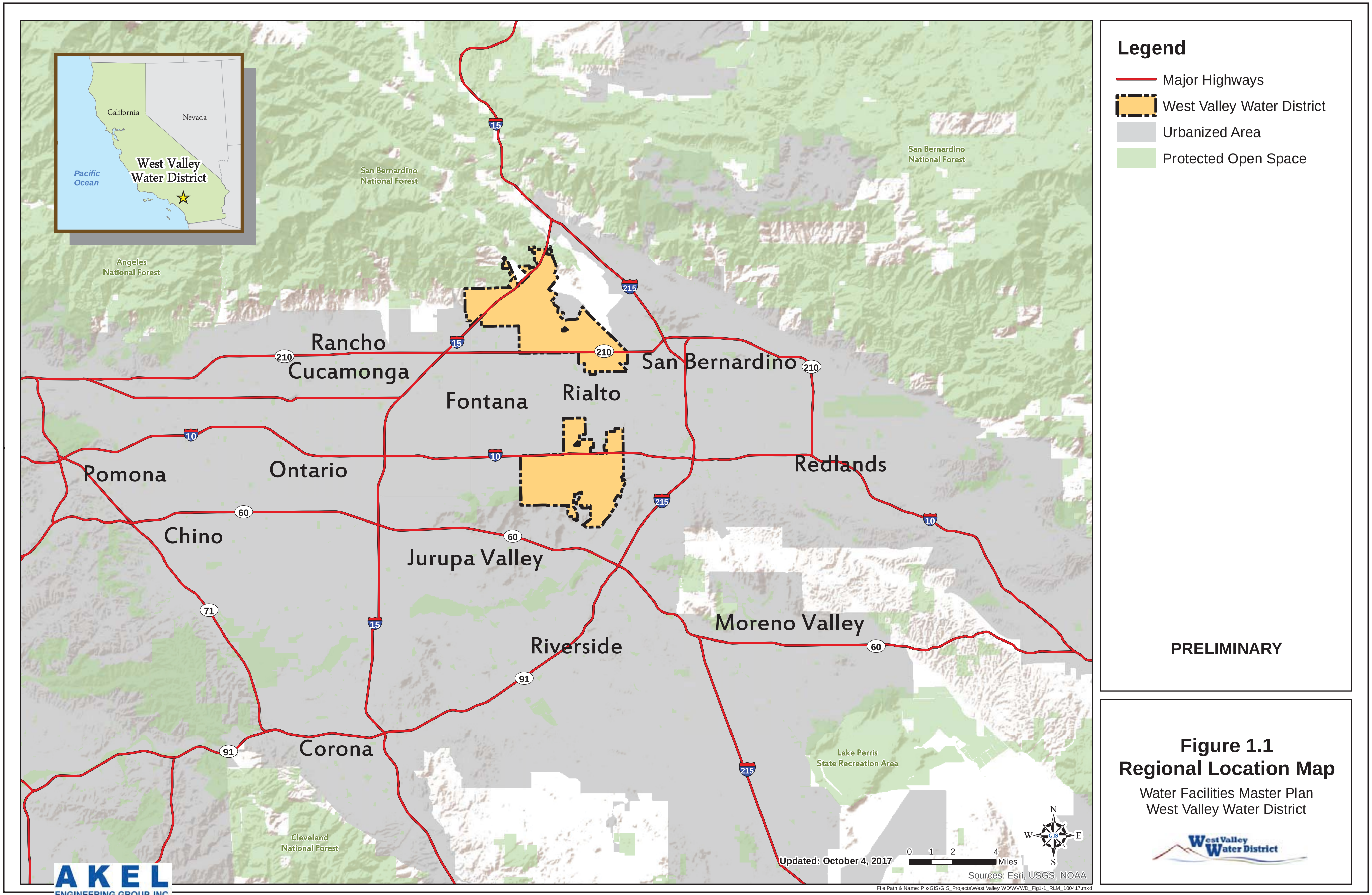
In 2012, the District developed a Water System Master Plan that identified capacity deficiencies in the existing water system and recommended improvements to alleviate existing deficiencies and serve future developments inside the District's service area. Recognizing the importance of planning, developing, and financing system facilities to provide reliable water service to existing customers and for servicing anticipated growth within the service area, the District initiated updating elements of the 2012 Water System Master Plan, to reflect current land use conditions.

1.2 SCOPE OF WORK

The District approved Akel Engineering Group Inc. to prepare this 2020 Water Facilities Master Plan (WFMP) in May of 2017. This 2020 WFMP is intended to serve as a tool for planning and phasing the construction of future domestic water system infrastructure for the projected buildout of the service area. The 2020 WFMP evaluates the District's water system and recommends capacity improvements necessary to service the needs of existing users and for servicing the future growth of the District.

The service area and horizon for the master plan are reflective of the cumulative growth associated with the differing municipalities serviced by the District. Should planning conditions change, and depending on their magnitude, adjustments to the master plan recommendations might be necessary.

This master plan included the following tasks:


West Valley Water District
California
Nevada
Pacific Ocean
San Bernardino National Forest
San Bernardino National Forest
Angeles National Forest
Cleveland National Forest
Lake Perris State Recreation Area
Rancho Cucamonga
Fontana
Rialto
San Bernardino
Redlands
Pomona
Ontario
Chino
Jurupa Valley
Riverside
Moreno Valley
Corona
15
215
210
10
60
71
91
N
E
S
W
0 1 2 4 Miles
Updated: October 4, 2017
Sources: Esri, USGS, NOAA
File Path & Name: P:\xGIS\GIS_Projects\West Valley WD\WVWD_Fig1-1_RLM_100417.mxd
AKEL ENGINEERING GROUP, INC.
Legend
Major Highways
West Valley Water District
Urbanized Area
Protected Open Space
PRELIMINARY
Figure 1.1
Regional Location Map
Water Facilities Master Plan
West Valley Water District
West Valley Water District

Packet P

- Summarizing the District's existing domestic water system facilities
- Documenting growth planning assumptions and known future developments
- Updating the domestic water system performance criteria
- Projecting future domestic water demands
- Creating and calibrating a new hydraulic model using Geographic Information Systems (GIS) data
- Evaluating the domestic water facilities to meet existing and projected demand requirements and fire flows
- Evaluating the existing groundwater conditions
- Performing a capacity analysis and fire flow analysis for distribution mains
- Recommending a capital improvement program (CIP) with an opinion of probable costs for 5-year and buildout growth
- Performing a capacity allocation analysis for cost sharing purposes

1.3 PREVIOUS MASTER PLANS

The District's most recent water master plan was completed in 2012. This master plan included an evaluation of servicing growth throughout the Sphere of Influence, evaluated existing demands and projected future demands, recommended phased improvements as part of a 5 year capital improvement program, and identified pumping and storage requirements for the buildout of the Sphere of Influence.

1.4 RELEVANT REPORTS

The District has completed several special studies intended to evaluate localized growth. These reports were referenced and used during the preparation of 2020 WFMP. The following lists relevant reports that were used in the completion of this master plan, as well as a brief description of each document:

- 2012 Water Master Plan, August 2012. (2012 WMP). This report documents the water demand projection and provides an update to the Capital Improvement Program, through the evaluation of the existing water system.
- 2015 San Bernardino Valley Regional Urban Water Management Plan. The District participated in the 2015 San Bernardino Valley Regional Urban Water Management Plan (RUWMP), which established a benchmark per capita water usage and targets in order to achieve higher levels of water conservation for the sustainability of water supply sources. This included adopting an updated water shortage contingency plan, defining supply sources, addressing supply reliability, and projecting sustainable supply yields and future demands.

- Draft 2017 Lytle Creek Ranch Water Facilities Feasibility Study. This report documents the preliminary water facility requirements for the buildout of the Lytle Creek Ranch Specific Plan. This report includes demand projections for the buildout of the Lytle Creek Ranch development and documents preliminary pipeline alignments as well as pump station and storage reservoir sizes and locations. Additionally, preliminary project costs are documented for the required water facility improvements.

1.5 REPORT ORGANIZATION

The water system master plan report contains the following chapters:

Chapter 1 - Introduction. This chapter provides a brief background of the District's domestic water system, the need for this master plan, and the objectives of the study. Abbreviations and definitions are also provided in this chapter.

Chapter 2 - Planning Areas Characteristics. This chapter presents a discussion of the planning area characteristics for this master plan and defines the land use classifications. The planning area is divided into several planning sub-areas, as established by the various city and county general plans.

Chapter 3 - System Performance and Design Criteria. This chapter presents the District's performance and design criteria, which was used in this analysis for identifying current system capacity deficiencies and for sizing proposed distribution mains, storage reservoirs, pump stations and wells.

Chapter 4 - Existing Domestic Water Facilities. This chapter provides a description of the District's existing domestic water system facilities including the distribution mains, storage reservoir, booster pump stations and the existing wells.

Chapter 5 - Water Demands and Supply Characteristics. This chapter summarizes existing domestic water demands, discussed available supply characteristics, and projects the future domestic water demands.

Chapter 6 - Hydraulic Model Development. This chapter describes the development and calibration of the District's domestic water distribution system hydraulic model. The hydraulic model was used to evaluate the capacity adequacy of the existing system and to plan its expansion to service anticipated future growth.

Chapter 7 - Evaluation and Proposed Improvements. This section presents a summary of the domestic water system evaluation and identifies improvements needed to mitigate existing deficiencies, as well as improvements needed to expand the system and service growth.

Chapter 8 - Capital Improvement Program. This chapter provides a summary of the recommended domestic water system improvements to mitigate existing capacity deficiencies and to accommodate anticipated future growth. The chapter also presents the cost criteria and methodologies for developing the capital improvement program. Finally, a capacity allocation analysis, usually used for cost sharing purposes, is also included.

1.6 ACKNOWLEDGEMENTS

Obtaining the necessary information to successfully complete the analysis presented in this report, and developing the long term strategy for mitigating the existing system deficiencies and for accommodating future growth, was accomplished with the strong commitment and very active input from dedicated team members including:

- Ms. Linda Jadeski, Engineering Services Manager
- Ms. Joanne Chan, Operations Manager
- Mr. Joe Schaack, Production Supervisor

1.7 UNIT CONVERSIONS AND ABBREVIATIONS

Engineering units were used in reporting flow rates and volumes pertaining to the design and operation of various components of the domestic water distribution system. Where it was necessary to report values in smaller or larger quantities, different sets of units were used to describe the same parameter. Values reported in one set of units can be converted to another set of units by applying a multiplication factor. A list of multiplication factors for units used in this report is shown on **Table 1.1**.

Various abbreviations and acronyms were also used in this report to represent relevant water system terminologies and engineering units. A list of abbreviations and acronyms is included in **Table 1.2**.

1.8 GEOGRAPHIC INFORMATION SYSTEMS

This master planning effort made extensive use of Geographic Information Systems (GIS) technology, for completing the following tasks:

- Developing the physical characteristics of the hydraulic model (pipes and junctions, wells, and storage reservoirs)
- Allocating existing water demands, as extracted from the water billing records, and based on each user's physical address.
- Calculating and allocating future water demands, based on future developments water use.
- Extracting ground elevations along the distribution mains from available digital elevation information.
- Generating maps and exhibits used in this master plan.

Table 1.1 Unit Conversions

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Volume Unit Calculations

To Convert From:	To:	Multiply by:
acre feet	gallons	325,851
acre feet	cubic feet	43,560
acre feet	million gallons	0.3259
cubic feet	gallons	7.481
cubic feet	acre feet	2.296×10^{-5}
cubic feet	million gallons	7.481×10^{-6}
gallons	cubic feet	0.1337
gallons	acre feet	3.069×10^{-6}
gallons	million gallons	1,000,000
million gallons	gallons	1×10^{-6}
million gallons	cubic feet	133,672
million gallons	acre feet	3.069

Flow Rate Calculations

To Convert From:	To:	Multiply By:
ac-ft/yr	mgd	8.93×10^{-4}
ac-ft/yr	cfs	1.381×10^{-3}
ac-ft/yr	gpm	0.621
ac-ft/yr	gpd	892.7
cfs	mgd	0.646
cfs	gpm	448.8
cfs	ac-ft/yr	724
cfs	gpd	646300
gpd	mgd	1×10^{-6}
gpd	cfs	1.547×10^{-6}
gpd	gpm	6.944×10^{-4}
gpd	ac-ft/yr	1.12×10^{-3}
gpm	mgd	1.44×10^{-3}
gpm	cfs	2.228×10^{-3}
gpm	ac-ft/yr	1.61
gpm	gpd	1,440
mgd	cfs	1.547
mgd	gpm	694.4
mgd	ac-ft/yr	1,120
mgd	gpd	1,000,000

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Table 1.2 Abbreviations and Acronyms
Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Abbreviation	Expansion	Abbreviation	Expansion
2012 WSMP	2012 Water System Master Plan	gpm	gallons per minute
AACE International	Association for the Advancement of Cost Engineering	hp	horsepower
AC	acre	HGL	hydraulic grade line
ACP	Asbestos Cement Pipe	HWL	high water level
ADD	average day demand	in	inch
AF	Acre Feet	LF	linear feet
Akel	Akel Engineering Group, Inc.	MG	million gallons
CCI	Construction Cost Index	MGD	million gallons per day
CDPH	California Department of Public Health	MMD	maximum month demand
cfs	cubic feet per second	NFPA	National Fire Protection Association
CI	cast iron pipe	PDD	peak day demand
CIB	Capital Improvement Budget	PHD	peak hour demand
CIP	Capital Improvement Program	PRV	pressure reducing valve
DIP	Ductile Iron Pipe	psi	pounds per square inch
District	West Valley Water District	ROW	Right of Way
DU	dwelling unit	SBVMWD	San Bernardino Valley Municipal Water District
EDU	equivalent dwelling unit	SCADA	Supervisory Control and Data Acquisition
ENR	Engineering News Record	SCAG	Southern California Association of Governments
EPA	Environmental Protection Agency	SHGL	Static Hydraulic Gradient Line
EPS	Extended Period Simulation	SS	Steady-State
FBR	Fluidized Bed Reactor	SOI	Sphere of Influence
ft	feet	TBD	to be determined
fps	feet per second	ULL	Urban Limit Line
FY	Fiscal Year	WFF	Oliver P. Roemer Water Filtration Facility
GIS	Geographic Information Systems	WFMP	Water Facilities Master Plan
gpd	gallons per day	WTP	Water Treatment Plant
gpdc	gallons per day per capita		

CHAPTER 2 - PLANNING AREA CHARACTERISTICS

This chapter presents a discussion of the planning area characteristics for this master plan and defines the land use classifications. The planning area is divided into several planning sub-areas, as established by the various city and county general plans.

2.1 STUDY AREA DESCRIPTION

The West Valley Water District provides domestic water service to customers throughout southwestern San Bernardino County and a small portion of northern Riverside County, as part of the greater San Bernardino-Riverside-Ontario metropolitan area. The service area, approximately 50 miles east of downtown Los Angeles, is generally bounded by U.S. Forest Service land to the north and Riverside County to the south, with the cities of San Bernardino and Colton serving as the eastern boundaries and the City of Fontana as the western boundary (**Figure 2.1**). The central portion of the City of Rialto divides the District's service area into a northern system and southern system and is served by the City of Rialto. The additional water agencies serving the areas adjacent to the District service area are summarized on **Figure 2.2**. The District Sphere of Influence encompass 18,076 acres, serving over 80,000 residents.

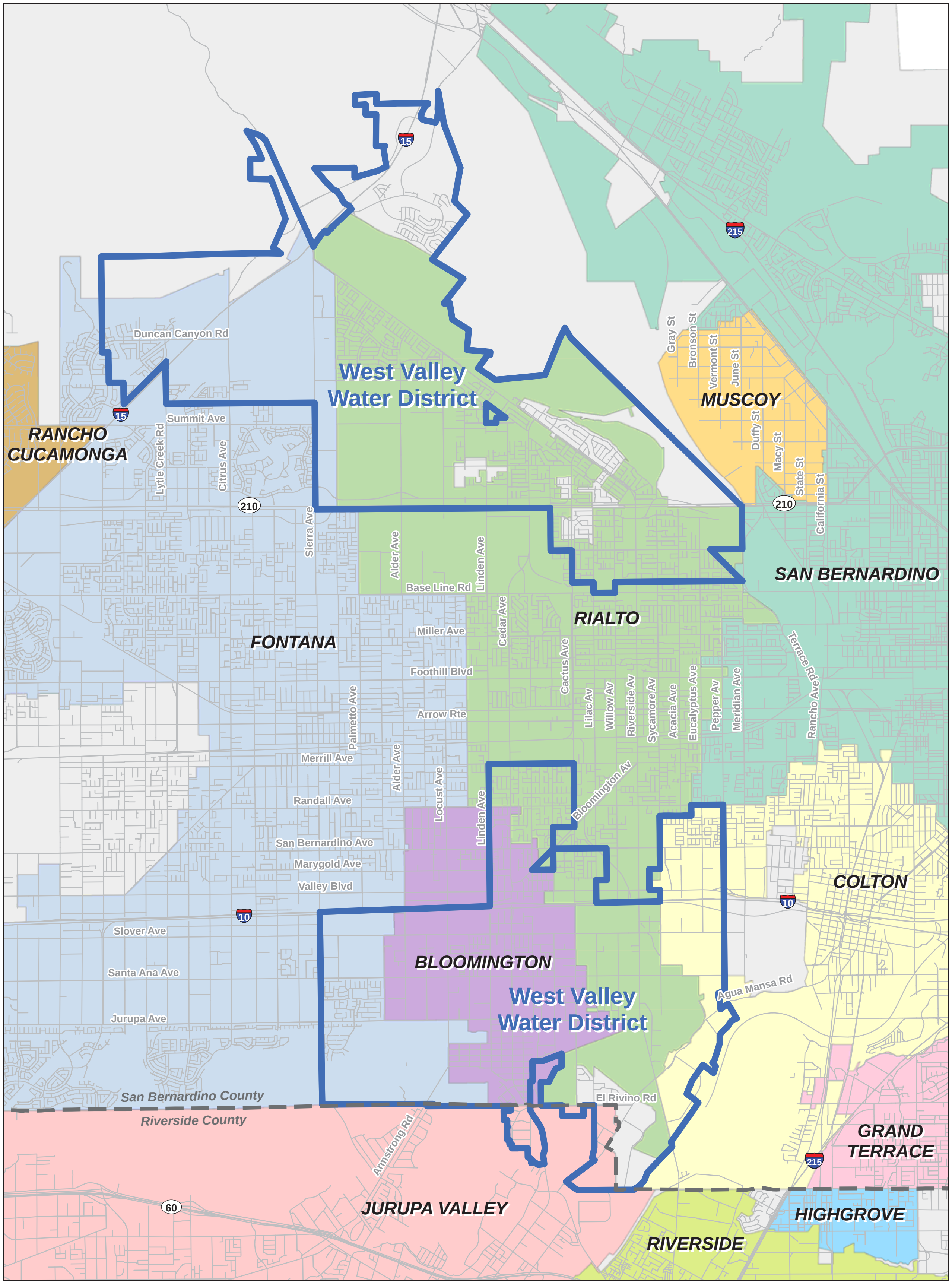
The topography of the service area generally slopes upward from south to north, with service elevations approximately ranging between 900 ft and 2,300 ft. Due to the varying terrain, the service area is divided into eight pressure zones to account for the changes in elevation. Currently, the water demands are met from a combination of groundwater wells and treated surface water. Booster stations and pressure reducing valves (PRVs) convey water from supply sources throughout the individual pressure zones.

2.2 WATER SERVICE AREA AND LAND USE

The existing service area is comprised of approximately 11,500 acres of developed lands and 6,300 acres of undeveloped land that is slated for growth. For planning purposes, this master plan evaluated the existing land use, 5-year growth projections, and buildout of the service area.

2.2.1 Existing Land Use

The existing land use within the District's service area is comprised of a relatively even split between residential and non-residential uses. Residential land uses comprise approximately 5,200 acres and non-residential uses totaling approximately 4,600 acres. Other land uses, including utilities, right of way, landscape irrigation, open space, and undeveloped land, make up the remainder of the service area. The existing land use is documented on **Figure 2.3** and included on **Table 2.1**.



Legend

- WVWD Service Area
- County Boundaries
- Street Centerlines

City Boundaries

- Bloomington
- Colton
- Fontana
- Grand Terrace
- Highgrove
- Jurupa Valley
- Muscoy
- Rancho Cucamonga
- Rialto
- Riverside
- San Bernardino
- Unincorporated Area

PRELIMINARY

Updated: September 29, 2017

0 0.25 0.5 1 Mile

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Figure 2.1
WVWD Service Area and Surrounding Cities

Water Facilities Master Plan
West Valley Water District

West Valley Water District

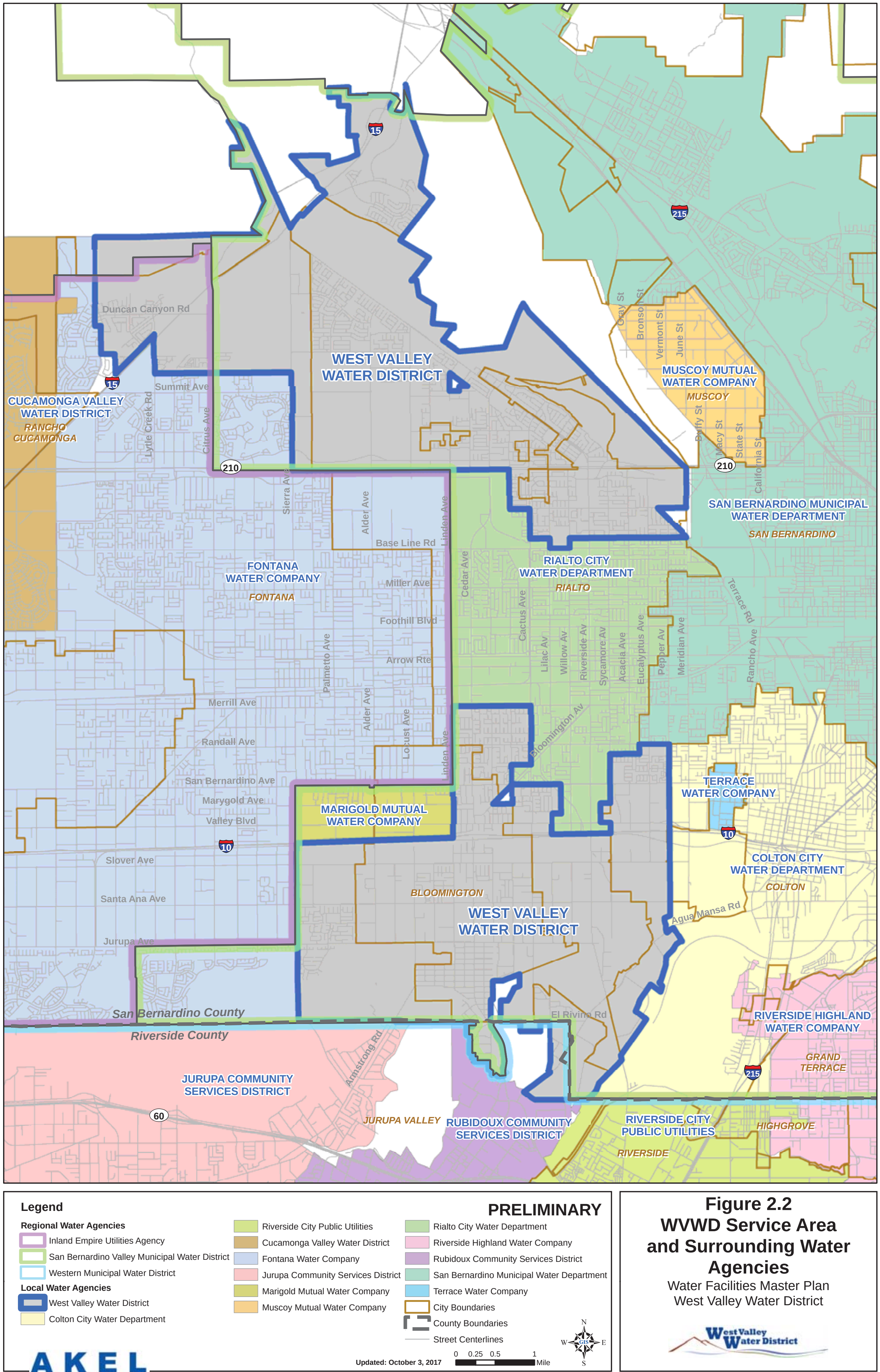

Figure 2.2
WVWD Service Area and Surrounding Water Agencies

Water Facilities Master Plan
West Valley Water District

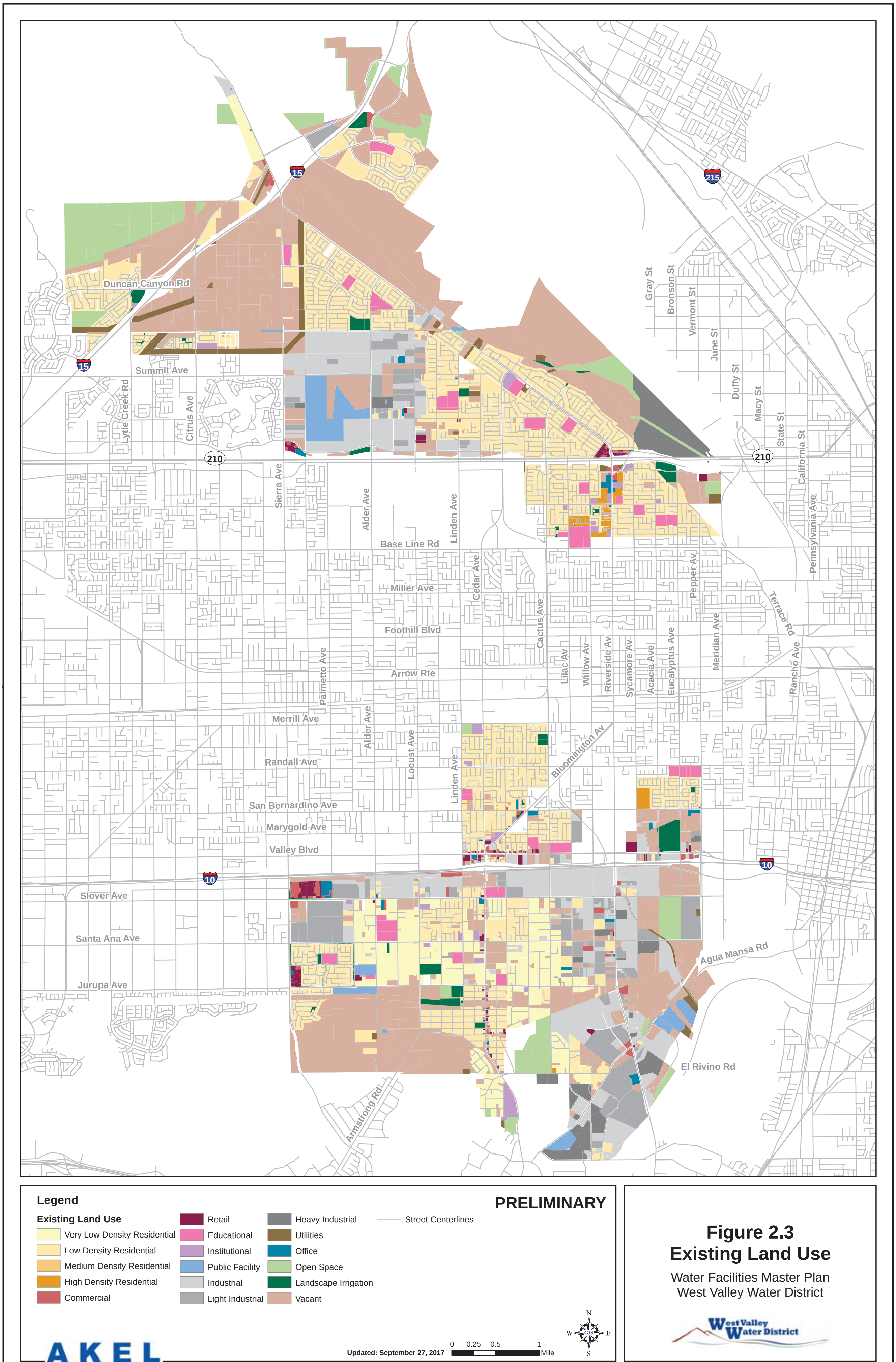

Figure 2.3
Existing Land Use
Water Facilities Master Plan
West Valley Water District

Table 2.1 Existing Service Area Land Use

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Land Use Designation	Existing Land Use within District's Service Area (acres)
Residential	
Residential 2	1,080
Residential 6	4,026
Residential 12	4
Residential 21	87
Subtotal- Residential	**5,196**
Non-Residential	
Commercial	123
Retail	121
Office	72
Educational	373
Institutional	129
Public Facility	324
Light Industrial	1,022
Heavy Industrial	510
Industrial	1,983
Subtotal-Non Residential	**4,657**
Other	
Utilities	293
ROW	110
Landscape Irrigation	238
Open Space	1,755
Vacant-Undeveloped	5,538
Subtotal- Other	**7,934**
Total	
	17,787

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2.2.2 Five Year Growth Projections

As part of this master plan evaluation, 5-year growth is evaluated for the purpose of identifying improvements necessary to serve development occurring in the near future. District staff have identified areas of development expected to occur within the next five years, which are summarized on Table 2.2 and shown graphically on Figure 2.4, and include the following large development projects:

- **Lytle Creek Ranch.** This development is located along the northeast side of the District service area. The 5-year growth projection for Lytle Creek Ranch includes approximately 1,390 equivalent dwelling units across three pressure zones.

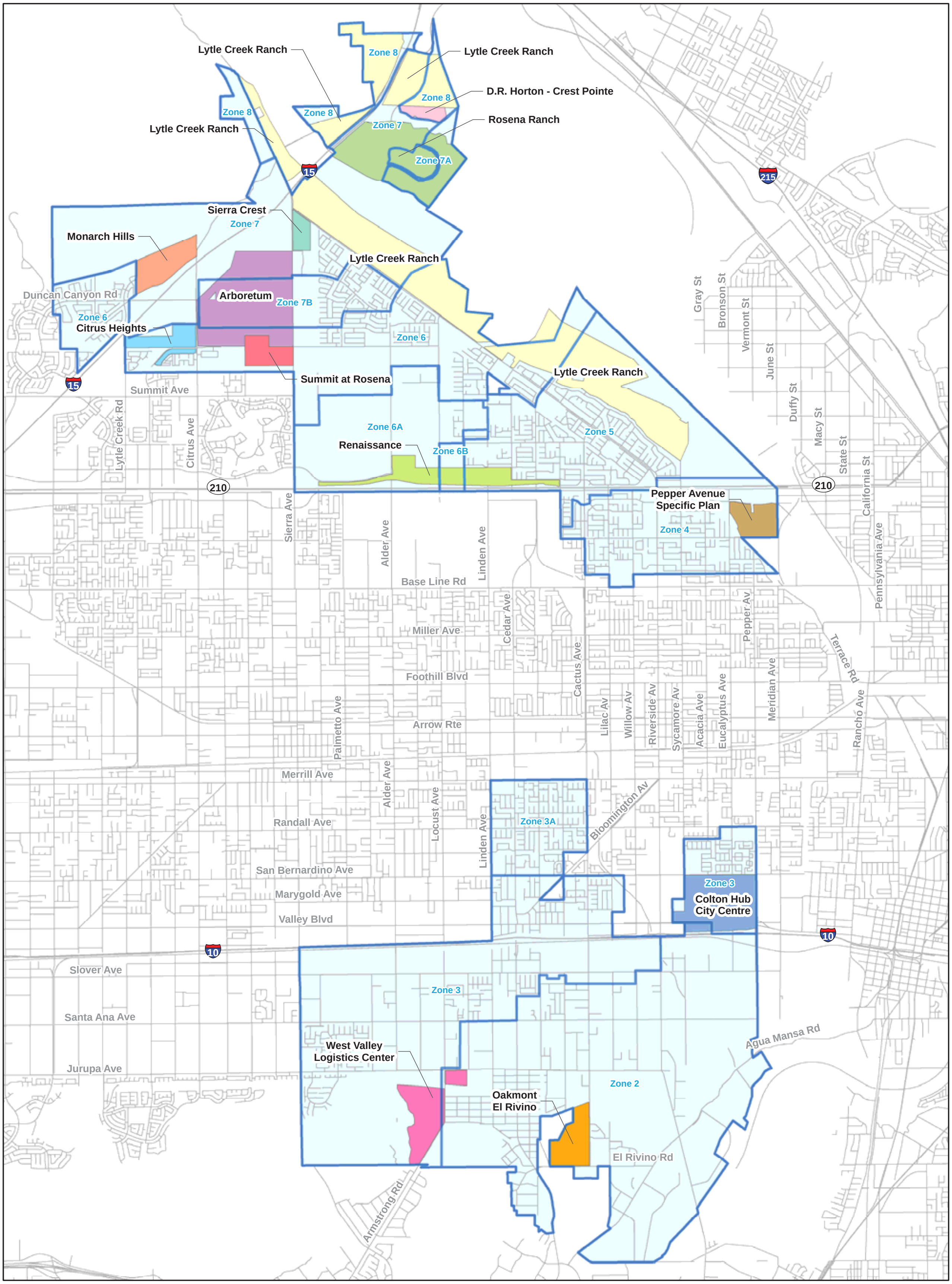
- **Arboretum.** This development is generally located north of Casa Grande Avenue between Sierra Avenue and Citrus Avenue, and south of Segovia Lane. 5-year growth estimates for Arboretum include approximately 1,990 equivalent dwelling units (EDU) in Pressure Zones 6 and 7.

2.2.3 Buildout Growth Projections

Buildout land use of the District service area is documented on Figure 2.5 and inventoried on Table 2.3. The existing and future land use acreages are broken down into the following categories:

- **Existing Development:** These acreages represent existing developed lands.
- **Existing Lands - Redeveloped:** These acreages represent existing developed lands expected to redevelop into other land use types within the buildout horizon of the master plan.
- **Existing Development - Unchanged:** These acreages represent the total existing acreages expected to remain within the buildout horizon of the master plan.
- **New Lands - Redevelopment:** These acreages represent lands that have redeveloped from a prior use and into a new respective category.
- **New Development:** These acreages represent gains from the development of existing vacant lands.

This table includes existing lands, lands planned for redevelopment, and undeveloped lands planned for development. The buildout land use projections include approximately 8,800 acres of residential and 5,900 acres of non-residential uses. These acreages were extracted from shapefiles provided by District staff, which consolidated local general plan land uses. For the purposes of this master plan, land use categories with similar densities were consolidated further for ease of reference.



Legend

Future Major Developments

- Arboretum
- Shady Trails
- Colton Hub City Centre
- D.R. Horton - Crest Pointe
- Lytle Creek Ranch
- Monarch Hills
- Oakmont El Rivino
- Pepper Avenue Specific Plan
- Renaissance
- Rosena Ranch
- Sierra Crest
- Summit at Rosena
- West Valley Logistics Center
- Pressure Zones
- Roads

PRELIMINARY

0 0.25 0.5 1 Mile

N W E S

Updated: April 2, 2018

File Path: P:\xGIS\GIS_Projects\West Valley WD\WVWD_Fig2-4_FutureDevelopments_040218.mxd

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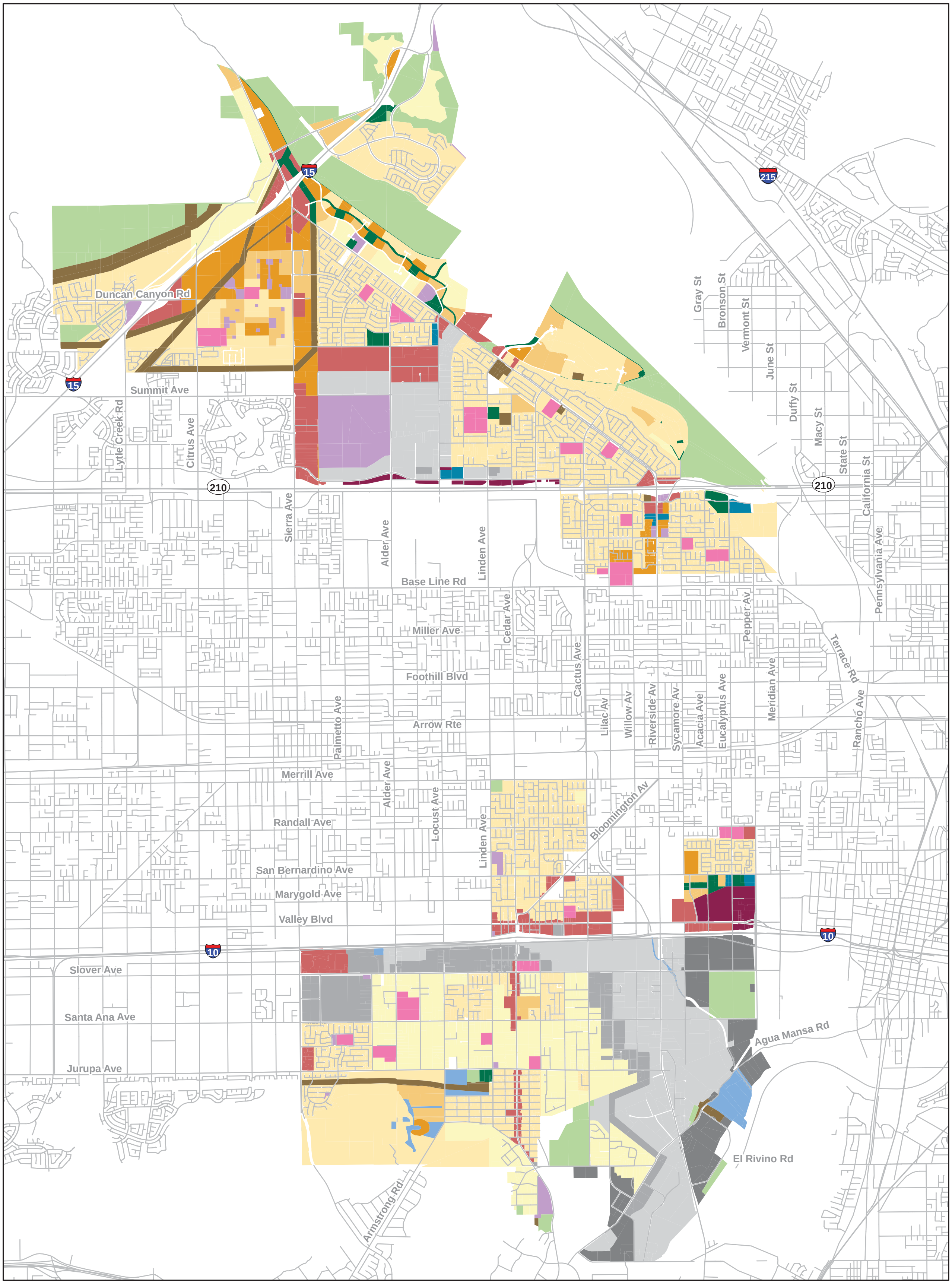
Figure 2.4
Future Major Developments

Water Facilities Master Plan
West Valley Water District

West Valley Water District



Legend

Future Land Use

- Renaissance Specific Plan
- Very Low Density Residential
- Low Density Residential
- Medium Density Residential
- High Density Residential
- Commercial
- Retail
- Educational
- Institutional
- Public Facility
- Industrial
- Light Industrial
- Heavy Industrial
- Utilities
- Office
- Open Space
- Landscape Irrigation
- Street Centerlines

PRELIMINARY

N W E S

0 0.25 0.5 1 Mile

Updated: December 3, 2018

File Path: P:\xGIS\GIS_Projects\West Valley WD\WVWD_Fig2-5_FutureLandUse_120318.mxd

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Figure 2.5
Future Land Use

Water Facilities Master Plan
West Valley Water District

West Valley Water District

Table 2.2 5 Year Growth Assumptions

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Pressure Zone ID	Development Designation	Projected EDUs
South System		
Zone 2		
	Miscellaneous Infill	200
	Subtotal	200
Zone 3		
	Wildrose Village- Phase 1	110
	Wildrose Village - Phase 2	64
	Miscellaneous Infill	230
	Subtotal	404
Zone 3A		
	Crestwood Communities	50
	Subtotal	50
North System		
Zone 4		
	Pepper Avenue Specific Plan	50
	Miscellaneous Infill	10
	Subtotal	60
Zone 5		
	Renaissance	50
	Lytle Creek Ranch	900
	Miscellaneous Infill	50
	Subtotal	1,000
Zone 6		
	Renaissance	50
	Arboretum - Meadow	200
	Arboretum - Garden	700
	Shady Trails - Phase 1	100
	Shady Trails - Phase 2	137
	Miscellaneous Infill	50
	Summit at Rosena Development	480

Table 2.2 5 Year Growth Assumptions

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Presssure Zone ID	Development Designation	Projected EDUs
	Tract 18944	90
	Subtotal	1,807
Zone 7		
	Arboretum - Meadow	390
	Arboretum - Garden	700
	Sierra Crest II	180
	Monarch Hills	472
	Lytle Creek Ranch	100
	Rosena Ranch	400
	D.R. Horton	80
	Tract 18944	90
	Subtotal	2,412
Zone 8		
	Lytle Creek Ranch	390
	Subtotal	390
	Grand Total	**6,323**

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3/13/2018

Source: Development information provided by WVWD staff.

Table 2.3 Existing and Future Service Area Land Use

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Land Use Classification	Existing Service Area			Inside Sphere of Influence			
	Existing Development	Existing Lands - Redeveloped	Subtotal Existing Lands - Unchanged	New Lands - Redevelopment	New Development: Inside Existing Service Area	New Development: Outside Existing Service Area	Total
	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	(acres)
1	2	3	4	5	6	7	8
Residential							
Residential 2	1,080	5	1,074	200	721	6	2,002
Residential 6	4,026	412	3,614	231	1,905	5	5,756
Residential 12	4	4	0	147	409	27	583
Residential 21	87	4	83	42	503	57	685
Subtotal- Residential	5,196	425	4,772	621	3,538	95	9,025
Non-Residential							
Commercial	123	65	58	604	323	18	1,004
Retail	121	117	4	96	84	0	184
Office	72	63	9	13	42	0	64
Educational	373	75	299	35	48	0	382
Institutional	129	121	8	283	192	0	482
Public Facility	324	271	53	32	99	0	184
Light Industrial	1,022	698	324	318	104	0	746
Heavy Industrial	510	348	162	178	302	0	643
Industrial	1,983	822	1,161	702	370	0	2,233
Subtotal-Non Residential	4,657	2,579	2,077	2,260	1,565	18	5,921
Other							
Utilities	293	70	223	46	316	0	585
ROW	110	75	35	15	60	0	110
Landscape Irrigation	238	161	77	10	114	25	226
Open Space	0	0	0	327	1,688	195	2,210
Vacant-Undeveloped	5,538	0	0	0	0	0	0
Subtotal- Other	6,179	306	335	397	2,178	219	3,130
Total							
	16,032	**3,310**	**7,184**	**3,278**	**7,281**	**333**	**18,076**

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2.3 HISTORICAL AND FUTURE POPULATION

The historical population (Table 2.4) was extracted from the District's 2015 Urban Water Management Plan (UWMP), which utilized population estimates prepared by the Southern California Association of Governments (SCAG). The methodologies for calculating the projected population varied and are briefly summarized as follows:

- 2018-2022: Linearly interpolated between 2017 and 2023 based on the 5-year projected growth.
- 2023: Based on 5-year projected growth assuming 3.5 people per EDU.
- 2024-2046: Calculated assuming 1.5% annual population growth, consistent with 2015 UWMP growth rate.

Though historical populations were used in understanding the domestic water consumption behaviors and trends, population forecasts are presented for informational purposes only. Estimates of future domestic water demands were not based on population, but rather on net acreage for residential and non-residential land uses. Future population and EDUs were used as a means for estimating the planning horizon of the water system and phasing improvements.

2.4 CLIMATE

This section documents the existing climate for the District service area, as well as the potential effects of climate change.

2.4.1 Existing Climate

The climate for the West Valley Water District is generally characterized by hot, dry summers and cool winters with intermittent rainfall. The bulk of the rainfall generally occurs in the months from November to April, with approximately 18.81 inches of rainfall typical to the area. The average high temperature in July and August ranges at approximately 95 degrees Fahrenheit, with the average low in December and February at approximately 42 degrees Fahrenheit. It should be noted that the San Gabriel Mountains border the northern extent of the service area, and form the Lytle Creek catchment. Rainfall amounts can rise significantly closer to the mountains due to orographic lifting.

2.4.2 Climate Change

The 2015 San Bernardino Valley Regional Urban Water Management Plan (SBVR-UWMP) included the West Valley Water District, and documents the potential effects of climate change on the region. This document sources information from the Upper Santa Ana River Watershed Integrated Regional Water Management Plan and the Climate Change Vulnerability Assessment Checklist.

The recent climate modeling documented in the SBVR-UWMP indicates that temperatures are expected to rise. The City of Riverside is expected to experience almost double the days exceeding 95 degrees Fahrenheit by 2070 than what were historically recorded. Big Bear, which historically has had no days of 95 degree heat, is expected to have 4 days exceeding this

Table 2.4 Historical and Projected Population

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Year	Population [1,2]	Annual Growth (%)	Average Annual Demand[3,4] (AF)	(mgd)	Per Capita Consumption[5] (gpdc)
Historical Population[1]					
2005	66,442	-	19,796	17.7	266
2006	67,821	2.1%	22,347	20.0	294
2007	69,228	2.1%	23,167	20.7	299
2008	70,665	2.1%	23,638	21.1	299
2009	72,131	2.1%	20,444	18.3	253
2010	73,469	1.9%	19,556	17.5	238
2011	74,807	1.8%	19,479	17.4	232
2012	76,145	1.8%	21,243	19.0	249
2013	77,483	1.8%	20,535	18.3	237
2014	78,821	1.7%	20,229	18.1	229
2015	80,161	1.7%	17,006	15.2	189
2016	82,013	2.3%	16,301	14.6	177
2017	83,902	2.3%	18,778	16.8	200
Projected Population[2]					
2018	87,590	4.4%	19,656	17.6	200
2019	91,279	4.2%	20,538	18.3	201
2020	94,967	4.0%	21,424	19.1	201
2021	98,656	3.9%	22,315	19.9	202
2022	102,344	3.7%	23,210	20.7	202
2023	106,033	3.6%	24,109	21.5	203
2024	107,623	1.5%	24,535	21.9	204
2025	109,237	1.5%	24,968	22.3	204
2026	110,876	1.5%	25,408	22.7	205
2027	112,539	1.5%	25,856	23.1	205
2028	114,227	1.5%	26,312	23.5	206
2029	115,941	1.5%	26,776	23.9	206
2030	117,680	1.5%	27,247	24.3	207
2031	119,445	1.5%	27,727	24.8	207
2032	121,236	1.5%	28,215	25.2	208
2033	123,055	1.5%	28,711	25.6	208
2034	124,901	1.5%	29,216	26.1	209
2035	126,774	1.5%	29,730	26.5	209
2036	128,676	1.5%	30,252	27.0	210
2037	130,606	1.5%	30,784	27.5	210
2038	132,565	1.5%	31,324	28.0	211
2039	134,554	1.5%	31,874	28.5	212
2040	136,572	1.5%	32,427	29.0	212
2041	138,621	1.5%	32,920	29.4	212
2042	140,700	1.5%	33,414	29.8	212

Table 2.4 Historical and Projected Population

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Year	Population [1,2]	Annual Growth (%)	Average Annual Demand[3,4] (AF)	Average Annual Demand[3,4] (mgd)	Per Capita Consumption[5] (gpdc)
2043	142,810	1.5%	33,915	30.3	212
2044	144,953	1.5%	34,424	30.7	212
2045	147,127	1.5%	34,940	31.2	212
2046	149,334	1.5%	**35,464**	**31.7**	**212**

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Notes :

1. Unless noted otherwise, historical population extracted from 2015 UWMP.
   Year 2005 - 2009, 2015: Extracted from 2015 UWMP WVWD SBX7-7 Table 5
   Year 2010 - 2014: Straight line linear interpolation between 2009 and 2015
   Year 2016: Extracted from 2016 Year End Report received June 15, 2017
   Year 2017: Extracted from "Population Estimates 2017" spreadsheet received June 15, 2017
2. Population Projection Source:
   Years 2018 - 2022: Linearly interpolated between 2017 and 2023
   Year 2023: Population growth based on 5-Year Growth Assumptions provided by District staff
   Years 2024 - 2046: Assuming a 1.5% annual growth rate
3. Historical demand extracted from production statistics received from WVWD staff October 30, 2017. Historical demands exclude water produced for wholesale delivery to other agencies.
4. Demand Projection Source.
   Years 2018 - 2022: Demand linearly interpolated between 2017 and 2023
   Year 2023: Additional demand due to 5 year growth, assuming 670 gpd/EDU, and accounting for conservation.
   Year 2024 - 2039: Demand linearly interpolated between 2023 and 2040
   Years 2040: 2015 Urban Water Management Plan
   Years 2041 - 2046: Calculated assuming per capita demand factor of 212 gpdc, consistent with 2015 UWMP demand projection methodology.
5. The 2015 UWMP calculated a 2020 Per Capita Water Use Target of 232 gpcd and a 2015 actual per capita water use of 190 gpcd. For demand planning purposes the UWMP used a per capita water use of 209 gpcd (10% increase over 2015). Accounting for water losses and occupancy vacancies the 2020 WFMP uses a per capita water use of 212 gpcd.

threshold by 2070. The causal effects of the increasing climate temperatures are the reduction in alpine and sub-alpine forestation, and increasing storm intensities with decreasing frequency. The reduction in forest matter with increasing storm intensities are expected to exacerbate flooding concerns. Furthermore, the increase in temperature is expected to elevate mean snow levels, and thus reduce snowpack and yearly groundwater recharge.

The two methods for addressing the changing climate are documented as mitigation and adaptation. Mitigation efforts involve programs and policies intended to reduce carbon emissions, while adaptation efforts involve adjusting to the outcomes of climate change (risk of flooding, temperature increase, etc). It is recommended that as scientific advancements in climate change occur, and the impacts to water infrastructure are documented, that the District plan for efforts in both adaptation and mitigation.

CHAPTER 3 - SYSTEM PERFORMANCE AND DESIGN CRITERIA

This chapter presents the District's performance and design criteria, which was used in this analysis for identifying current system capacity deficiencies and for sizing proposed distribution mains, storage reservoirs, pump stations and wells.

3.1 HISTORICAL WATER USE TRENDS

The historical domestic water consumption per capita was calculated to determine the average water use per capita per day. This was accomplished by dividing the District's historical water production by the historical population for the respective year.

The District's historical per capita consumption factors, for the period 2005-2016, are listed in **Table 3.1**. The per capita consumption has generally decreased since 2005, being reduced by approximately 20%. This trend is largely attributed to the District's effort of implementing water conservation measures. **Table 3.2** lists the last four years of monthly water production for the District from 2013 to 2016.

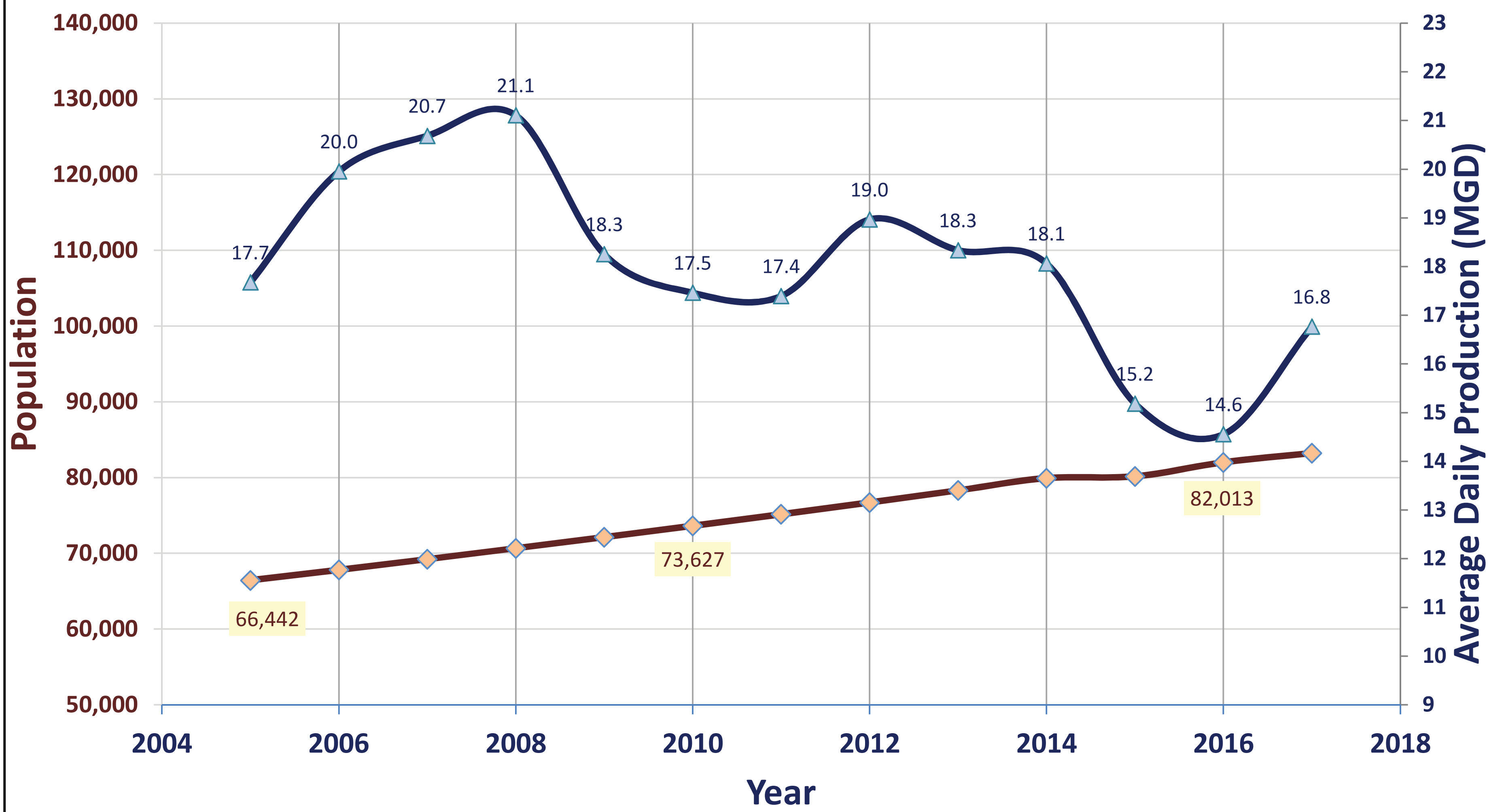
The ultimate demand forecasts included in this master plan for residential and non-residential land uses is based on net acreages. However, to generalize trends in the District's water use, per capita water use was documented. **Figure 3.1** displays the historical population in relation to average daily water production. **Figure 3.2** displays a comparison in the per capita water use and average daily water production. The remainder of the District's criteria are summarized in the following sections and on **Table 3.3**.

3.2 SUPPLY CRITERIA

In determining the adequacy of the domestic water supply facilities, the source must be large enough to meet the varying water demand conditions, as well as provide sufficient water during potential emergencies such as power outages and natural or created disasters.

Ideally, a water distribution system should be operated at a constant water supply rate with consistent supply from the water source. On the day of peak day demand it is desirable to maintain a water supply rate equal to the peak day rate. Water required for peak hour demands or for fire flows would come from storage.

The District currently uses a combination of groundwater wells, State Water Project (SWP) water and treated surface water from Lytle Creek to meet the varying demand conditions of the existing customers. The minimum reliable supply to the surface water treatment facility is estimated to be approximately 4,000 afy, or 3.6 mgd. For supply planning purposes it is assumed that the total required groundwater supply shall be adequate to supply peak day demands less 4,000 afy, which is summarized on the following page.



LEGEND

Population

Average Daily Production (MGD)

PRELIMINARY

September 25, 2018

AKEL ENGINEERING GROUP, INC.

Figure 3.1

Historical Population vs. Average Daily Production

Water Facilities Master Plan

West Valley Water District

LEGEND

Per Capita Consumption (gpdc)

Average Daily Production (MGD)

PRELIMINARY

September 25, 2018

Figure 3.2

Water Use Per Capita vs. Average Daily Production

Water Facilities Master Plan

West Valley Water District

AKEL ENGINEERING GROUP, INC.

Table 3.1 Historical Annual Water Production and Peak Day Peaking Factors (2005-2017)

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Year	Population[1,2,3,4]	% Increase	Historical Water Production										Average Daily Water Use per Capita
			Total Annual Production[5]					Monthly Production[6]			Daily Production[6]		
			Consumption by WVWD	Delivered to Others	Total		Percent Increase	Maximum	Month of Occur.	Max-to-Avg Ratio	Average	Max-to-Avg Ratio	
			(AF)	(AF)	(AF)	(gpm)		(mgd)			(MGD)		(gpdc)
2005	66,442	-	19,796	1,355	21,151	13,114	-	27.49	July	1.46	17.7	-	266
2006	67,821	2.1%	22,347	1,970	24,317	15,078	15%	30.58	August	1.41	20.0	-	295
2007	69,228	2.1%	23,167	171	23,338	14,471	-4%	28.58	August	1.37	20.7	-	299
2008	70,665	2.1%	23,638	429	24,068	14,923	3%	28.38	August	1.32	21.1	-	299
2009	72,131	2.1%	20,444	1,137	21,581	13,381	-10%	24.97	August	1.30	18.3	-	253
2010	73,469	1.9%	19,556	1,210	20,766	12,876	-4%	25.19	August	1.36	17.5	-	238
2011	74,807	1.8%	19,479	1,146	20,624	12,788	-1%	27.25	July	1.48	17.4	-	233
2012	76,145	1.8%	21,243	1,294	22,537	13,974	9%	26.08	August	1.30	19.0	-	249
2013	77,483	1.8%	20,535	1,065	21,600	13,393	-4%	23.13	July	1.20	18.3	-	237
2014	78,821	1.7%	20,229	931	21,160	13,120	-2%	23.63	July	1.25	18.1	-	230
2015	80,161	1.7%	17,006	1,191	18,197	11,283	-14%	18.62	August	1.15	15.2	-	190
2016	82,013	2.3%	16,301	2,070	18,371	11,391	1%	20.08	August	1.22	14.6	-	178
2017	83,902	2.3%	18,778	1,243	20,021	12,414	9%	22.47	July	1.26	16.8	-	200
Historical Maximum Peaking Factors													
7-Year Maximum (2011-2017)					22,537	13,974	9%	27		1.48	19.0	-	249
5-Year Maximum (2013-2017)					21,600	13,393	9%	24		1.26	18.3	-	237
3-Year Maximum (2015-2017)					20,021	12,414	9%	22		1.26	16.8	-	200
2017 Maximum					20,021	12,414	9%	22		1.26	16.8	-	200
Recommended Peaking Factors													
2012 Water System Master Plan Criteria												1.70	
2020 Water Facilities Master Plan										1.40		1.70	

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9/12/2019

Notes:

1. Historical Population from 2005 to 2014 extracted from the District's Public Water System Statistics provided by District staff September 12, 2019
2. 2015 population extracted from 2015 Urban Water Management Plan
3. 2016 population extracted from "2016 Year End Report", provided by District Staff on June 17, 2017
4. 2017 population extracted from "2017 Year End Report", provided by District Staff on September 25, 2018
5. Annual production statistics received September 25, 2018 (including distinction between actual WVWD consumption and water delivered to others (WVWD customers versus Water Wholesale to other agencies).
6. Source : Public Water System Statistics received from District staff June 15, 2017. "Year end report" for year 2016, received June 15, 2017. Monthly and Daily Production Statistics not including water wholesale to other agencies.

Table 3.2 Historical Monthly Water Production (2015-2017)

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Month	2015			2016			2017		
	Monthly[1]		Peaking Factor	Monthly[2]		Peaking Factor	Monthly[3]		Peaking Factor
	Production (mgd)	Percent of Annual (%)	Month to Avg Factor	Production (mgd)	Percent of Annual (%)	Month to Avg Factor	Production (mgd)	Percent of Annual (%)	Month to Avg Factor
January	12.6	7%	0.83	9.0	5%	0.62	8.22	4%	0.49
February	12.4	7%	0.82	11.0	6%	0.75	8.34	4%	0.50
March	14.5	8%	0.96	11.8	7%	0.81	12.63	6%	0.76
April	17.2	9%	1.14	12.1	7%	0.83	16.39	8%	0.98
May	15.2	8%	1.00	14.2	8%	0.98	17.27	9%	1.03
June	18.5	10%	1.22	17.8	10%	1.22	20.41	10%	1.22
July	17.0	9%	1.12	20.0	11%	1.38	22.47	11%	**1.34**
August	18.6	10%	**1.23**	20.1	12%	**1.38**	20.72	10%	1.24
September	16.5	9%	1.09	17.5	10%	1.20	19.16	10%	1.15
October	14.1	8%	0.93	15.6	9%	1.07	19.56	10%	1.17
November	13.3	7%	0.88	14.0	8%	0.96	18.08	9%	1.08
December	12.1	7%	0.80	11.4	7%	0.78	17.32	9%	1.04
Total	**182.1**			**174.4**			**200.6**		
Average Value	**15.2**			**14.5**			**16.7**		
Maximum Value	**18.6**		**1.23**	**20.1**		**1.38**	**22.5**		**1.34**

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9/25/2018

Notes:
1. PWSS Statistics received from District Staff, not including water deliveries to customers outside the District Service Area (wholesale to other agencies)
2. Monthly Production extracted from " 2016 Year End Report", received from District Staff 06/15/2017. Does not include wholesale to other agencies.
3. Monthly Production extracted from " 2017 Year End Report", received from District Staff 09/25/2018. Does not include wholesale to other agencies.

Table 3.3 Planning and Design Criteria
Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Design Parameter	Criteria	
Supply Requirement	Supply to meet Peak Day Demand with firm capacity only	
	Peak day pumping shall be based on 16 hour of pumping/ day	
Storage Requirement	Total Required Storage = Operational + Fire (For Zone 2, 3, 3A, 8)	
	Total Required Storage = Operational + Fire + Pumping (For Zone 4, 5, 6, & 7)	
	Operational Storage	100% of Peak Day Demand
	Fire Storage	Low Density Residential: 0.18 MG (1,500 gpm for 2 hours)
		High Density Residential: 0.54 MG (3,000 gpm for 3 hours)
		Schools/Commercial: 0.54 MG (3,000 gpm for 3 hours)
		Office/Light Industrial: 0.54 MG (3,000 gpm for 3 hours)
		Heavy Industrial: 0.96 MG (4,000 gpm for 4 hours)
	Pumping Storage	100% Average Day Demand for Supply Dependent Pumping Zones
Pump Stations[1]	Pump Stations shall meet Peak Day Demand with respective firm capacity of Pressure Zone (on a 16-hour per day pumping schedule). Firm capacity of Pressure Zone is defined as the sum of the total capacity of each pump station pumping into the pressure zone, with each pump station operating without their largest unit.	
Pressure Reducing Valves[1]	PRV should be designed to meet the greater of:	
	Peak Hour Demand, or Peak Day Demand + Fire Flow	
Pipelines	Pipelines should be designed to meet the greater of:	
	1) Peak Hour Demand, or 2) Peak Day Demand + Fire Flow	
	Criteria for existing and future pipelines include	
	Maximum Velocity:	5 ft/s during Peak Day Demand
		10 ft/s during Peak Day Demand + Fire Flow
	Maximum Headloss:	5 ft/1,000 ft during Peak Day Demand (assuming a C-Factor of 120)
	Dead-end pipelines shall not exceed 660 feet in length	
Service Pressures	Maximum Pressure	
	In Pipelines	130 psi
	At Service Connections	80 psi
	Minimum Pressure	
	Peak Hour Demand	40 psi
	Peak Day Demand + Fire Flow	20 psi
Demand Peaking Factors	Peak Month Demand	1.40 x Average Day Demand
	Peak Day Demand	1.70 x Average Day Demand
	Peak Hour Demand	1.70 x Peak Day Demand
Water Demand Factors	2015 UWMP Water Use Rate	212 gallons per capita per day (gpcd)
	EDU Water Use	670 gpd/EDU
Fire Flows	Low Density Residential	1,500 gpm for 2 hours
	High Density Residential	3,000 gpm for 3 hours
	Schools/Commercial	3,000 gpm for 3 hours
	Office/Light Industrial	3,000 gpm for 3 hours
	Heavy Industrial	4,000 gpm for 4 hours

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2/9/2018

Notes:
1. Criteria not included in District 2012 Water Master Plan. Criteria shown recommended by Akel Engineering Group.
2. Water use rate consistent with 2020 per capita water use target per District 2015 Urban Water Management Plan.

- Total Required Groundwater Supply = Peak Day Demands – 4,000 afy (3.6 mgd)

3.3 STORAGE CRITERIA

The intent of domestic water storage is to provide supply for operational equalization, fire protection, and other emergencies, such as power outages or supply outages. Operational or equalization storage provides the difference in quantity between the customer's peak hour demands and the system's available reliable supply. The District storage criteria varies depending on what pressure zone is being served.

3.3.1 Typical Storage Criteria

The District's storage criteria consists of three main elements: operational, fire flow, and pumping.

Operational Storage

Operational or equalization storage capacity is necessary to reduce the variations imposed on the supply system by daily demand fluctuations. Peak hour demands may require up to 2 times the amount of maximum day supply capacity. With storage in place, this increase in demand can be met by the operational storage rather than by increasing production from the supply sources. The District criteria for all pressure zones is to maintain an operational storage amount equal to 100 percent of peak day demand.

- Operational Storage = 100% x PDD

Fire Storage

Fire storage is also needed to mitigate potential emergencies that may occur in the pressure zone, and in compliance with relevant fire codes. The recommended fire storage capacity varies by pressure zone and land use type, and is usually higher for commercial and industrial areas. Fire flow provisions for each pressure zone were calculated based on the governing (highest) land use type within a reservoir service area as follows:

- Low Density Residential: 1,500 gpm for 2 hours = 0.18 MG
- High Density Residential: 3,000 gpm for 3 hours = 0.54 MG
- Schools/Commercial: 3,000 gpm for 3 hours = 0.54 MG
- Office/Light Industrial: 3,000 gpm for 3 hours = 0.54 MG
- Heavy Industrial: 4,000 gpm for 4 hours = 0.96 MG

Pumping Storage

The majority of the District's existing and planned groundwater wells with pump stations convey through the North System. In order to ensure a sufficient volume of water is available for pumping to meet the demands of the North System the District requires an additional amount of water to be stored in the water storage reservoirs. Therefore, Pressure Zones 4, 5, 6 and 7 carry additional pumping storage volumes for the respective higher zones, less the 4.0 mgd capacity of the WFF.

- Pumping Storage = 100% x ADD of Supply Dependent Pressure Zones - 4.0 mgd

Total Storage Requirement

The total storage (Qs) is the summation of operational (equalization), fire, and pumping storage requirements as follows:

For Pressure Zones 2, 3, 3A, 8:

- Qs =Peak Day Demand + fire flow (varies)

For Pressure Zones 4, 5, 6, 7:

- Qs =Peak Day Demand + fire flow (varies) + Pumping (varies)

3.4 PRESSURE CRITERIA

Acceptable service pressures within distribution systems vary depending on District criteria and pressure zone topography. It is essential that the water pressure in a consumer's residence or place of business be maintained within an acceptable range. Low pressures below 30 psi can cause undesirable flow reductions when multiple faucets or water using appliances are used at once.

Excessively high pressures can cause faucets to leak and valve seats to wear out prematurely. Additionally, high service pressures can cause unnecessarily high flow rates, which can result in wasted water and high utility bills. The criteria for pressures in the domestic water system include the following:

- Maximum pressure, usually experienced during low demands and winter months
- Minimum pressure, usually experienced during peak hour demands and summer months
- Minimum pressure during simultaneous peak day demand and fire flow

The American Water Works Association Manual on Computer Modeling and Water Distribution System (AWWA M-32) indicates that maximum pressures are usually in the range of 90-110 pounds per square inch (psi). In some communities, the maximum pressure may be limited to 80 psi to mitigate the impact on internal plumbing. In this case, the distribution system is usually sized for the higher pressures, and individual pressure-reducing valves are installed on service lines where the pressure may be exceeded.

The minimum acceptable pressure is usually in the range of 40-50 psi, which generally provides for sufficient pressures for second story fixtures. When backflow preventers are required, they may reduce the pressures by approximately 5-15 psi. The recommended minimum pressure during fire flows is 20 psi, as established by the National Fire Protection Association (NFPA).

The District's pressure criteria are summarized as follows:

- Maximum pressure (pipelines): 130 psi
- Maximum pressure (service connections): 80 psi
- Minimum pressure (PHD): 40 psi
- Minimum pressure (PDD + Fire Flow): 20 psi

3.5 UNIT FACTORS

Domestic water demand unit factors are coefficients commonly used in planning level analysis to estimate future average daily demands for areas with predetermined land uses. The unit factors are multiplied by net acreages to yield the average daily demand projections.

The total domestic water demand was extracted from consumption data maintained by the District. The demand was adjusted to balance with current production records, and to account for transmission main losses and vacancies in existing land uses. For planning purposes, the production used to develop the water demand unit factors was based on 2014 production data minus ten percent to account for current water conservation trends. The demand unit factor was then calculated using the calculated water production and total number of residential and non-residential land use acreages.

This analysis generally indicates that existing residential land uses have higher consumptive use factors than that of non-residential land uses. The existing unit factor analysis is shown on **Table 3.4**. It should be noted that extensive water conservation efforts have reduced water demands beyond the required "20x2020" target water use. The water production target of 2014 minus 10 percent is below the "20x2020" target, but is considered reasonable and conservative based on 2015 and 2016 production records. The water demand unit factors are summarized on **Table 3.5**. It should be noted that the existing industrial factors are low compared to industry standards, and were adjusted to reflect more conservative planning assumptions.

It should be noted that the water demand unit factors utilized in this WFMP are generally lower for all land use types as compared to the 2012 WMP. A comparison of the water demand unit factors is included in **Appendix A**. The water demand unit factors prepared as part of this master plan reflect changes in water use due to recent drought conditions, as well as a revised land use analysis.

Table 3.4 Water Demand Unit Factor Analysis
Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Land Use Classification	Existing Development within Service Area	Existing Average Daily Water Demand Unit factors									
		Consumption[1]			Production[2]		Production at 100% Occupancy			Recommended Water Unit Factor	
		Unadjusted Water Unit Factors	Annual Consumption		Unadjusted Water Unit Factors	Production (w/o Vacancy rate)	Vacancy Rate[3,4]	Projected Production at 100% Occupancy		Recommended Factor	Balance Using Recommended Unit Factor
	(net acres)	(gpd/net acres)	(gpd)	(gpm)	(gpd/net acres)	(gpd)	(%)	(gpd/net acres)	(gpd)	(gpd/net acres)	(gpd)
Residential											
Residential 2	1,080	734	792,487	550	926	1,000,047	5.9%	984	1,062,750	990	1,068,792
Residential 6	4,026	1,974	7,945,858	5,518	2,491	10,026,958	5.9%	2,647	10,655,641	2,650	10,667,777
Residential 12	4	3,414	12,569	9	4,308	15,861	5.9%	4,578	16,856	4,580	16,864
Residential 21	87	4,196	367,009	255	5,295	463,133	5.9%	5,627	492,171	5,630	492,419
Subtotal Residential	5,196		9,117,923	6,332		11,505,999			12,227,417		12,245,852
Non-Residential											
Commercial	123	1,249	154,053	107	1,576	194,401	12.1%	1,794	221,254	1,800	221,977
Retail	121	1,311	158,092	110	1,655	199,498	12.1%	1,884	227,055	1,890	227,828
Office	72	981	70,462	49	1,238	88,916	12.1%	1,409	101,198	1,410	101,302
Educational	373	1,415	528,135	367	1,786	666,459	0.0%	1,786	666,459	1,790	667,905
Institutional	129	1,112	142,911	99	1,403	180,341	0.0%	1,403	180,341	1,410	181,224
Public Facility	324	191	61,965	43	241	78,194	0.0%	241	78,194	250	81,009
Light Industrial	1,022	380	388,224	270	479	489,904	4.6%	502	513,508	500	511,143
Industrial	1,983	332	657,527	457	418	829,740	4.6%	439	869,718	1,000	1,983,076
Heavy Industrial	510	1,149	586,004	407	1,451	739,484	4.6%	1,520	775,113	1,530	780,002
Subtotal - Non-Residential	4,657		2,747,373	1,908		3,466,938			3,632,842		4,755,466
Other											
Landscape Irrigation[6]	450	2,125	956,577	664	2,681	1,207,114	0.0%	2,681	1,207,114	2,690	1,210,981
Marygold Mutual Water Company[7]			652,512			652,212			652,212		652,212
ROW	110	0	0	0	0	0	0.0%	0	0	0	0
Utilities	293	2	445	0	2	561	0.0%	2	561	10	2,931
Open Space	1,755	0	0	0	0	0	0.0%	0	0	0	0
Subtotal - Other	2,820		1,609,534	1,118		1,859,888			1,859,888		1,866,124
	12,673		**13,474,831**	9,358		**16,832,825**			17,720,146		**18,867,442**

AKEL ENGINEERING GROUP, INC.

10/5/2017

Note:
1. Consumption extracted from the 2016 water meter shapefile database, provided by District Staff July 5, 2017.
2. Meters consumption was normalized to 2014 production records minus 10 percent (90% of 2014 Production Records).
3. Residential vacancy rate extracted from California Department of Finance Sheet E-5 published 2016.
4. Non-residential vacancy rates extracted from Inland Empire 2013 market report prepared by Voit Real Estate Services, downloaded September 11, 2017. Vacancy rates shown are average of rates for the cities of Fontana, Rialto, and Colton.
5. Residential Landuse categories extracted from the 2010 General Plan Landuse, published by the City of Rialto.
6. Landscape irrigation acres include estimated acres for irrigated parkways, which were assumed at 1 acre per meter.
7. Marygold Mutual Water Company demand extracted from wholesale water sale information included in water billing records received from District staff July 5, 2017. Meter located south of the intersection of Randall Avenue and Cedar Avenue.

Table 3.5 Recommended Water Unit Factors

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Land Use Designation	Recommended Water Factor (gpd/ acre)	Recommended Water Factor (gpm/acre)
Residential		
Residential 2	990	0.69
Residential 6	2,650	1.84
Residential 12	4,580	3.18
Residential 21	5,630	3.91
Non-Residential		
Commercial	1,800	1.25
Retail	1,890	1.31
Office	1,410	0.98
Educational	1,790	1.24
Institutional	1,410	0.98
Public Facility	230	0.16
Light Industrial	500	0.35
Industrial	1,000	0.69
Heavy Industrial	1,530	1.06
Other		
Landscape Irrigation	2,690	1.87
ROW	0	0
Utilities	10	0.01

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1/11/2019

3.6 SEASONAL DEMANDS AND PEAKING FACTORS

Domestic water demands within municipal water systems vary with the time of day and month of the year. It is necessary to quantify this variability in demand so that the water distribution system can be evaluated and designed to provide reliable water service under these variable demand conditions.

Water use conditions that are of particular importance to water distribution systems include the average day demand (ADD), the peak month demand (PMD), the peak day demand (PDD), the peak hour demand (PHD), and the winter demand.

The average day demand represents the annual water demand, divided by 365 days, since it is expressed in daily units. The winter demand typically represents the low month water demands and is used for simulating water quality analysis.

3.6.1 Peak Month Demand

The peak month demand (PMD) is the highest demand that occurs within a calendar month during a year. The District's PMD usually occurs in the summer months, in either July or August. The PMD is used primarily in the evaluation of supply capabilities.

Historical monthly water production records, obtained for the period between 2005 and 2015 (Table 3.1), indicate the maximum month to average month ratio ranging between 1.25 and 1.52. Over the reviewed period, this ratio showed increasing or decreasing trends. Therefore, a PMD factor of 1.40 was deemed representative of trends in the District service area. The following equation is recommended for estimating the maximum month demand, given the average day demand:

Peak Month Demand = **1.40** x Average Day Demand

3.6.2 Peak Day Demand

The peak day demand is the highest demand that occurs within a 24 hour day during a year. The District's PDD, which usually occurs during the summer months, is typically used for the evaluation and design of storage facilities, distribution mains, pump stations, and pressure reducing valves. The PDD, when combined with fire flows, is one of the highest demands that these facilities should be able to service while maintaining acceptable pressures within the system.

The peak day demands were obtained from the District's water production records. Production records indicate the date of occurrence and magnitude of the peak day demand for each calendar year, as listed in Table 3.1. Monthly data was provided by the District for review of water demand trends and peaking factor evaluation. For the purposes of this Master Plan, the peak day demand factor is assumed at 1.7 times the average day demand and consistent with the previous master plan. The following equation is then used to estimate the peak day demand, given the average day demand:

Peak Day Demand = **1.70** x Average Day Demand

3.6.3 Peak Hour Demand

The peak hour demand is another high demand condition that is used in the evaluation and design of water distribution systems. The peak hour demand is the highest demand that occurs within a one-hour period during a year. The peak hour demand is considered to be the largest single measure of the maximum demand placed on the distribution system. The PHD is often compared to the MDD plus fire flow to determine the largest demand imposed on the system for the purpose of evaluating distribution mains.

A peak hour to peak day ratio of 1.7 was applied to the peak day demand to yield the peak hour demand ratio of 2.9, consistent with the District design standards. The peak hour demand can then be calculated using the average day demand and the following equation:

Peak Hour Demand = **1.70** x Peak Day Demand

3.7 FIRE FLOWS

Fire flows are typically based on land use, with the potential for increased fire flow based on the building type. The following are the criteria for fire flows:

- **Low Density Residential.** Fire flows for low density residential land use types were calculated at 1,500 gpm for two hours.
- **High Density Residential.** Fire flows for high density residential land use types were calculated at 3,000 gpm for three hours.
- **Schools/ Commercial.** Fire flows for schools and commercial land use types were calculated at 3,000 gpm for three hours.
- **Office/ Light Industrial.** Fire flows for office and light industrial land use types was calculated at 3,000 gpm for three hours.
- **Heavy Industrial.** Fire flows for heavy industrial land use types were calculated at 4,000 gpm for four hours.

3.8 TRANSMISSION AND DISTRIBUTION MAIN CRITERIA

Transmission and distribution mains are usually designed to convey the maximum expected flow condition. In municipal water systems, this condition is usually the greater of either the peak hour demand or the peak day demand plus fire flow. The hydrodynamics of pipe flow create two additional parameters that are taken into consideration when evaluating or sizing water mains: head loss and velocity.

Head loss is a loss of energy within pipes that is caused by the frictional effects of the inside surface of the pipe and friction within the moving fluid itself. Head loss creates a loss in pressure which is undesirable in water distribution systems. Head loss, by itself, is not a critical factor as long as the pressure criterion has not been violated. However, high head loss may be an indicator that the pipe is nearing the limit of its carrying capacity and may not have sufficient capacity to perform under stringent conditions. The District criterion for maximum pipeline head loss is summarized as follows:

- Peak Day Demand: 5 feet per 1,000 feet of pipe

Since high flow velocities can cause damage to pipes and lead to high head loss, it is desirable to keep the velocity below a predetermined limit. The District criteria for maximum pipeline velocity are summarized as follows:

- Peak Day Demand: 5 feet per second
- Peak Day Demand + Fire Flow: 10 feet per second

These velocity criteria also ensure that the head loss is kept below an acceptable limit, as the head loss in a pipe is a function of the flow velocity. Flow velocities in transmission mains 14 inches and larger are governed by the head loss criteria.

A summary of the criteria pertaining to transmission and distribution mains is included in **Table 3.3**. The pipe roughness coefficient used for calculating head loss was based on the District criterion of 120.

It should be noted that the headloss criteria in transmission mains may be relaxed, where feasible, to account for transmission main redundancy and reliability. Relaxing of the criteria requires the review and approval of the District.

3.9 TIME OF USE

Southern California Edison (SCE) has defined peak use times of the year where a tiered system of energy rates are implemented to encourage decreased energy consumption. Time of use is implemented from June 1 through September 30, which coincides with the maximum day and peak hour demands in the water system. There are three stages of energy rates during summer time of use:

- **Off Peak:** This category is typically associated with the lowest energy costs and occurs from 9:00 PM to 4:00 PM.
- **Partial Peak:** This category has medium energy costs and is intended to minimize energy use when possible. It occurs from 4:00 PM to 9:00 PM on weekends and holidays.
- **On Peak:** This is the highest cost category, and is intended to encourage users to avoid energy consumption whenever possible. It occurs from 4:00 PM to 9:00 PM.

District staff have been implementing time of use pumping, when possible, throughout their system to reduce operational costs. It should be noted that time of use pumping may impact the sizing of pipelines within pressure zones during nighttime replenishment pumping. This high pumping period is accounted for in this master plan analysis, and modeling scenarios reflect the time of use periods.

CHAPTER 4 - EXISTING DOMESTIC WATER FACILITIES

This chapter provides a description of the District's existing domestic water system facilities including the distribution mains, storage reservoir, booster pump stations and the existing wells.

4.1 EXISTING WATER SYSTEM OVERVIEW

The District operates a domestic water distribution system that consists of 21 groundwater wells, 25 separate storage reservoirs across eight pressure zones shown in **Figure 4.1**, for a total storage over 72 million gallons (MG), and over 375 miles of transmission and distribution pipelines.

The District's existing domestic water distribution system is shown in **Figure 4.2**, which displays the existing system by pipe size. This figure provides a general color coding for the distribution mains, as well as labeling the existing wells, booster stations, pressure reducing valves, and the storage reservoirs. Additionally, **Figure 4.3** summarizes the existing system with pipelines colored based on pressure zone. A hydraulic profile based on the existing operations of the District's water system is provided on **Figure 4.4**. The District is generally divided into two sections, commonly referred to as the North System and South System, which are briefly summarized in the following sections.

4.1.1 North System

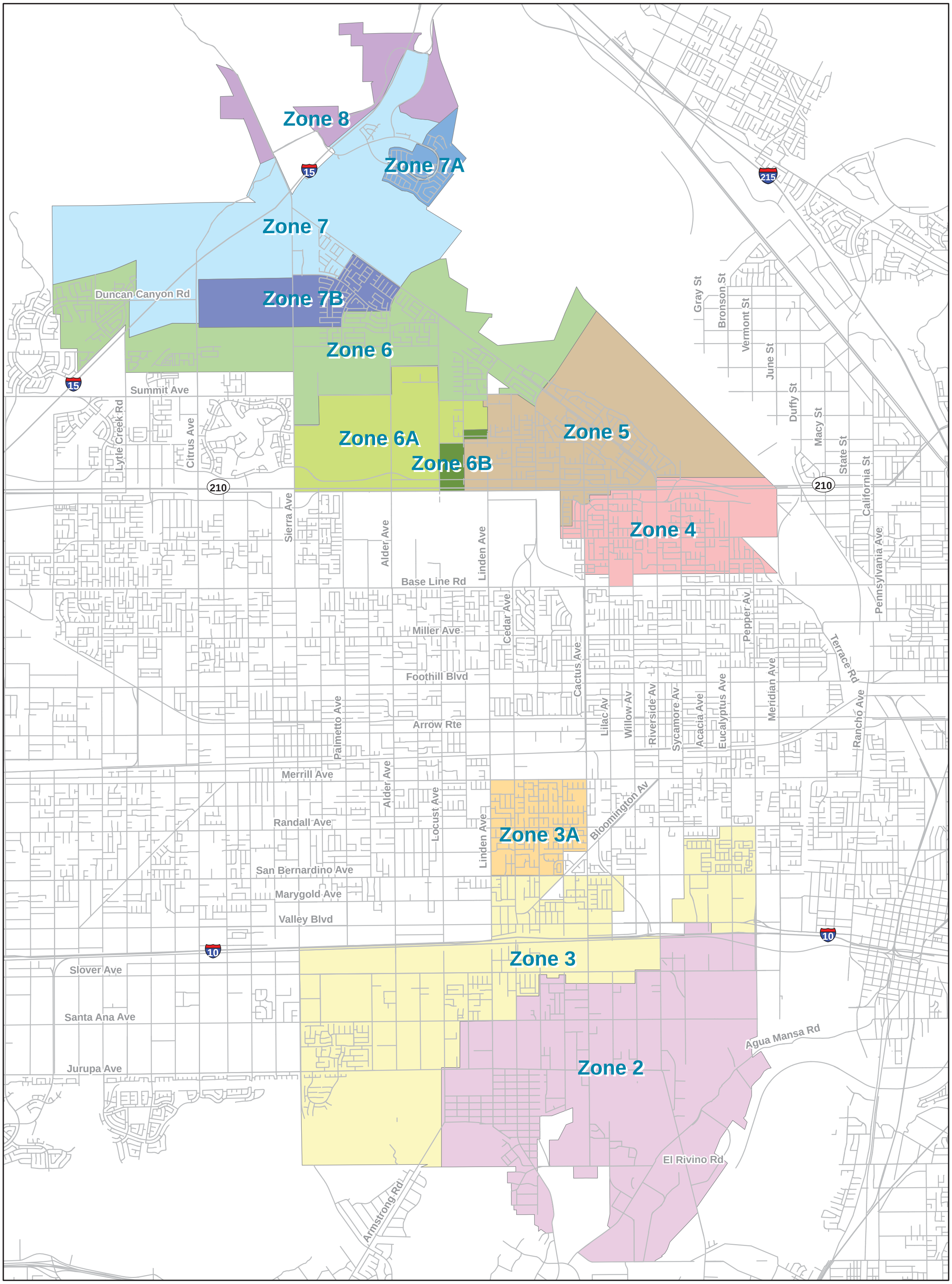
The District's North System, comprised of Pressure Zones 4, 5, 6, 7 and 8, provides domestic water service to the District's customers north of Baseline Road. Supply for this system is provided by multiple groundwater wells, the Roemer WFF in Pressure Zone 5, and water boosted from the Baseline Feeder to Pressure Zone 4 at the Lord Ranch Facility.

4.1.2 South System

The District's South System, comprised of Pressure Zones 3A, 3, and 2, provides domestic water service to the District's customers generally located south of Merrill Avenue. Supply for this system is provided by multiple groundwater wells and the FBR treatment facility in Pressure Zone 3A.

4.2 SOURCE OF SUPPLY

In order to meet existing domestic water demands, the District utilizes several sources of supply, including groundwater and treated surface water. The following section provides a brief summary of these sources, with a more detailed discussion provided in the Water Demands and Supply Characteristics chapter.



Legend

Pressure Zones

- Zone 2
- Zone 3
- Zone 3A
- Zone 4
- Zone 5
- Zone 6
- Zone 6A
- Zone 6B
- Zone 7
- Zone 7A
- Zone 7B
- Zone 8
- Street Centerlines

PRELIMINARY

Updated: October 9, 2017

0 0.25 0.5 1 Mile

N W E S

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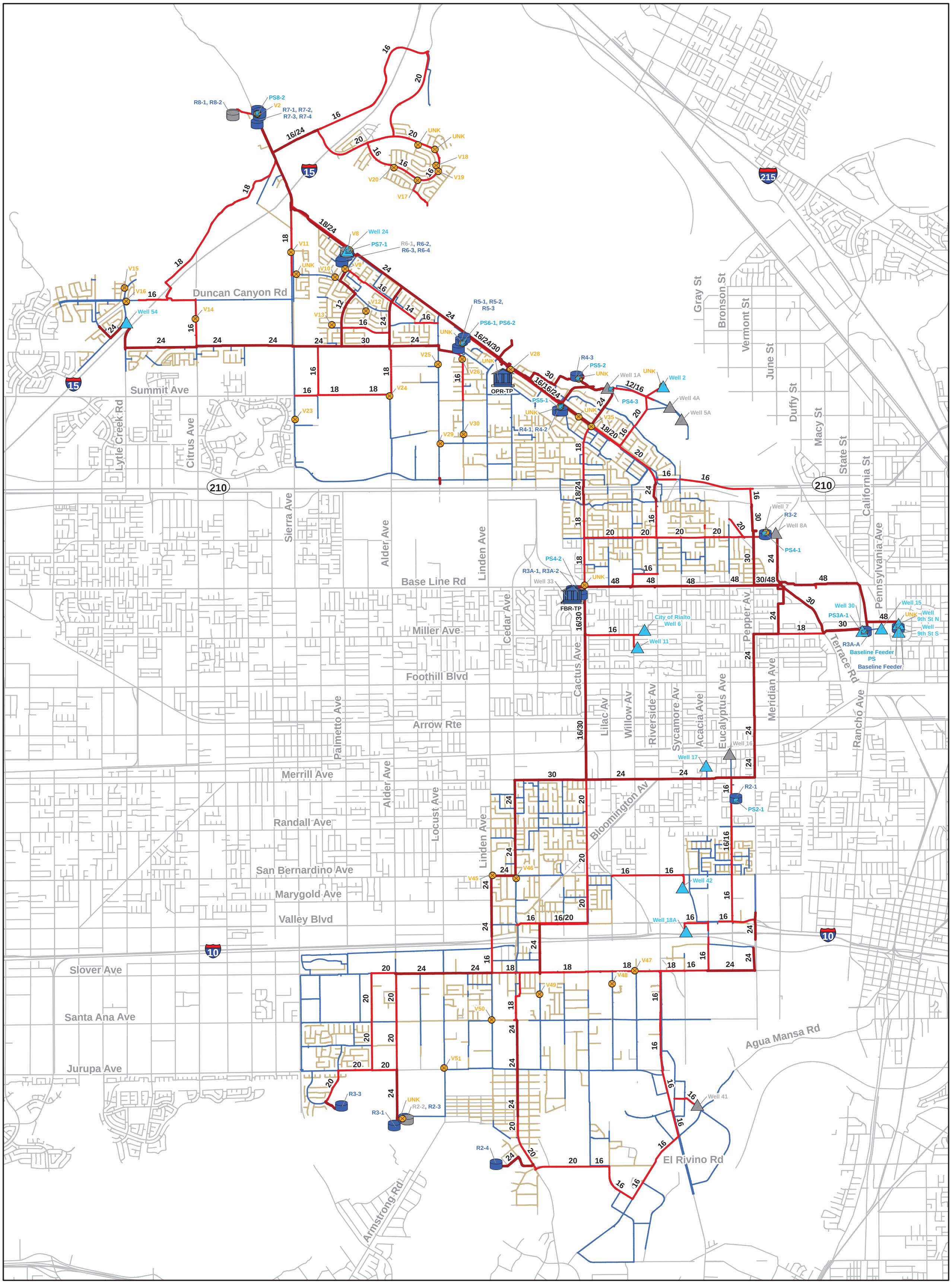
File Path: P:\xGIS\GIS_Projects\West Valley WD\WVWD_Fig4-1_PressureZones_100917.mxd

Figure 4.1
Existing Pressure Zones

Water Facilities Master Plan
West Valley Water District

West Valley Water District



Legend

Existing System

- WTP
- Tanks
- Inactive Tanks
- Active Wells
- Inactive Wells
- Pumps
- Valves

Pipes by Diameter

- 8" and Smaller
- 10" - 12"
- 16" - 20"
- 24" - 48"
- Street Centerlines

PRELIMINARY

Updated: March 13, 2019

0 0.25 0.5 1 Mile

AKEL ENGINEERING GROUP, INC.

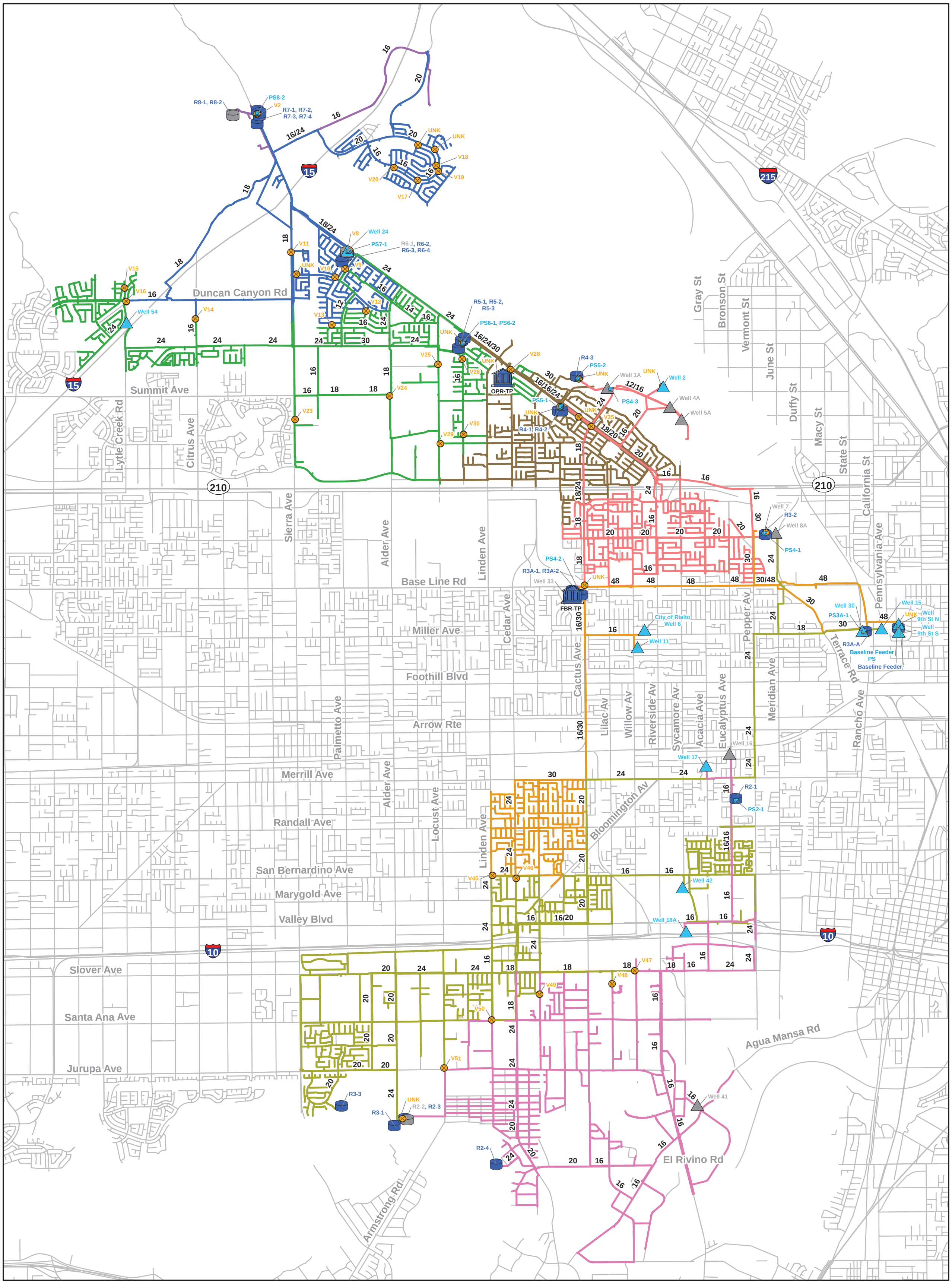
File Path: P:\xGIS\GIS_Projects\West Valley WD\WVWD_Fig4-2_ExistingSystem_031319.mxd

Figure 4.2 Existing Water Distribution System

Water Facilities Master Plan
West Valley Water District

West Valley Water District

Packet P



Legend

Existing System

- WTP
- Tanks
- Inactive Tanks
- Active Wells
- Inactive Wells
- Pumps
- Valves

Pipes by Pressure Zone

- Zone 2
- Zone 3
- Zone 3A
- Zone 4
- Zone 5
- Zone 6
- Zone 7
- Zone 8
- Street Centerlines

PRELIMINARY

Figure 4.3
Existing System Pipes by Pressure Zone

Water Facilities Master Plan
West Valley Water District

West Valley Water District

AKEL ENGINEERING GROUP, INC.

Updated: March 13, 2019

0 0.25 0.5 1 Mile

N W E S

File Path: P:\xGIS\GIS_Projects\West Valley WD\WVWD_Fig4-3_PipesPZ_031319.mxd

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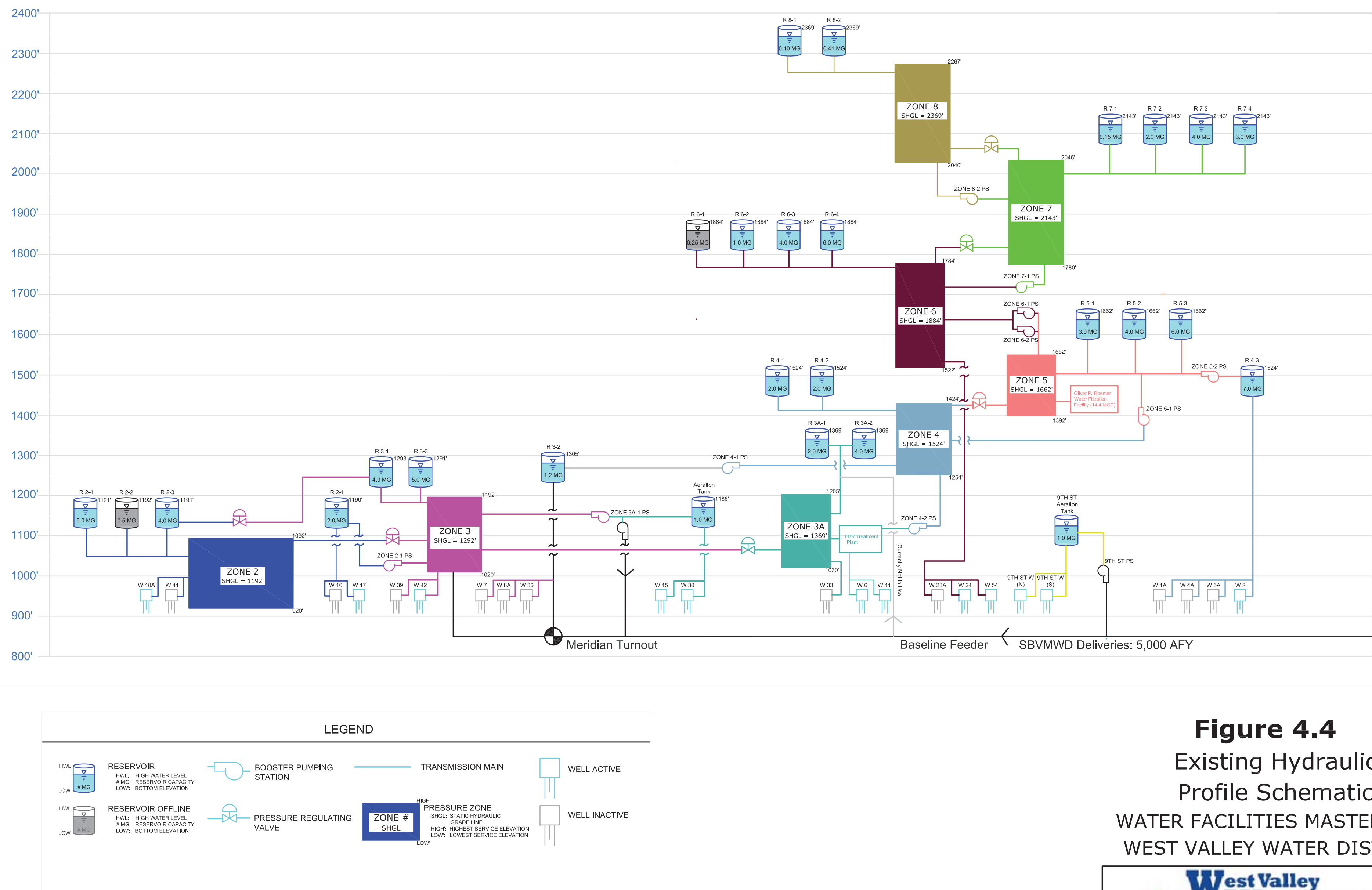

Figure 4.4

Existing Hydraulic Profile Schematic

WATER FACILITIES MASTER PLAN

WEST VALLEY WATER DISTRICT

PRELIMINARY

West Valley Water District

AKEL ENGINEERING GROUP, INC.

Last Updated: 3/7/19

Packet P

Table 4.1 Existing Groundwater Wells

Water Facilities Master Plan

West Valley Water District

PRELIMINARY

Supply Well	Zone	Groundwater Basin	Location	Pump Test Capacity[1] Flow Rate (gpm)	Flow Rate (mgd)	Total Dynamic Head (ft)	Test Year	Production Capacity[2] (mgd)	Operational Controls[3] Low Demand On (ft)	Low Demand Off (ft)	High Demand On (ft)	High Demand Off (ft)
Active Groundwater Wells												
W-2	4	Lytle Creek	19973 Country Club Drive, Rialto	1,532	2.2	519	2017	1.47	18	20	18	20
W-4A	4	Lytle Creek	5914 N. Sycamore Avenue, Rialto	2,318	3.3	512	2017	2.23	9	11	12	14
W-5A	4	Lytle Creek	5914 N. Sycamore Avenue, Rialto	1,085	1.6	532	2017	1.04	8	10	10	12
W-11[4]	3A	Rialto	238 W. Victoria St., Rialto	1,346	1.9	465	2017	1.29	VFD			
W-15	2,3,3A	Bunker Hill	1950 W. 9th St. San Bernardino	1,380	2.0	380	2016	1.32	24	26	24	26
W-17	2	Rialto	404 S. Acacia Avenue, Rialto	1,000	1.4		2010	0.96	10	18	10	18
W-18A	2	North Riverside	1783 S. Sycamore Avenue, Colton	2,170	3.1		2010	2.08	16	18	20	22
W-24	6	Rialto	4334 Riverside Avenue, Rialto	475	0.7	145	2017	0.46				
W-30	2,3,3A	Bunker Hill	2015 W. 9th St. San Bernardino	1,520	2.2	375	2016	1.46	22	24.5	22	24.5
W-42	3	North Riverside	295 E. San Bernardino Avenue, Rialto	1,625	2.3	578	2017	1.56	20	22	24	26
W-54	6	Rialto	Duncan Canyon Road, Fontana	920	1.3	930	2017	0.88	16	18	26	28
Rialto W-6[4]	3A	Rialto	204 W. Etiwanda Ave.	1,870	2.7	451	2017	1.80	VFD			
			Total Well Capacity[4]	15,895	22.9			**15.26**				
			Firm Well Capacity[4] (largest unit out of service)	13,577	19.6			**13.03**				
Inactive Groundwater Wells												
W-1A	4	Lytle Creek	19523 Country Club Drive, Rialto	822	1.2	367.1	2017	0.79				
W-7	3,4	Lytle Creek	6871 Martin PMP, San Bernardino	1,100	1.6		2010	1.06				
W-8A	3,4	Lytle Creek	6871 Martin Road, San Bernardino	1,700	2.4		2010	1.63				
W-41	2	North Riverside	3353 Industrial, Rialto	2,104	3.0	376.4	2016	2.02				
W-16		Rialto	296 S. Eucalyptus Avenue, Rialto	1,550	2.2		2010	1.49				
W-33	3A	Rialto	855 W Baseline Road, Rialto	2,517	3.6	425.3	2017	2.42				
W-23A	6	Rialto	4334 Riverside Avenue, Rialto	200	0.3		2010	0.19				
W-36	3,4	Lytle Creek	20600 Walnut Avenue, San Bernardino									
W-39	3	Chino	10272 Cedar Place, San Bernardino County					0.89				

AKEL ENGINEERING GROUP, INC.

1/11/2019

Notes:

1. Source: Pump tests received from District staff August 2, 2017.
2. Production capacity assumes operating time of 16 hours per day.
3. Source: Operational control document received from District staff August 31, 2017.
4. Well 11 and Rialto Well 6 both feed the District's Groundwater Wellhead Treatment System (FBR); only one well operates at any given time.

4.2.1 Groundwater Supply and Treatment Facilities

The District has 21 existing production wells, which are summarized on **Table 4.1**; this includes 12 active and nine inactive groundwater wells. As shown on **Table 4.1**; the firm capacity of the District's active groundwater wells is approximately 13,600 gpm. Rehabilitation, including water treatment, is needed to bring the remaining eight non-operational wells into production. The Kleinfelder firm was included as part of this team to evaluate the water supply and quality of the District's production wells.

Some wells are adversely impacted by contaminants, both human-caused and naturally occurring, which may limit the ability to use them as a source for consumption. The following documents the wells and their limiting water quality contaminant:

- **Arsenic:** Wells W-8A, W-36 and W-2
- **Perchlorate:** Wells W-16, W-17, W-18A, W-33, W-41 and W-42
- **Nitrate:** Wells W-16, W-18A, W-22A, W-39, and W-42

The District monitors groundwater quality and the movement of the groundwater contaminants, and in response to water quality concerns, groundwater treatment at the wellhead have been installed by the District on some wells. For example, well W-2 has Arsenic treatment and coagulation, and well W-11 has Perchlorate treatment.

A fluidized bed reactor (FBR) facility was constructed at the District's headquarters to remove perchlorate and nitrates. The FBR facility currently is used for perchlorate removal from the groundwater produced by wells W-11 and W-6. The process involves pumping groundwater from the two wells to the FBR, and additional downstream treatment facilities are utilized prior to discharge into the system, including: post-aeration tanks for treated water oxygenation, media filtration for solids removal, and a filtered water tank with a chlorination system for disinfection.

4.2.2 Surface Water Supply

The Oliver P. Roemer Water Filtration Facility (Roemer WFF) treats raw water from Lytle Creek, and is supplemented with State Water Project (SWP) water from Silverwood Lake. The facility is designed to treat local Lytle Creek water, imported SWP water, and a blend of the two. Kleinfelder, included on the Master Plan team, evaluated the Roemer WFF and provided discussion and recommendations.

The current capacity of the Roemer WFF is 14.4 mgd. This treatment facility has a current maximum treatment capacity of 14.4 mgd with plans to expand to 20.4 mgd. The planned expansion assumes the construction of a 6.0 mgd membrane filtration plant. Two additional lead-lag granular activated carbon (GAC) vessel systems were installed in 2017. **Appendix B** documents figures from the previous master plan that include a flow schematic of the Roemer WFF and a plant site diagram of the Roemer WFF.

The current Roemer WFF consists of influent water blending ponds, rapid mixing/coagulation, flocculation, sedimentation and dual-media filtration. Filtered water is treated with GAC to remove volatile organic compounds (VOCs) and odor and taste contaminants; the filtered water ultimately is disinfected with ultraviolent (UV) light. The finished product water is chlorinated using free chlorine for further virus deactivation and to provide residual disinfectant in the distribution system.

The Roemer WFF also integrates auxiliary facilities including two filter backwash water ponds, three sludge disposal and drying ponds, multiple flow controlling/splitting structures, chemical storage building, Lytle Creek pump station, water distribution pump station, multiple intermediate pumping systems, electrical/power supply and instrumentation and control installations.

It should be noted that the City of Rialto owns 1.5 mgd of the Lytle Creek treated flows. Currently, the District delivers these flows through a connection with the City of Rialto at their Cedar Reservoir site, along Cedar Avenue south of Persimmon Avenue. The District delivers approximately 1.2 mgd, which can increase to the City of Rialto’s owned capacity of 1.5 mgd depending on Lytle Creek flows.

4.2.3 Baseline Feeder Pipeline

Beginning in 1998, the District began receiving water through what is known as the Baseline Feeder (BLF) pipeline. This pipeline was constructed in a joint venture with the City of Rialto and San Bernardino Valley Municipal Water District (SBVWMD). The current agreement with SBVWMD allows the District to receive up to 5,000 afy of supply through this 48-inch transmission pipeline.

In 2012, two new groundwater wells, along with an aeration tank and pump station, were constructed as part of the Baseline Feeder Well Replacement and Improvement project, which was implemented to provide adequate supply to meet the District’s 5,000 afy allotment. Before this time the District received an average of 2,700 afy due to diminishing operational capacity of the original SBVWMD BLF supply wells.

Water is currently delivered to the existing system through the following two facilities.

4.2.3.1 Meridian Turnout

The District receives water delivered through the BLF pipeline using a control structure at the intersection of Baseline Road and Meridian Avenue. This control structure, known as the Meridian Turnout, currently regulates the delivery of water to the District at the following locations:

- North from Baseline Road to the Lord Ranch Facility via a 24-inch pipeline
- South from Baseline Road to Pressure Zone 3 via a 24-inch pipeline

Based on current operating conditions, the Meridian Turnout prioritizes maintaining the level of the water storage reservoir 3-2, which serves as a forebay reservoir for pump station 4-1. Excess water in the BLF not required to maintain the tank level is transferred south to Pressure Zone 3.

4.2.3.2 Lord Ranch Facility

The District currently relies on pump stations to transfer supply delivered via the BLF to Pressure Zone 4 and the higher North System pressure zones. Pump Station 4-1 is currently utilized as the primary pump station to convey BLF deliveries to Pressure Zone 4, and is referred to as the Lord Ranch Facility. This facility is currently comprised of a forebay water storage reservoir (Reservoir 3-2), and Pump Station 4-1. Water is delivered to the forebay reservoir via a 24-inch pipeline from the Meridian Turnout. A new pump station planned for this facility will be the primary pump station to transfer future water extracted from the Bunker Hill groundwater basin to Pressure Zone 4.

4.3 PRESSURE ZONES

The District's service area generally slopes upward from south to north, with service elevations ranging between 900 ft and 2,300 ft. Due to the varying terrain, the service area is divided into eight pressure zones to account for the changes in elevation.

4.3.1 Zone 2 (SHGL = 1,192 feet)

Zone 2 is the southernmost zone in the District's southern system. It is generally bounded by the Santa Ana River and Riverside/San Bernardino County Line to the south, Locust, Maple and Cedar Avenues to the west, Interstate 10 to the north and Pepper Avenue to the east.

Elevations served in this pressure zone range from approximately 920 feet to 1,092 feet. This zone is supplied from one groundwater well (Well 18A) as well as PRVs from Zone 3; this zone has 3 active ground level storage reservoirs for a total storage capacity of 11.0 MG.

4.3.2 Zone 3 (SHGL = 1,292 feet)

Zone 3, located within the District's southern system, is separated into two distinct areas that are divided by the City of Rialto. The first area is generally bounded by Sierra Avenue to the west and Zone 2 to the east, with San Bernardino Avenue and the Riverside/San Bernardino County Line serving as the northern and southern boundaries respectively. The second area is generally bounded by Sycamore Avenue to the west and Pepper Avenue to the east, with Randall Avenue and Interstate 10 serving as the northern and southern boundaries respectively.

Elevations served in this pressure zone range from approximately 1,020 feet to 1,192 feet. This zone can be supplied from multiple locations, which are summarized as follows:

- Baseline feeder pipeline through the Meridian Turnout
- Well 17 supply, which first enters Reservoir 2-1, before being boosted into the Pressure Zone by the 2-1 Booster Station.

- Direct supply from Well 42
- Wells 15 and 30 supply, which first enters Aeration Tank 3A-1, before being boosted into the Pressure Zone by the 3A-1 Booster Station.
- PRVs from Zone 3A

This zone has three storage reservoirs for a total storage capacity of 10.2 MG.

4.3.3 Zone 3A (SHGL = 1,369 feet)

Zone 3A is the northernmost zone in the District' southern system. It is generally bound by Merrill Avenue to the north and San Bernardino Avenue to the south, with Linden Avenue and Cactus Avenue serving as the western and eastern boundaries respectively.

Elevations served in this pressure zone range from approximately 1,030 feet to 1,205 feet. This zone can be supplied from multiple locations, which are summarized as follows:

- The Fluidized Bed Reactor (FBR) treatment plant, which treats groundwater from well 11 and the City of Rialto well 6,
- Baseline feeder pipeline through the Meridian Turnout

This zone has two storage reservoirs for a total storage capacity of 6.0 MG.

4.3.4 Zone 4 (SHGL = 1,524 feet)

Zone 4 is the southernmost zone of the District's northern system. It is generally bound by Highland Avenue to the north and Baseline Road to the south, with Cactus Avenue and the Southern Pacific Railroad serving as the western and eastern boundaries respectively

Elevations served in this pressure zone range from approximately 1,254 feet to 1,424 feet. This zone is currently supplied by pump station 4-1 and pump station 4-2 as well as PRVs from Zone 5. This zone has three storage reservoirs for a total storage capacity of 11.0 MG, which includes pumping storage for Zones 5, 6, 7, and 8.

4.3.5 Zone 5 (SHGL = 1,662 feet)

Zone 5 is located within the District's northern system and generally bound by Summit Avenue to the north and Highland Avenue in the south. Maple Avenue and Linden Avenue serve as the western boundary while the Lytle Creek wash serves as the eastern boundary.

Elevations served in this pressure zone range from approximately 1,392 feet to 1,552 feet. This zone is supplied by the Roemer WFF as well as booster stations 5-1 and 5-2, which draw water from Zone 4. This zone has three storage reservoirs for a total storage capacity of 13.0 MG, which includes pump storage for Zones 6, 7, and 8.

4.3.6 Zone 6 (SHGL = 1,884 feet)

Zone 6, located within the District's northern system, is generally bound by Duncan Canyon Road and Casa Grande Drive to the north and Highland Avenue to the south; Sierra Avenue and Brookside Avenue generally serve as the western boundaries while the Lytle Creek wash serves as the eastern boundary.

Elevations served in this pressure zone range from approximately 1,522 feet to 1,784 feet. This zone is supplied from booster stations 6-1 and 6-2, which draw water from Zone 5, as well as PRVs from Zone 6; this zone has 3 active storage reservoirs for a total storage capacity of 11.0 MG, which includes pumping storage for Zones 7 and 8.

Zone 6 includes two subzones: Zone 6A, and Zone 6B. Zone 6A includes the developed area bound to the north by Summit Avenue and Lowell Street, Locust Avenue to the east, Foothill Freeway to the south and Sierra Avenue to the west. Zone 6B is bound to the north and west by Zone 6A, with Maple Avenue and Highland Avenue generally serving as the eastern and southern boundaries respectively.

4.3.7 Zone 7 (SHGL = 2,143 feet)

Zone 7, located within the District's northern system, is bounded to the south by pressure zone 6, and bounded north by the San Bernardino National Forest, then along the Interstate 15 to Glen Helen Regional Park. Elevations served in this pressure zone range from approximately 1,780 feet to 2,045 feet. This zone is supplied from booster station 7-1, which draws water from Zone 6, as well as PRVs from Zone 8; this zone has 4 storage reservoirs for a total storage capacity of 9.2 MG, which includes pumping storage for Zone 8.

Pressure Zone 7 includes two subzones: Zone 7A, and Zone 7B. Zone 7A serves the residential development along Sycamore Creek Loop. Zone 7B is generally south of Terra Vista Drive, between Riverside Avenue and Citrus Avenue.

4.3.8 Zone 8 (SHGL = 2,369 feet)

Pressure Zone 8 is the northernmost zone in the District's northern system and is generally north of Glen Helen Parkway, with Sierra Avenue and Clearwater Parkway serving as the western and eastern boundaries respectively.

Elevations in this pressure zone range from approximately 2,040 feet to 2,267 feet. This zone is supplied from booster stations 8-1 and 8-2, which draw water from Zone 7; this zone has two storage reservoirs for a total storage capacity of 0.51 MG.

4.4 TRANSMISSION AND DISTRIBUTION PIPELINES

Supply is pumped directly into the District's distribution system via 375 miles of pipeline, with diameters ranging from pipelines less than 6-inches in diameter to 48-inch pipelines. The District maintains a robust transmission system, with approximately 60 miles of pipeline greater than or equal to 18-inches in diameter. The existing system pipelines are documented on **Figure 4.2**, and color-coded by pipe size. Similarly, **Figure 4.3** documents the existing system, and color-coded by pressure zone serviced.

An inventory of existing pipes, extracted from the GIS-based hydraulic model and used in this analysis, is included in **Table 4.2**. For each pipe diameter, the inventory lists the length in feet, as well as the total length in units of miles. Additionally, standard pipe roughness coefficients used for various materials are included for reference on **Table 4.3**.

4.5 STORAGE RESERVOIR

Storage reservoirs are typically incorporated in the water system to provide water supply for operation during periods of high demand, for meeting fire flow requirements, and for other emergencies, as defined in the District's planning criteria.

The District's existing storage reservoirs are summarized on **Table 4.4**, along with their capacity, high water level, tank height, and construction type. These reservoirs are also shown on the hydraulic profile schematic (**Figure 4.4**), the high water level and bottom tank elevations. The District maintains a robust system storage capacity, in excess of 71 million gallons.

4.6 BOOSTER STATIONS

Water is conveyed from the lower pressure zones to the higher pressure zones via a series of booster pump stations (**Table 4.5**). Water is extracted from various sources, including surface water from Lytle Creek and purchased State Water Project water treated at the Oliver P. Roemer Water Filtration Facility, the Bunker Hill Basin water delivered through the Baseline Feeder, and groundwater wells. This water is then boosted throughout the water system by an interconnected transmission network.

Table 4.5 lists the location, design capacity, and individual pump information at each pump station. Operational controls for the booster pumps are controlled to turn "on" or "off" depending on their assigned storage reservoirs, as listed in this table.

4.7 PRESSURE REDUCING VALVES

There are several sub-pressure zones that are pressure reducing valve (PRV) dependent within the existing system. Other PRVs act as emergency connections between pressure zones in case of a catastrophic failure. An inventory of the PRVs, their size, location, pressure zone serviced and settings are included on **Table 4.6**.

Table 4.2 Existing Modeled Pipe Inventory

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Pipe Diameter (in)	Pipe Length By Material							Total	
	Steel (ft)	Asbestos Cement (ft)	Cast Iron (ft)	Ductile Iron (ft)	PVC (ft)	HDPE (ft)	Unknown (ft)	(ft)	(mile)
Existing Distribution System									
2	3,186	0	255	23	20	0	464	3,948	0.7
3	586	0	167	0	0	0	43	796	0.2
4	33,969	12,833	6,186	0	81	0	5,421	58,489	11.1
6	133,232	155,210	8,011	453	26,841	0	5,953	329,700	62.4
8	57,416	293,451	6,076	1,858	300,829	0	10,721	670,350	127.0
10	36,799	79,143	122	30	9,752	0	1,543	127,390	24.1
12	160,537	115,728	0	431	104,318	0	25,357	406,370	77.0
14	2,709	0	0	0	0	0	0	2,709	0.5
16	93,109	11,983	0	19,812	2,163	0	4,315	131,383	24.9
18	46,114	12,562	0	136	16	0	154	58,981	11.2
20	50,480	7,864	0	10,040	13	0	287	68,684	13.0
22	0	0	0	0	0	0	47	47	0.0
24	94,076	24,214	2,174	16,787	31	279	3,393	140,956	26.7
30	33,615	14,545	0	1,059	0	0	1,732	50,951	9.6
36	2,568	0	0	0	0	0	117	2,685	0.5
Total	**748,396**	**727,534**	**22,991**	**50,629**	**444,064**	**279**	**59,547**	**2,053,440**	**388.9**
Baseline Feeder Pipeline									
Total	**19,735**	**0**	**0**	**0**	**0**	**0**	**286**	**20,021**	**3.8**

AKEL ENGINEERING GROUP, INC.

10/3/2017

Note:

1. Pipeline length and material based on GIS data provided by District Staff, as included in the 2017 Water System Hydraulic Model.

Table 4.3 Pipe Roughness Coefficients

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Pipe Material	Age (years)					
	0	10	20	30	40	50
Asbestos Cement	125	125	125	125	125	125
Cast Iron	120	110	100	90	85	80
Ductile Iron	130	125	120	115	110	105
Plastic (PVC)	145	145	140	140	135	135
Steel	130	120	110	100	90	80

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Note: 9/29/2017

1. At age=0, the roughness coefficients are commonly used values for new pipes. Roughness coefficients decrease with age at a rate that depends on pipe material.
2. Pipes with an unknown material or age were assigned a roughness coefficient of 110.

Table 4.4 Existing Storage Facilities
Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Designation	Capacity (MG)	High Water Level (ft)	Tank Height (ft)	Type of Construction
Zone 2				
R2-1	2.00	1,190	29.0	Reinforced Concrete
R2-2 (Inactive)	0.50	1,192	30.0[2]	Welded Steel
R2-3	4.00	1,191	31.0	Welded Steel
R2-4	5.00	1,191	31.0	Welded Steel
Subtotal (Active Facilities)	**11.00**			
Zone 3A				
R3A-1	2.00	1,369	18.0	Reinforced Concrete
R3A-2	4.00	1,369	23.0	Welded Steel
Subtotal	**6.00**			
Zone 3				
R3-1	4.00	1,293	33.0	Welded Steel
R3-2	1.20	1,305	32.0	Welded Steel
R3-3	5.00	1,292	31.0	Welded Steel
Subtotal	**10.20**			
Zone 4				
R4-1	2.00	1,524	24.0	Reinforced Concrete
R4-2	2.00	1,524	19.0	Reinforced Concrete
R4-3	7.00	1,524	24.0	Welded Steel
Subtotal	**11.00**			
Zone 5				
R5-1	3.00	1,662	24.0	Reinforced Concrete
R5-2	4.00	1,662	23.5	Welded Steel
R5-3	6.00	1,662	24.0	Reinforced Concrete
Subtotal	**13.00**			

Table 4.4 Existing Storage Facilities

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Designation	Capacity (MG)	High Water Level (ft)	Tank Height (ft)	Type of Construction
Zone 6				
R6-1 (Inactive)	0.25	1,885	24.0	Welded Steel
R6-2	1.00	1,884	24.0	Welded Steel
R6-3	4.00	1,884	31.0	Welded Steel
R6-4	6.00	1,884	31.0	Welded Steel
Subtotal (Active Facilities)	**11.00**			
Zone 7				
R7-1	0.15	2,143	23.5	Welded Steel
R7-2	2.00	2,143	23.0	Welded Steel
R7-3	4.00	2,143	23.5	Welded Steel
R7-4	3.00	2,143	23.5	Welded Steel
Subtotal	**9.15**			
Zone 8				
R8-1	0.10	2,369	24.0	Welded Steel
R8-2	0.41	2,363	18.0	Welded Steel
Subtotal	**0.51**			
Total Storage Capacity				
	71.86			

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Note:
1. Unless noted otherwise, storage facility information extracted from West Valley Water District 2012 Water System Master Plan
2. Source: Tank information received from district staff October 30, 2017.

Table 4.5 Existing Booster Pump Stations

Water Facilities Master Plan

West Valley Water District

PRELIMINARY

Designation No.	Location	Source Pressure Zone	Destination Pressure Zone	Design Capacity[1]	Operational Capacity[2]			Operational Controls[4]			
					Total (mgd)	Hours or operation	Firm[3] (mgd)	Low Demand On	Low Demand Off	High Demand On (ft)	High Demand Off (ft)
Zone 2 to Zone 3 Transfer PS	Zone 2-1 Reservoir	2	3	1,500 gpm (1 pump)	1.4	16.0	0.0	19.0	21.0	23.0	25.0
FBR Treatment Facility		-	3A	2,000 gpm	2.9	24.0	2.9				
Zone 3A-1 PS[3]	2015 9th St	3, 3A	3, 3A	3,500 gpm @ 210' (2 pumps, Z3A) 3,400 gpm @ 150' (2 pumps, Z3)	20.0	16.0	16.6	18.0	20.0	22.0	24.0
Zone 4-1 PS	6871 Martin Rd	3	4	2,000 gpm @ 240' (2 pumps) 1,100 gpm @ 240' (1 pump)	4.9	16.0	3.0	10.0	12.0	13.0	15.0
Zone 4-2 PS	855 Baseline Rd	3A	4	2,400 gpm @ 170' (3 pumps)	6.9	16.0	4.6	7.0	9.0	9.0	11.0
Zone 4 Transfer PS	Zone 4-3 Reservoir	4	4	5,000 gpm (1 pump)		As Needed					
Zone 5-1 PS[4]	5700 Riverside Ave	4	5	3,000 gpm @ 170' (4 pumps)	11.5	16.0	8.6	9.0	11.0	13.0	15.0
Zone 5-2 PS	At Reservoir R4-3	4	5	3,200 gpm @ 181' (6 pumps)	18.4	16.0	15.4	10.0	12.0	14.0	16.0
Oliver P. Roemer WFF Effluent Pumps	3010 Cedar Ave	-	5	1,800 gpm @ 130' (4 pumps)	10.4	24.0	7.8				
Zone 6-1 PS[4]	5210 Riverside Ave	5	6	2,200 gpm @ 230' (3 pumps) 1,850 gpm @ 235' (1 pump) 850 gpm @ 220' (1 pump)	8.9	16.0	6.8	14.0	16.0	24.0	26.0
Zone 6-2 PS	5210 Riverside Ave	5	6	2,590 gpm @ 265' (6 pumps)	14.9	16.0	12.4	15.0	17.0	25.0	27.0
Zone 7-1 PS	4334 Riverside Ave	6	7	2,200 gpm @ 280' (3 pumps) 1,300 gpm @ 280' (1 pump)	7.6	16.0	5.5	16.0	18.0	20.0	22.0
Zone 8-1 PS	3434 Lytle Creek Rd	7	8	280 gpm @ 225' (1 pump) 175 gpm @ 225' (1 pump)		As Needed					
Zone 8-2 PS	3296 Lytle Creek Rd	7	8	1,630 gpm @ 252' (4 pumps)	6.3	16.0	4.7	10.0	16.5	10.0	16.5

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Notes:

1. Source : West Valley Water District 2012 Water Master Plan
2. Excluding the Roemer WFF and FBR Treatment plant, production capacity assumes operating time of 16 hours per day.
3. Firm capacity defined as total pump capacity excluding largest pump.

Table 4.6 Existing Pressure Reducing Valves

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Valve ID	Location	Size	Pressure Zone		Settings	
		(in)	Upstream	Downstream	Upstream	Downstream
Zone 8						
V2	8-2 Pump Station	10	8	7	111	N/A
Zone 7						
V8	Riverside (By Zone 7-1 PS)	12	7	7B	120	80
V9	Live Oak & Via Bello	8	7	7B	-	-
V10	Dove Tree & Terra Vista	8	7	7B	-	-
V11	North Sierra, across from school	8	7	7B	Not in Use	
V12	Terra Vista & Tamarind	8	7	6	95	60
V13	Goldenrod & Sunrise	8	7	6	-	-
V14	Citrus 1/4 mile south of Duncan Canyon	8	7	6	-	-
V15	Six M Ranch Ln & Cloudcrest Way	8	7	6	Not in Use	
V16	Duncan Canyon & Coyote Canyon South side	8	7	6	190	80
V17	Sweet bay and Sycamore Creek	8	7	7A	140	73
V18	Kimberlite & Sycamore Creek	8	7	7A	140	80
V19	Black Cottonwood & Sycamore Creek	8	7	7A	140	92
V20	Eve Primrose Ln & Sycamore Creek	8	7	7A	140	80
Zone 6						
V23	South Sierra, Sierra & Summit	8	6	6A	-	-
V24	End of Alder (by Target warehouse)	12	6	6A	105	75
V25	Locust (by fireworks factory)	12	6	6A	115	75
V26	Maple (top near bend)	8	6	6A	114	70
V27	Linden South of Riverside	8	6	6A	-	-
V28	Riverside and Cedar	6	6	6A	140	75
V29	Locust and Bohnert	8	6A	6B	112	82
V30	Maple and Banyon	6	6A	6B	120	70
Zone 5						
V35	Riverside and Cactus	8	5	4	-	-
Zone 3						
V44	San Bernardino and Linden	16	3A	3	-	-
V45	San Bernardino and Linden	12	3A	3	-	-
V46	San Bernardino and Cedar	12	3A	3	-	-
V47	Slover near Willow	12	3	2	-	-
V48	Lilac below Slover	8	3	2	-	-
V49	Larch and Buckskin	8	3	2	-	-
V50	Santa Ana and Linden	10	3	2	-	-
V51	Locust and Jurupa	12	3	2	-	-

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Notes:

1. Source: Control valve inventory received from District staff August 3, 2017.

CHAPTER 5 – WATER DEMANDS AND SUPPLY CHARACTERISTICS

This chapter summarizes existing domestic water demands, discussed available supply characteristics, and projects the future domestic water demands.

5.1 EXISTING DOMESTIC WATER DEMANDS

The existing water demands used for this master plan were based on the District's 2016 water billing consumption records as well as total annual production. The existing water demands in this analysis are adjusted to match the annual production records and account for system losses.

The existing demand distribution, by pressure zone, was obtained from the water billing records. Using GIS, each customer account was geocoded to its physical location within its existing pressure zone. The accounts were then sorted by pressure zone and the total demand in each zone was calculated.

The District's existing average day domestic water demands, as extracted from the water billing records, were lower than the total demands listed in the annual production records due to system losses that occurred between the groundwater wells and customer service connections. In 2016 this water loss volume was approximately 6% of the total water produced by the District. For evaluation purposes the total domestic water demands were adjusted to reflect the 2014 production volume less 10%. This adjustment accounts for continuing changes in customer water use in response to State-mandated drought measures. The existing domestic water demands used in the evaluation, for each pressure zone, are summarized by pressure zone on **Table 5.1**.

5.2 FUTURE DOMESTIC WATER DEMANDS

Future demands were projected using the unit factors for residential and non-residential land uses and included the developments within the District service area. **Table 5.2** organizes the future land use categories and their corresponding domestic water demands. It should be noted that the existing domestic water demands in **Table 5.2** were calculated using the recommended water unit factors, which take into account future water conservation practices, and are intended to represent the water use practices of customers at the buildout of the master plan horizon. The total average day domestic water demands from existing and future developments is calculated at 31.6 mgd.

These demands were used in sizing the future infrastructure facilities, including distribution mains, storage reservoirs, and booster stations. Demands were also used for allocating and reserving capacities in the existing or proposed facilities. **Table 5.1** summarizes the buildout water demand for each pressure zone.

Table 5.1 Demands by Pressure Zone

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Pressure Zone	Existing[1]	5-Year Growth[2]		Buildout[3]			
		New Demand (mgd)	Subtotal (mgd)	New Demand (mgd)	Total Average Day Demands (mgd)	Increase from Existing (%)	Total Peak Day Demands[4] (mgd)
South System Pressure Zones							
2	2.7	0.1	2.8	1.8	4.6	72%	7.7
3	3.9	0.3	4.1	2.5	6.6	72%	11.3
3A	1.0	0.0	1.1	0.0	1.1	7%	1.9
Subtotal	**7.6**	**0.4**	**8.0**	**4.3**	**12.3**	**63%**	**20.9**
North System Pressure Zones							
4	2.0	0.0	2.0	0.3	2.3	16%	3.9
5	2.0	0.7	2.6	0.2	2.8	43%	4.8
6	3.2	1.2	4.4	2.4	6.8	114%	11.6
7	2.5	1.6	4.0	2.5	6.5	165%	11.1
8	0.2	0.3	0.5	0.4	0.9	276%	1.5
Subtotal	**9.8**	**3.7**	**13.5**	**5.8**	**19.3**	**97%**	**32.8**
System-Wide Demands							
	17.4	**4.2**	**21.5**	**10.1**	**31.6**	**82%**	**53.7**

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Notes:

1. Average day demands based on 2014 production less 10%, where the demand distribution by pressure zone is based on 2016 water billing records
2. Demands due to 5-Year growth based on development information provided by District Staff.
3. Future demands based on additional growth due to buildout of General Plan Land Use.
4. Peak Day Demand = 1.7 x Average Day Demand
5. The demands shown in this table include system losses.

Table 5.2 Buildout Average Daily Water Demands

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Land Use Classifications	Buildout Water Demands											
	Existing Development			Future Development to be Serviced within Planned Area Boundary								
	Within Service Area			Within Service Area			Sphere of Influence				Total	
	Existing Development (net acre)	Water Unit Factor (gpd/net acre)	Average Daily Demand (gpd)	New Development (net acre)	Future Water Unit Factor (gpd/net acre)	Average Daily Demand (gpd)	Existing Development (net acre)	New Development (net acre)	Future Water Unit Factor (gpd/net acre)	Average Daily Demand (gpd)	Total Development within SOI (net acre)	Average Daily Demand (gpd)
Residential												
Residential 2	1,074	990	1,063,695	921	990	912,078	0	6	990	5,842	2,002	1,981,614
Residential 6	3,614	2,650	9,577,035	2,136	2,650	5,660,863	0	5	2,650	14,234	5,756	15,252,132
Residential 12	0	4,580	0	556	4,580	2,544,483	0	27	4,580	124,527	583	2,669,010
Residential 21	83	5,630	468,282	545	5,630	3,069,456	0	57	5,630	319,248	685	3,856,986
Subtotal Residential	4,772		11,109,011	4,158		12,186,880	0	95		463,851	9,025	23,759,741
Non-Residential												
Commercial	58	1,800	105,083	927	1,800	1,668,923	0	18	1,800	32,621	1,004	1,806,627
Retail	4	1,890	7,317	180	1,890	339,845	0	0	1,890	0	184	347,162
Office	9	1,410	12,207	55	1,410	77,652	0	0	1,410	0	64	89,859
Educational	299	1,790	534,407	84	1,790	149,565	0	0	1,790	0	382	683,972
Institutional	8	1,410	10,866	475	1,410	669,137	0	0	1,410	0	482	680,003
Public Facility	53	250	13,324	131	250	32,761	0	0	250	0	184	46,085
Light Industrial	324	500	161,978	422	500	210,874	0	0	500	0	746	372,852
Heavy Industrial	162	1,530	248,184	480	1,530	735,142	0	0	1,530	0	643	983,325
Industrial	1,161	1,000	1,160,728	1,072	1,000	1,071,836	0	0	1,000	0	2,233	2,232,564
Subtotal Non-Residential	2,077		2,254,094	3,825		4,955,735	0	18		32,621	5,921	7,242,450
Other												
Utilities	223	10	2,230	362	10	3,618	0	0	10	0	585	5,849
ROW	35	0	0	75	0	0	0	0	0	0	110	0
Landscape Irrigation	77	2,690	207,367	124	2,690	333,334	0	25	2,690	66,291	226	606,992
Open Space	0	0	0	2,015	0	0	0	195	0	0	2,210	0
Subtotal Other	335		209,598	2,576		336,952	0	219		66,291	3,130	612,841
Totals	7,184		**13,572,703**	10,559		17,479,567	0	333		562,763	18,076	**31,615,032**

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2/10/2017

5.3 REGULATIONS IMPACTING DEMAND

The State of California recently enacted Senate Bill 606 and Assembly Bill 1668, which regulate water demands based on user categories and establish planning targets for indoor and outdoor water use. These laws establish a target of maximum indoor residential water use of 55 gpdc by the year 2025, and a target of 50 gpdc by 2030. The State Water Resources Control Board is also expected to provide guidance on the calculation of indoor and outdoor water use from commercial, industrial and institutional uses, and similar targets, which are expected by 2022. These regulations are likely to establish long term water use reductions, which will impact supply and infrastructure planning.

5.4 DIURNAL DEMAND PATTERNS

Water demands vary with the time of day and by account type according to the land use designation. These fluctuations were accounted for in the modeling effort and evaluation of the water distribution system. The diurnal demand patterns affect the water levels in storage reservoirs and amount of flow through distribution mains.

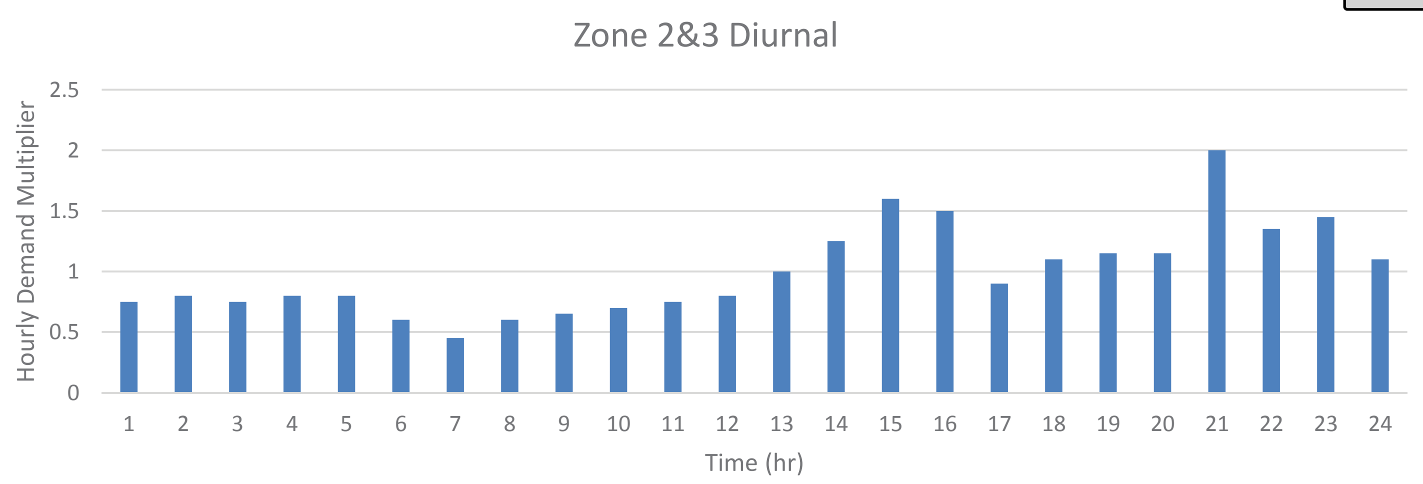
Using available SCADA data provided by District staff, unique diurnal curves were developed for the Pressure Zones 3, 3A, 4, 5, 6, and 7. These patterns were developed using a mass balance method for each pressure zone, using the pump station flow in, pump station flow out, and the change in storage volume to estimate the fluctuation in zone demand. As shown on **Figure 5.1** and **Figure 5.2**, the hourly demand multipliers by pressure zone range from a maximum of 2.3 in Pressure Zone 6 to a minimum of 0.3 in Pressure Zone 5. The diurnal patterns were confirmed during the calibration effort of the District's hydraulic model and corresponding SCADA information.

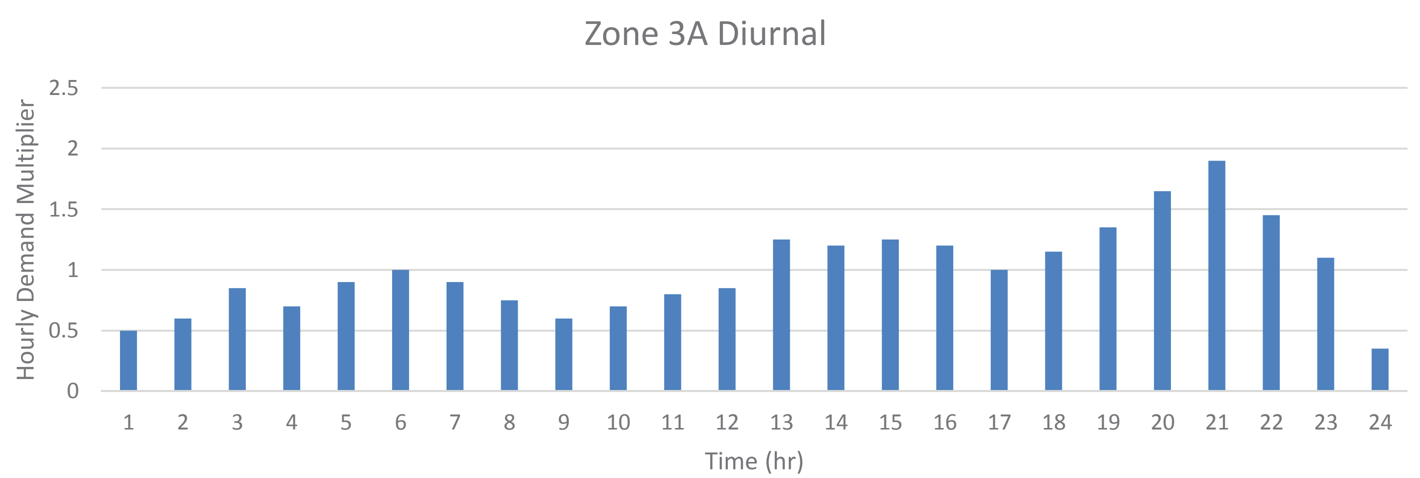
5.5 WATER SUPPLY CHARACTERISTICS

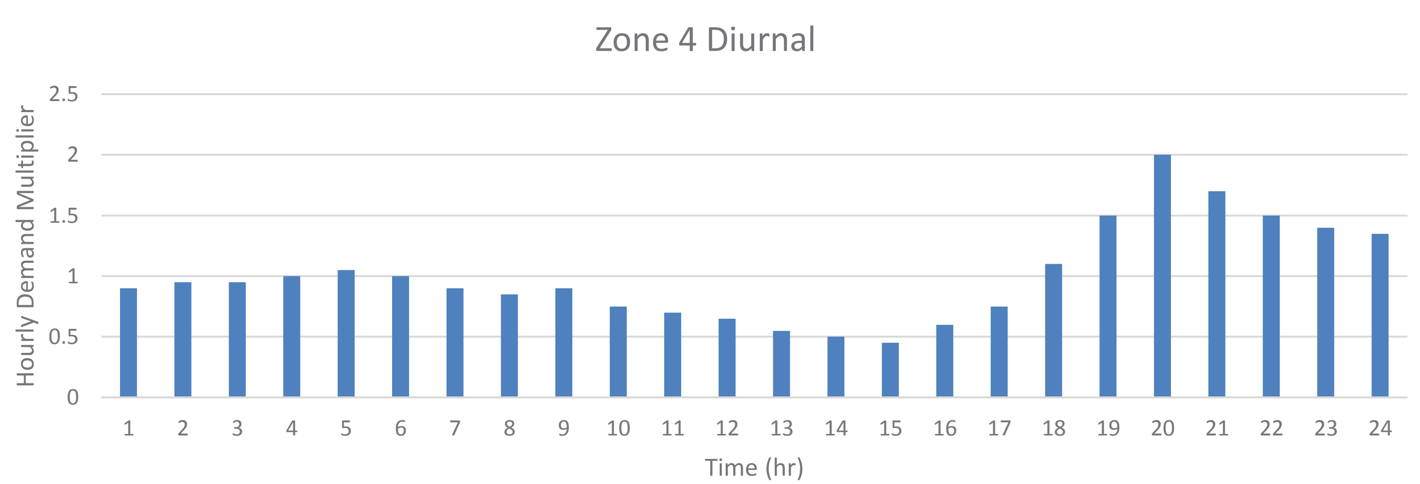
In order to meet the existing domestic water demands, the District utilizes several sources of supply, including groundwater and treated surface water. Some supply sources are subject to constraints that can impact the availability and reliability. The following sections summarize the supply sources and the related constraints, as well as documents the assumptions utilized in planning the supply-related improvements intended to meet future demands at the buildout.

5.5.1 Groundwater Supply Sources and Constraints

As discussed in a previous chapter, the District currently utilizes multiple wells to extract groundwater for delivery to existing water system customers. These groundwater wells extract water from five separate groundwater basins, which are shown graphically on **Figure 5.3** and briefly summarized on the following pages.







LEGEND

Hourly Demand Multiplier

PRELIMINARY

February 5, 2018

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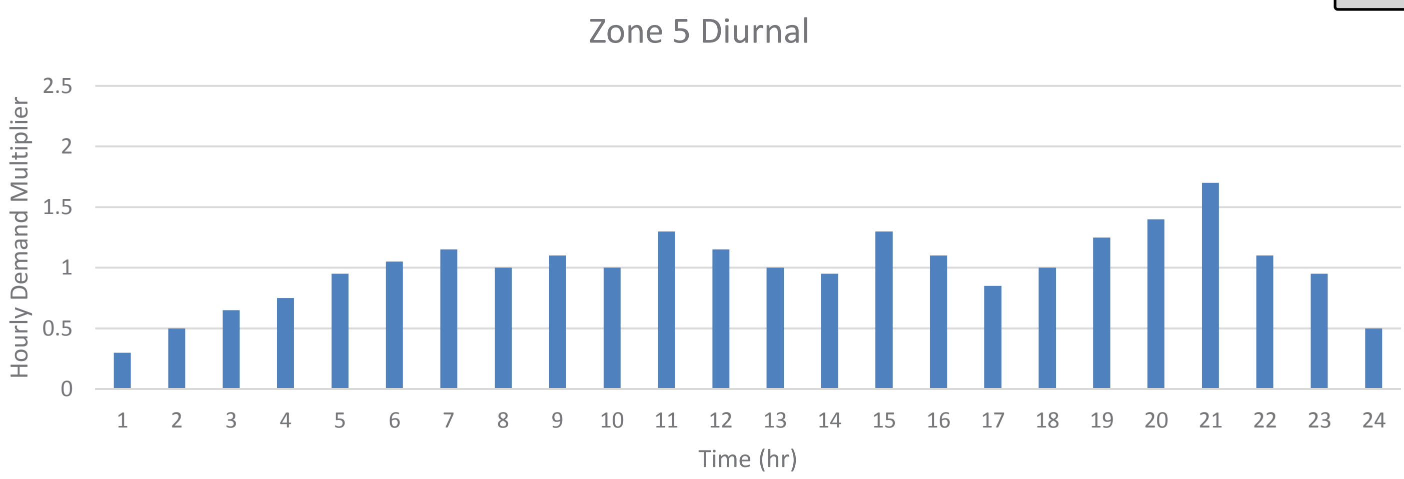
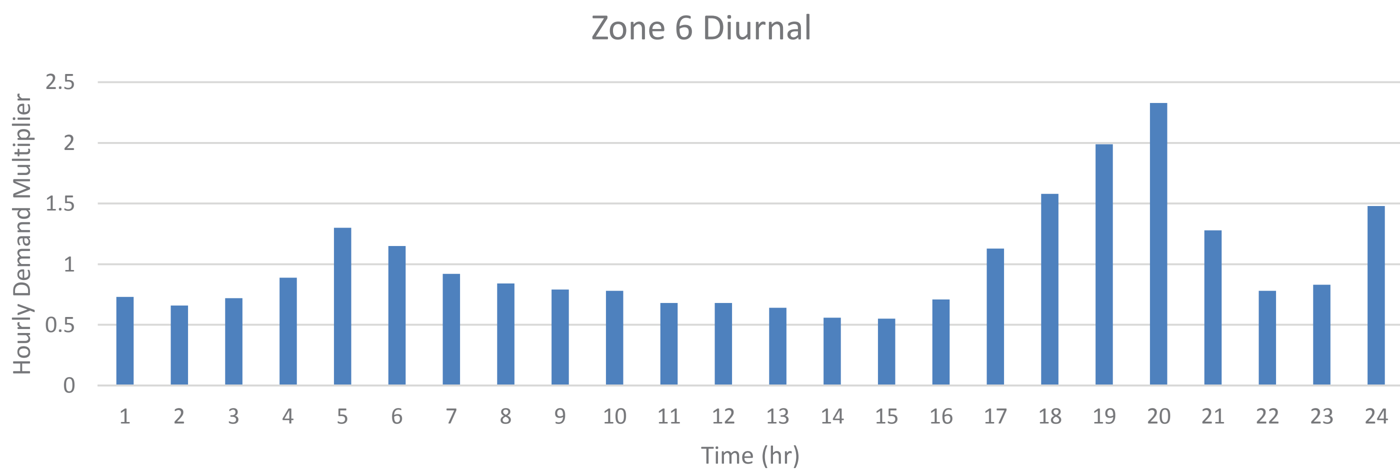
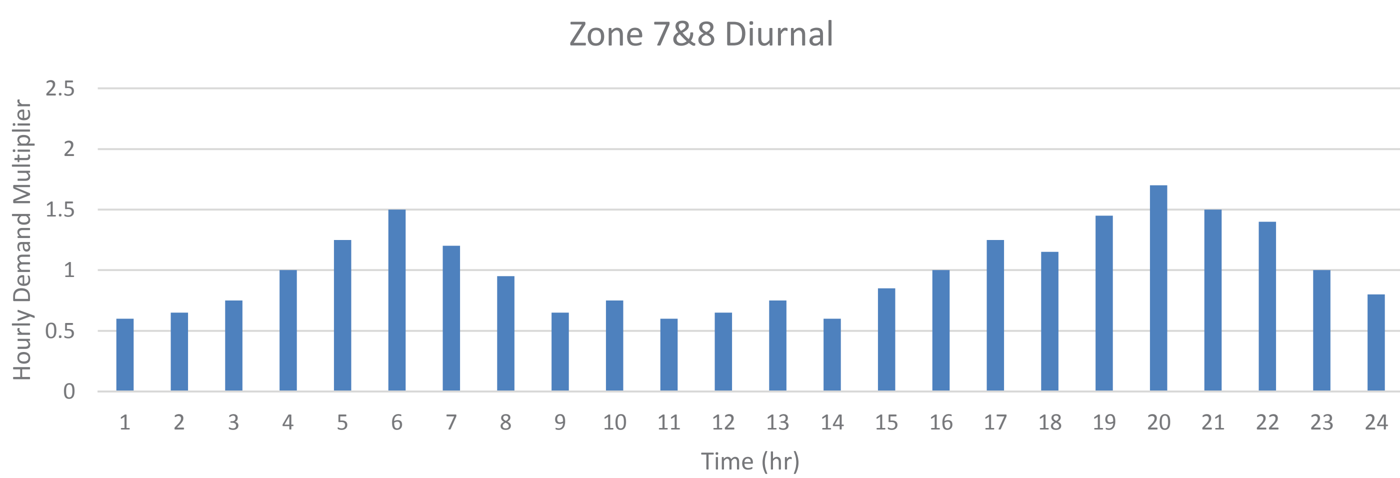
Figure 5.1
Pressure Zone Demand Diurnals

Water Facilities Master Plan
West Valley Water District

West Valley Water District







LEGEND

PRELIMINARY

Hourly Demand Multiplier

February 5, 2018

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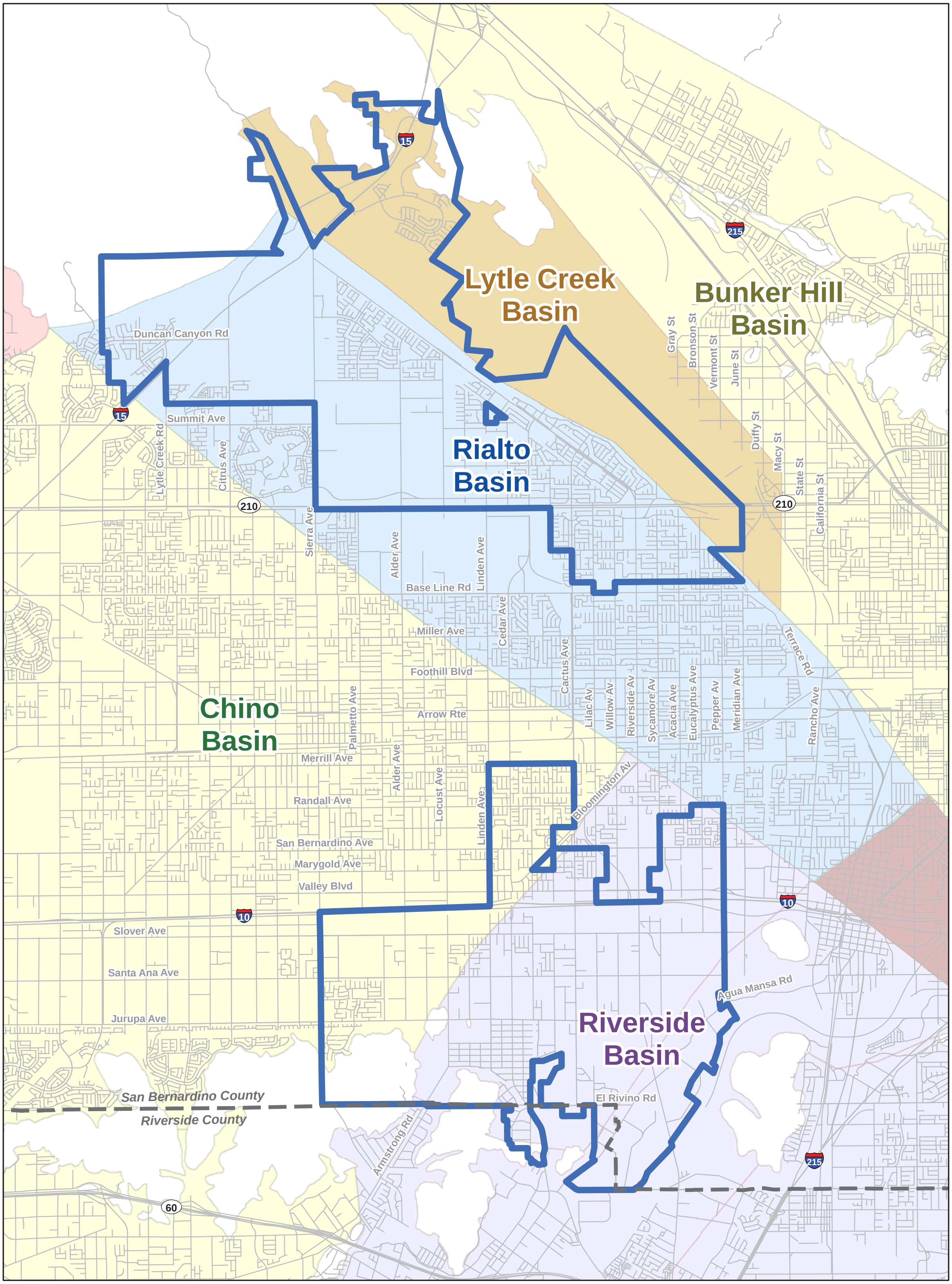
Figure 5.2
Pressure Zone Demand Diurnals

Water Facilities Master Plan
West Valley Water District

West Valley Water District



Legend

WVWD Service Area
County Boundaries

Groundwater Subbasins
- Bunker Hill
- Chino
- Colton
- Cucamonga
- Lytle Creek
- Rialto
- Riverside

Street Centerlines

PRELIMINARY

Updated: January 28, 2019

0 0.25 0.5 1 Mile

N W E S

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File Path: P:\xGIS\GIS_Projects\West Valley WD\WVWD_Fig5-3_GWsubbasins_012819.mxd

Figure 5.3
Groundwater Subbasins

Water Facilities Master Plan
West Valley Water District

West Valley Water District

5.5.1.1 Lytle Creek Basin

The Lytle Creek groundwater basin is a subbasin of the Bunker Hill groundwater basin, and underlies the northern extent of the District's North System. The subbasin is part of the Upper Santa Ana Valley Groundwater Basin and is generally adjoined to the west by the Rialto-Colton basin along the Lytle Creek fault and along the east and southeast by the remaining portions of the Bunker Hill basin. The San Gabriel Mountains form the northwestern border. It should be noted that DWR Bulletin 118 includes the Lytle Creek subbasin as part of the Bunker Hill basin and does not address it separately. However, the Santa Ana Region Basin Plan identifies this area as a separate management zone, and the District currently refers to it separately in discussions of groundwater quality and quantity from the remaining Bunker Hill basin.

The District's water rights in the Lytle Creek Basin are limited to 12,105 gallons per minute (gpm) if they are diverting their full allotment (2,290 gpm) of surface flow from Lytle Creek. If flows from the Creek are low and the District is receiving a portion of their allotment, they can pump the difference from the wells to a combined maximum of 14,395 gpm from the basin, depending on how much water is available to pump and how much water is available to divert from Lytle Creek. The District has no restrictions on how much is can pump and serve within the Lytle Creek Region.

The basin is an adjudicated groundwater basin and is managed by the Lytle Creek Water Conservation Association. The basin is highly porous and easily replenished during heavy precipitation years. Well production in the basin varies as the basin levels change from year to year.

The quality of groundwater in the Lytle Creek basin is characterized with arsenic contamination, in particular Well No 36 (not currently in use). Currently, only well W-2 has coagulation-based wellhead treatment to remove arsenic before its water is used for water supply.

5.5.1.2 Bunker Hill Basin

The Bunker Hill groundwater basin adjoins the eastern boundary of the District's North System. The basin is part of the San Bernardino Basin Area and is generally adjoined to the west by the Lytle Creek basin and the Rialto-Colton basin

The extractions in the Bunker Hill basin are governed by the Western Judgement. The Western Judgment defined and adjudicated the San Bernardino Basin Area in 1969, and allocates percentages of the safe yield volume to the various agencies capable of extracting water from the basin.

The District has unrestricted water rights in the Bunker Hill basin, but has restrictions on pumping and exporting from certain areas of the basin as is defined in the 1924 Judgment for Lytle Creek Region and as defined in a City of San Bernardino Municipal Water Department's Basin Management Ordinance.

Plumes of various chemical pollutants have been detected in the Bunker Hill groundwater basin requiring installation of treatment to protect basin water quality. Currently, the District has two operational wells producing high quality water for water supply without any regulated contaminants requiring treatment. The Bunker Hill Basin is expected to be a reliable long-term water supply source able to make up shortfalls in water supply that could be caused by long-term droughts.

The District has two existing wells in the Bunker Hill Basin (Wells W-15 and W-30) within the defined area of the 1924 Judgment for the Lytle Creek Region.

In addition to the two existing wells, the District and the City of Rialto by agreement with the SBVMWD, have renewed a contract for a project to pump groundwater from the Bunker Hill Basin through a 48-inch diameter pipeline known as the BLF. The agreement requires that SBVMWD provide a supply up to 5,000 afy to the District (5.76 mgd).

The District owns one third of the BLF from Meridian Avenue to the Cactus Reservoir. This can provide up to 14,000 gpm of capacity in the pipeline. The additional capacity in the pipeline may be utilized for pumping water from the Bunker Hill Basin into the Baseline Reservoirs (R3A-1 and R3A-2). Additional agreements in the future may provide for more purchased water from SBVMWD or the City of San Bernardino or the District could drill additional wells to meet ultimate water demand.

5.5.1.3 Rialto-Colton Basin

The Rialto-Colton basin underlies a majority of the District's North System. The basin is generally bounded to the northwest by the San Gabriel Mountains, the San Jacinto fault to the northeast, and the Rialto-Colton fault to the southwest, with the Santa Ana River traversing the southeastern portion of the basin.

Extractions in the Rialto-Colton basin are governed by the 1961 Rialto Basin Decree. Based on the groundwater elevations for three specific index wells verified between March and May of each year, the extraction entitlement for the District may be limited. Water levels in the Basin have declined in recent years, reducing the amount of groundwater extractions. Steps are being taken to formulate a long term strategy to manage the basin.

When the basin is not subject to restrictions by the adjudication, the District has unlimited extraction rights. During drought conditions, and when the adjudication is in effect, the extraction right ranges from 6,134 afy during drought periods to 3,067 afy in the most severe drought periods.

Since 2002, the Santa Ana River Water Quality Control Board (SARWQCB) has been conducting an investigation of groundwater contamination in the area of the City of Rialto. This site has also been designated as a Superfund site by the US EPA. Water quality of the Rialto Basin is characterized with elevated concentrations of perchlorate and nitrate, thus requiring treatment and reducing its ability to be a reliable water supply. Currently installed wellhead treatment systems utilize ion exchange (IX) and fluidized bed reactor (FBR) treatment to mitigate perchlorate and nitrate contamination.

During years when the average elevation of the spring-high water levels in the three index wells is below 967.7 feet above mean sea level, the amount of water which the stipulated parties are entitled to pump from the Basin is reduced one percent (1%) for each foot. The average elevations of the spring-high water levels for the October 1, 2017 through the September 30, 2018 water year is 931.3 feet above mean sea level, or 38.4 feet below 969.7 feet mean sea level, thus reducing the District's extractions from the Basin by thirty-eight percent (38%).

5.5.1.4 Chino Basin

The Chino basin underlies a portion of the District's South System. The basin is generally bounded to the east by the Rialto-Colton fault, the San Gabriel Mountains to the north, and the Jurupa Mountains and Puente Hills to the south. The Chino Basin consists of about 235 square miles of the Upper Santa Ana River Watershed, and is an alluvial valley that is mainly flat from east to west, and slopes from the north to the south at a one to two percent grade. This basin is among the largest groundwater basins in southern California, with about 5,000,000 acre-feet of water and an unused storage capacity of about 1,000,000 acre-feet.

The Chino basin is an adjudicated groundwater basin and is managed by the Chino Basin Watermaster, which manages the basin through the Chino Optimum Basin Management Plan. Without incurring replenishment costs, the District is entitled to approximately 1,000 afy of groundwater extraction from this subbasin. The District has two wells (W-37 and W-39) in the Chino Basin which can produce 1.4 mgd and 3.8 mgd, but are not currently in service due to high levels of perchlorate and nitrate. The District will have to install wellhead treatment on these wells to take advantage of their pumping ability and the District's rights in the basin.

5.5.1.5 Riverside-Arlington Basin (North Riverside Groundwater Basin)

The Riverside-Arlington basin underlies a majority of the District's South System. The basin is generally bounded to the north by the Jurupa Mountains, to the northeast by the Rialto-Colton fault, and the Box Springs Mountains and Arlington Mountain to the south, with the Santa Ana River traversing the northern portion of the basin. This groundwater basin is a large alluvial fill basin that is bound by major faults and topographic barriers. Recharge to the basin occurs by the underflow from basins to the north, from the Santa Ana River, and from percolation of surface water runoff from the surrounding uplands.

The extractions in a portion of the North Riverside basin upstream of the Riverside Narrows are governed by the Western Judgement. However, there is no extraction limit for the District's wells in this basin. Water quality of the basin is characterized with elevated concentration of perchlorate and emerging increase of nitrate concentration. The currently installed wellhead treatment system utilize IX to remove perchlorate. The District has identified that some wells located in the basin present possible contamination with Methyl tert-butyl ether (MTBE). Wells Number 40 and 41 are monitored monthly, however no MTBE has been detected in these wells or any other District wells.

5.5.2 Surface Water Supply

The following sections document the District's existing sources of surface water supply, current water supply constraints, and existing surface water quality.

5.5.2.1 Surface Water Supply Sources

As discussed in a previous chapter, the District currently treats two sources of surface water at the Roemer WFF for delivery to existing water system customers: State Water Project water and flow from Lytle Creek. These sources and the related reliability are briefly summarized in the following sections and shown on **Table 5.3**.

- **Lytle Creek.** The District has 5.09 cubic feet per second (2,290 gpm), water right in Lytle Creek surface water and has entered into an agreement with the City of San Bernardino to purchase the City of San Bernardino's 3.00 cfs (1,350 gpm) water rights for a total of 8.09 cfs (3,640 gpm or 5.2 mgd) of Lytle Creek surface water. The City of San Bernardino, due to infrastructure limitations, is unable to utilize its rights and divert water from the Creek. The District also has a court settlement agreement with Fontana Union Water Company for approximately one percent (1%) of Fontana Union Water Company's annual water production to be taken at the District's WFF. This is approximately 320 acre feet per year, or 200 gpm. The City of Rialto has 2.3 cfs water rights. The District, the City of Rialto, and the City of San Bernardino, have a combined capacity of 10.39 cfs (6.7 mgd) of Lytle Creek surface water rights.

  In 1993, the District and the City of Rialto jointly constructed the Oliver P. Roemer WFF, a 7.2 mgd water treatment plant, in Pressure Zone 5, to treat 6.7 mgd of Lytle Creek surface water. The facility produced approximately 5.2 mgd annual average daily flow of supply to the District and approximately 1.5 mgd for the City of Rialto from Lytle Creek.

  Lytle Creek surface water flows fluctuate seasonally and the District and City of Rialto's water right could be prorated whenever the Lytle Creek water flow is below 800 miner inches (16 cfs). When the Lytle Creek surface water flow drops below 16 cfs, the water right of both the District and the City of Rialto are subject to proration. In addition to the flow fluctuation, the turbidity of Lytle Creek surface water flow also varies seasonally.

- **State Water Project.** The District currently imports SWP water from SBVMWD through the Lytle Turnout off of the San Gabriel Feeder Pipeline. This SWP water is delivered to the Roemer WFF and treated in addition to the Lytle Creek flows. Recently constructed

Table 5.3 Water Supply Portfolio

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Source	Maximum Water When Available[1] (AFY)	Imported Water[1] (AFY)	Historical Water Use[2] 2011 (AFY)	2012 (AFY)	2013 (AFY)	2014 (AFY)	2015 (AFY)	2016 (AFY)	2017 (AFY)
Surface Water									
Imported SWP[3]		No Limit	400	849	1,194	1,643	2,244	2,839	2,653
Lytle Creek	5,870[4]		4,203	4,700	3,110	2,363	2,271	2,026	4,540
Other Surface Water									
Groundwater Basins[5]									
Lytle Creek Basin	19,500[6]		2,983	4,002	3,776	3,262	2,159	1,850	2,365
Bunker Hill Basin	No Restrictions		1,335	1,682	1,885	1,478	1,520	1,351	2,300
Chino Basin	1000[7]		0	0	0	0	0	0	0
Rialto-Colton	No Restrictions[8]		4,883	4,093	4,005	3,916	2,505	2,123	3,923
Riverside-Arlington	No Restrictions		3,144	3,932	3,389	2,992	2,065	2,745	1,089
Total Groundwater Use			12,345	13,709	13,055	11,648	8,249	8,069	9,677
Other Water Sources									
Purchased GW through Baseline Feeder Pipeline		5,000	3,020	1,990	3,350	4,819	4,367	3,380	3,151
Total Historical Water Use									
Total			**19,968**	**21,248**	**20,709**	**20,473**	**17,131**	**16,314**	**20,022**

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Note:

1. Source: WVWD 2012 Water System Master Plan.
2. Unless noted otherwise, historical water use extracted from Water System Statistics provided by WVWD Staff on September 25. 2018.
3. Water imported from the SWP is purchased from San Bernardino Valley Municipal Water District.
4. The District has a 3,700 AFY water right to Lytle Creek and has entered into an agreement with the City of San Bernardino to purchase the City's 2,170 AFY water right for a total of 5,870 AFY water right to Lytle Creek
5. Historical water use by groundwater basin extracted from the following:
   Years 2011-2015: WVWD 2015 Urban Water Management Plan, Table 11-10.
   Year 2016: Basin data provided by WVWD staff on January 28, 2019.
   Year 2017: Groundwater basin production report provided by WVWD staff on September 24, 2018.
6. During extended periods of drought well production in Lytle Creek Basin is projected to be reduced. However, there is no maximum amount of water that can be pumped and served within the Lytle Creek Basin region.
7. The District's water rights are limited to approximately 1000 AFY without incurring replenishment costs.
8. When the basin adjudication is in effect the extractions rights range from 6,134 AFY to 3,067 AFY depending on the severity of the drought.

metering and transmission facilities will enable the District to import and treat up to 20 mgd upon the completion of the Roemer WFF capacity expansion. It should be noted that the SWP water is considered an interruptible water supply, and while historically reliable, the potential disruption of SWP water deliveries are accounted for when planning future water infrastructure facilities.

5.5.3 Water Supply Planning

In order to meet the growing demand requirements of the District service area and provide additional water supply reliability, the existing water supply capacity will require expansion. This expansion will include the rehabilitation of existing groundwater wells, the construction of new groundwater wells, and the expansion of the Roemer WFF treatment plant, which are generally described in the following sections.

5.5.3.1 Rehabilitate Existing Wells

The District currently has multiple groundwater wells that are inactive due to water quality constraints or other operational issues. The rehabilitation of these existing wells will increase the District's supply capacity and multiple sites have infrastructure in place to facilitate the delivery of water to the existing water distribution system. The rehabilitation of these existing wells is considered the first priority for planning water supply improvements, which is reflected in the supply capacity analysis and recommended improvements discussed in a later chapter.

5.5.3.2 Construct New Wells

New groundwater wells are required to meet the expanded needs of the planning area boundary. The well locations shown in this WFMP are preliminary and are intended as placeholders for planning purposes. The location of future groundwater wells will be determined based on site feasibility studies completed as part of the design process. The general assumptions for the recommendation of new wells are documented as follows:

- Due to the availability of water supply in the Bunker Hill groundwater basin the development of future wells is recommended. However, as an alternative to constructing new groundwater wells the District could also enter into contract to receive deliveries of Bunker Hill water through the Baseline Feeder pipeline.

- As discussed in a previous section, Pressure Zone 2 receives a majority of its supply by PRV from Pressure Zone 3. To limit this supply dependency, new wells are recommended to meet the buildout development demand requirements within Pressure Zone 2.

5.5.3.3 Roemer WFF Treatment Expansion

The Roemer WFF has a current treatment capacity of 14.4 mgd. The District has plans to expand the capacity by an additional 6.0 mgd, which will increase the total treatment capacity to 20.4 mgd. Based on the 4,000 afy (3.6 mgd) of projected Lytle Creek flows, it is estimated that approximately 16.8 mgd total of SWP water could be purchased to utilize the full treatment capacity of the Roemer WFF.

5.5.4 Surface Water Quality

Lytle Creek and State Water Project are the two sources of surface water currently used for the District's surface water supply. Lytle Creek, which is a perennial stream in the upper watershed, is a local surface water that is treated for domestic water use. During the summer for short periods, Lytle Creek surface water flow will drop below 16 cfs, which causes the District's water rights to be subject to proration. Turbidity, microbiological contaminants and other surface water-typical constituents characterize the quality of the water from Lytle Creek.

The District has been utilizing water from the State Water Project since 1999. The current metering and transmission facilities allow the District to import 20 mgd (23,000 afy) of the SWP water. Quality of the SWP water is characterized with elevated concentration of total organic carbon (TOC). Traditionally, the District imports and treats the SWP water for potable water supply at the Roemer WFF.

5.5.5 Other Water Sources

This section documents other sources of water supply, both existing and potential, that are available to the District. This section was completed by Kleinfelder.

5.5.5.1 Baseline Feeder

The water supply of the Baseline feeder comes from SBVMWD-owned wells in the Bunker Hill Basin. The current agreement with SBVMWD allows the District to receive up to 5,000 afy of supply. The District could investigate additional supply through the BLF.

5.5.5.2 Alternative Water Sources

No other water source is currently being utilized by the District. However, due to climate change and severe droughts, the District is considering the feasibility of developing alternative source of water supplies including but not limited to water banking, storm water run-off collection and recyclable water. Capacity and water quality of these alternative sources are not defined at this point in time. Further study of potential yields and treatment methodologies will need to be completed prior to implementing new water sources. Treatments may include removal of turbidity, oil, heavy metals, microbiological contaminants, and other regulated water quality constituents may be necessary. As opportunities arise and technology advances, it is recommended that the District continue to explore the possibility of expanding its water supply portfolio and developing new sources of water supply.

5.5.6 Current and Future Regulations

The US EPA has set mandatory water quality standards in the National Primary Drinking Water Regulations (NPDWRs) for inorganics, organic chemicals, disinfectant and disinfection by-products, and microbiological contaminants. The US EPA recommends secondary non-enforceable National Secondary Drinking Water Standards (NSDWSs) for 15 contaminants that may cause aesthetic effects on potable water. The quality of the District's potable water is in full compliance with local, state and federal regulatory requirements.

The pending regulations that may be of importance for the District and its water supply system include:

- California DDW's recommendations to establish a lower perchlorate detection limit for purposes of reporting. If proved technically and economically feasible and beneficial to the public health, the current perchlorate MCL of 6 parts per billion (PBB) may be revised.
- The Lead and Copper Rule will be updated in 2018 to incorporate EPA changes and lessons learned from the water crisis in Flint, Michigan.
- Development of a new unregulated contaminant monitoring regulation. DDW is in the process of gathering information on the presence and concentration of contaminants of concern in potable water systems. If deemed necessary, the DDW may choose to regulate, or increase regulation, of some of these contaminants in the future.

Although not currently utilized by the District, the pending new regulation for water reuse, including recycled water and water for potable reuse, may be important for the District's future water supply.

CHAPTER 6 - HYDRAULIC MODEL DEVELOPMENT

This chapter describes the development and calibration of the District's domestic water distribution system hydraulic model. The hydraulic model was used to evaluate the capacity adequacy of the existing system and to plan its expansion to service anticipated future growth.

6.1 OVERVIEW

Hydraulic network analysis has become an effectively powerful tool in many aspects of water distribution planning, design, operation, management, emergency response planning, system reliability analysis, fire flow analysis, and water quality evaluations. The District's hydraulic model was used to evaluate the capacity adequacy of the existing system and to plan its expansion to service anticipated future growth.

6.2 MODEL SELECTION

The District's hydraulic model combines information on the physical characteristics of the water system (pipelines, groundwater wells, and storage reservoir) and operational characteristics (how they operate). The hydraulic model then performs calculations and solves a series of equations to simulate flows in pipes and calculate pressures at nodes or junctions.

There are several network analysis software products that are released by different manufacturers, which can equally perform the hydraulic analysis satisfactorily. The selection of a particular software depends on user preferences, the distribution system's unique requirements, and the costs for purchasing and maintaining the software.

The District's previous model was developed using the Innovyze (formerly known as MWHSoft) H2ONet, which allows for steady-state and extended period simulations within an AutoCAD user interface. As part of this master plan, the hydraulic model was redeveloped into the GIS-based hydraulic model InfoWater by Innovyze. The model has an intuitive graphical interface and is directly integrated with ESRI's ArcGIS (GIS), providing a useful modeling tool linked to the newly developed District GIS.

6.3 HYDRAULIC MODEL DEVELOPMENT

Developing the hydraulic model included skeletonization, digitizing and quality control, developing pipe and node databases, and water demand allocation.

6.3.1 Skeletonization

Skeletonizing the model refers to the process where pipes not essential to the hydraulic analysis of the system are stripped from the model. Skeletonizing the model is useful in creating a system that accurately reflects the hydraulics of the pipes within the system, while reducing complexities of large systems, which will reduce the time of analysis while maintaining accuracy, but will also comply with limitations imposed by the computer program. For the purposes of this master plan, skeletonizing was kept to a minimum due to the integrity of the GIS.

6.3.2 Pipes and Nodes

Computer modeling requires the compilation of large numerical databases that enable data input into the model. Detailed physical aspects, such as pipe size, pipe elevation, and pipe lengths, contribute to the accuracy of the model.

Pipes and nodes represent the physical aspect of the system within the model. A node is a computer representation of a place where demand may be allocated into the hydraulic system, while a pipe represents the distribution and transmission aspect of the water demand. In addition, reservoir dimensions and capacities, and groundwater well capacity and design head, were also included in the hydraulic model.

6.3.3 Digitizing and Quality Control

The District's existing domestic water distribution system was digitized in GIS using several sources of data and various levels of quality control. The data sources included the District's existing system as maintained by staff in GIS, as well as conversation with District staff and record drawings.

After reviewing the available data sources, the hydraulic model was updated and verified by District staff. Resolving discrepancies in data sources was accomplished by graphically identifying each discrepancy and submitting it to engineering and GIS staff for review and comments. District comments were incorporated in the verified model.

6.3.4 Demand Allocation

Demand allocation consists of assigning water demand values to the appropriate nodes in the model. The goal is to distribute the demands throughout the model to best represent actual system response.

Allocating demands to nodes within the hydraulic model required multiple steps, incorporating the efficiency and capabilities of GIS and hydraulic modeling software. Existing land use water demand factors were used in conjunction with the existing land use map. Each demand factor was applied to the appropriate land use and then multiplied by the acreage. In the absence of complete water billing records, this methodology was considered the best approach for accurately allocating the existing water demands.

Domestic water demands from each anticipated future development, as presented in a previous chapter, were also allocated to the model for the purpose of sizing the required future facilities. The demands from the greater Planning Area were allocated based on proposed land use and the land use acreages. As many of the areas were very large in size, demands were allocated evenly to the demand nodes within each area. Infill areas, redevelopment areas, and vacant lands were also included in the future demand allocation.

6.4 MODEL CALIBRATION

Calibration is intended to instill a level of confidence in the pressures and flows that are simulated. Calibration generally consists of comparing model predictions to field measured results and making necessary adjustments.

6.4.1 Calibration Plan and SCADA

The District relies on multiple sources of supply, including groundwater wells, treated water supply, and water deliveries through the Baseline Feeder. The District maintains SCADA at its tank sites, booster stations, and the Oliver P Roemer Water Filtration Facility. As such, this SCADA information was considered adequate for calibrating the hydraulic model. **Figure 6.1** documents each point used in the calibration of the hydraulic model.

District staff provided hourly flow data for each well and booster station, as well as tank levels for each pressure zone for July 2017. This data was further consolidated and compared with daily demand data to best calibrate to peak day conditions.

6.4.2 Steady State Calibration

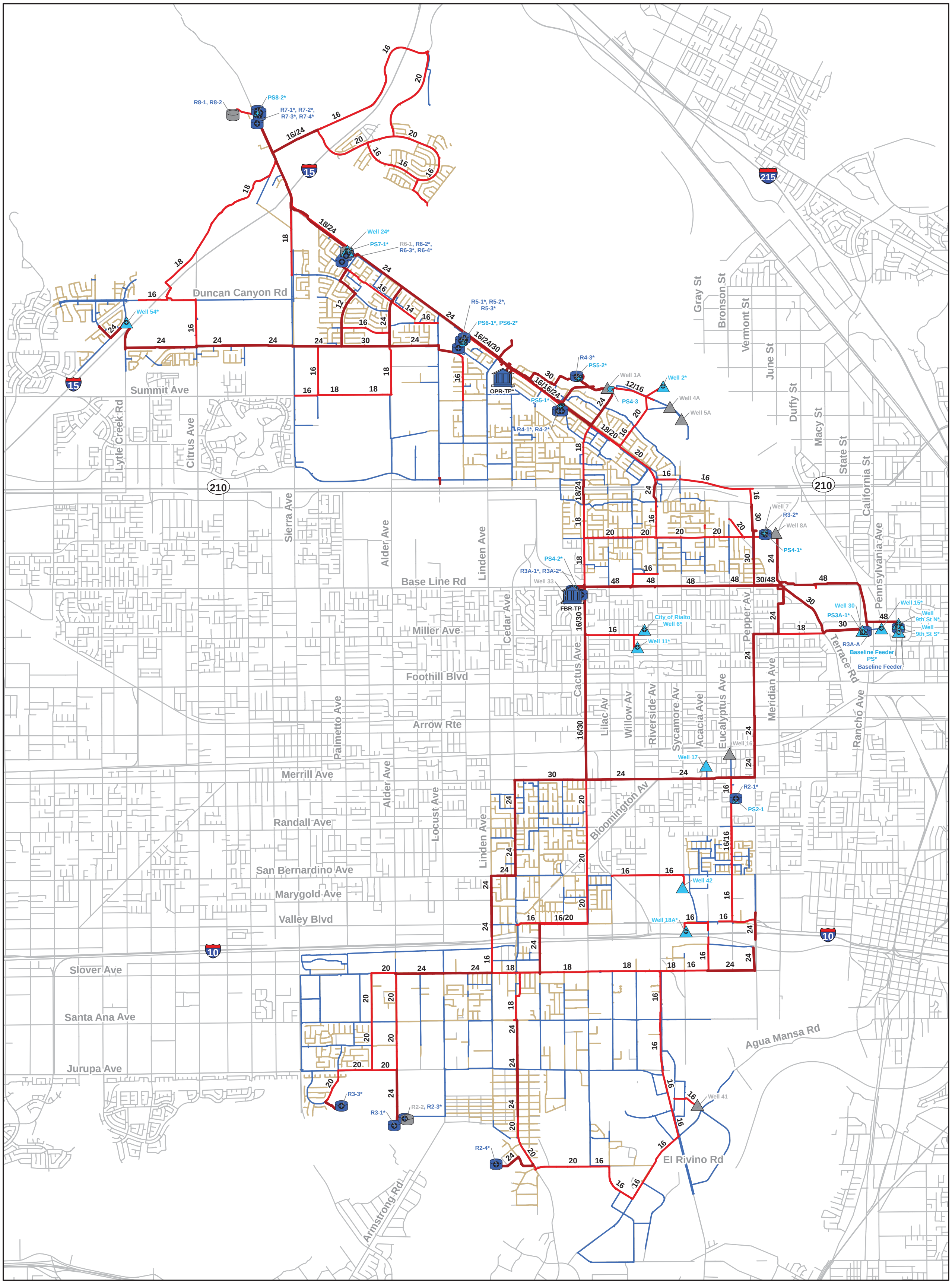
As part of this master plan, a steady-state calibration was performed on the existing system. Steady-state model runs consist of "snapshot" model run where the system is evaluated for a single specified hour. Typically, steady-state model runs are calibrated to fire flow tests, where a static pressure and residual pressure are provided. The model is then simulated for that specific hour and fire flow, and a pressure comparison is completed. The modeled Hazen Williams C-Factor and connectivity are adjusted based on the calibration results.

The steady-state calibration results are documented on **Table 6.1**. The results generally indicate that the system is in good health. There are robust looped-pipe networks and transmission main connectivity within the existing system, which help to mitigate the negative effects of fire flows.

6.4.3 EPS Calibration

The model was also calibrated for extended period simulation (EPS), which typically involved comparing the hydraulic model to field conditions over at least 24 hours. EPS calibration consists of comparing model predictions to diurnal operational changes in the water system. The intent of an extended period simulation

The calibration process was iterative and resulted in satisfactory comparisons between the field measurements and the hydraulic model predictions at each well site. It should be noted that some of the SCADA information at the well sites and the booster station sites were found to be



Legend

- *Model Calibration Point
- Pumps

Existing System

- WTP
- Tanks
- Inactive Tanks
- Active Wells
- Inactive Wells

Pipes by Diameter

- 8" and Smaller
- 10" - 12"
- 16" - 20"
- 24" - 48"
- Street Centerlines

PRELIMINARY

Updated: February 7, 2018

0 0.25 0.5 1 Mile

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Figure 6.1
Hydraulic Model Calibration Program

Water Facilities Master Plan
West Valley Water District

West Valley Water District

Table 6.1 Steady State Calibration Results

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Location Number	Pressure Zone	Date	Time	Address of Gauging Hydrant	Static Pressure			Residual Pressure		
					Observed (psi)	Simulated (psi)	Percent Difference	Observed (psi)	Simulated (psi)	Percent Difference
560	2	3/30/16		1350 Brown Ave., Riverside, CA	113	114	1.3%	107	109.63	2.5%
569	4	7/25/16		1571 N Sycamore Avenue, Rialto, CA	71	70	-1.9%	68	65.44	-3.8%
568	3A	8/8/16		654 S. Cactus Avenue, Rialto, CA	73	72	-1.3%	66	65.32	-1.0%
570	2	8/8/16		2755 S Willow Avenue, Bloomington, CA	82	87	6.5%	75	82.48	10.0%
573	5	11/2/16		5891 N Sycamore Avenue, Rialto, CA	80	85	6.0%	74	80.35	8.6%
576	6	11/2/16		2010 W Stonehurst Dr., Rialto, CA	85	86	1.5%	80	79.05	-1.2%
578	5	1/10/17		2092 Spruce Avenue, Rialto, CA	85	83	-1.9%	72	77.17	7.2%
580	3	3/16/17		17132 Slover Avenue, Fontana, CA	75	84	11.5%	74	78.64	6.3%
581	3A	3/16/17		884 S Church Street, Rialto, CA	80	78	-2.0%	76	70.35	-7.4%

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9/11/2017

Notes:

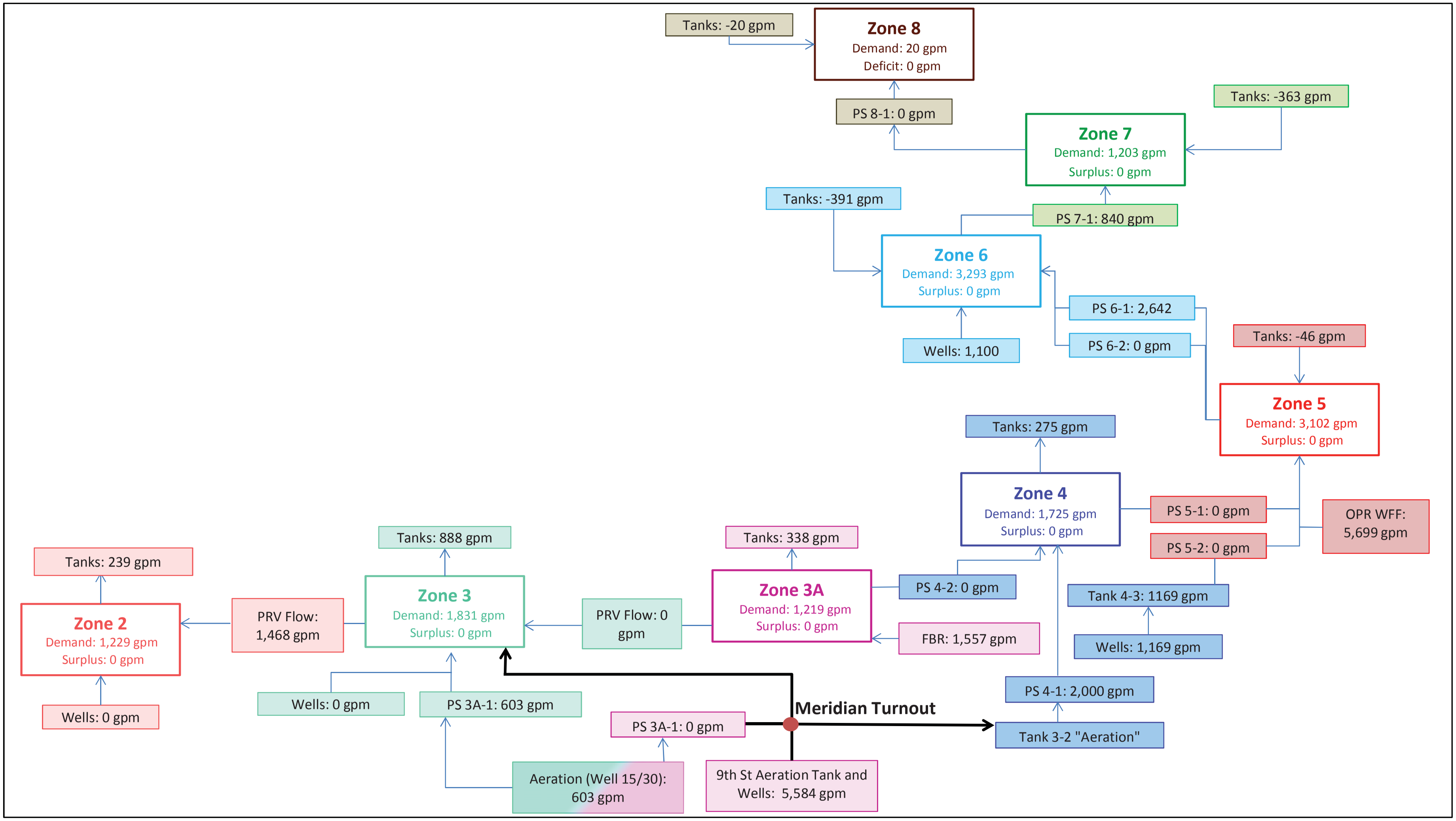
1. Fire flow locations and results based of historical fire flow tests received from District staff.

erroneous. As such, a mass balance of the existing water system by pressure zone was completed and submitted to District staff for review (**Figure 6.2**). Calibration information for the wells and the booster stations relied heavily on District staff knowledge of the system, and interpretation of trendlines observed in the SCADA. The calibration results were graphically summarized for each site and included in **Appendix C**.

Representative extracts from **Appendix C** are shown on **Figure 6.3** for calibration points at the Zone 5, 6, and 7 storage reservoirs.

6.4.4 Use of the Calibrated Model

The calibrated hydraulic model was used as an established benchmark in the capacity evaluation of the existing water distribution system. The model was also used to identify improvements necessary for mitigating existing system deficiencies and for accommodating future growth. This valuable investment will continue to prove its value to the District as future planning issues or other operational conditions surface. It is recommended that the model be maintained and updated with recent construction to preserve its integrity.



NOTES

PRELIMINARY

1. Flow information shown based on SCADA data for July 9, 2017 and additional adjustments based on information provuded by WVWD staff.
2. Zone 8 Tank flow based on modeling results in absence of SCADA data.
3. Zone demands based on SCADA flows provided by WVWD staff.
4. Combined Zone 2 and Zone 3 demand assumed to be equal to water supplied to Zone 3. Distribution of Zone 2 and 3 demand based on 2016 production records.
5. Positive tank flow reflects filling; negative tank flow reflects emptying.

January 30, 2018

Figure 6.2
SCADA Mass Balance
Water Facilities Master Plan
West Valley Water District

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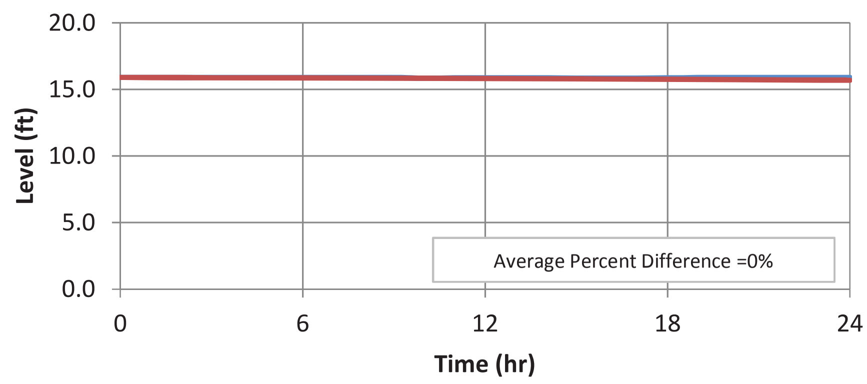
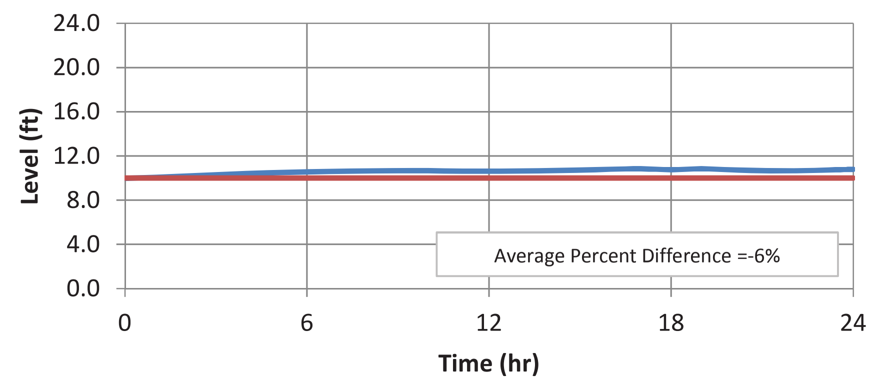
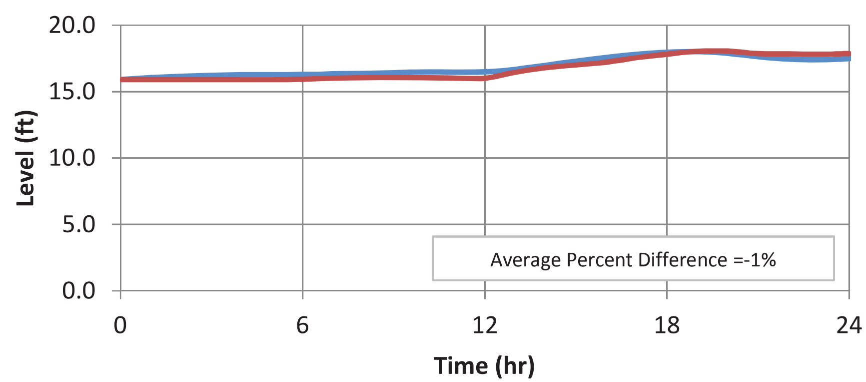
Tank 2-1



Tank 2-2,3



Tank 2-4



LEGEND

SCADA (July 9, 2017)
Hydraulic Model

PRELIMINARY

January 23, 2018

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Figure 6.3
Hydraulic Model Calibration

Water Facilities Master Plan
West Valley Water District

West Valley Water District

CHAPTER 7 - EVALUATION AND PROPOSED IMPROVEMENTS

This section presents a summary of the domestic water system evaluation and identifies improvements needed to mitigate existing deficiencies, as well as improvements needed to expand the system and service growth.

7.1 OVERVIEW

The calibrated hydraulic model was used for evaluating the distribution system for capacity deficiencies during peak hour demand and during peak day demands in conjunction with fire flows. Since the hydraulic model was calibrated for extended period simulations, the analysis duration was established at 24 hours for analysis.

The criteria used for evaluating the capacity adequacy of the domestic water distribution system summarized in the System Performance and Design Criteria chapter.

7.2 FIRE FLOW ANALYSIS

The fire flow analysis consisted of using the peak day demand in the hydraulic model and applying hypothetical fire flows. The magnitude and duration of each fire flow was based on the governing land use type within proximity to the fire location. The criterion for fire flows was also summarized in the System Performance and Design Criteria chapter.

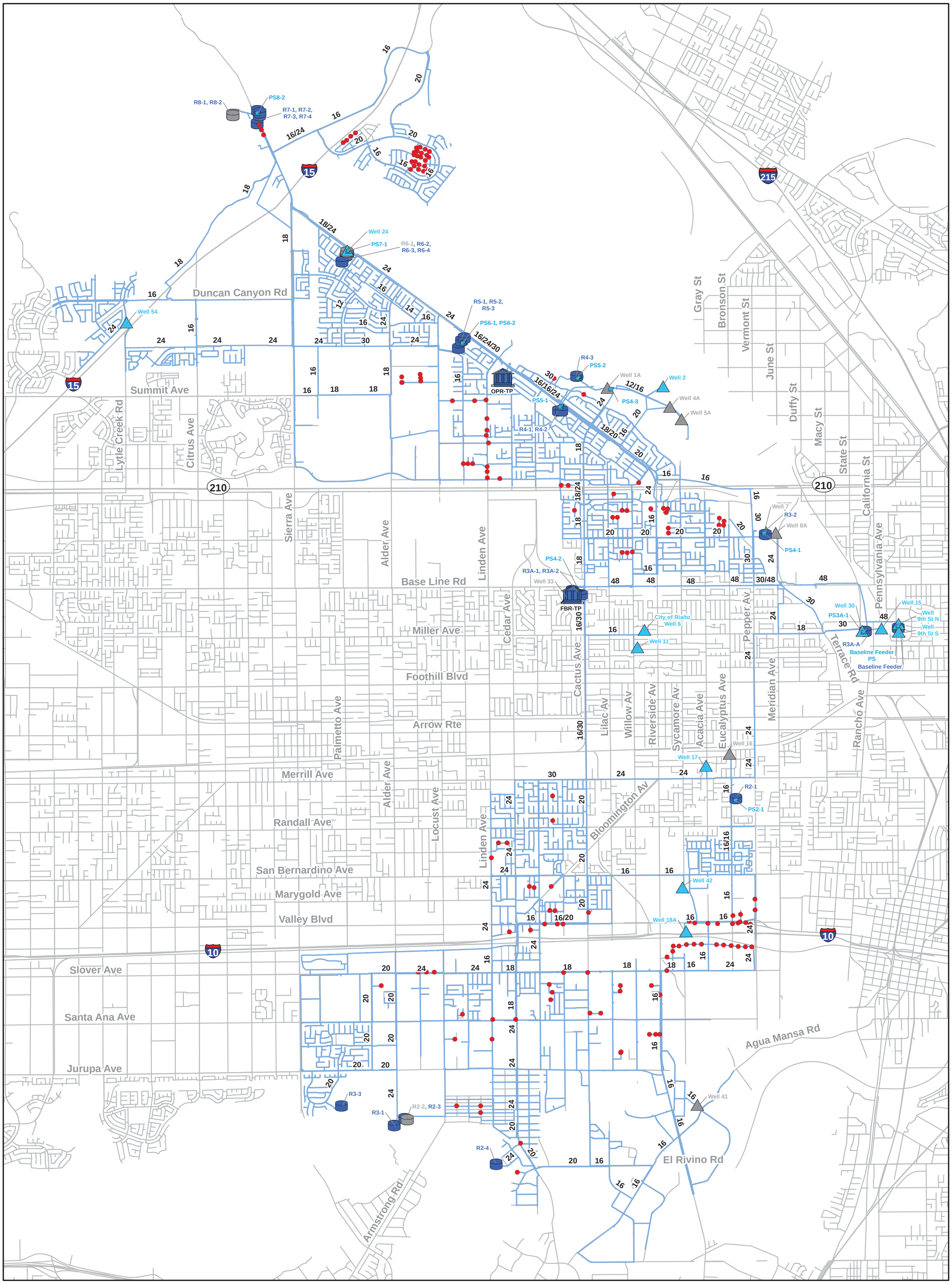
The hydraulic model indicates that the District's existing distribution system performed adequately during the fire flow analysis. **Figure 7.1** documents the hydraulically simulated pressure deficiencies within the existing distribution system. As discussed in the system performance and design criteria chapter, pressures within the water main must be above 20 psi to provide adequate pressure for firefighting purposes. **Figure 7.2** documents the fire flow availability based on the nearby infrastructure and hydraulically available head pressure.

7.2.1 Fire Flow Improvements

Improvements recommended to support fire flow delivery are shown with the 5-year improvements on **Figure 7.3**.

7.2.2 Other Potential Improvements

It should be noted that there are areas of the system that have vulnerabilities when assessed against the Master Plan fire flow criteria. However, it was determined that some of these areas may have reduced fire flow requirements, per the California Fire Code, or other potential fire fighting capabilities, and thus, improvements are not included in this Master Plan. As future development occurs, it is recommended that a development specific fire flow analysis be completed to document any potential deficiencies and appropriate mitigation be completed.



Legend

- Node Pressures < 20 psi

Existing System

- WTP
- Tanks
- Inactive Tanks
- Active Wells
- Inactive Wells
- Pumps
- Pipes
- Street Centerlines

PRELIMINARY

Updated: February 13, 2018

0 0.25 0.5 1 Mile

File Path: P:\xGIS\GIS_Projects\West Valley WD\WVWD_Fig7-1_FireFlowAnalysis_021318.mxd

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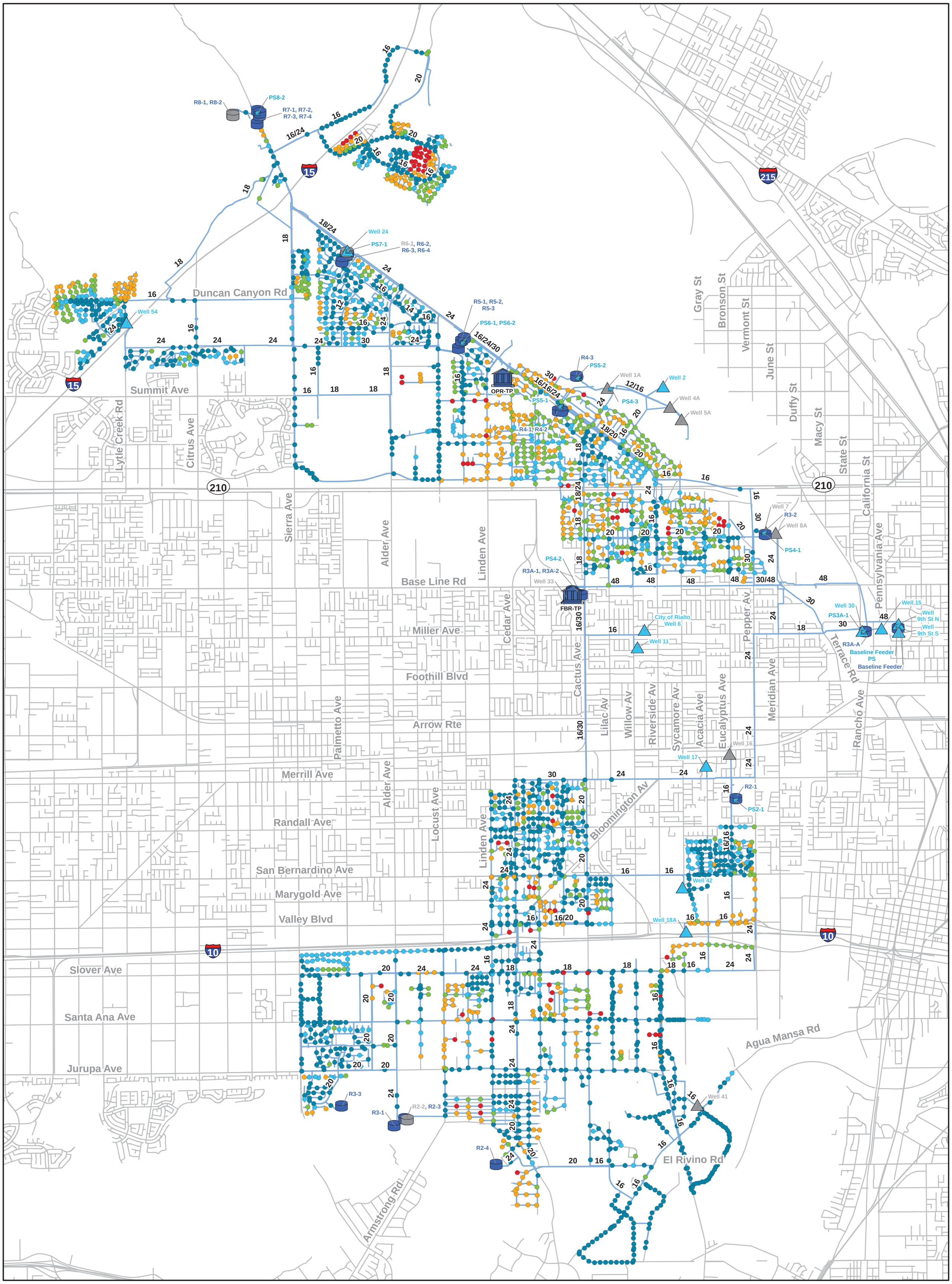
Figure 7.1
Fire Flow Analysis
Water Facilities Master Plan
West Valley Water District



Legend

Available Fire Flow

- ≤ 1,500
- 1,500 - 3,000
- 3,000 - 4,000
- 4,000 - 5,000
- > 5,000

Existing System

- WTP
- Tanks
- Inactive Tanks
- Active Wells
- Inactive Wells
- Pumps
- Pipes
- Street Centerlines

PRELIMINARY

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Updated: February 13, 2018

0 0.25 0.5 1 Mile

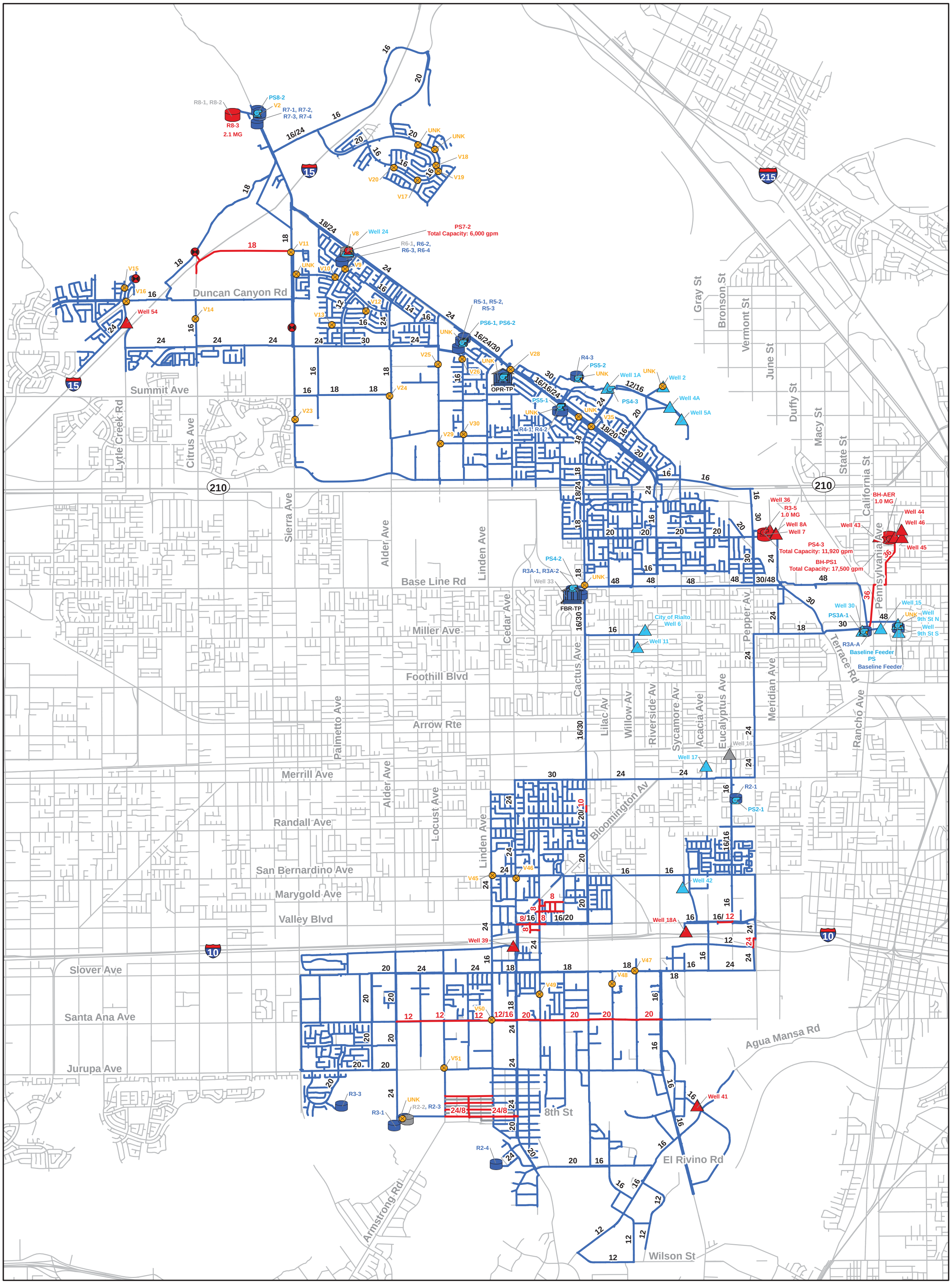
N S E W

File Path: P:\xGIS\GIS_Projects\West Valley WD\WVWD_Fig7-2_AvailableFireFlow_021318.mxd

Figure 7.2
Available Fire Flow

Water Facilities Master Plan
West Valley Water District

West Valley Water District



Legend

System Improvements
- Tanks
- Wells
- Pumps
- Valves
- Pipes

Existing System
- WTP
- Tanks
- Active Wells
- Pumps
- Valves
- Pipes
- Inactive Tanks
- Inactive Wells
- Abandoned Pipes
- Street Centerlines

PRELIMINARY

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Updated: March 13, 2019

0 0.25 0.5 1 Mile

File Path: P:\xGIS\GIS_Projects\West Valley WD\WVWD_Fig7-3_5yrImprovements_031319.mxd

Figure 7.3
5 Year Improvements

Water Facilities Master Plan
West Valley Water District

West Valley Water District

7.3 LOW PRESSURES ANALYSIS

The existing domestic water distribution system was evaluated to determine the minimum pressure adequacy during peak day demand conditions. During peak day demands, the minimum pressure requirement is 40 psi, while during the peak hour demand, the minimum pressure requirement is 35 psi. The hydraulic analysis indicated the existing system is able to provide minimum pressures reasonably well. Minimum pressures during peak day demand conditions are summarized graphically on **Figure 7.4**. Areas of low pressure are briefly described as follows:

- Zone 4, approaching Highway 210
- Zone 5, approaching Roemer WFF

7.4 HIGH PRESSURES ANALYSIS

The hydraulic model was also used to determine if the existing domestic water distribution system meets the District's System Performance and Design Criteria for maximum pressures. Under typical operating conditions the maximum allowable pressure in a pipeline is 130 psi, while the maximum service connection pressure is 80 psi. It is recommended that any new service connections made in areas identified as experiencing high pressure implement a pressure reducing device as part of the service connection. The hydraulic analysis indicated the existing system is able to provide minimum pressures reasonably well. Maximum pressures during peak day demand conditions are summarized graphically on **Figure 7.5**. Areas of maximum pressure are briefly summarized as follows:

- Zone 2, southeast of Agua Mansa Road
- Zone 8, Glen Helen Parkway
- Zone 6, southwest of I15 and Duncan Canyon Rd
- Zone 6, north of the existing Zone 5 tanks

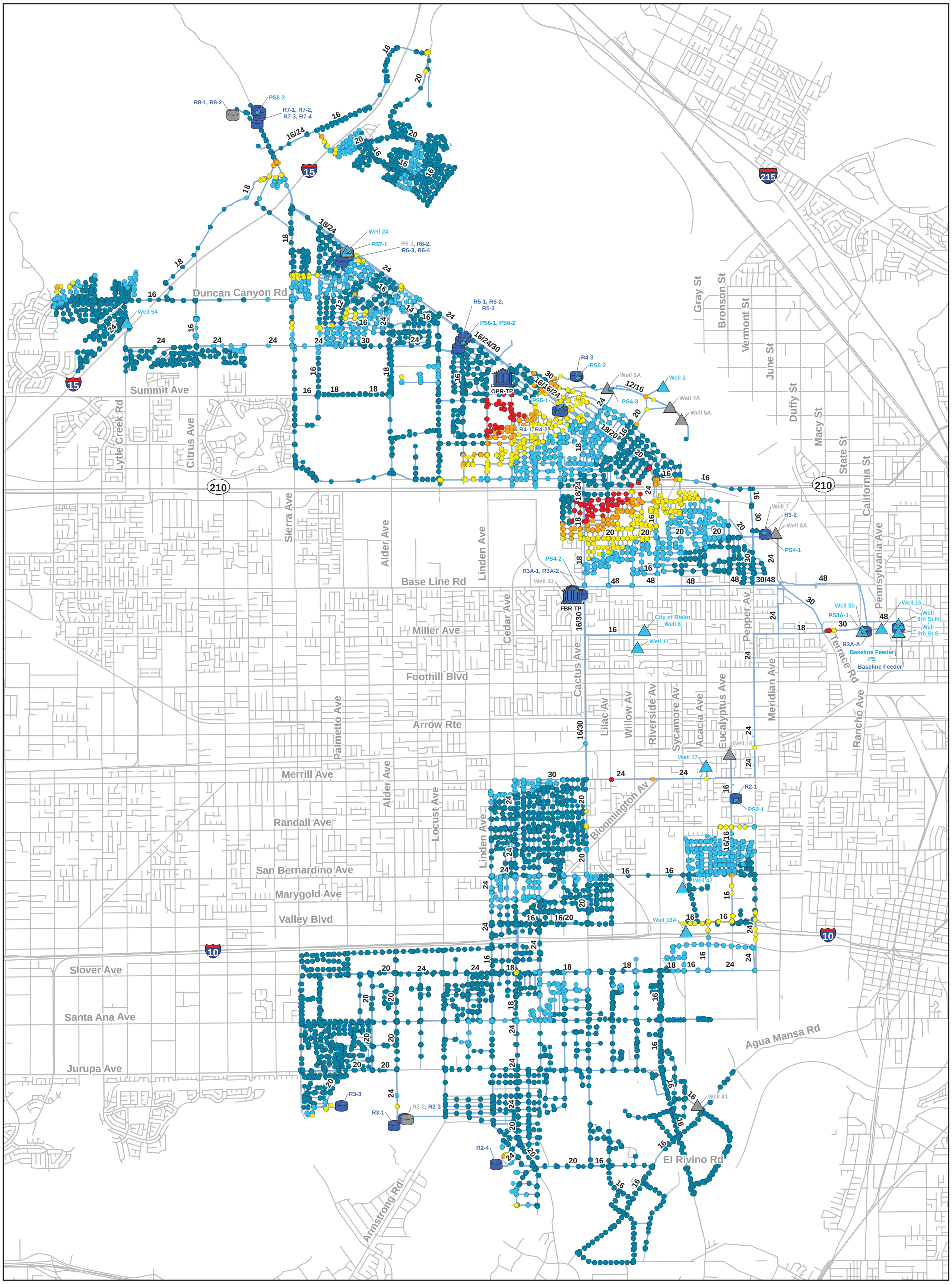
7.5 WATER SUPPLY REQUIREMENTS

The District's existing water supply capacity is identified in this section. Additionally, this section documents the additional supply capacity recommended to meet the requirements of the 5-year and buildout development horizons.

7.5.1 Water Supply Scenarios

As discussed in previous chapters the District's existing supply capacity is comprised of both groundwater and treated surface water. For planning purposes, the supply capacity analysis considered two supply alternatives, which are summarized as follows:

- **Supply Scenario 1:** This supply scenario assumes Roemer WFF is operating at maximum



Legend

Minimum Pressures
- ≤ 35
- 35 - 40
- 40 - 50
- 50 - 65
- > 65

Existing System
- WTP
- Tanks
- Inactive Tanks
- Active Wells
- Inactive Wells

- Pumps
- Pipes
- Street Centerlines

PRELIMINARY

Figure 7.4
Minimum Pressures
Peak Day Demand

Water Facilities Master Plan
West Valley Water District

West Valley Water District

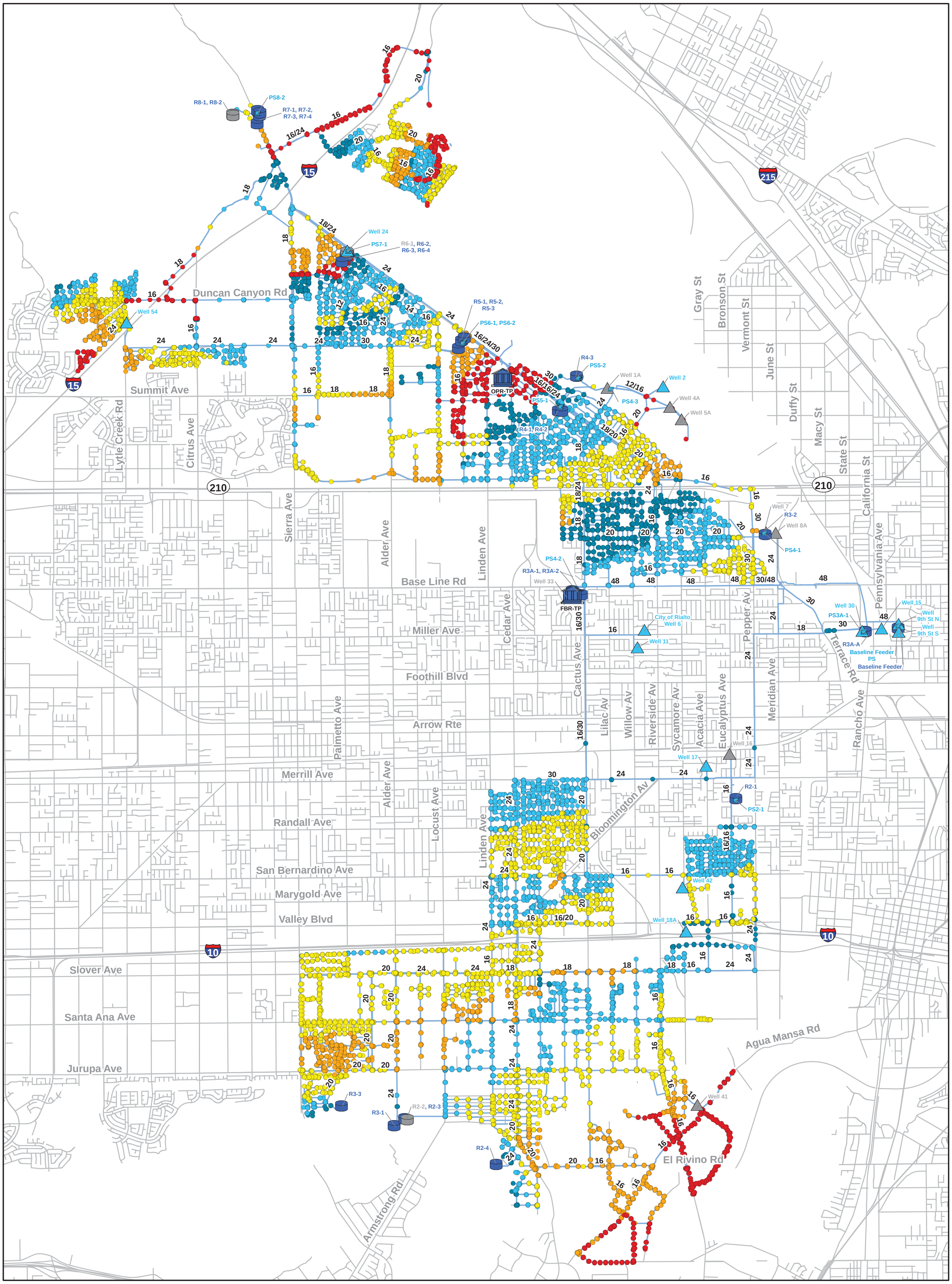
AKEL ENGINEERING GROUP, INC.

Updated: February 7, 2018

0 0.25 0.5 1 Mile

N W E S

File Path: P:\xGIS\GIS_Projects\West Valley WD\WVWD_Fig7-4_MinPressure_020718.mxd



Legend

Maximum Pressures

- ≤ 60
- 60 - 80
- 80 - 100
- 100 - 120
- > 120

Existing System

- WTP
- Tanks
- Inactive Tanks
- Active Wells
- Inactive Wells
- Pumps
- Pipes
- Street Centerlines

PRELIMINARY

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Updated: February 7, 2018

0 0.25 0.5 1 Mile

File Path: P:\xGIS\GIS_Projects\West Valley WD\WVWD_Fig7-5_MaxPressure_020718.mxd

Figure 7.5
Maximum Pressures
Peak Day Demand

Water Facilities Master Plan
West Valley Water District

West Valley Water District

treatment capacity, with groundwater wells providing the remaining supply requirements.

- **Supply Scenario 2:** This supply scenario assumes an interruption in SWP water availability and Roemer WFF is assumed to be treating Lytle Creek flows, which are estimated at 4,000 afy (3.6 mgd).

Thus, supply recommendations are based on the ability of the water facilities meeting each of the aforementioned supply scenarios.

7.5.2 System-Wide Water Supply Analysis

The system-wide water supply capacity analysis for existing and buildout conditions is summarized on **Table 7.1**, which includes the supply requirements and available supply volumes under both Supply Scenario 1 and Supply Scenario 2. **Table 7.1** also documents the phased supply improvements, which includes the rehabilitation of existing wells and the construction of new wells. In addition to a system-wide supply capacity analysis.

As documented on **Table 7.1**, the District's supply facilities are capable of meeting the existing supply requirements. Under the conservative Supply Scenario 2, the District has a supply deficiency of approximately the District has an existing supply capacity surplus the District

7.5.3 Pressure Zone Supply Analysis

In addition to a system-wide water supply capacity analysis, the existing pressure zones were evaluated to determine the feasibility of reducing the interzonal supply dependencies with the construction and rehabilitation of new wells. Pressure Zones 2, 3, and 3A were evaluated independently to identify supply improvements to mitigate existing supply dependencies while Pressure Zones 4-8 were evaluated together, with future pump stations planned to convey the existing and future supplies to the higher zones. The pressure zone supply analyses are summarized in the following sections.

7.5.3.1 Pressure Zone 2

Under existing conditions Pressure Zone 2 relies on groundwater wells and PRVs from Pressure Zone 3 to meet existing supply requirements. As documented on **Table 7.2**, three new wells are recommended for equipping and construction to mitigate this existing supply dependency. Additionally, one new well will be required within the buildout development horizon to meet additional demands.

7.5.3.2 Pressure Zone 3

Under existing conditions Pressure Zone 3 utilizes groundwater wells and water delivered through the Meridian Turnout to meet existing supply requirements. As documented on **Table 7.3**, three wells are recommended for rehabilitation and construction to mitigate a portion of this supply dependency. It should be noted that the potential future wells in this pressure zone are located

Table 7.1 Phased Supply Planning
Water Facilities Master Plan
West Valley Water District

PRELIMINARY

	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046
Population Forecasting																													
Projected Annual Growth Rate	4.4%	4.2%	4.0%	3.9%	3.7%	3.6%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
Projected Population	87,590	91,279	94,967	98,656	102,344	106,033	107,623	109,237	110,876	112,539	114,227	115,941	117,680	119,445	121,236	123,055	124,901	126,774	128,676	130,606	132,565	134,554	136,572	138,621	140,700	142,810	144,953	147,127	149,334
Projected Demands																													
Average Day Demands, mgd	17.6	18.3	19.1	19.9	20.7	21.5	21.9	22.3	22.7	23.1	23.5	23.9	24.3	24.8	25.2	25.6	26.1	26.5	27.0	27.5	28.0	28.5	29.0	29.4	29.8	30.3	30.7	31.2	31.7
Peak Day Demands[1], mgd	29.8	31.2	32.5	33.9	35.2	36.6	37.2	37.9	38.6	39.2	39.9	40.6	41.4	42.1	42.8	43.6	44.3	45.1	45.9	46.7	47.5	48.4	49.2	50.0	50.7	51.5	52.3	53.0	53.8
Buildout Supply Analysis																													
Required Supply (PDD)	29.8	31.2	32.5	33.9	35.2	36.6	37.2	37.9	38.6	39.2	39.9	40.6	41.4	42.1	42.8	43.6	44.3	45.1	45.9	46.7	47.5	48.4	49.2	50.0	50.7	51.5	52.3	53.0	53.8
Available Supply				OPR Expansion Online ↓																									
Supply Scenario 1 (Maximum Surface Water Treatment)																													
Surface Water[2]	12.9	12.9	12.9	12.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9	18.9
Groundwater[3,4]	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Firm Available Supply	32.9	32.9	32.9	32.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9	38.9
Supply Scenario 2 (Minimum Surface Water Treatment)																													
Surface Water[2]	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Groundwater[3,4]	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5	14.5
Total Available Supply	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6	16.6
Recommended New Wells																													
Well ID		39	41, 50	16, 52	29A	43, 44	45, 46					7, 8A	36						51				34B, 35C		22A				
Estimated Production Capacity[5,6]			2.1, 1.4	1.4, 1.9	1.4	3.4, 3.4	3.4, 3.4					2, 2.3	2.6						2.9				1.9, 1.9		1.4				
Supplied Zone			2, 3	3, 3	2	3A, 3A	3A, 3A					4, 4	4						2				4, 4		4				
New Firm Well Capacity	20.0	21.8	25.3	28.6	31.8	38.6	45.4	45.4	45.4	45.4	45.4	47.0	49.6	49.6	49.6	49.6	49.6	49.6	52.5	52.5	52.5	52.5	56.3	56.3	57.7	57.7	57.7	57.7	57.7
Supply Capacity Analysis																													
Scenario 1 (Maximum Surface Water Supplies)	- Treat maximum Lytle Creek and State Water Project water at OPR WFF, with 1,680 afy delivery to City of Rialto - Includes additional 4,000 AFY SWP water delivery for 15 years (2022-2036) - Rehabilitate existing offline wells - Construct new wells to offset surface water treatment - OPR WFF treatment capacity expansion online 2022																												
	3.1	3.5	5.7	7.6	15.5	20.9	27.0	26.4	25.7	25.0	24.3	25.3	27.1	26.4	25.7	24.9	24.2	23.4	25.5	24.7	23.9	23.0	26.0	25.2	25.9	25.1	24.4	23.6	22.8
Scenario 2 (Conservative Surface Water Supplies)	- Treat 4,000 AFY of Lytle Creek water at OPR WFF, with 1,680 afy delivery to City of Rialto. - Existing Lytle Creek wells considered non-reliable and not included in existing supply totals - Rehabilitate existing offline wells - Construct new wells as needed																												
	-13.3	-12.8	-10.7	-8.7	-6.9	-1.5	4.7	4.0	3.4	2.7	2.0	2.9	4.8	4.1	3.3	2.6	1.8	1.0	3.1	2.3	1.5	0.7	3.6	2.9	3.5	2.8	2.0	1.2	0.4

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4/17/2020

Notes

1. Peak Day Demand = 1.7 x Average Day Demand
2. Available Surface Water supply excludes City of Rialto capacity ownership (1.5 mgd)
3. Existing groundwater capacity based on historical pump tests provided by WVWD staff August 2, 2017 and assumes 16-hour daily runtime
4. Groundwater supply shown equal to firm supply, which reflects total supply with largest unit out of service
5. Estimated production capacities extracted from WVWD 2012 WMP.
6. Well 39 capacity based on the following Chino Groundwater Basin Water Rights:
   - 2019-2021: 1,000 AFY WVWD rights + 1,000 AFY leased rights
   - 2022-2028: 1,000 AFY WVWD rights + 3,000 AFY leased rights
   - 2029-Buildout: 1,000 AFY WVWD Rights

WVWD may renegotiate additional lease rights following 10-year lease term. However, for conservative planning purposes Well 39 currently planned to extract only WVWD right after 2028.

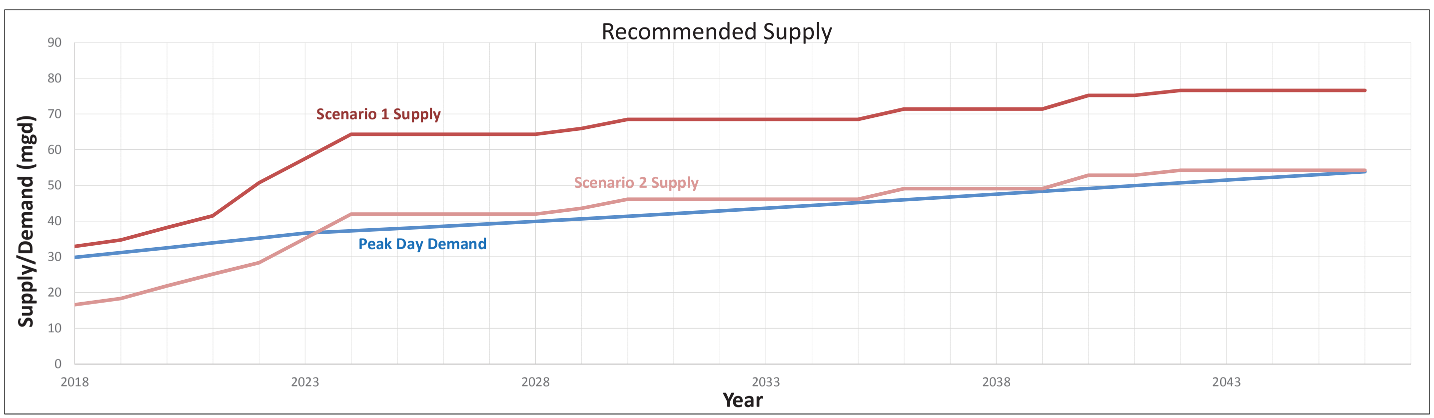

Table 7.2 Pressure Zone 2 Supply Analysis

Water Facilities Master Plan

West Valley Water District

PRELIMINARY

Year	ADD[1] (mgd)	PDD[2] (mgd)	Supply Sources[3,4,5] Well	Source (mgd)	Groundwater Supply[6] Total (mgd)	Groundwater Supply[6] Firm (mgd)	Surplus/Deficit Total (mgd)	Surplus/Deficit Firm (mgd)
2018/19	2.65	4.51	Existing W-17	0.96				
			Existing W-18A	2.08	3.04	0.96	-1.47	-3.55
2019/20	2.68	4.56	Equip W-41 (Treatment)	2.10	5.14	3.04	0.59	-1.51
2020/21	2.71	4.60	Equip W-16 (Pump Shaft)	1.40	6.54	4.44	1.94	-0.16
2021/22	2.73	4.65	Construct W-29A	1.40	7.94	5.84	3.30	1.20
2022/23	2.76	4.69			7.94	5.84	3.25	1.15
2023/24	2.79	4.74			7.94	5.84	3.21	1.11
Buildout	4.55	7.74	Construct W-51	2.90	10.84	7.94	3.10	**0.20**

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2/4/2019

Notes:

1. Demands are based on the following:
   - 2018/19: Estimated existing demand
   - 2019/19-2022/23: Linear interpolation between 2018/19 and 2023/24
   - 2023/24: Additional demand based on projected 5-year growth.
2. PDD = 1.7 x ADD
3. Existing well capacities based on pump tests received from District staff August 2, 2017 and assume 16-hour daily operations.
4. Future well capacities based on 2012 Water Master Plan and assume 16-hour daily operations.
5. Firm capacity excludes largest groundwater supply.

Table 7.3 Pressure Zone 3 Supply Analysis

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Year	ADD[1]	PDD[2]	Supply Sources[3,4,5]		Groundwater Supply[6]		Surplus/Deficit	
			Well	Source	Total	Firm	Total	Firm
	(mgd)	(mgd)		(mgd)	(mgd)	(mgd)	(mgd)	(mgd)
2018/19	3.87	6.57	Existing W-15	1.32				
			Existing W-30	1.46				
			Existing W-42	1.56	4.34	2.78	-2.23	-3.79
2019/20	3.92	6.66	Construct W-50	1.40				
			Rehabilitate W-39	3.80	9.54	5.74	2.88	-0.92
2020/21	3.97	6.75	Construct W-52	1.90	11.44	7.64	4.69	0.89
2021/22	4.02	6.84			11.44	7.64	4.60	0.80
2022/23	4.08	6.93			11.44	7.64	4.51	0.71
2023/24	4.13	7.02			11.44	7.64	4.42	0.62
Buildout	6.63	11.28	Meridian Turnout Delivery	3.63	15.07	11.27	3.80	0.00

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2/4/2019

Notes:

1. Demands are based on the following:
   - 2018/19: Estimated existing demand
   - 2019/20-2022/23: Linear interpolation between 2018/19 and 2023/24
   - 2023/24: Additional demand based on projected 5-year growth.
2. PDD = 1.7 x ADD
3. Existing well capacities based on pump tests received from District staff August 2, 2017 and assume 16-hour daily operations.
4. Future well capacities based on 2012 Water Master Plan and assume 16-hour daily operations.
5. Under buildout development PDD conditions Pressure Zone 3 will require approximately 2,500 gpm supply deliveries through the District's Meridian Turnout facility.
6. Firm capacity excludes largest groundwater supply.

within the Chino Groundwater Basin. Based on the existing water rights limitations within the Chino Groundwater Basin, the District currently plans to extract its allowed amount utilizing Well 39 and no additional wells are planned for construction. Therefore, under the buildout development horizon Pressure Zone 3 will require continued supply deliveries through the Meridian Turnout.

7.5.3.3 Pressure Zone 3A

Under existing conditions Pressure Zone 3A utilizes the FBR treatment facility to meet existing supply requirements. As documented on **Table 7.4**, under existing and buildout conditions, this facility is anticipated to be sufficient to meet the zone's supply requirements. However, it should be noted that in the event the FBR treatment facility supply is interrupted this pressure zone can receive deliveries through both the Baseline Feeder Pipeline and Pump Station 3A.

7.5.3.4 Pressure Zone 4-8 (North System Pressure Zones)

Under existing conditions Pressure Zones 4, 5, 6, 7, and 8 are supplied by both groundwater wells and the OPR treatment facility. As summarized on **Table 7.5**, under Supply Scenario 1 the existing water supply facilities are capable of meeting the supply requirements of the pressure zones. However, under the conservative Supply Scenario 2, the available groundwater supply capacity is unable to offset the reduction in surface water available for treatment. In order to mitigate this deficiency the new wells are recommended for construction and equipping; this includes the development of the Bunker Hill well field, comprised of future wells 43, 44, 45, and 46, which is recommended for immediate design and construction. Additionally, to continue to maximize the treatment of surface water supplies, the OPR WFF 6.0 mgd expansion is planned for immediate design and construction. This capacity expansion will enable the District to take advantage of available surface water supplies and minimize groundwater pumping when possible.

7.5.4 Recommended Supply Improvements

The following sections summarize the recommended supply improvements intended to mitigate existing supply deficiencies and accommodate future growth under the five-year and buildout development horizon.

7.5.4.1 Five-Year Supply Improvements

The following section summarizes the supply improvements recommended for implementation within the five-year development horizon, which are briefly on the following pages.

- **Well 16:** This well has a design capacity of 1,500 gpm and discharges into water storage reservoir 2-1. This well has existing treatment for perchlorate and additional treatment is required for nitrate before being activated.

Table 7.4 Pressure Zone 3A Supply Analysis

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Year	ADD[1]	PDD[2]	Supply Sources[3,4]		Groundwater Supply[5]		Surplus/Deficit	
			Well	Source	Total	Firm	Total	Firm
	(mgd)	(mgd)		(mgd)	(mgd)	(mgd)	(mgd)	(mgd)
2018/19	1.04	1.77	FBR	2.88	2.88	2.88	1.11	1.11
2019/20	1.05	1.78			2.88	2.88	1.10	1.10
2020/21	1.05	1.79			2.88	2.88	1.09	1.09
2021/22	1.06	1.80			2.88	2.88	1.08	1.08
2022/23	1.07	1.81			2.88	2.88	1.07	1.07
2023/24	1.07	1.82			2.88	2.88	1.06	1.06
Buildout	1.11	1.89			2.88	2.88	0.99	**0.99**

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2/4/2019

Notes:

1. Demands are based on the following:
   - 2018/19: Estimated existing demand
   - 2019/20-2022/23: Linear interpolation between 2018/19 and 2023/24
   - 2023/24: Additional demand based on projected 5-year growth.
2. PDD = 1.7 x ADD
3. Existing well capacities based on pump tests received from District staff August 2, 2017 and assume 16-hour daily operations.
4. Future well capacities based on 2012 Water Master Plan and assume 16-hour daily operations.
5. The FBR treatment facility is planned to provide supplies to Pressure Zone 3A under existing and buildout conditions. However, the District can provide supplemental supplies to this zone through the Baseline Feeder Pipeline as well as Pump Station 3A.

Table 7.5 North System Pressure Zone Supply Analysis

Water Facilities Master Plan

West Valley Water District

PRELIMINARY

Year	ADD[1]	PDD[2]	Groundwater Supply: Supply Source[3,4,5] Well	Groundwater Supply: Capacity	Supply Capacity[6] Total	Supply Capacity[6] Firm	Surface Water: Scenario 1[7,8] (Maximum Surface Water)	Surface Water: Scenario 2[9] (Minimum Surface Water)	Surplus/Deficit: Scenario 1 (Maximum Surface Water) Total	Surplus/Deficit: Scenario 1 Firm	Surplus/Deficit: Scenario 2 (Minimum Surface Water) Total	Surplus/Deficit: Scenario 2 Firm
	(mgd)	(mgd)		(mgd)	(mgd)	(mgd)	(mgd)	(mgd)	(mgd)	(mgd)	(mgd)	(mgd)
2018/19	9.81	16.67	Existing W-24	0.46								
			Existing W-54	0.88								
			Existing W-9th St (North)	2.88								
			Existing W-9th St (South)	3.36	7.58	4.22	12.90	2.10	3.81	0.45	-8.65	-10.35
2019/20	10.55	17.94			7.58	4.22	12.90	2.10	2.54	-0.82	-8.26	-11.62
2020/21	11.30	19.21			7.58	4.22	12.90	2.10	1.27	-2.09	-9.53	-12.89
2021/22	12.05	20.48			7.58	4.22	12.90	2.10	0.00	-3.36	-10.80	-14.16
2022/23	12.79	21.75	Construct W-43	3.40			*OPR WFF Expansion Online*					
			Construct W-44	3.40	14.38	10.98	18.90	2.10	11.53	8.13	-5.27	-8.67
2023/24	13.54	23.02	Construct W-45	3.40								
			Construct W-46	3.40	21.18	17.78	18.90	2.10	17.06	13.66	0.26	-3.14
Buildout	19.32	32.84	Equip W-7 (Blind Flanged)	2.00								
			Equip W-8A (Treatment)	2.30								
			Equip W-22A (Treatment)	1.40								
			Construct W-34B	1.90								
			Construct W-35C	1.90								
			Equip W-36 (Treatment)	2.60	33.28	29.88	18.90	2.10	19.34	**15.94**	2.54	**-0.86**

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2/4/2019

Notes:

1. Demands are based on the following:
   - 2018/19: Estimated existing demand
   - 2019/20-2022/23: Linear interpolation between 2018/19 and 2023/24
   - 2023/24: Additional demand based on projected 5-year growth.
2. PDD = 1.7 x ADD
3. Existing well capacities based on pump tests received from District staff August 2, 2017 and assume 16-hour daily operations.
4. Future well capacities based on 2012 Water Master Plan and assume 16-hour daily operations.
5. For conservative supply planning purposes existing Lytle Creek groundwater basin wells (W-1, W-2, W-4A, W-5A) are considered non-reliable and excluded from the supply analysis.
6. Firm capacity excludes largest groundwater supply.
7. Scenario 1 assumes OPR WFF operating at maximum treatment capacity, with 1.5 mgd of treated water delivered to the City of Rialto.
8. The OPR WFF treatment capacity expansion is assumed to come online in the year 2022/23.
9. Scenario 2 assumes OPR WFF treating minimum reliable Lytle Creek supply of 4,000 AFY, with 1.5 mgd of treated water delivered to the City of Rialto.

- **Well 29A:** This well has a design capacity of 1,500 gpm and is planned to discharge directly into Pressure Zone 2. Treatment for perchlorate and nitrate is required before being activated.

- **Well 39:** This well has a capacity of up to 4,000 gpm and is planned to discharge directly into Pressure Zone 3. Once drilled, water quality sampling indicated nitrate exceeding regulatory limits. As such, the well was never equipped, and requires treatment and equipping prior to production.

- **Well 41:** This well has a design capacity of 2,000 gpm and directly discharges into Pressure Zone 2. Currently, this well experiences levels of perchlorate above the regulated maximum contaminant levels and wellhead treatment is required to bring online. Existing treatment vessels located at the reservoir 2-1 site are currently unused and may potentially be relocated to this well site. Feasibility of the relocation of these vessels is dependent on the site constraints. Additional land purchase may be required, should the site not accommodate the vessels. It should be noted that the rehabilitation of this well is expected to reduce the required PRV flow from Pressure Zone 3.

7.5.5 Recommended Supply Improvements

- **Wells 43, 44, 45, and 46:** These wells each have a planned design capacity of 3,400 gpm and are planned as part of the Bunker Hill wellfield development. These wells are planned to discharge into a new aeration tank, which will act as a forebay to a new pump station discharging into a transmission pipeline that will ultimately connect to an existing 30-inch transmission main near the Pump Station 3A site before being conveyed to the Lord Ranch Facility.

- **Well 50:** This well has a design capacity of 1,500 gpm and is planned to discharge directly into Pressure Zone 3. Once drilled, water quality sampling indicated perchlorate exceeding regulatory limits. Treatment for perchlorate and nitrate is required before being activated.

- **Well 52:** This well has a design capacity of 2,000 gpm and is planned to discharge directly into Pressure Zone 3. Treatment for perchlorate and nitrate is required before being activated.

7.5.5.1 Buildout Supply Improvements

The following section summarizes the supply improvements recommended for implementation within the buildout development horizon, which are briefly summarized as follows:

- **Well 7:** This well has a design capacity of 2,100 gpm and is planned to discharge directly into water storage reservoir 3-2. According to District records this well is currently blind flanged.

- **Well 8A:** This well has a design capacity of 2,400 gpm and discharges directly into water storage reservoir 3-2. Currently this well experiences high levels of arsenic and wellhead treatment is required prior to activation.

- **Well 22A:** This well has a design capacity of 1,500 gpm and discharges directly into Pressure Zone 4. Currently, this well experiences high levels of nitrate and wellhead treatment is recommended to bring online. This well will require further study to determine the best methodology to mitigate the ongoing nitrate contamination.

- **Well 34B:** This well has a planned design capacity of 2,000 gpm and discharges directly into Pressure Zone 4. This well is replacing a previously destroyed well and will require re-drilling and equipping. It is also assumed that this well will require wellhead treatment for arsenic levels required prior to activation.

- **Well 35C:** This well has a planned design capacity of 2,000 gpm and discharges directly into Pressure Zone 4. A casing currently exists at this well location and a new study is recommended to confirm the construction and water quality requirements of this well. It is also assumed that this well will require wellhead treatment for arsenic levels required prior to activation.

- **Well 36:** This well has a design capacity of 2,700 gpm and discharges directly into water storage reservoir 3-2. Currently, this well experiences high levels of arsenic and wellhead treatment is required prior to activation.

- **Well 51:** This well has a design capacity of 2,000 gpm and is planned to discharge directly into Pressure Zone 2. The specific location of this well has not been determined and well site investigations should include a water quality study to determine the need for treatment. It should be noted that the construction of this well will reduce the required PRV flow from Pressure Zone 3.

7.5.6 Water Supply Treatment Evaluation

This section documents the groundwater and surface water treatment options for the District, as recommended by Kleinfelder.

7.5.6.1 Groundwater Treatment

Table 7.6 documents the existing conditions of the District's groundwater wells. There are currently 12 active production wells. Some of the production wells are contaminated with perchlorate, nitrate, arsenic, or have issues with air entrapment producing milky water and inducing customer complaints. The District has been proactive in its efforts to install wellhead treatment to maintain the operational status of these wells, and provide high quality drinking water.

Table 7.6 Well Production Capacity and Water Quality Issues
Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Well	Zone	Basin	Location	Five Year Projections: Pump Capacity (gpm)	Five Year Projections: Product. Capacity 16h/d Ops (mgd)	Five Year Projections: Severe Drought Capacity (mgd)	Five Year Projections: Water Demand (afy)	Ultimate Buildout: Pump Capacity (gpm)	Ultimate Buildout: Product. Capacity 16h/d Ops (mgd)	Ultimate Buildout: Severe Drought Capacity (mgd)	Ultimate Buildout: Water Demand (afy)	Current Condition of Use	Water Quality Issues
Lytle Creek Basin													
W-7	3, 4	LC	6871 Martin Road, San Bernardino	2,100	2.0	1.0		2,100	2.0	1.0		Not in operation, Blind flanged	
W-8A	3, 4	LC	6871 Martin Road, San Bernardino	2,400	2.3	0.9		2,400	2.3	0.9		Not currently used, arsenic issue	Low level arsenic
W-36	3,4	LC	20600 Walnut Avenue, San Bernardino					2,700	2.6	0.9		Not currently used	Arsenic removal required
W-1A	4	LC	19523 Country Club Drive, Rialto					760	0.7	0.6		Not currently used due to declining water level	
W-2	4	LC	19973 Country Club Drive, Rialto	2,800	2.7	1.6		2,800	2.7	1.6		Has arsenic treatment, coagulation line	Arsenic
W-4A	4	LC	5914 N. Sycamore Avenue, Rialto					2,600	2.5	0.9		Not currently used due to declining water level	
W-5A	4	LC	5914 N. Sycamore Avenue, Rialto					2,200	2.1	1.0		Not currently used due to declining water level	
W-34B	4	LC	19655 Country Club Drive, Rialto (Future)					2,000	1.9	0.8		Not constructed, replacement for Well 34B	Assumed As removal
W-35C	4	LC	5855 N. Sycamore Avenue, Rialto (Future)					2,000	1.9	0.8		Not constructed, replacement for capped Well 35C	Assumed As removal
			TOTAL LC Current	7,300	7.0	3.5		12,860	12.3	6.0			
			TOTAL LC FUTURE	0	0.0	0.0		6,700	6.4	2.5			
			TOTAL LC Basin	**7,300**	**7.0**	**3.5**		**19,560**	**18.7**	**8.5**			
Rialto-Colton Basin													
W-16	2	R	296 S. Eucalyptus Avenue, Rialto	1,500	1.4	0.8		1,500	1.4	0.8		Current IX for perchlorate, Not used-pump shaft	Perchlorate, Now nitrate
W-17	2	R	404 S. Acacia Avenue, Rialto	1,250	1.2	0.6		1,250	1.2	0.6		Current IX for perchlorate, Operational	Perchlorate
W-49	2	R	Eucalyptus Avenue, Rialto (Future)					1,500	1.4	0.7		Not constructed	
W-11	3A	R	238 W. Victoria Street, Rialto	1,800	1.7	0.9		1,800	1.7	0.9		Current perchlorate FBR, runs when Well 6 is off	
W-33	3A	R	855 W. Baseline Road, Rialto	2,600	2.5	1.3		2,600	2.5	1.3		Not in use, FBR has no capacity, Need to add IX	Perchlorate
W-22A	4	R	5700 N. Riverside Avenue, Rialto (Future)					1,500	1.4	0.7		Well constructed & deactivated, needs treatment	Nitrate >MCL
W-23A	6	R	4334 N. Riverside Avenue, Rialto	200	0.2	0.0		200	0.2	0.0		Not regularly used. Serve as standby for zone 3	
W-24	6	R	4334 N. Riverside Avenue, Rialto	600	0.6	0.3		600	0.6	0.3		OK, Operational	

Table 7.6 Well Production Capacity and Water Quality Issues
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PRELIMINARY

Well	Zone	Basin	Location	Five Year Projections				Ultimate Buildout				Current Condition of Use	Water Quality Issues
				Pump Capacity (gpm)	Product. Capacity 16h/d Ops (mgd)	Severe Drought Capacity (mgd)	Water Demand (afy)	Pump Capacity (gpm)	Product. Capacity 16h/d Ops (mgd)	Severe Drought Capacity (mgd)	Water Demand (afy)		
W-54	6	R	Duncan Canyon Road, Fontana	1,000	1.0	0.6		1,000	1.0	0.6		Air in water, customer complaints, Operational	
			TOTAL RC Current	8,950	8.6	4.4		8,950	8.6	4.4			
			TOTAL RC FUTURE	0	0.0	0.0		3,000	2.8	1.4			
			TOTAL RC Basin	**8,950**	**8.6**	**4.4**		**11,950**	**11.4**	**5.8**			
Bunker Hill Basin													
W-15	3, 3A, 2	BH	1915 W. 9th Street, San Bernardino	2,700	2.6	0.6		2,700	2.6	0.6		OK, Operational	
W-30	3, 3A, 2	BH	2015 W. 9th Street, San Bernardino	3,100	3.0	3.0		3,100	3.0	3.0		OK, Operational	
W-43	3, 3A, 4	BH	Along Baseline Feeder (Future)		0.0			3,500	3.4	3.4		Not constructed, Options: BH or through Baseline Feeder	
W-44	3, 3A, 4	BH	Along Baseline Feeder (Future)		0.0			3,500	3.4	3.4		Not constructed, Options: BH or through Baseline Feeder	
W-45	3, 3A, 4	BH	Along Baseline Feeder (Future)		0.0			3,500	3.4	3.4		Not constructed, Options: BH or through Baseline Feeder	
W-46	3A	BH	Along Baseline Feeder (Future)		0.0			3,500	3.4	3.4		Not constructed, Options: BH or through Baseline Feeder	
W-47	3A	BH	Along Baseline Feeder (Future)		0.0			3,500	3.4	3.4		Not constructed, Options: BH or through Baseline Feeder	
W-48	3A	BH	Along Baseline Feeder (Future)		0.0			3,500	3.4	3.4		Not constructed, Options: BH or through Baseline Feeder	
			TOTAL BH Current	5,800	5.6	5.6		5,800	5.6	3.6			
			TOTAL BH FUTURE	0	0.0	0.0		21,000	20.4	20.4			
			TOTAL BH Basin	**5,800**	**5.6**	**5.6**		**26,800**	**26.0**	**24.0**			
North Riverside Basin													
W-18A	2	NR	1783 S. Sycamore Avenue, Colton	2,700	2.6	1.3		2,700	2.6	1.3		Current IX perchlorate	Perchlorate, Now nitrate, Oil
W-41	2	NR	3353 S. Industrial, Rialto	2,200	2.1	1.1		2,200	2.1	1.1		Currently off	Now perchlorate
W-42	3	NR	295 E. San Bernardino, Rialto	2,200	2.1	1.1		2,200	2.1	1.1		Current IX for perchlorate. OK, Operational	Perchlorate, Now nitrate = 6ppm
W-19A	2	NR	TBD (Future)		0.0			2,100	1.5	0.7		Not constructed	
W-29A	2	NR	180 W. Slover Avenue, Rialto (Future)		0.0			1,500	1.0	0.5		Not constructed	
W-38	2	NR	TBD (Future)		0.0			1,900	1.4	0.7		Not constructed	
W-40	2	NR	157 W. Resource Drive, Rialto (Future)		0.0			1,500	1.0	0.5		Drilled but not equipped	
W-53	2	NR	TBD (Future)		0.0			2,100	1.7	0.9		Not constructed	

Table 7.6 Well Production Capacity and Water Quality Issues
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PRELIMINARY

Well	Zone	Basin	Location	Five Year Projections				Ultimate Buildout				Current Condition of Use	Water Quality Issues
				Pump Capacity (gpm)	Product. Capacity 16h/d Ops (mgd)	Severe Drought Capacity (mgd)	Water Demand (afy)	Pump Capacity (gpm)	Product. Capacity 16h/d Ops (mgd)	Severe Drought Capacity (mgd)	Water Demand (afy)		
W-51	2	NR	TBD (Future)		0.0			3,000	2.2	1.1		Not constructed	
W-52	3	NR	TBD (Future)		0.0			2,000	2.2	1.1		Not constructed	
W-50	3	NR	Willow Ave. and San Bernardino Ave. (Future)		0.0			1,500	1.0	0.5		Not constructed	
			TOTAL NR Current	7,100	6.8	3.4		7,100	6.8	3.4			
			TOTAL NR FUTURE	0	0.0			15,600	12.0	6.0			
			TOTAL NR Basin	**7,100**	**6.8**	**3.4**		**22,700**	**18.8**	**9.4**			
Chino Basin													
W-39	3	C	10272 Cedar Place, San Bernardino Co (Future)		0.0			4,000	3.8	2.0		High levels of nitrate Drilled but not equipped	
			TOTAL C Current	0	0.0	0.0		0	0.0	0.0			
			TOTAL C FUTURE	0	0.0	0.0		4,000	3.8	2.0			
			TOTAL C Basin	**0**	**0.0**	**0.0**		**4,000**	**3.8**	**2.0**			
			TOTAL Ground Water Current	29,150	28.0	16.8		34,710	33.3	17.3			
			TOTAL Ground Water FUTURE	0	0.0	0.0		50,300	45.4	32.3			
			TOTAL Ground Water	**29,150**	**28.0**	**16.8**		**85,010**	**78.7**	**49.6**			

Notes:
1. Table prepared by Kleinfelder, Inc staff February 2018.
2. Annual average and maximum water demand for intermediate water supply conditions by year 2022 can be satisfied by utilizing all existing wells. This assumes all currently running wells shall be operable which will requires regular and preventive maintenance.
3. To satisfy intermediate water supply demand, capital improvements by implementing wellhead treatments will be required to bring the currently constructed but not running wells in operation by the intermediate condition.
4. Capacity of the current and the identified additional ground water wells has potential for production of 84.8 MGD which exceeds the average and daily maximum demands of 30.55 MG and 58.68 MGD, respectively.
5. Under sever drought conditions, Baseline Feeder and/or SWP shall be utilized to provide supplemental water supply during peak day demands for intermediate condition and for built out condition.
6. The OPR WFF with its current capacity of 14.4 MG provides supplemental water supply to the proposed wellhead supply for the intermediate water supply conditions. The planned 6 MGD expansion shall be realized to satisfy ultimate buildout water demand

The District owns seven non-operating wells that have been inactivated due to mechanical failure of the equipment, or due to contamination such as perchlorate, nitrate, arsenic. For example, W-16, which already has an ionic exchange; wellhead treatment for perchlorates, has a malfunction of the shaft of the pump, W-8A is contaminated with arsenic; and W-33 and W-41 have perchlorate levels that exceed the current MCL. Each of these wells will require treatment or rehabilitation prior to activation.

7.5.6.2 Surface Water Treatment

The Roemer WFF uses raw water from Lytle Creek, and supplemental water from the SWP to treat and deliver high quality drinking water to the existing District customers. The Roemer WFF is operated up to the design capacity and, with regular and planned maintenance, is producing drinking water in compliance with current water quality standards, including TOC reduction to above regulated 35 percent.

7.6 STORAGE ANALYSIS

The section documents the District's existing domestic water storage capacity. Additionally, this section identifies the existing and future storage requirements to meet the storage capacity criteria by pressure zone.

7.6.1 Storage Requirements

The following sections summarize the storage requirements under existing, 5-year, and buildout development conditions. The storage requirements for each development condition are calculated based on criteria discussed in the System Performance and Design Criteria chapter and are summarized on **Table 7.7**.

7.6.1.1 Existing Development

Existing storage requirements were identified for each pressure zone and are summarized in **Table 7.7**. The table lists the existing domestic water demands and operational, pumping, and fire storage for each pressure zone. As summarized on this table the total required storage for existing domestic water demands is 51.8 MG. The current usable storage capacity is 71.86 MG. There are two inactive reservoirs: R6-1 (0.25 MG) and R2-2 (0.5 MG). Reservoir R2-2 is tar lined and R6-6 needs interior recoating. The cost to rehabilitate these two older reservoirs is quite substantial compared to their limited storage capacity.

7.6.1.2 5-Year Development

The storage requirements due to 5-year development were identified based on the planned five year growth and are summarized by pressure zone on **Table 7.7**. The table lists the additional domestic water demands due to 5-year development and identifies the operational, pumping, and fire storage for each pressure zone. As summarized on this table the total required storage for

Table 7.7 Storage Requirements

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Pressure Zone	Water Demands		Water Storage Requirements			
	Average Day Demand[1] (mgd)	Peak Day Demand[2] (mgd)	Operational at 100% (MG)	Fire Protection[3] (MG)	Pumping Storage[4,5] (MG)	Total, By Pressure Zone (MG)
Existing Storage Requirements						
South System Pressure Zones						
2	2.65	4.51	4.51	0.96	-	5.47
3	3.87	6.57	6.57	0.96	-	7.53
3A	1.04	1.77	1.77	0.54	-	2.31
Subtotal	**7.56**	**12.85**	**12.85**	**2.46**	**0.00**	**15.31**
North System Pressure Zones						
4	1.96	3.32	3.32	0.54	7.85	11.72
5	1.98	3.36	3.36	0.54	5.87	9.78
6	3.18	5.40	5.40	0.96	2.70	9.06
7	2.46	4.18	4.18	0.54	0.24	4.96
8	0.24	0.41	0.41	0.54	-	0.95
Subtotal	**9.81**	**16.67**	**16.67**	**3.12**	**16.66**	**36.46**
Existing Storage Requirements						
	17.37	**29.52**	**29.52**	**5.58**	**16.66**	**51.77**
New Storage Requirements (Near-Term 5-Year Planning)						
South System Pressure Zones						
2	0.13	0.22	0.22	0.96	-	1.18
3	0.27	0.45	0.45	0.96	-	1.41
3A	0.03	0.06	0.06	0.54	-	0.60
Subtotal	**0.43**	**0.73**	**0.73**	**2.46**	**0.00**	**3.19**
North System Pressure Zones						
4	0.04	0.07	0.07	0.54	3.69	4.30
5	0.66	1.12	1.12	0.54	3.03	4.69
6	1.19	2.02	2.02	0.96	1.84	4.83
7	1.59	2.70	2.70	0.54	0.26	3.49
8	0.26	0.44	0.44	0.54	-	0.98
Subtotal	**3.73**	**6.34**	**6.34**	**3.12**	**8.82**	**18.29**
New Storage Requirements						
	4.16	**7.07**	**7.07**	**5.58**	**8.82**	**21.48**

Table 7.7 Storage Requirements

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PRELIMINARY

Pressure Zone	Water Demands		Water Storage Requirements			
	Average Day Demand[1] (mgd)	Peak Day Demand[2] (mgd)	Operational at 100% (MG)	Fire Protection[3] (MG)	Pumping Storage[4,5] (MG)	Total, By Pressure Zone (MG)
New Storage Requirements (Year 6 through Buildout Planning)						
South System Pressure Zones						
2	1.77	3.00	3.00	0.96	-	3.96
3	2.50	4.26	4.26	0.96	-	5.22
3A	0.04	0.07	0.07	0.54	-	0.61
Subtotal	**4.31**	**7.32**	**7.32**	**2.46**	**0.00**	**9.78**
North System Pressure Zones						
4	0.27	0.46	0.46	0.54	5.51	6.51
5	0.19	0.33	0.33	0.54	5.31	6.18
6	2.44	4.16	4.16	0.96	2.87	7.98
7	2.47	4.19	4.19	0.54	0.40	5.14
8	0.40	0.68	0.68	0.54	-	1.22
Subtotal	**5.78**	**9.83**	**9.83**	**3.12**	**14.09**	**27.04**
New Storage Requirements						
	10.09	**17.15**	**17.15**	**5.58**	**14.09**	**36.82**
Total Storage Requirements at Buildout						
South System Pressure Zones						
2	4.55	7.74	7.74	0.96	-	8.70
3	6.63	11.28	11.28	0.96	-	12.24
3A	1.11	1.89	1.89	0.54	-	2.43
Subtotal	**12.30**	**20.90**	**20.90**	**2.46**	**0.00**	**23.36**
North System Pressure Zones						
4	2.27	3.85	3.85	0.54	17.05	17.44
5	2.83	4.81	4.81	0.54	14.22	15.57
6	6.81	11.58	11.58	0.96	7.41	19.95
7	6.51	11.07	11.07	0.54	0.90	12.51
8	0.90	1.53	1.53	0.54	-	2.07
Subtotal	**19.32**	**32.84**	**32.84**	**3.12**	**39.58**	**67.54**
Total Storage Requirements						
	31.62	**53.75**	**53.75**	**5.58**	**39.58**	**90.91**

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Notes: 2/6/2019

1. Existing average day demands based on 2014 production less 10%, where the demand distribution by pressure zone is based on 2016 water billing records.
2. Peak Day Demand = 1.7 x Average Day Demand
3. Fire Protection requirement represents largest fire requirement for each zone, based on account types listed in water billing records
4. Zones 4-7 include a pumping storage capacity which is equal to 1-day storage of ADD for the higher zones.
5. The pumping storage shown in this table is the maximum pumping storage required and does not take into account the 4.0 MG of pumping storage available at the OPR WFF during emergency conditions.

5-year domestic water demands is 21.5 MG, which excludes the demands due to existing development.

7.6.1.3 Buildout Development Storage Requirements

The storage requirements due to buildout development of the District service area are summarized by pressure zone on **Table 7.7**. The table lists the additional domestic water demands due to buildout development and identifies the operational, pumping, and fire storage for each pressure zone. The table also lists the total required storage for buildout domestic water demands at 36.8 MG, which excludes the demands due to existing and 5-year development.

7.6.2 Storage Analysis and Recommended New Storage Facilities

The existing and future storage requirements, shown on **Table 7.7**, were compared with existing District storage facilities in each pressure zone and the required storage facility improvements for the 5-year (**Table 7.8**) and Buildout (**Table 7.9**) development horizons were identified; these tables list existing storage facilities for each zone, identifies existing storage capacity deficiencies, and identifies future storage capacity requirements to meet the needs from future growth.

7.6.2.1 5-year Development Storage Analysis

Based on the storage analysis shown on **Table 7.8**, the majority of the existing pressures zones have sufficient storage capacity to meet existing and five-five year requirements. The storage improvements recommended for construction within the five-year development horizon include the replacement of the existing Pressure Zone 8 storage reservoirs and the construction of a planned aeration reservoir, which are briefly summarized as follows:

Pressure Zone 8: In order to meet the storage capacity requirements due to the 5-year development within this pressure zone, an additional 0.5 MG of storage capacity is required. However, in order provide additional capacity for buildout development within the pressure zone a total capacity of 2.1 MG is recommended, which will provide surplus storage capacity to meet growing storage requirements as development continues beyond the 5-year development planning horizon. This storage volume also accounts for the demolition of the existing Zone 8 storage reservoirs.

- **Lord Ranch Facility:** The current designs for the Lord Ranch Facility include the construction of one new aeration reservoir. This reservoir is not intended to float on the District's distribution system and will serve as a forebay to the Lord Ranch Facility pump station expansion.

The proposed storage reservoir improvements for the 5-year development horizon are included on **Table 7.10** and graphically shown on **Figure 7.3**, and described as follows:

- **Z8-R8-3:** Replace the existing 0.10 MG and 0.41 MG Zone 8 water storage reservoirs with a 2.1 MG storage reservoir at the existing Zone 8 Tank site.

Table 7.8 Storage Capacity Analysis - 5 Year Growth

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Pressure Zone	Demands				Operational + Emergency Storage		Pumping Storage[1,2]		Fire Protection	Total Existing and Future Storage Requirement[5]	Existing Storage Reservoirs									Storage Balance for Existing Demands	Proposed New Storage Reservoirs									Total Storage	Storage Balance for Existing and 5-Year Demands
	Existing Average Day Demand (MGD)	Existing Peak Day Demand (MGD)	5-Year Average Day Demand (MGD)	5-Year Peak Day Demand (MGD)	Existing (MG)	5-Year Growth (MG)	Existing (MG)	5-Year Growth (MG)	(MG)	(MG)	Zone 2 (MG)	Zone 3 (MG)	Zone 3A (MG)	Zone 4 (MG)	Zone 5 (MG)	Zone 6 (MG)	Zone 7 (MG)	Zone 8 (MG)	Total (MG)	(MG)	Zone 2 (MG)	Zone 3 (MG)	Zone 3A (MG)	Zone 4 (MG)	Zone 5 (MG)	Zone 6 (MG)	Zone 7 (MG)	Zone 8[6] (MG)	Total (MG)	(MG)	(MG)
South System																															
Pressure Zone 2	2.65	4.51	0.13	0.22	4.51	0.22	0.00	0.00	0.96	5.70	11.00								11.00	5.53									0.00	11.00	5.30
Pressure Zone 3	3.87	6.57	0.27	0.45	6.57	0.45	0.00	0.00	0.96	7.98		9.00							9.00	1.47									0.00	9.00	1.02
Pressure Zone 3A	1.04	1.77	0.033	0.06	1.77	0.06	0.00	0.00	0.54	2.36			6.00						6.00	3.69									0.00	6.00	3.64
Subtotal	7.56	12.85	0.43	0.73	12.85	0.73	0.00	0.00	2.46	16.04									26.00	9.96									0.00	26.00	9.96
North System																															
Pressure Zone 4	1.96	3.32	0.04	0.07	3.32	0.07	7.85	3.69	0.54	11.47				11.00					11.00	3.28									0.00	11.00	-0.47
Pressure Zone 5	1.98	3.36	0.66	1.12	3.36	1.12	5.87	3.03	0.54	9.93					13.00				13.00	7.22									0.00	13.00	3.07
Pressure Zone 6	3.18	5.40	1.19	2.02	5.40	2.02	2.70	1.84	0.96	12.92						11.00			11.00	1.94									0.00	11.00	-1.92
Pressure Zone 7	2.46	4.18	1.59	2.70	4.18	2.70	0.24	0.26	0.54	7.91							9.15		9.15	4.19									0.00	9.15	1.24
Pressure Zone 8	0.24	0.41	0.26	0.44	0.41	0.44	0.00	0.00	0.54	1.38								0.51	0.51	-0.44								2.10	2.10	2.10	0.72
Subtotal	9.81	16.67	3.73	6.34	16.67	6.34	16.66	8.82	3.12	43.62									44.66	1.04									2.10	46.76	2.63
Total	**17.37**	**29.52**	**4.16**	**7.07**	**29.52**	**7.07**	**16.66**	**8.82**	**5.58**	**59.66**									**70.66**	**11.00**									2.10	72.76	13.10

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Notes:

1. Total Required Storage for Pressure Zone 2, 3, 3A, 8 : Operational + Fire
2. Total Required Storage for Pressure Zone 4, 5, 6, 7 : Operational + Fire + Pumping Storage
3. Pumping Storage defined as 100% Average Day Demand (ADD) for supply dependent pumping zone.
4. The pumping storage shown in this column is the maximum pumping storage required and does not take into account the 4.0 MG of pumping storage available and the OPR WFF.
5. The total pumping requirement for Zone 4 and Zone 5 reflects a 4.0 MG reduction in pumping storage due to supply available at the OPR WFF under emergency operational conditions.
6. Proposed new Zone 8 storage tank volume based on buildout land use demand requirements, which exceed the storage requirements due to 5 year growth.

Table 7.9 Storage Capacity Analysis - Buildout

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Pressure Zone	Demands: Existing Average Day Demand (MGD)	Demands: Existing Peak Day Demand (MGD)	Demands: Future Average Day Demand (MGD)	Demands: Future Peak Day Demand (MGD)	Operational + Emergency Storage: Existing (MG)	Operational + Emergency Storage: Future (MG)	Pumping Storage[1,2]: Existing (MG)	Pumping Storage[1,2]: Future (MG)	Fire Protection[3] (MG)	Total Existing and Future Storage Requirement[4] (MG)	Existing Storage Reservoirs: Zone 2 (MG)	Existing Storage Reservoirs: Zone 3 (MG)	Existing Storage Reservoirs: Zone 3A (MG)	Existing Storage Reservoirs: Zone 4 (MG)	Existing Storage Reservoirs: Zone 5 (MG)	Existing Storage Reservoirs: Zone 6 (MG)	Existing Storage Reservoirs: Zone 7 (MG)	Existing Storage Reservoirs: Zone 8 (MG)	Existing Storage Reservoirs: Total (MG)	Storage Balance for Existing and Buildout Demands (MG)	Proposed New Storage Reservoirs: Zone 2 (MG)	Proposed New Storage Reservoirs: Zone 3 (MG)	Proposed New Storage Reservoirs: Zone 3A (MG)	Proposed New Storage Reservoirs: Zone 4 (MG)	Proposed New Storage Reservoirs: Zone 5 (MG)	Proposed New Storage Reservoirs: Zone 6 (MG)	Proposed New Storage Reservoirs: Zone 7 (MG)	Proposed New Storage Reservoirs: Zone 8 (MG)	Proposed New Storage Reservoirs: Total (MG)	Total Storage (MG)	Storage Balance for Existing and Buildout Demands (MG)
South System																															
Pressure Zone 2	2.65	4.51	1.90	3.23	4.51	3.23	0.00	0.00	0.96	8.70	11.00								11.00	2.30									0.00	11.00	2.30
Pressure Zone 3	3.87	6.57	2.77	4.71	6.57	4.71	0.00	0.00	0.96	12.24		9.00							9.00	-3.24		3.25							3.25	12.25	0.01
Pressure Zone 3A	1.04	1.77	0.07	0.12	1.77	0.12	0.00	0.00	0.54	2.43			6.00						6.00	3.57									0.00	6.00	3.57
Subtotal	7.56	12.85	4.74	8.06	12.85	8.06	0.00	0.00	2.46	23.36									26.00	2.64									3.25	29.25	5.89
North System																															
Pressure Zone 4	1.96	3.32	0.31	0.53	3.32	0.53	7.85	9.20	0.54	17.44				11.00					11.00	-6.44				7.00					7.00	18.00	0.56
Pressure Zone 5	1.98	3.36	0.85	1.45	3.36	1.45	5.87	8.35	0.54	15.57					13.00				13.00	-2.57					2.60				2.60	15.60	0.03
Pressure Zone 6	3.18	5.40	3.63	6.18	5.40	6.18	2.70	4.71	0.96	19.95						11.00			11.00	-8.95						9.00			9.00	20.00	0.05
Pressure Zone 7	2.46	4.18	4.05	6.89	4.18	6.89	0.24	0.66	0.54	12.51							9.15		9.15	-3.36							3.40		3.40	12.55	0.04
Pressure Zone 8	0.24	0.41	0.66	1.12	0.41	1.12	0.00	0.00	0.54	2.07								0.51	0.51	-1.56								2.10	2.10	2.10	0.03
Subtotal	9.81	16.67	9.51	16.17	16.67	16.17	16.66	22.92	3.12	67.54									44.66	-22.88									24.10	68.76	1.22
Total	**17.37**	**29.52**	**14.25**	**24.22**	**29.52**	**24.22**	**16.66**	**22.92**	**5.58**	**90.91**									**70.66**	**-20.25**									27.35	98.01	7.10

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Notes:

1. Pumping Storage defined as 100% Average Day Demand (ADD) for supply dependent pumping zone.
2. The pumping storage shown in this column is the maximum pumping storage required and does not take into account the 4.0 MG of pumping storage available and the OPR WFF.
3. Fire storage requirement is the greatest fire flow volume of existing and future customers for each pressure zone.
4. The total pumping requirement for Zone 4 and Zone 5 reflects a 4.0 MG reduction in pumping storage due to supply available at the OPR WFF under emergency operational conditions.

Table 7.10 Proposed Storage Reservoirs

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Tank ID	Pressure Zone	Volume (MG)	Bottom Elevation (ft)
R3-4	3	3.25	1,260
LR-R3-5	3	1.00	1,156
R4-4	4	7.00	1,500
R5-4	5	2.60	1,638
R6-5	6	6.00	1,860
R6-6	6	3.00	1,860
R7-5	7	3.40	2,120
R8-3	8	2.10	2,363
R-BH-AER	-	1.00	2,345
Total		**29.35**	

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1/11/2019

- **LR-R3-5**: Construct a new 1.0 MG water storage reservoir at the existing Lord Ranch Facility.

7.6.2.2 Buildout Development Storage Analysis

Based on the storage analysis shown on **Table 7.9**, the existing storage capacity of multiple pressure zones is unable to meet the storage requirements at buildout of the District service area. In order to mitigate these storage deficiencies multiple storage reservoirs are recommended, as summarized on **Table 7.10** and shown graphically on **Figure 7.6**.

These storage deficiencies and recommended improvements are also briefly summarized below:

- **Pressure Zone 2:** Pressure Zone 2 is expected to have surplus storage capacity at buildout demands, and no improvements are recommended.

- **Pressure Zone 3:** In order to meet the storage capacity requirements at the buildout of the District service area, an additional 3.25 MG of storage capacity is recommended. This additional capacity is planned to be provided by the construction of one new storage reservoir.

- **Pressure Zone 3A:** Pressure Zone 3A is expected to have surplus storage capacity at buildout demands and no improvements are recommended.

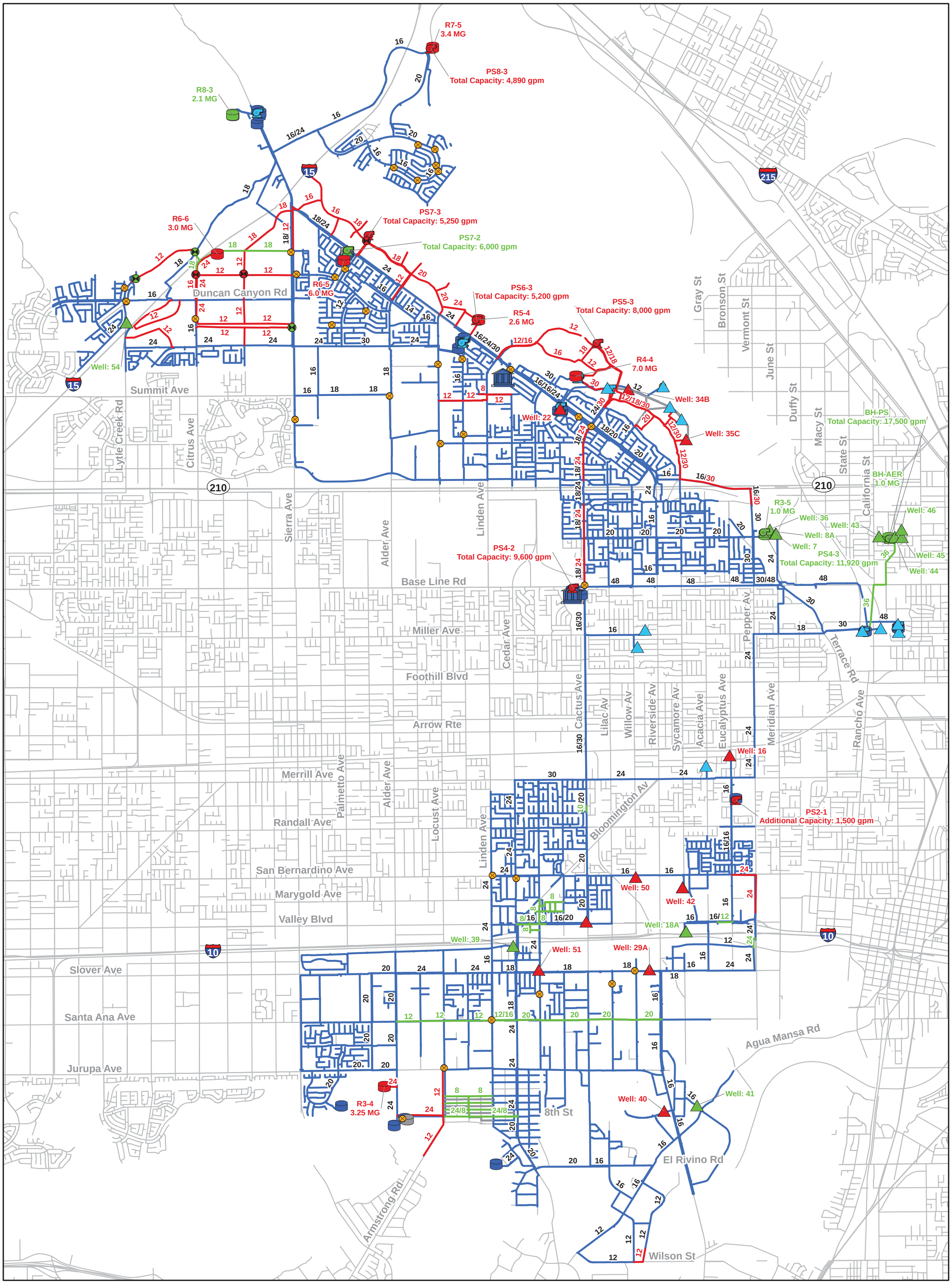
- **Pressure Zone 4:** In order to meet the storage capacity requirements at the buildout of the District service area, an additional 7.0 MG of storage capacity is recommended. This additional capacity is planned to be provided by the construction of one new storage reservoir.

- **Pressure Zone 5:** In order to meet the storage capacity requirements at the buildout of the District service area, an additional 2.6 MG of storage capacity is recommended. This additional capacity is planned to be provided by the construction of one new storage reservoir.

- **Pressure Zone 6:** In order to meet the storage capacity requirements at the buildout of the District service area an additional 9.0 MG of storage capacity is recommended. This additional capacity is planned to be provided by the construction of two new storage reservoirs.

- **Pressure Zone 7:** In order to meet the storage capacity requirements at the buildout of the District service area, an additional 3.4 MG of storage capacity is recommended. This additional capacity is planned to be provided by the construction of one new storage reservoir.

- **Pressure Zone 8:** As described in a previous section, the existing Zone 8 storage



Legend

5 Year Improvements
- Tanks
- Wells
- Pumps
- Valves
- Pipes

Buildout Improvements
- Tanks
- Wells
- Pumps
- Valves
- Pipes

Existing System
- WTP
- Tanks
- Wells
- Pumps
- Valves
- Pipes

- Inactive Tanks
- Abandoned Pipes
- Street Centerlines

PRELIMINARY

Updated: March 18, 2019

0 0.25 0.5 1 Mile

File Path: P:\xGIS\GIS_Projects\West Valley WD\WVWD_Fig7-6_BuildoutImprovements_031819.mxd

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Figure 7.6
Buildout Improvements

Water Facilities Master Plan
West Valley Water District

West Valley Water District

reservoirs are planned for replacement as part of the 5-year planning horizon. The recommended tank volume is sized to meet the buildout storage need.

- **Bunker Hill Well Field:** Plans for the Bunker Hill supply include the construction of a 1.0 MG aeration tank, which will serve as an equalization reservoir for the discharge of planned groundwater wells 43, 44, 45, and 46.

The proposed storage reservoirs summarized on **Table 7.10** are briefly described as follows:

- **Z3-R3-4:** Construct a new 3.25 MG storage reservoir approximately 1,100 ft southwest of the intersection of Jurupa Avenue and Alder Avenue.
- **Z4-R4-4:** Construct a new 7.0 MG storage reservoir at the existing water storage reservoir 4-3 site.
- **Z5-R5-4:** Construct a new 2.6 MG storage reservoir within the planned Lytle Creek Ranch development approximately 1,000 feet northeast of the existing water storage reservoir 5-1 site.
- **Z6-R6-5:** Construct a new 6.0 MG storage reservoir at the existing water storage reservoir 6-2 site.
- **Z6-R6-6:** Construct a new 3.0 MG storage reservoir approximately 1,100 feet east of the intersection of Citrus Avenue and Segovia Lane.
- **Z7-R7-5:** Construct a new 3.4 MG storage reservoir at the intersection of Clearwater Parkway and Glen Helen Parkway.

7.7 PUMP STATION CAPACITY ANALYSIS

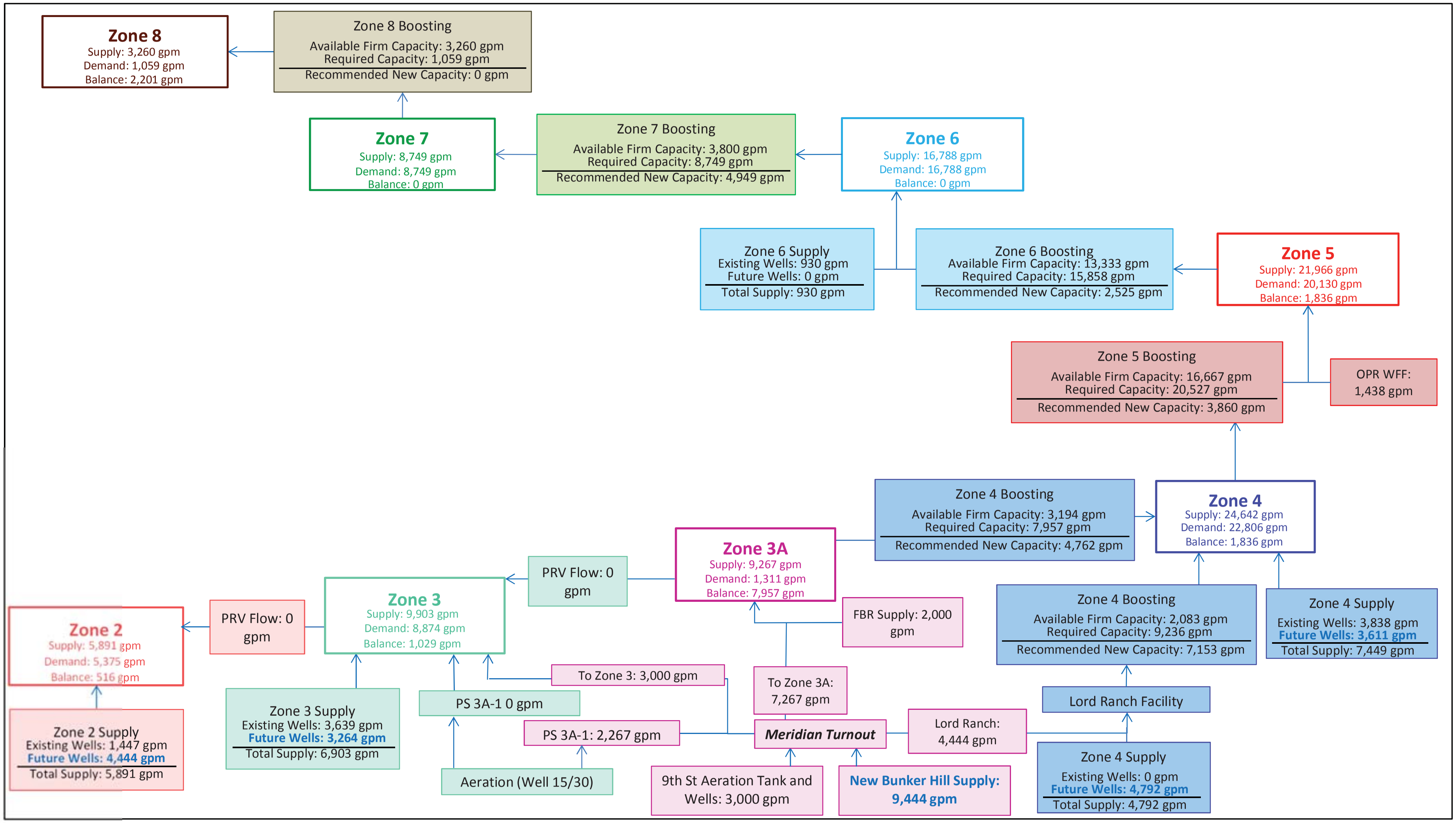
The section documents the existing pump station capacity, as well as the requirements to meet existing and future pumping needs. The pump station capacity evaluation is consolidated by pressure zone, and improvements are documented where necessary.

7.7.1 Existing Pump Station Capacity Requirements

The existing pump station requirements were identified for each station and are summarized on **Table 7.11**. The table lists the existing pump station capacities and identifies the required capacity, based on the District criteria. The existing pump station capacity analysis indicates the District's current pump stations have adequate capacity to service existing customers.

7.7.2 Future Pump Station Capacity Requirements

Future pump station requirements were identified for each pressure zone and are summarized on **Figure 7.7**. Based on the pump station criteria discussed in the System Performance and Design Criteria chapter, the combined firm capacity of each zone pump station is required to meet the Peak Day Demands of each zone in addition to any supply dependent zones. Pump station capacity requirements will vary based on supply scenarios discussed in an earlier section.



NOTES

PRELIMINARY

1. Demands shown based on Buildout Peak Day Demand conditions (1.7 x 31.6 mgd)
2. Total zone demand equal to a sum of the following:
   - Pressure zone demand
   - Total demand of supply dependent boosted zones
   - Any assumed PRV outflow
3. Available pump station firm capacities equal to the sum capacity of each pressure zone pump station operating without its largest unit.
4. Supply and boosting flowrates assume 16-hour a day operations; this excludes FBR and OPR WFF.
5. OPR WFF treating minimum reliable Lytle Creek supply of 4,000 AFY.
6. Recommended new Zone 4 boosting capacity equal to total supply delivered to Lord Ranch Facility less existing PS 4-1 firm capacity.
7. Future wells shown include both the rehabilitation of existing offline wells and the construction of new wells.
8. Zone 5 demands include delivery of 1.5 mgd of treated surface water to the City of Rialto.
9. Recommended new boosting capacity based on 16-hour daily pumping.

March 11, 2019

Figure 7.7
Buildout Supply and Boosting Capacity
Water Facilities Master Plan
West Valley Water District

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Table 7.11 Existing Pump Station Analysis
Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Pump Station Name	Pressure Zone		Pressure Zone Demands		Average Day Demand			Pump Station Capacity Analysis				
	Source	Destination	Destination Zone (gpm)	Supply Dependent Zones (gpm)	Destination Zone (gpm)	Supply Dependent Zones (gpm)	Total (gpm)	Total Capacity[1] (gpm)	Firm Capacity[2] (gpm)	Required Capacity[3] (gpm)	Credit for Firm Supply[4] (gpm)	Surplus/ Deficiency (gpm)
South System												
Pressure Zone 2												
Wells (W18A)	-	3						1,447	0			
Total			3	-	1,291	0	1,291	1,447	0	2,195	0	-2,195
Pressure Zone 3												
2-1 PS	Wells 16, 17	3						1,000	0			
3A-1 PS	Wells 15, 30	3						1,933	1,933			
9th Street PS	-	3, 4						4,000	1,000			
Wells (W42)	-	3						1,447	0			
Total			3	2	1,903	1,291	3,194	8,380	2,933	5,429	0	-2,496
Pressure Zone 3A												
3A-1 PS	Wells 15, 30	3, 3A						0	0			
FBR	Wells 6, 11							2,000	2,000			
Total			3A	-	709	0	709	2,000	2,000	1,206	0	794
North System												
Pressure Zone 4												
4-1 PS	3	4	4	-				3,400	2,067			
4-2 PS	3A	4	4	-				4,800	3,200			
Total			4	-	1,273	3,733	5,006	8,200	5,267	8,511	0	-3,244
Pressure Zone 5												
5-1 PS	4	5						8,000	6,000			
5-2 PS	4	5						12,800	10,667			
Oliver P. Roemer WFF Effluent Pumps											2,484	
Total			5	6, 7, 8	1,313	2,420	3,733	20,800	16,667	6,346	2,484	12,804

Table 7.11 Existing Pump Station Analysis
Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Pump Station Name	Pressure Zone		Pressure Zone Demands					Pump Station Capacity Analysis				
	Source	Destination	Destination Zone	Supply Dependent Zones	Average Day Demand: Destination Zone	Average Day Demand: Supply Dependent Zones	Average Day Demand: Total	Total Capacity[1]	Firm Capacity[2]	Required Capacity[3]	Credit for Firm Supply[4]	Surplus/ Deficiency
			(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)	(gpm)
Pressure Zone 6												
6-1 PS	5	6						6,200	4,733			
6-2 PS	5	6						10,360	8,633			
Wells (W24, W54)											317	
Total			6	7, 8	1,443	978	2,420	16,560	13,367	4,115	317	**9,569**
Pressure Zone 7												
7-1 PS	6	7						5,267	3,800			
Total			7	8	938	40	978	5,267	3,800	1,662		**2,138**
Pressure Zone 8												
8-2 PS	7	8						4,375	3,260	0		
Total			8	-	40	0	40	4,375	3,260	68	0	**3,192**

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4/2/2018

Notes:
1. Firm capacity for each pressure zone is defined as the sum of the total capacity of each pump station pumping into the pressure zone, with each pump station operating without their largest unit.
2. Firm and Total capacity based on 16-hour daily pumping times.
3. Pump stations to supply PDD of destination zone and all other supply dependent zones.
4. Total pump station requirement reduced based on firm capacity of wells and treatment plants pumping directly in to destination zone.

Supply Scenario 2 represents the most conservative pump station capacity requirements and improvements recommended are consistent with this scenario. The proposed pump stations are briefly described by pressure zone in the following sections.

Pressure Zone 2: This pressure zone has no existing pump stations and the existing wells, in addition to the planned future wells, will provide sufficient supply capacity to meet the peak day demands of the zone.

Pressure Zone 3: The pump station capacity requirements for this zone are supplied by Pump Station 3A, Pump Station 2-1, and the 9th Street Pump Station through the Meridian Turnout. This zone has no supply dependent demands and a portion of the zone demands are provided by existing and planned future wells. Based on the firm capacity of the existing pump stations, this pressure zone has pumping capacity to meet the peak day demand requirements. However, in order to create firm capacity at the existing Pump Station 2-1, one new pump is recommended.

- **Z3-PS2-1:** Construct one additional 1,500 gpm pump at the existing Pump Station 2-1 site. This will increase the total station capacity to 3,000 gpm and create a firm capacity of 1,500 gpm.

Pressure Zone 3A: The pump station capacity requirements for this zone are supplied by pump station 3A and the 9th Street Pump Station through the Meridian Turnout. This zone has no supply dependent demands and a portion of the zone demands are provided by the FBR and existing and planned future wells. Based on the firm capacity of the existing pump stations, this zone has a pump station capacity surplus and no improvements are recommended.

Pressure Zone 4: The pump station capacity requirements for this zone are supplied by Pump Station 4-1 and Pump Station 4-2. In addition to meeting the peak day demands for Pressure Zone 4, these pump stations must also provide water to Pressure Zones 5, 6, 7 and 8, which are supply dependent pressure zones. Based on these requirements approximately 16,000 gpm of additional pump station capacity is recommended in this zone, which is planned to be met through the construction of two new pump stations.

- **Z4-PS4-2:** Construct a new pump station at the existing Pump Station 4-2 site. This pump station is planned to have four 2,400 gpm pumps, three duty and one standby, for a total station capacity of 9,600 gpm. It should be noted that if space is available the recommended pumps could be incorporated into the existing Pump Station 4-2.

- **Z4-PS4-3:** Construct a new pump station at the existing Lord Ranch Facility. This pump station is planned to have four 2,980 gpm pumps, three duty and one standby.. This pump station is planned to discharge into the existing 30-inch transmission main in Pepper Avenue north to Highland Avenue.

Pressure Zone 5: The pump station capacity requirements for this zone are supplied by Pump Station 5-1 and Pump Station 5-2. In addition to meeting the peak day demands for Pressure

Zone 5 these pump stations must also provide water to Pressure Zone 6, 7, and 8, which are supply dependent pressure zones. A portion of these demands will be met by surface water treatment at Roemer WFF. Based on the existing pumping capacity and planned supply capacity at the Roemer WFF, approximately 6,000 gpm of additional pump station capacity is recommended in this zone, which is planned to be met through the construction of one new pump station.

- **Z5-PS5-3:** Construct a new pump station within the planned Lytle Creek Ranch development approximately 2,200 feet northeast of the existing water storage reservoir 4-3 site. This pump station is planned to have four 2,000 gpm pumps, three duty and one standby, for a total station capacity of 8,000 gpm.

Pressure Zone 6: The pump station capacity requirements for this zone are supplied by Pump Station 6-1 and Pump Station 6-2. In addition to meeting the peak day demands for Pressure Zone 6, these pump stations must also provide water to Pressure Zone 7 and 8, which are supply dependent pressure zones. A portion of these demands are offset by an existing groundwater well. Based on these requirements approximately 3,900 gpm of additional pump station capacity is recommended in this zone, which is planned to be met through the construction of one new pump station.

- **Z6-PS6-3:** Construct a new pump station within the planned Lytle Creek Ranch development approximately 1,000 feet northeast of the existing water storage reservoir 5-1 site. This pump station is planned to have four 1,300 gpm pumps, three duty and one standby, for a total station capacity of 4,200 gpm.

Pressure Zone 7: The pump station capacity requirements for this zone are supplied by Pump Station 7-1. In addition to meeting the peak day demands for Pressure Zone 7, this pump station must also provide water to Pressure Zone 8, which is a supply dependent pressure zone. Based on these requirements approximately 7,500 gpm of additional pump station capacity is recommended in this zone, which is planned to be met through the construction of two new pump stations.

- **Z7-PS7-2:** Construct a new pump station at the existing Pump Station 7-1 location. This pump station is planned to have three 2,000 gpm pumps, two duty and one standby, for a total station capacity of 6,000 gpm.

- **Z7-PS7-3:** Construct a new pump station within the planned Lytle Creek Ranch development approximately 1,500 feet northeast of the existing water storage reservoir 6-2 site. This pump station is planned to have three 1,750 gpm pumps, two duty and one standby, for a total station capacity of 5,250 gpm.

Pressure Zone 8: The pump station capacity requirements for this zone are provided by Pump Station 8-2. The existing pump station is capable of meeting the buildout peak day demands.

However, in order to create hydraulic reliability in this zone one new pump station is recommended with a capacity equal to the existing Pump Station 8-1.

- **Z8-PS8-3:** Construct a new pump station at the intersection of Clearwater Parkway and Glen Helen Parkway. This pump station is planned to have three 1,630 gpm pumps, two duty and one standby, for a total station capacity of 4,890 gpm.

Bunker Hill Well Field: The new Bunker Hill wellfield, comprised of future Wells 43, 44, 45, and 46 as discussed in a previous section, will require a new pump station to transfer the extracted groundwater from the planned aeration tank to the existing 30-inch transmission main at the existing pump station 3A-1 site. This pump station is planned to have a firm capacity of 14,000 gpm, which is equal to the sum of the planned design capacities of the recommended Bunker Hill supply wells.

- **BH-PS:** Construct a new pump station with five 3,500 gpm pumps, four duty and one standby, for a total station capacity of 17,500 gpm.

7.8 PIPELINE IMPROVEMENTS TO SERVE FUTURE GROWTH

The buildout of the District's service area includes development outside of the extent of the existing domestic water distribution system. New pipelines are recommended to serve future growth as well as increase the hydraulic reliability of the domestic water distribution system. Each pipeline improvement is assigned a uniquely coded identifier, which is intended to aid in defining the location of the improvements for mapping purposes. These identifiers reflect the pressure zone and sequence in the improvement schedule. The pipeline improvements are described in detail on the following pages.

7.8.1 Pressure Zone 2

The following section documents pipeline improvements within Pressure Zone 2.

- **Z2-P1:** Construct new parallel 24-inch and 8-inch pipelines in Eighth Street from Locust Avenue to Cedar Avenue.
- **Z2-P2:** Construct a new 8-inch pipeline in Eighth Street from Locust Avenue to Linden Avenue.
- **Z2-P3:** Replace an existing 4-inch and 6-inch pipeline in Ninth Street from Locust Avenue to Linden Avenue with a new 8-inch pipeline.
- **Z2-P4:** Replace an existing 6-inch and 8-inch pipeline in Tenth Street from Locust Avenue to Linden Avenue with a new 8-inch pipeline.
- **Z2-P5:** Construct a new 8-inch pipeline in Eleventh Street from Locust Avenue to Linden Avenue.

- **Z2-P6:** Replace an existing 6-inch pipeline in Maple Street from Eleventh Street to Eighth Street with a new 12-inch pipeline.
- **Z2-P7:** Construct a new 12-inch pipeline in Santa Ana Avenue from Linden Avenue to Cedar Avenue.
- **Z2-P8:** Replace an existing 12-inch pipeline in Santa Ana Avenue with a new 20-inch pipeline from Cedar Avenue to Riverside Avenue.
- **Z2-P9:** Construct a new 24-inch pipeline in Pepper Avenue from approximately 1,200 ft north of Slover Avenue to approximately 300 ft south of I-10. This pipeline includes a casing to cross beneath the South Pacific Railway.
- **Z2-P10:** Construct a new 24-inch pipeline in Pepper Avenue and San Bernardino Avenue from approximately 400 ft north of the intersection of Valley Boulevard and Pepper Avenue to the intersection of San Bernardino Avenue and Eucalyptus Avenue.

7.8.2 Pressure Zone 3

The following section documents pipeline improvements within Pressure Zone 3.

- **Z3-P1:** Construct a new 24-inch pipeline in future right-of-way from planned reservoir 3-4 to Alder Avenue.
- **Z3-P2:** Construct a new 24-inch pipeline in future right-of-way from Alder Avenue to Locust Avenue.
- **Z3-P3:** Construct a new 12-inch pipeline in Locust Avenue and Armstrong Road from Jurupa Avenue to approximately 2,200 ft southwest of Eighth Street.
- **Z3-P4:** Replace existing 4-inch, 6-inch, and 12-inch pipelines in Santa Ana Avenue with a new 12-inch pipeline from Alder Avenue to Linden Avenue.
- **Z3-P5:** Construct a new 16-inch pipeline in Santa Ana Avenue from Linden Avenue to Cedar Avenue.
- **Z3-P6:** Replace existing 2-inch, 4-inch, and 6-inch pipelines in and north of Valley Boulevard generally between Cedar Avenue and larch Avenue.
- **Z3-P7:** Replace existing 4-inch and 6-inch pipelines north of Valley Boulevard generally between Olive Street and Spruce Avenue.
- **Z3-P8:** Construct a new 16-inch pipeline in Valley Boulevard from approximately 850 ft west of Eucalyptus Avenue to Eucalyptus Avenue.

7.8.3 Pressure Zone 3A

The following section documents pipeline improvements within Pressure Zone 3A.

- **Z3A-P1:** Construct a new 10-inch pipeline in Cactus Avenue from James Street to Alru Street.

7.8.4 Pressure Zone 4

The following section documents pipeline improvements within Pressure Zone 4.

- **Z4-P1:** Construct a parallel 24-inch pipeline in Cactus Avenue from Baseline Road to I-210.
- **Z4-P2:** Construct a parallel 24-inch pipeline in Cactus Avenue from Casmalia Street to Riverside Avenue.
- **Z4-P3:** Construct a parallel 30-inch pipeline in Pepper Avenue, Highland Avenue, Oakdale Avenue, and in the planned Lytle Creek Ranch development from the existing Lord Ranch facility to reservoir 4-3.
- **Z4-P4:** Construct a new 12-inch pipeline in the Planned Lytle Creek Ranch development to Well 35C.
- **Z4-P5:** Construct a new 12-inch pipeline in the Planned Lytle Creek Ranch development to Well 5A.
- **Z4-P6:** Construct a new 12-inch pipeline in the Planned Lytle Creek Ranch development to Well 4A.
- **Z4-P7:** Construct a new 18-inch pipeline in the Planned Lytle Creek Ranch development.
- **Z4-P8:** Construct a new 20-inch pipeline in Future ROW from Sycamore Avenue to Planned Lytle Creek Ranch development.
- **Z4-P9:** Construct a new 12-inch pipeline in the Planned Lytle Creek Ranch development.
- **Z4-P10:** Construct a new 12-inch pipeline in the Planned Lytle Creek Ranch development to Well 34B.
- **Z4-P11:** Construct a new 24-inch pipeline in the Planned Lytle Creek Ranch development.
- **Z4-P12:** Construct a new 12-inch pipeline in the Planned Lytle Creek Ranch development.
- **Z4-P13:** Construct a new 24-inch pipeline in the Planned Lytle Creek Ranch development.
- **Z4-P14:** Construct a new 24-inch pipeline in the planned Lytle Creek Ranch development.

- **Z4-P15:** Construct a new 18-inch pipeline in the planned Lytle Creek Ranch development.
- **Z4-P16:** Construct a new 24-inch pipeline in the planned Lytle Creek Ranch development.

7.8.5 Pressure Zone 5

The following section documents pipeline improvements within Pressure Zone 5.

- **Z5-P1:** Construct a new 12-inch pipeline in the planned Lytle Creek Ranch development.
- **Z5-P2:** Construct a new 12-inch pipeline in the planned Lytle Creek Ranch development.
- **Z5-P3:** Construct a new 12-inch pipeline in the planned Lytle Creek Ranch development.
- **Z5-P4:** Construct a new 18-inch pipeline in the planned Lytle Creek Ranch development.
- **Z5-P5:** Construct a new 16-inch pipeline in the planned Lytle Creek Ranch development.
- **Z5-P6:** Construct a new 24-inch pipeline in the planned Lytle Creek Ranch development.

7.8.6 Pressure Zone 6

The following section documents pipeline improvements within Pressure Zone 6.

- **Z6-P1:** Construct a new 12-inch pipeline in Persimmon Street and Summit Avenue generally between Locust Avenue and Cedar Avenue
- **Z6-P2:** Replace existing 4-inch and 6-inch pipelines in Persimmon Street and Summit Avenue with a new 8-inch pipeline generally between Locust Avenue and Cedar Avenue.
- **Z6-P3:** Construct a new 12-inch pipeline in the planned Lytle Creek Ranch development.
- **Z6-P4:** Construct a new 24-inch pipeline in the planned Lytle Creek Ranch development.
- **Z6-P5:** Construct a new 20-inch pipeline in the planned Lytle Creek Ranch development.
- **Z6-P6:** Construct a new 12-inch pipeline in the planned Lytle Creek Ranch development.
- **Z6-P7:** Construct a new 16-inch pipeline in the planned Lytle Creek Ranch development.
- **Z6-P8:** Construct a new 12-inch pipeline in the planned Lytle Creek Ranch development.
- **Z6-P9:** Construct a new 12-inch pipeline in the planned Lytle Creek Ranch development.
- **Z6-P10:** Construct a new 18-inch pipeline in the planned Lytle Creek Ranch development.
- **Z6-P11:** Construct a new 24-inch pipeline in the planned Lytle Creek Ranch development.

- **Z6-P12:** Construct a new 12-inch pipeline in the planned Lytle Creek Ranch development.
- **Z6-P13:** Construct a new 12-inch pipeline in Sunrise Drive from Sierra Avenue to Citrus Avenue.
- **Z6-P14:** Construct a new 12-inch pipeline in Cypress Avenue from Sunrise Avenue to Casa Grande Avenue.
- **Z6-P15:** Construct a new 24-inch pipeline in Citrus Avenue from planned reservoir 6-6 to approximately 1,000 ft south of Duncan Canyon Road.
- **Z6-P16:** Construct a new 12-inch pipeline in future right-of0way from Knox Avenue to Citrus Avenue.

7.8.7 Pressure Zone 7

The following section documents pipeline improvements within Pressure Zone 7.

- **Z7-P1:** Construct a new 12-inch pipeline in Alder Avenue from Via Bello Drive to Lytle Creek Ranch Development.
- **Z7-P2:** Construct a new 12-inch pipeline in the planned Lytle Creek Ranch development
- **Z7-P3:** Construct a new 18-inch pipeline in the planned Lytle Creek Ranch development.
- **Z7-P4:** Construct a new 16-inch pipeline in the planned Lytle Creek Ranch development.
- **Z7-P5:** Construct a new 12-inch pipeline in the planned Lytle Creek Ranch development.
- **Z7-P6:** Construct a new 12-inch pipeline in the planned Lytle Creek Ranch development.
- **Z7-P7:** Construct a new 12-inch pipeline in the planned Lytle Creek Ranch development.
- **Z7-P8:** Construct a new 12-inch pipeline in the planned Lytle Creek Ranch development.
- **Z7-P9:** Construct a new 18-inch pipeline in the planned Lytle Creek Ranch development.
- **Z7-P10:** Construct a new 18-inch pipeline in the planned Lytle Creek Ranch development.
- **Z7-P11:** Construct a new 12-inch pipeline in the planned Lytle Creek Ranch development.
- **Z7-P12:** Construct a new 12-inch pipeline in the planned Lytle Creek Ranch development.
- **Z7-P13:** Construct a new 12-inch pipeline in Cypress Avenue from Terra Vista Drive to Sunrise Drive.
- **Z7-P14:** Construct a new 16-inch pipeline in from Terra Vista Drive to Duncan Canyon Road.

- **Z7-P15:** Construct a new 12-inch pipeline in Sunrise Drive from Sierra Avenue to Citrus Avenue
- **Z7-P16:** Construct a new 18-inch pipeline in future right-of-way from Citrus Avenue to Lytle Creek Road. This pipeline includes a casing to cross beneath I-10.
- **Z7-P17:** Construct a new 12-inch pipeline in Coyote Canyon Road from Lytle Creek Road to Hawk Ridge Road.
- **Z7-P18:** Construct a new 12-inch pipeline in planned future development south of Duncan Canyon Road.

7.8.8 Bunker Hill Supply

The following section documents pipeline improvements to convey future Bunker Hill supply to the existing District transmission system.

- **BH-P1:** Construct new 18-inch pipelines from the planned wells 43, 44, 45, and 46 to the planned in Alder Avenue from Via Bello Drive to Lytle Creek Ranch Development.
- **BH-P1:** Construct new 18-inch pipelines from the planned wells 43, 44, 45, and 46 to the planned in Alder Avenue from Via Bello Drive to Lytle Creek Ranch Development.
- **BH-P2:** Construct a new 36-inch pipeline from the planned Bunker Hill supply to the existing pump station 3A site.

CHAPTER 8 – CAPITAL IMPROVEMENT PROGRAM

This chapter provides a summary of the recommended domestic water system improvements to mitigate existing capacity deficiencies and to accommodate anticipated future growth. The chapter also presents the cost criteria and methodologies for developing the capital improvement program. Finally, a capacity allocation analysis, usually used for cost sharing purposes, is also included.

8.1 COST ESTIMATE ACCURACY

Cost estimates presented in the CIP were prepared for general master planning purposes and, where relevant, for further project evaluation. Final costs of a project will depend on several factors including the final project scope, costs of labor and material, and market conditions during construction.

The Association for the Advancement of Cost Engineering (AACE International), formerly known as the American Association of Cost Engineers has defined three classifications of assessing project costs. These classifications are presented in order of increasing accuracy: Order of Magnitude, Budget, and Definitive.

- **Order of Magnitude Estimate.** This classification is also known as an “original estimate”, “study estimate”, or “preliminary estimate”, and is generally intended for master plans and studies.

  This estimate is not supported with detailed engineering data about the specific project, and its accuracy is dependent on historical data and cost indexes. It is generally expected that this estimate would be accurate within -30 percent to +50 percent.

- **Budget Estimate.** This classification is also known as an “official estimate” and generally intended for predesign studies. This estimate is prepared to include flow sheets and equipment layouts and details. It is generally expected that this estimate would be accurate within -15 percent to +30 percent.

- **Definitive Estimate.** This classification is also known as a “final estimate” and prepared during the time of contract bidding. The data includes complete plot plans and elevations, equipment data sheets, and complete specifications. It is generally expected that this estimate would be accurate within -5 percent to + 15 percent.

Costs developed in this study should be considered “Order of Magnitude” and have an expected accuracy range of **-30 percent** and **+50 percent**.

8.2 COST ESTIMATE METHODOLOGY

Cost estimates presented in this chapter are opinions of probable construction and other relevant costs developed from several sources including cost curves, Akel experience on other master planning projects, and input from District staff. Where appropriate, costs were escalated to reflect the more current Engineering News Records (ENR) Construction Cost Index (CCI).

This section documents the unit costs used in developing the opinion of probable construction costs, the Construction Cost Index, the land acquisition costs, and markups to account for construction contingency and other project related costs.

8.2.1 Unit Costs

The unit cost estimates used in developing the Capital Improvement Program are summarized on **Table 8.1**. Domestic water pipeline unit costs are based on length of pipes, in feet. Storage reservoir unit costs are based on capacity, per million gallons (MG). Pump Station costs are based on an equation that utilizes the total recommended pump station improvement capacity. Well construction costs are preliminary and are intended for planning purposes; a well site investigation is recommended to determine site specific costs involved in new well construction.

The unit costs are intended for developing the Order of Magnitude estimate and do not account for site specific conditions, labor and material costs during the time of construction, final project scope, implementation schedule, detailed utility and topography surveys for reservoir sites, investigation of alternative routings for pipes, and other various factors. The capital improvement program included in this report accounts for construction and project-related contingencies as described in this chapter.

8.2.2 Treatment Costs

Kleinfelder used an analogous cost estimating methodology, which consisted of researching similar facilities and documenting those costs for the purposes of estimating proposed capital improvements costs for the water treatment facilities for the District. Based on water quality data, the best available technology was identified for each specific water source and its associated contaminant (s).

- Microsand based Actiflo coagulation and sedimentation is selected as a practical technology for wellhead treatment to remove arsenic from ground water most commonly occurring in the Lytle Creek Basin water.
- Single pass IX technology is selected for perchlorate removal, a contaminant identified in ground waters of the Rialto Basin and Riverside-Arlington Basin.
- Regenerable IX technology is selected for nitrate removal, the contaminant in the ground water wells of Rialto Basin, Riverside-Arlington Basin and Chino Basin.

Table 8.1 Unit Costs

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Pipelines[1]

Pipe Size (in)	New/Parallel/Replacement ($/unit length)
6	100
8	133
10	167
12	200
16	267
18	300
20	333
24	400
30	500
36	600
42	700

Pump Station

Estimated Pumping Station Project Cost=

$2.075*10^{(0.7583*\log(Q)+3.1951)}$ where Q is in gpm

Storage[2]

$1.38 / gallon

Land Acquisition Cost[3]

$7.99 per square foot

Pipeline Casings

$24 per inch diameter per linear foot

Groundwater Wells

$3,000,000 per well

Notes :

1. Pipeline unit cost based on $15/in.-diameter/foot, consistent with 2014 East Valley Water District Water Master Plan
2. Source: 2014 East Valley Water District Water Master Plan
3. Source: Land appraisal report received from District staff October 12, 2017.
4. Unit costs escalated based on an ENR CCI Index Value of 10,889 (01/2018)

The above water treatment technologies were selected solely for purpose of construction cost estimates for this Water Master Plan, as representatives of reasonable cost technologies.

To estimate costs for the proposed facilities, known cost of similar designed or constructed facilities were prorated proportionally with the flow rates. To accommodate the economy of scale and to come up with cost "*multipliers*", the prorated values are powered with power index varying from 0.5 to 0.65. Finally, the costs were adjusted using an "*Escalation Factor,*" which was calculated for each individual facility assuming 2.5% for annual inflation.

Details of the applied methodology, selected treatment technologies, sources of analogous cost information (Cost basis), calculated *Multipliers* and *Escalation Factors*, and estimated cost for the proposed wellhead treatments are presented in **Table 8.2**.

8.2.3 Construction Cost Index

Costs estimated in this study are adjusted utilizing the Engineering News Record (ENR) Construction Cost Index (CCI), which is widely used in the engineering and construction industries.

The costs in this Water Facilities Master Plan were benchmarked using a 20-City national average ENR CCI of 10,889, reflecting a date of January 2018.

8.2.4 Land Acquisition

Construction of pipelines is generally assumed to be within existing or future street right-of-ways. A land acquisition fee for the construction of storage reservoirs and pump stations was assumed based on recent land acquisitions.

8.2.5 Construction Contingency Allowance

Knowledge about site-specific conditions for each proposed project is limited at the master planning stage; therefore, construction contingencies were used. The estimated construction costs in this master plan include a **20 percent** contingency allowance to account for unforeseen events and unknown field conditions.

8.2.6 Project Related Costs

The capital improvement costs also account for project-related costs, comprising of engineering design, project administration (developer and District staff), construction management and inspection, and legal costs. The project related costs in this master plan were estimated by applying an additional **15 percent** to the estimated construction costs.

Table 8.2 CIP Cost Estimates for Wellhead Treatments

Water Master Plan Update
West Valley Water District

PRELIMINARY

No.	Well	Contaminant	Applicable Technology	Well Capacity, (gpm)	Multiplier	Escalation factor, 2.5% per year	CIP Wellhead Treatment Cost		Comment
							Intermediate	Buildout	
Lytle Creek Basin									
1	W7	No WQ issues	NA	2,100	NA	NA	50,000	0	Rehab and retest existing well
2	W8A	As	Coagulation	2,400	0.93	NA	3,288,359	0	Construct Arsenic treatment , assumed Actiflo
3	W36	As	Coagulation	2,700	1.00	NA	3,550,000	0	Construct Arsenic treatment , assumed Actiflo
4	W34B	Assumed, As	Coagulation	2,000	0.82	NA	0	2,920,864	Construct Arsenic treatment , assumed Actiflo
5	W35C	Assumed, As	Coagulation	2,000	0.82	NA	0	2,920,864	Construct Arsenic treatment , assumed Actiflo
				Subtotal - Lytle Creek Basin			**6,888,359**	**5,841,728**	
Rialto Basin									
6	W16	ClO4, NO2	IX for nitrate	1,500	1.00	1.22	0	5,716,015	Current ClO4 is OK. Construct IX for NO2 only
7	W17	ClO4	Existing IX is OK	1,250	NA	NA	0	0	Current IX for ClO4 is OK. Regular maintenance, only
8	W22A	NO2	IX for nitrate	1,500	1.00	1.22	0	5,716,015	Construct IX for NO2 only
9	W24	No WQ issue	NA	600	NA	-	0	0	Regular Maintenance, Only
10	W54	Air	Dearation , break tanks	1,000	NA	NA	150,000	0	Install 30 minute RT break tank
				Subtotal - Rialto Basin			**150,000**	**11,432,030**	
Bunker Hill Basin									
11	W15	No WQ issue	NA	2,700	NA	-	0	0	Regular Maintenance, Only
12	W30	No WQ issue	NA	3,100	NA	-	0	0	Regular Maintenance, Only
13	W43	No WQ issue	NA	3,500	NA	-	0	0	Well construction
14	W44	No WQ issue	NA	3,500	NA	-	0	0	Well construction
15	W45	No WQ issue	NA	3,500	NA	-	0	0	Well construction
16	W46	No WQ issue	NA	3,500	NA	-	0	0	Well construction
				Subtotal - Bunker Hill Basin			**0**	**0**	
North Riverside Basin									
17	W18A	ClO4, NO2	IX, FBR	2,700	1.34	1.22	7,668,839	0	Current ClO4 is OK. IX for NO2 is proposed
18	W41	ClO4	IX, FBR	2,200	0.84	1.22	550,000		IX for NO2 only[2]
19	W42	ClO4 and NO2	IX, FBR	2,200	1.28	1.22	0	9,246,213	IX for Nitrate and IX for Perchlorate
20	W29A	ClO4 and NO2	IX, FBR	1,500	1.00	1.22	0	7,208,559	IX for Nitrate and IX for Perchlorate
21	W40	ClO4 and NO2	IX, FBR	1,500	1.00	1.22	0	7,208,559	IX for Nitrate and IX for Perchlorate
22	W51	ClO4 and NO2	IX, FBR	3,000	1.57	1.22	0	11,311,441	IX for Nitrate and IX for Perchlorate
23	W52	ClO4 and NO2	IX, FBR	2,000	1.21	1.22	0	8,690,777	IX for Nitrate and IX for Perchlorate
24	W50	ClO4 and NO2	IX, FBR	1,500	1.00	1.22	0	7,208,559	IX for Nitrate and IX for Perchlorate
				Subtotal - North Riverside Basin			**8,218,839**	**50,874,108**	
Chino Basin									
25	W39	No WQ issue	NA	4,000	NA	-	9,334,214	0	Well drilled but not equipped. Requires treatment.
				Subtotal - Chino Basin			**9,334,214**	**0**	
				Subtotal - Total Wellhead Treatments			**24,591,412**	**68,147,866**	

Notes:

3/7/2019

1. Table prepared by Kleinfelder, Inc staff February 2018.
2. District staff indicated that 2 available treatment vessels are currently unused at the Reservoir 2-1 site. Those vessels may potentially be moved to W41 for treatment purposes. Cost shown accounts for this assumption.
3. Well costs include master planning contingencies provided by Kleinfelder, Inc staff, which include overhead, margin, insurance and bonding, and contingency.

8.3 CAPITAL IMPROVEMENT PROGRAM

This section documents the capital improvement program and the allocation of costs to meet the requirements of AB1600.

8.3.1 Capital Improvement Costs

The Capital Improvement Program costs for the projects identified in this master plan for mitigating existing system deficiencies and for serving anticipated future growth throughout the District are summarized by improvement type on **Table 8.3** through **Table 8.6**.

As summarized in previous chapters the District is currently planning a 6.0 mgd expansion to the OPR WFF; however, in the event additional surface water supplies become available the District may elect to increase this expansion up to 16.0 mgd. Therefore, for conservative planning purposes, this capital improvement program includes the cost of a 16.0 mgd expansion. This cost estimate, prepared by Carollo Engineers, is summarized on **Table 8.4**.

Each improvement was assigned a unique coded identifier associated with the improvement type, and are summarized graphically on **Figure 8.1** through **Figure 8.4**. A hydraulic profile schematic of the buildout of the water distribution system is provided on **Figure 8.5**.

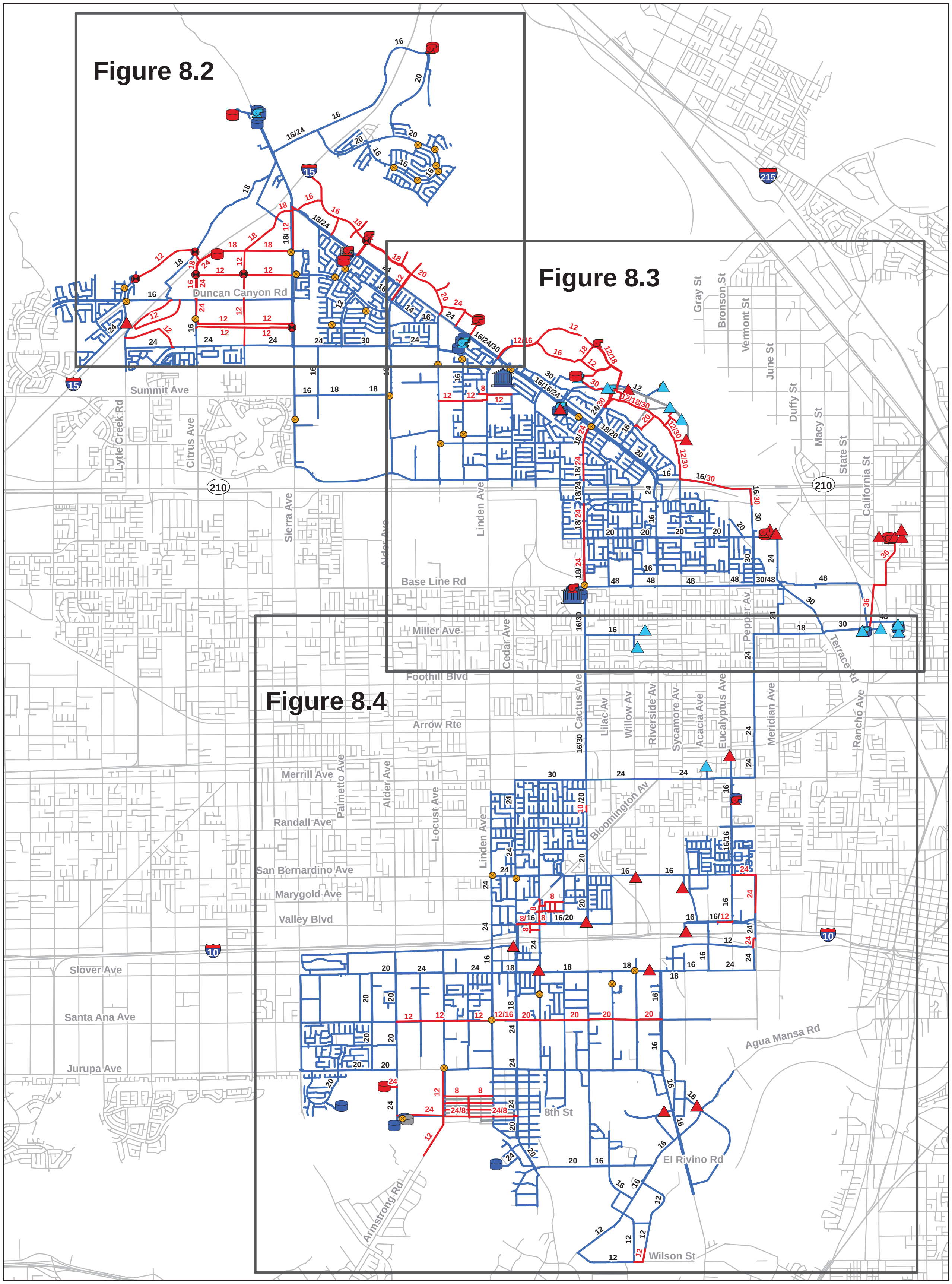
The estimated construction costs include the baseline costs plus **20 percent** contingency allowance to account for unforeseen events and unknown field conditions, as described in a previous section. Capital improvement costs include the estimated construction costs plus **15 percent** project-related costs (engineering design, project administration, construction management and inspection, and legal costs. It should be noted that contingencies for costs associated with well construction and treatment were provided by Kleinfelder Inc and account for margin, overhead, insurance and bonding, or contingencies.

8.3.2 Recommended Cost Allocation Analysis

Cost allocation analysis is needed to identify improvement funding sources, and to establish a nexus between development impact fees and improvements needed to service growth. In compliance with the provisions of Assembly Bill AB 1600, the analysis differentiates between the project needs of servicing existing users and for those required to service anticipated future developments. The cost responsibility is based on model parameters for existing and future land use, and may change depending on the nature of development. **Table 8.3** lists each improvement, and separates the cost by responsibility between existing and future users.

8.3.3 5-Year Capital Improvement Costs and Phasing

The capital improvement program costs and phasing for the next five years are summarized on **Table 8.7**. This plan includes the total costs for pipelines, tanks, booster stations, and valves to be



Legend

System Improvements
- Tanks
- Wells
- Pumps
- Valves
- Pipes

Existing System
- WTP
- Tanks
- Wells
- Pumps
- Valves
- Pipes

- Inactive Tanks
- Abandoned Pipes
- Street Centerlines

PRELIMINARY

Updated: March 18, 2019

0 0.25 0.5 1 Mile

N E S W

File Path: P:\xGIS\GIS_Projects\West Valley WD\WVWD_Fig8-1_FutureImprovements_Keymap_031819.mxd

AKEL ENGINEERING GROUP, INC.

Figure 8.1 Future Improvements Keymap

Water Facilities Master Plan
West Valley Water District

West Valley Water District

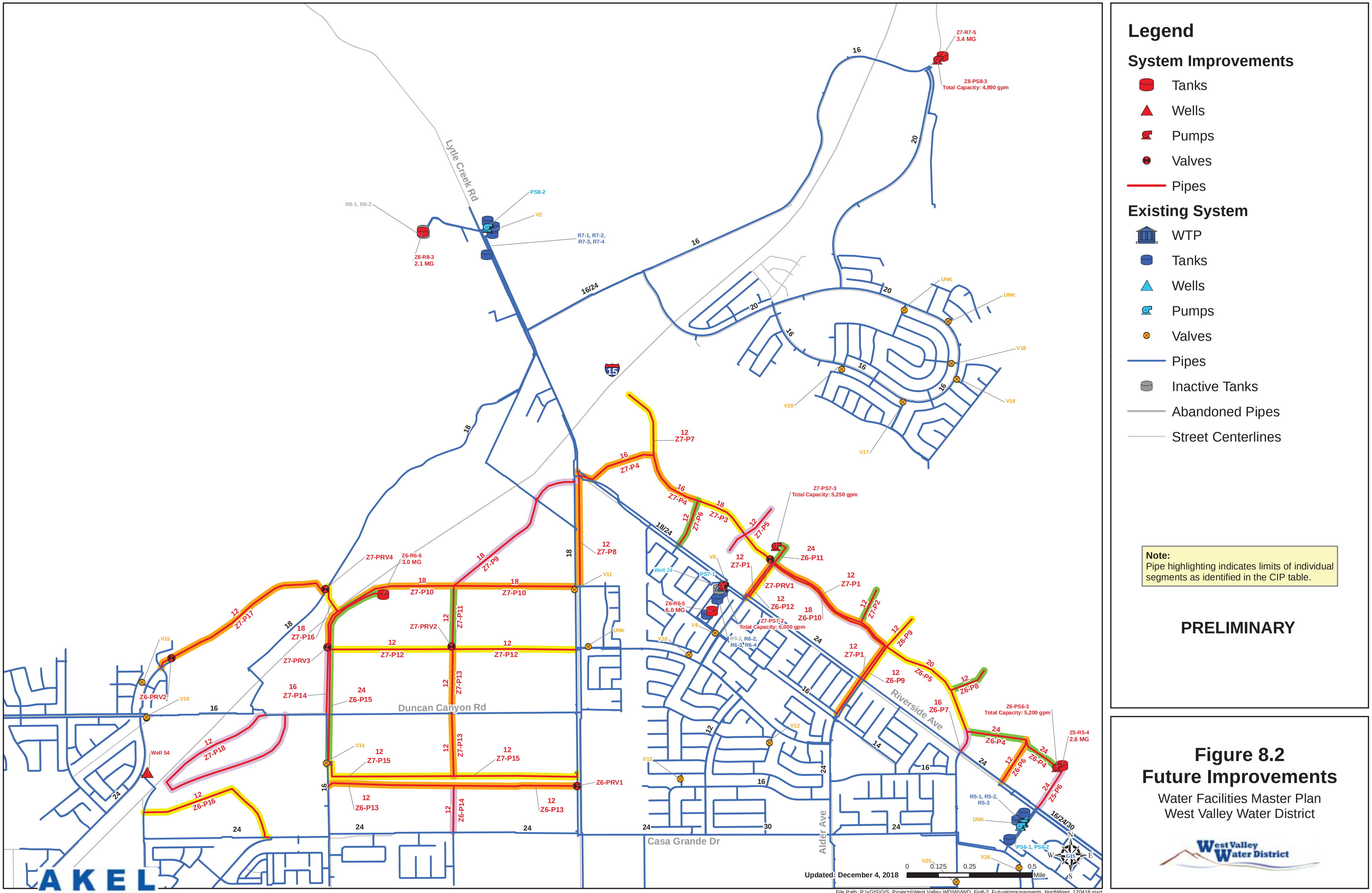
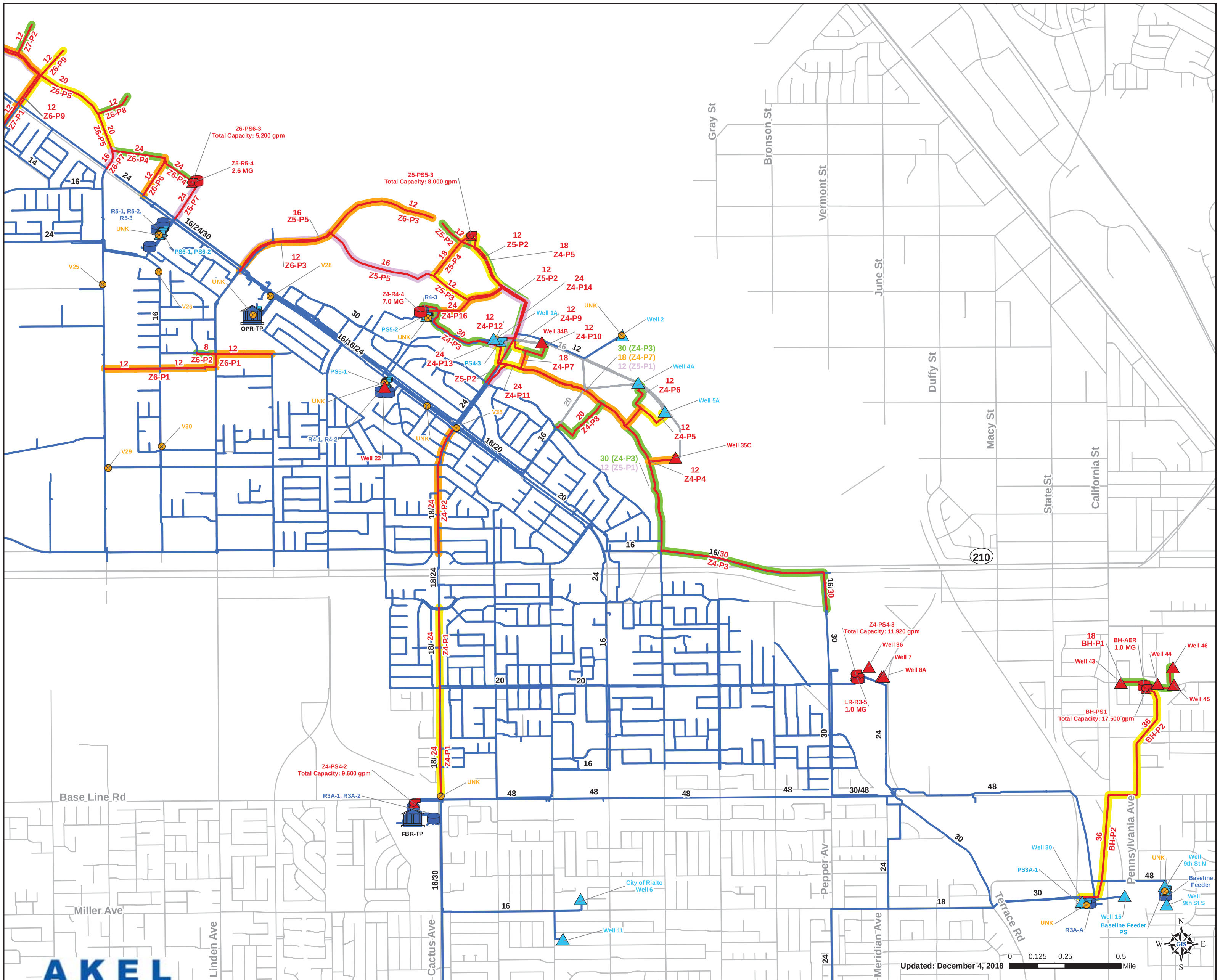


Figure 8.2
Future Improvements
Water Facilities Master Plan
West Valley Water District



Legend

System Improvements

- Tanks
- Wells
- Pumps
- Valves
- Pipes

Existing System

- WTP
- Tanks
- Wells
- Pumps
- Valves
- Pipes
- Inactive Tanks
- Abandoned Pipes
- Street Centerlines

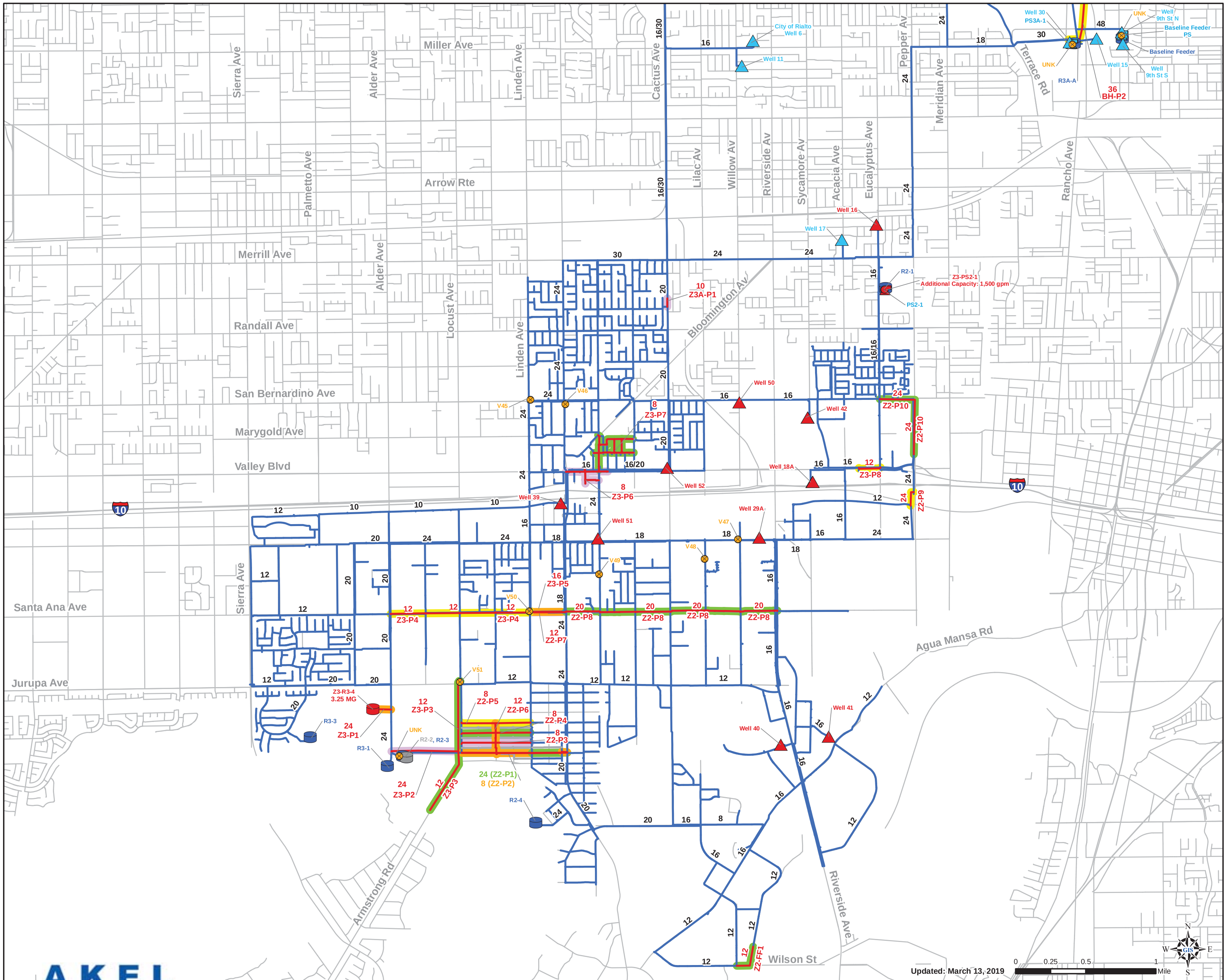
Note: Pipe highlighting indicates limits of individual segments as identified in the CIP table.

PRELIMINARY

Figure 8.3
Future Improvements

Water Facilities Master Plan
West Valley Water District

AKEL ENGINEERING GROUP, INC.



Legend

System Improvements

- Tanks
- Wells
- Pumps
- Valves
- Pipes

Existing System

- WTP
- Tanks
- Wells
- Pumps
- Valves
- Pipes
- Inactive Tanks
- Abandoned Pipes
- Street Centerlines

Note: Pipe highlighting indicates limits of individual segments as identified in the CIP table.

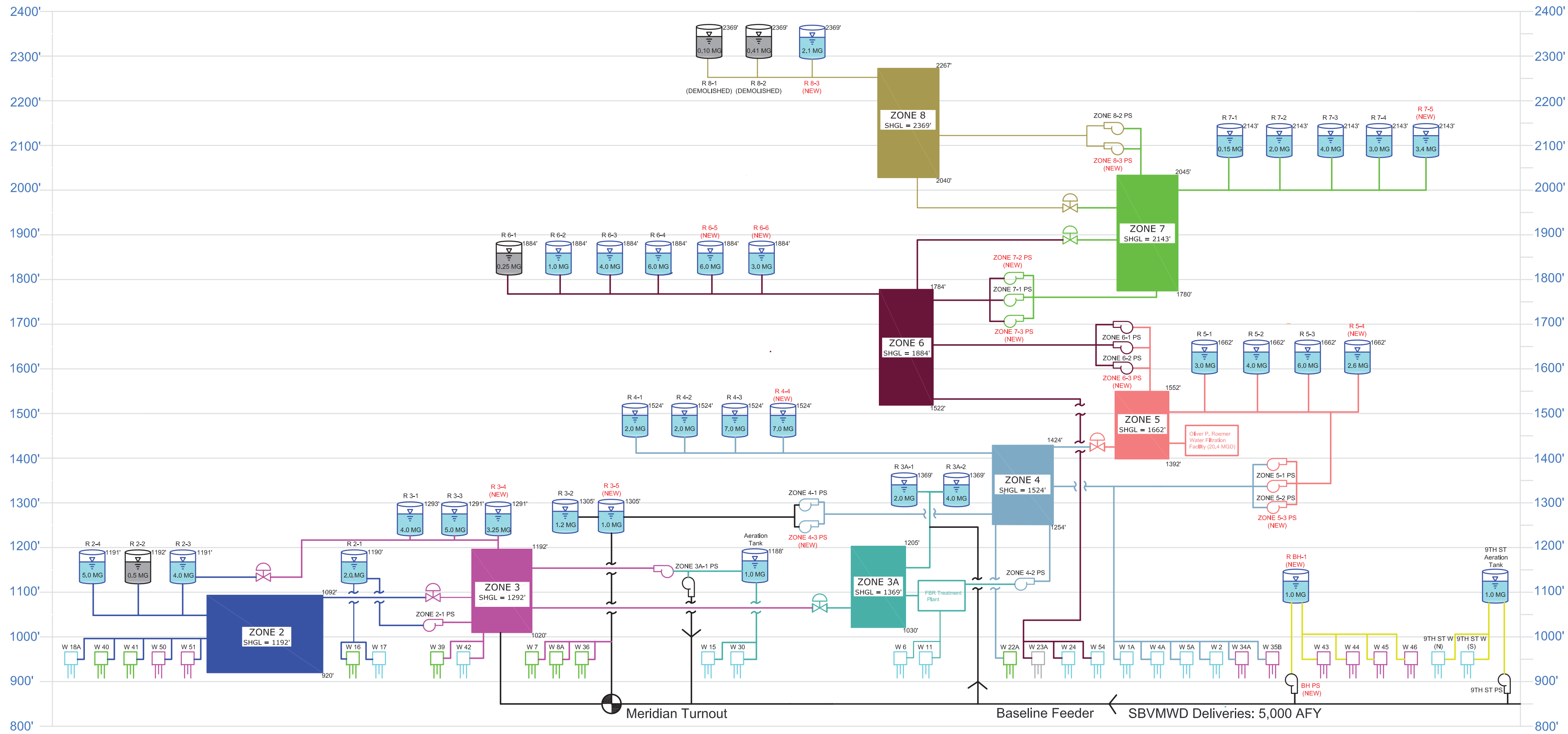
PRELIMINARY

Figure 8.4
Future Improvements

Water Facilities Master Plan
West Valley Water District

West Valley Water District

AKEL ENGINEERING GROUP, INC.



LEGEND

RESERVOIR
HWL: HIGH WATER LEVEL
MG: RESERVOIR CAPACITY
LOW: BOTTOM ELEVATION

RESERVOIR OFFLINE
HWL: HIGH WATER LEVEL
MG: RESERVOIR CAPACITY
LOW: BOTTOM ELEVATION

BOOSTER PUMPING STATION

PRESSURE REGULATING VALVE

TRANSMISSION MAIN

PRESSURE ZONE
SHGL: STATIC HYDRAULIC GRADE LINE
HIGH: HIGHEST SERVICE ELEVATION
LOW: LOWEST SERVICE ELEVATION

WELL ACTIVE

WELL INACTIVE

WELL REHABILITATED

FUTURE WELL

Figure 8.5

Buildout Hydraulic Profile Schematic

WATER FACILITIES MASTER PLAN

WEST VALLEY WATER DISTRICT

PRELIMINARY

AKEL ENGINEERING GROUP, INC.

Last Updated: 3/10/19

Table 8.3 Capital Improvement Costs - Pipelines

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Improv. No.	Pressure Zone	Alignment	Limits	Pipeline Improvements: Existing Diameter (in)	Pipeline Improvements: New/Parallel/Replace	Infrastructure Costs: Diameter (in)	Infrastructure Costs: Length (ft)	Infrastructure Costs: Unit Cost ($)	Infrastructure Costs: Infr. Cost ($)	Baseline Constr. Costs ($)	Estimated Const. Costs[1] ($)	Capital Improv. Costs[2,3] ($)	Improvement Horizon	Construction Trigger	Suggested Cost Allocation: Existing Users	Suggested Cost Allocation: Future Users	Cost Sharing: Existing Users	Cost Sharing: Future Users
Pressure Zone 2																		
Z2-P1	2	Bloomington Phase 4	From Locust Ave to Cedar Ave	-	New	24	4,000	-	-	-	-	2,222,000	Five-Year	Immediate	100%	0%	2,222,000	0
Z2-P2	2	Bloomington Phase 4	From Locust Ave to Linden Ave	-	New	8	4,075					850,000	Five-Year	Immediate	100%	0%	850,000	0
Z2-P3	2	Bloomington Phase 5	From Locust Ave to Linden Ave	4, 6	Replace	8	2,625	-	-	-	-	650,000	Five-Year	Immediate	100%	0%	650,000	0
Z2-P4	2	Bloomington Phase 3	From Locust Ave to Linden Ave	4, 8	Replace	8	2,625	-	-	-	-	650,000	Five-Year	Immediate	100%	0%	650,000	0
Z2-P5	2	Bloomington Phase 3	From Locust Ave to Linden Ave	-	New	8	2,625	-	-	-	-	400,000	Five-Year	Immediate	100%	0%	400,000	0
Z2-P6		Bloomington Phase 3	From Eleventh St to Eighth St	6	Replace	12	1,275	-	-	-	-	650,000	Five-Year	Immediate	100%	0%	650,000	0
Z2-P7	2	Santa Ana Ave	From Linden Ave to Cedar Ave	-	New	12	1,375	200	274,835	275,000	330,000	380,000	Five-Year	Immediate	100%	0%	380,000	0
Z2-P8	2	Santa Ana Ave	From Cedar Ave to Riverside Ave	12	Replace	20	8,250	333	2,748,345	2,749,000	3,299,000	3,794,000	Five-Year	Immediate	100%	0%	3,794,000	0
Z2-P9	2	Pepper Ave	From approx. 1,200 ft n/o Slover Ave to approx. 300 ft s/o I-10	-	New	24	550	400	219,868	220,000	264,000	304,000	Five-Year	Immediate	100%	0%	304,000	0
Z2-P9C	2	Pepper Ave	From approx. 150' s/o railway to 150' n/o railway (Casing)	-	New	-	400	24	422,400	423,000	508,000	585,000	Five-Year	Immediate	100%	0%	585,000	0
Z2-P10		Pepper Ave, San Bernardino Ave	From approx. 400' n/o the intersection of Valley Blvd and Pepper Ave to the intersection of San Bernardino Ave and Eucalyptus Ave	-	New	24	3,375	400	1,349,188	1,350,000	1,620,000	1,863,000	Buildout	As Development Occurs	0%	100%	0	1,863,000
Z2-FF1	2	Holly St and Wilson St	From the intersection of Brown Ave and Wilson St to approx 700' n/o Wilson St	-	New	12	1,225	200	244,853	245,000	294,000	339,000	Five-Year	Immediate	100%	0%	339,000	0
									Subtotal - Pressure Zone 2	**5,262,000**	**6,315,000**	**12,687,000**					**10,824,000**	**1,863,000**
Pressure Zone 3																		
Z3-P1	3	Future ROW	From planned reservoir 3-4 site to Alder Ave	-	New	24	700	400	279,832	280,000	336,000	387,000	Buildout	With Reservoir 3-4	0%	100%	0	387,000
Z3-P2	3	Future ROW	From Alder Ave to Locust Ave	-	New	24	2,525	400	1,009,392	1,010,000	1,212,000	1,394,000	Buildout	As Development Occurs	0%	100%	0	1,394,000
Z3-P3	3	Locust Ave, Armstrong Rd	From Jurupa Ave to approx. 2,200' sw/o Eighth St	-	New	12	5,250	200	1,049,368	1,050,000	1,260,000	1,449,000	Buildout	As Development Occurs	0%	100%	0	1,449,000
Z3-P4	3	Santa Ana Ave	From Alder Ave to Linden Ave	4, 6, 12	Replace	12	5,375	200	1,074,353	1,075,000	1,290,000	1,484,000	Five-Year	Immediate	100%	0%	1,484,000	0
Z3-P5	3	Santa Ana Ave	From Linden Ave to Cedar Ave	-	New	16	1,250	267	333,133	334,000	401,000	462,000	Five-Year	Immediate	100%	0%	462,000	0
Z3-P6	3	Valley Blvd, s/o Valley Blvd	Generally between Cedar Ave and Larch Ave	2, 4, 6	Replace	8	2,800	133	373,109	374,000	449,000	517,000	Five-Year	Immediate	100%	0%	517,000	0
Z3-P7	3	Generally n/o Valley Blvd	Generally Between Olive St and Spruce Ave	4, 6	Replace	8	5,650	133	752,880	753,000	904,000	1,040,000	Five-Year	Immediate	100%	0%	1,040,000	0
Z3-P8	3	Valley Blvd, s/o Valley Blvd	From approx. 850' w/o Eucalyptus Ave to Eucalyptus Ave	2, 4, 6	Replace	12	875	-	-	-	-	210,000	Five-Year	Immediate	100%	0%	210,000	0
									Subtotal - Pressure Zone 3	**4,876,000**	**5,852,000**	**6,943,000**					**3,713,000**	**3,230,000**
Pressure Zone 3A																		
Z3A-P1	3	Cactus Ave	From James St to Alru St	-	New	10	325	-	-	-	-	143,500	Five-Year	Immediate	100%	0%	143,500	0
									Subtotal - Pressure Zone 3A	**0**	**0**	**143,500**					**143,500**	**0**
Pressure Zone 4																		
Z4-P1	4	Cactus Ave	From Baseline Rd to I-210	18	Parallel	24	4,525	400	1,808,911	1,809,000	2,171,000	2,497,000	Buildout	With PS 4-2 Expansion	0%	100%	0	2,497,000
Z4-P2	4	Cactus Ave	From Casmalia St to Riverside Ave	18	Parallel	24	3,125	400	1,249,248	1,250,000	1,500,000	1,725,000	Buildout	With PS 4-2 Expansion	0%	100%	0	1,725,000
Z4-P3	4	Pepper Ave, Highland Ave, Oakdale Ave, Future ROW	From Lord Ranch Facility to reservoir 4-3 site	16	Parallel	30	14,600	500	7,295,608	7,296,000	8,756,000	10,070,000	Buildout	With Reservoir 4-4	0%	100%	0	10,070,000
Z4-P4	4	Future ROW	From Well 35C to Lytle Creek Ranch Development	-	New	12	700	200	139,916	140,000	168,000	194,000	Buildout	With Well 35C	0%	100%	0	194,000
Z4-P5	4	Future ROW	From Well 5A to Lytle Creek Ranch Development	-	New	12	950	200	189,886	190,000	228,000	263,000	Buildout	As Development Occurs	0%	100%	0	263,000
Z4-P6	4	Future ROW	From Well 4A to Lytle Creek Ranch Development	-	New	12	850	200	169,898	170,000	204,000	235,000	Buildout	As Development Occurs	0%	100%	0	235,000
Z4-P7	4	Future ROW	Lytle Creek Ranch Development	-	New	18	3,950	300	1,184,287	1,185,000	1,422,000	1,636,000	Buildout	As Development Occurs	0%	100%	0	1,636,000
Z4-P8	4	Future ROW	From Sycamore Ave to Lytle Creek Ranch Development	-	New	20	1,600	333	533,012	534,000	641,000	738,000	Buildout	As Development Occurs	0%	100%	0	738,000
Z4-P9	4	Future ROW	Lytle Creek Ranch Development	-	New	12	425	200	84,949	85,000	102,000	118,000	Buildout	As Development Occurs	0%	100%	0	118,000
Z4-P10	4	Future ROW	From Well 34B to Lytle Creek Ranch Development	-	New	12	800	200	159,904	160,000	192,000	221,000	Buildout	With Well 34B	0%	100%	0	221,000
Z4-P11	4	Future ROW	Lytle Creek Ranch Development	-	New	24	1,275	400	509,693	510,000	612,000	704,000	Buildout	As Development Occurs	0%	100%	0	704,000
Z4-P12	4	Future ROW	Lytle Creek Ranch Development	-	New	12	75	200	14,991	15,000	18,000	21,000	Buildout	As Development Occurs	0%	100%	0	21,000
Z4-P13	4	Future ROW	Lytle Creek Ranch Development	-	New	24	125	400	49,970	50,000	60,000	69,000	Buildout	As Development Occurs	0%	100%	0	69,000
Z4-P14	4	Future ROW	Lytle Creek Ranch Development	-	New	24	1,800	400	719,567	720,000	864,000	994,000	Buildout	As Development Occurs	0%	100%	0	994,000

Table 8.3 Capital Improvement Costs - Pipelines
Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Improv. No.	Pressure Zone	Alignment	Limits	Pipeline Improvements: Existing Diameter (in)	Pipeline Improvements: New/Parallel/ Replace	Infrastructure Costs: Diameter (in)	Infrastructure Costs: Length (ft)	Infrastructure Costs: Unit Cost ($)	Infrastructure Costs: Infr. Cost ($)	Baseline Constr. Costs ($)	Estimated Const. Costs[1] ($)	Capital Improv. Costs[2,3] ($)	Improvement Horizon	Construction Trigger	Suggested Cost Allocation: Existing Users	Suggested Cost Allocation: Future Users	Cost Sharing: Existing Users	Cost Sharing: Future Users
Z4-P15	4	Future ROW	Lytle Creek Ranch Development	-	New	18	1,550	300	464,720	465,000	558,000	642,000	Buildout	As Development Occurs	0%	100%	0	642,000
Z4-P16	4	Future ROW	Lytle Creek Ranch Development	-	New	24	2,125	400	849,489	850,000	1,020,000	1,173,000	Buildout	As Development Occurs	0%	100%	0	1,173,000
						Subtotal - Pressure Zone 4				**15,429,000**	**18,516,000**	**21,300,000**					**0**	**21,300,000**
Pressure Zone 5																		
Z5-P1	5	Future ROW	Lytle Creek Ranch Development	-	New	12	6,900	200	1,379,170	1,380,000	1,656,000	1,905,000	Buildout	As Development Occurs	0%	100%	0	1,905,000
Z5-P2	5	Future ROW	Lytle Creek Ranch Development	-	New	12	4,975	200	994,401	995,000	1,194,000	1,374,000	Buildout	As Development Occurs	0%	100%	0	1,374,000
Z5-P3	5	Future ROW	Lytle Creek Ranch Development	-	New	12	1,925	200	384,768	385,000	462,000	532,000	Buildout	As Development Occurs	0%	100%	0	532,000
Z5-P4	5	Future ROW	Lytle Creek Ranch Development	-	New	18	1,275	300	382,270	383,000	460,000	529,000	Buildout	As Development Occurs	0%	100%	0	529,000
Z5-P5	5	Future ROW	Lytle Creek Ranch Development	-	New	16	5,400	267	1,439,134	1,440,000	1,728,000	1,988,000	Buildout	As Development Occurs	0%	100%	0	1,988,000
Z5-P6	5	Future ROW	Lytle Creek Ranch Development	-	New	24	1,000	400	399,759	400,000	480,000	552,000	Buildout	As Development Occurs	0%	100%	0	552,000
						Subtotal - Pressure Zone 5				**4,983,000**	**5,980,000**	**6,880,000**					**0**	**6,880,000**
Pressure Zone 6																		
Z6-P1	6	Persimmon St and Summit Ave	Generally between Locust Ave and Cedar Ave	-	New	12	4,375	200	874,474	875,000	1,050,000	1,208,000	Buildout	As Funding is Available	100%	0%	1,208,000	0
Z6-P2	6	Persimmon St and Summit Ave	Generally between Locust Ave and Cedar Ave	4, 6	Replace	8	475	133	63,295	64,000	77,000	89,000	Buildout	As Funding is Available	100%	0%	89,000	0
Z6-P3	6	Future ROW	Lytle Creek Ranch Development	-	New	12	5,275	200	1,054,365	1,055,000	1,266,000	1,456,000	Buildout	As Development Occurs	0%	100%	0	1,456,000
Z6-P4	6	Future ROW	Lytle Creek Ranch Development	-	New	24	2,175	400	869,477	870,000	1,044,000	1,201,000	Buildout	As Development Occurs	0%	100%	0	1,201,000
Z6-P5	6	Future ROW	Lytle Creek Ranch Development	-	New	20	2,625	333	874,474	875,000	1,050,000	1,208,000	Buildout	As Development Occurs	0%	100%	0	1,208,000
Z6-P6	6	Future ROW	Lytle Creek Ranch Development	-	New	12	1,050	200	209,874	210,000	252,000	290,000	Buildout	As Development Occurs	0%	100%	0	290,000
Z6-P7	6	Future ROW	Lytle Creek Ranch Development	-	New	16	475	267	126,590	127,000	153,000	176,000	Buildout	As Development Occurs	0%	100%	0	176,000
Z6-P8	6	Future ROW	Lytle Creek Ranch Development	-	New	12	850	200	169,898	170,000	204,000	235,000	Buildout	As Development Occurs	0%	100%	0	235,000
Z6-P9	6	Future ROW	Lytle Creek Ranch Development	-	New	12	1,650	200	329,801	330,000	396,000	456,000	Buildout	As Development Occurs	0%	100%	0	456,000
Z6-P10	6	Future ROW	Lytle Creek Ranch Development	-	New	18	3,025	300	906,954	907,000	1,089,000	1,253,000	Buildout	As Development Occurs	0%	100%	0	1,253,000
Z6-P11	6	Future ROW	Lytle Creek Ranch Development	-	New	24	550	400	219,868	220,000	264,000	304,000	Buildout	As Development Occurs	0%	100%	0	304,000
Z6-P12	6	Future ROW	Lytle Creek Ranch Development	-	New	12	875	200	174,895	175,000	210,000	242,000	Buildout	As Development Occurs	0%	100%	0	242,000
Z6-P13	6	Sunrise Dr	From Sierra Ave to Citrus Ave	-	New	12	5,325	200	1,064,359	1,065,000	1,278,000	1,470,000	Buildout	As Development Occurs	0%	100%	0	1,470,000
Z6-P14	6	Cypress Ave	From Sunrise Ave to Casa Grande Ave	-	New	12	975	200	194,883	195,000	234,000	270,000	Buildout	As Development Occurs	0%	100%	0	270,000
Z6-P15	6	Citrus Ave	From planned reservoir 6-6 site to approx. 1,000' s/o Duncan Canyon Rd	-	New	24	4,350	400	1,738,953	1,739,000	2,087,000	2,401,000	Buildout	With Reservoir 6-6	0%	100%	0	2,401,000
Z6-P16	6	Future ROW	From Knox Ave to Citrus Ave	-	New	12	3,325	200	664,600	665,000	798,000	918,000	Buildout	As Development Occurs	0%	100%	0	918,000
						Subtotal - Pressure Zone 6				**9,542,000**	**11,452,000**	**13,177,000**					**1,297,000**	**11,880,000**
Pressure Zone 7																		
Z7-P1	7	Alder Ave	From Via Bello Dr to Lytle Creek Ranch Development	-	New	12	5,750	200	1,149,308	1,150,000	1,380,000	1,587,000	Buildout	As Development Occurs	0%	100%	0	1,587,000
Z7-P2	7	Future ROW	Lytle Creek Ranch Development	-	New	12	775	200	154,907	155,000	186,000	214,000	Buildout	As Development Occurs	0%	100%	0	214,000
Z7-P3	7	Future ROW	Lytle Creek Ranch Development	-	New	18	1,975	300	592,144	593,000	712,000	819,000	Buildout	As Development Occurs	0%	100%	0	819,000
Z7-P4	7	Future ROW	Lytle Creek Ranch Development	-	New	16	3,275	267	872,808	873,000	1,048,000	1,206,000	Buildout	As Development Occurs	0%	100%	0	1,206,000
Z7-P5	7	Future ROW	Lytle Creek Ranch Development	-	New	12	1,275	200	254,847	255,000	306,000	352,000	Buildout	As Development Occurs	0%	100%	0	352,000
Z7-P6	7	Future ROW	Lytle Creek Ranch Development	-	New	12	1,025	200	204,877	205,000	246,000	283,000	Buildout	As Development Occurs	0%	100%	0	283,000
Z7-P7	7	Future ROW	Lytle Creek Ranch Development	-	New	12	1,500	200	299,819	300,000	360,000	414,000	Buildout	As Development Occurs	0%	100%	0	414,000
Z7-P8	7	Sierra Ave	From Riverside Ave to Segovia Ln	-	New	12	2,250	200	449,729	450,000	540,000	621,000	Five-Year	As Development Occurs	0%	100%	0	621,000
Z7-P9	7	Future ROW	From the intersection of Riverside Ave and Sierra Ave to the intersection of Cypress Ave	-	New	18	3,625	300	1,086,846	1,087,000	1,305,000	1,501,000	Buildout	As Development Occurs	0%	100%	0	1,501,000
Z7-P10	7	Segovia Ln	From Sierra Ave to Citrus Ave	-	New	18	5,950	300	1,783,926	1,784,000	2,141,000	2,463,000	Buildout	As Development Occurs	0%	100%	0	2,463,000
Z7-P11	7	Cypress Ave	From Segovia Ln to Terra Vista Dr	-	New	12	1,225	200	244,853	245,000	294,000	339,000	Buildout	As Development Occurs	0%	100%	0	339,000
Z7-P12	7	Terra Vista Dr	From Sierra Ave to Citrus Ave	-	New	12	5,225	200	1,044,371	1,045,000	1,254,000	1,443,000	Buildout	As Development Occurs	0%	100%	0	1,443,000
Z7-P13	7	Cypress Ave	From Terra Vista Dr to Sunrise Dr	-	New	12	2,650	200	529,681	530,000	636,000	732,000	Buildout	As Development Occurs	0%	100%	0	732,000
Z7-P14	7	Citrus Ave	From Terra Vista Dr to Duncan Canyon Rd	-	New	16	1,350	267	359,783	360,000	432,000	497,000	Buildout	As Development Occurs	0%	100%	0	497,000
Z7-P15	7	Sunrise Dr	From Sierra Ave to Citrus Ave	-	New	12	5,625	200	1,124,323	1,125,000	1,350,000	1,553,000	Buildout	As Development Occurs	0%	100%	0	1,553,000
Z7-P16	7	Future ROW	From Citrus Ave to Lytle Creek Rd	-	New	18	600	300	179,892	180,000	216,000	249,000	Buildout	As Development Occurs	0%	100%	0	249,000
Z7-P16C	7	Future ROW	From Citrus Ave to Lytle Creek Rd (Casing)	-	New	-	600	24	547,200	548,000	658,000	757,000	Buildout	As Development Occurs	0%	100%	0	757,000
Z7-P17	7	Coyote Canyon Rd	From Lytle Creek Rd to Hawk Ridge Rd	-	New	12	4,150	200	829,501	830,000	996,000	1,146,000	Five-Year	As Development Occurs	0%	100%	0	1,146,000

Table 8.3 Capital Improvement Costs - Pipelines

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Improv. No.	Pressure Zone	Alignment	Limits	Pipeline Improvements: Existing Diameter (in)	Pipeline Improvements: New/Parallel/Replace	Infrastructure Costs: Diameter (in)	Infrastructure Costs: Length (ft)	Infrastructure Costs: Unit Cost ($)	Infrastructure Costs: Infr. Cost ($)	Baseline Constr. Costs ($)	Estimated Const. Costs[1] ($)	Capital Improv. Costs[2,3] ($)	Improvement Horizon	Construction Trigger	Suggested Cost Allocation: Existing Users	Suggested Cost Allocation: Future Users	Cost Sharing: Existing Users	Cost Sharing: Future Users
Z7-P18	7	Future ROW	Planned Development south of Duncan Canyon Rd	-	New	12	5,875	200	1,174,293	1,175,000	1,410,000	1,622,000	Buildout	As Development Occurs	0%	100%	0	1,622,000
									Subtotal - Pressure Zone 7	**12,890,000**	**15,470,000**	**17,798,000**					**0**	**17,798,000**
Bunker Hill Supply																		
BH-P1	-	To be determined	From planned wells 43, 44, 45, and 46 to planned Bunker Hill aeration tank			18	2,025	300	607,134	608,000	730,000	840,000	Five-Year	With Well 43	0%	100%	0	840,000
BH-P2	-	To be determined	From planned Bunker Hill supply to existing pump station 3A site			36	6,375	600	3,822,699	3,823,000	4,588,000	5,277,000	Five-Year	With Well 43	0%	100%	0	5,277,000
									Subtotal - Pressure Zone 8	**4,431,000**	**5,318,000**	**6,117,000**					**0**	**6,117,000**
Total Improvement Cost																		
									Pressure Zone 2	**5,262,000**	**6,315,000**	**12,687,000**					**10,824,000**	**1,863,000**
									Pressure Zone 3	**4,876,000**	**5,852,000**	**6,943,000**					**3,713,000**	**3,230,000**
									Pressure Zone 3A	**-**	**-**	**143,500**					**143,500**	**0**
									Pressure Zone 4	**15,429,000**	**18,516,000**	**21,300,000**					**0**	**21,300,000**
									Pressure Zone 5	**4,983,000**	**5,980,000**	**6,880,000**					**0**	**6,880,000**
									Pressure Zone 6	**9,542,000**	**11,452,000**	**13,177,000**					**1,297,000**	**11,880,000**
									Pressure Zone 7	**12,890,000**	**15,470,000**	**17,798,000**					**0**	**17,798,000**
									Bunker Hill Supply	**4,431,000**	**5,318,000**	**6,117,000**					**0**	**6,117,000**
									Total Improvement Costs	**57,413,000**	**68,903,000**	**85,045,500**					**15,977,500**	**69,068,000**

AKEL ENGINEERING GROUP, INC.

3/7/2019

Notes:

1. Baseline construction costs plus 20% to account for unforeseen events and unknown conditions.
2. Estimated construction costs plus 15% to cover other costs including: engineering design, project administration (developer and District staff), construction management and inspection, and legal costs.
3. Costs for improvements shown with only Capital Improvement Cost are based on information provided by WVWD staff.

Table 8.4 Capital Improvement Costs - Storage Reservoirs, Pump Stations, Pressure Reducing Valves

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Improv. No.	Pressure Zone	Location	New/ Replace	Infrastructure Costs		Baseline Constr. Costs	Estimated Const. Costs[1]	Capital Improv. Costs[2,3]	Improvement Horizon	Construction Trigger	Suggested Cost Allocation		Cost Sharing	
				Recommended Capacity	Infr. Cost ($)	($)	($)	($)		(EDU)	Existing Users	Future Users	Existing Users	Future Users
Storage Reservoir Improvements				(MG)										
Z3-R3-4	3	Approx. 1,100' sw/o the intersection of Jurupa Ave and Alder Ave	New	3.25	4,485,000	4,485,000	5,382,000	6,190,000	Buildout	2,200 EDUs	0%	100%	0	6,190,000
Z4-R4-4	4	Reservoir 4-3 site	New	7.00	9,660,000	9,660,000	11,592,000	13,331,000	Buildout	4,900 EDUs	0%	100%	0	13,331,000
Z5-R5-4	5	Lytle Creek Ranch Development, approx. 1,000' ne/o reservoir 5-1 site	New	2.60	3,588,000	3,588,000	4,306,000	4,952,000	Buildout	10,900 EDUs	0%	100%	0	4,952,000
Z6-R6-5	6	Reservoir 6-2 site	New	6.00	8,280,000	8,280,000	9,936,000	11,427,000	Buildout	2,900 EDUs	0%	100%	0	11,427,000
Z6-R6-6	6	Approx. 1,100' e/o the intersection of Citrus Avenue and Segovia Ave	New	3.00	4,140,000	4,140,000	4,968,000	5,714,000	Buildout	As Development Occurs	0%	100%	0	5,714,000
Z7-R7-5	7	Intersection of Clearwater Pkwy and Glen Helen Pkwy	New	3.40	4,692,000	4,692,000	5,631,000	6,476,000	Buildout	6,300 EDUs	0%	100%	0	6,476,000
Z8-R8-3	8	Existing Z8 Tank Site	Replace	2.10	-	-	-	4,080,000	Five-Year	Immediate	10%	90%	408,000	3,672,000
BH-AER	-		New	1.00	1,380,000	1,380,000	1,656,000	1,905,000	Buildout	With Well 43	0%	100%	0	1,905,000
LR-R3-5	-	Existing Lord Ranch Facility	New	1.00	-	-	-	1,905,000	Five-Year	Immediate	0%	100%	0	1,905,000
				Total Reservoir Improvement Costs		**36,225,000**	**43,471,000**	**55,980,000**					**408,000**	**55,572,000**
Pump Station Improvements				(gpm)										
Z3-PS2-1	3	Existing Pump Station 2-1 site	New	1,500	-	-	-	320,000	Buildout	With Well 16	100%	0%	320,000	0
Z4-PS4-2	4	Existing Pump Station 4-2 site	New	9,600	3,403,097	3,404,000	4,085,000	4,698,000	Buildout	With Well 43	0%	100%	0	4,698,000
Z4-PS4-3	4	Lord Ranch Facility	New	11,920	-	-	-	3,000,000	Five-Year	Immediate	0%	100%	0	3,000,000
Z5-PS5-3	5	Lytle Creek Ranch development, approx. 2,200' ne/o reservoir 4-3 site	New	8,000	2,963,680	2,964,000	3,557,000	4,091,000	Buildout	As Development Occurs	0%	100%	0	4,091,000
Z6-PS6-3	6	Lytle Creek ranch development, approx. 1,000' ne/o reservoir 5-1 site	New	5,200	2,137,782	2,138,000	2,566,000	2,951,000	Buildout	As Development Occurs	0%	100%	0	2,951,000
Z7-PS7-2	7	Existing Pump Station 7-1 site	New	6,000	2,382,814	2,383,000	2,860,000	3,289,000	Five-Year	Immediate	0%	100%	0	3,289,000
Z7-PS7-3	7	Lytle Creek Ranch development, approx. 1,500' ne/o reservoir 6-2 site	New	5,250	2,153,351	2,154,000	2,585,000	2,973,000	Buildout	As Development Occurs	0%	100%	0	2,973,000
Z8-PS8-3	8	Intersection of Clearwater Pkwy and Glen Helen Pkwy	New	4,890	2,040,427	2,041,000	2,450,000	2,818,000	Buildout	As Development Occurs	0%	100%	0	2,818,000
BH-PS	-	Intersection of 16th St and Pennsylvania Ave	New	17,500	5,365,545	5,366,000	6,440,000	7,406,000	Buildout	With Well 43	0%	100%	0	7,406,000
				Total Pump Station Improvement Costs		**20,450,000**	**24,543,000**	**31,546,000**					**320,000**	**31,226,000**
Pressure Reducing Valve Improvements														
Z6-PRV1	7B-6	Sierra Ave, approx. 1,000' n/o Casa Grande Dr	New		75,000	75,000	90,000	104,000	Five-Year	As Development Occurs	0%	100%	0	104,000
Z6-PRV2	7B-6	Coyote Canyon Rd, approx. 300' ne/o Hawk Ridge Ave	New		75,000	75,000	90,000	104,000	Five-Year	As Development Occurs	0%	100%	0	104,000
Z7-PRV1	7-7B	Lytle Creek Ranch Development	New		75,000	75,000	90,000	104,000	Five-Year	As Development Occurs	0%	100%	0	104,000
Z7-PRV2	7-7B	Intersection of Terra Vista Dr and Cypress Ave	New		75,000	75,000	90,000	104,000	Buildout	As Development Occurs	0%	100%	0	104,000
Z7-PRV3	7-7B	Intersection of Terra Vista Dr and Citrus Ave	New		75,000	75,000	90,000	104,000	Buildout	As Development Occurs	0%	100%	0	104,000

Table 8.4 Capital Improvement Costs - Storage Reservoirs, Pump Stations, Pressure Reducing Valves

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Improv. No.	Pressure Zone	Location	New/ Replace	Infrastructure Costs: Recommended Capacity	Infrastructure Costs: Infr. Cost ($)	Baseline Constr. Costs ($)	Estimated Const. Costs[1] ($)	Capital Improv. Costs[2,3] ($)	Improvement Horizon	Construction Trigger (EDU)	Suggested Cost Allocation: Existing Users	Suggested Cost Allocation: Future Users	Cost Sharing: Existing Users	Cost Sharing: Future Users
Z7-PRV4	7-7B	Lytle Creek Rd, nw/o Monarch Hills Development	New		75,000	75,000	90,000	104,000	Five-Year	Immediate	0%	100%	0	104,000
			Total Pressure Reducing Valve Improvement Costs			450,000	540,000	624,000					0	624,000
Total Improvement Costs														
					Storage Reservoir Improvements	36,225,000	43,471,000	55,980,000					408,000	55,572,000
					Pump Station Improvements	20,450,000	24,543,000	31,546,000					320,000	31,226,000
					Pressure Reducing Valve Improvements	450,000	540,000	624,000					0	624,000
					Total Improvement Costs	57,125,000	68,554,000	88,150,000					728,000	87,422,000

AKEL ENGINEERING GROUP, INC.

3/7/2019

Notes:

1. Baseline construction costs plus 20% to account for unforeseen events and unknown conditions.
2. Estimated construction costs plus 15% to cover other costs including: engineering design, project administration (developer and District staff), construction management and inspection, and legal costs.
3. Costs for improvements shown with only Capital Improvement Cost are based on information provided by WVWD staff.

Table 8.5 Capital Improvement Costs - OPR WFF Expansion

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Item No.	Expansion Item	Capital Improvement Cost ($)
1	Civil Costs	15,719,030
2	Raw Water Control Structures	1,376,530
3	Microfiltration	20,160,000
4	UV	3,216,401
5	GAC Contactors	18,276,187
6	Chlorine Contact	525,960
7	Equalization Storage	1,722,652
8	Membrane Pumping	1,552,386
9	Chemicals	680,507
10	Influent Blending Ponds	2,174,933
11	Sludge Ponds	3,342,534
12	Administration Building (7,000 s.f.)	3,000,000
	Total Improvement Cost	**71,747,120**

AKEL ENGINEERING GROUP, INC.

2/19/2019

Notes:

1. Capital Improvement costs extracted from opinion of probable costs prepared by Carollo Engineers March 19, 2019 and provided by District staff.
2. Estimate is based on a number of assumptions and limited information, approximate accuracy is +50% to -30%.

Table 8.6 Capital Improvement Costs - Supply

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Improv. No.	New/ Rehabilitate	Infrastructure Costs: Planned Capacity (gpm)	Infrastructure Costs: Well Construction Cost	Infrastructure Costs: Treatment Cost	Infrastructure Costs: Total Infr. Cost ($)	Baseline Constr. Costs ($)	Estimated Const. Costs[1] ($)	Capital Improv. Costs[2] ($)	Improvement Phase	Construction Trigger (year)	Suggested Cost Allocation: Existing Users	Suggested Cost Allocation: Future Users	Cost Sharing: Existing Users	Cost Sharing: Future Users
Groundwater Supply Improvements[3,4]														
W54	Rehabilitate	1,000	-	150,000	150,000	-	-	150,000	Five-Year	2019	80%	20%	120,000	30,000
W18A	Rehabilitate	2,700	-	7,668,839	7,668,839	-	-	7,669,000	Five-Year	2019	80%	20%	6,135,200	1,533,800
W42	Rehabilitate	2,200	-	9,246,213	9,246,213	-	-	9,247,000	Five-Year	2019	80%	20%	7,397,600	1,849,400
W39	Rehabilitate	4,000	-	9,334,214	9,334,214	-	-	9,335,000	Five-Year	2019	80%	20%	7,468,000	1,867,000
W41	Rehabilitate	2,200	-	550,000	550,000	-	-	550,000	Five-Year	2020	80%	20%	440,000	110,000
W50	New	1,500	-	7,208,559	7,208,559	-	-	7,209,000	Five-Year	2020	80%	20%	5,767,200	1,441,800
W52	New	2,000	-	8,690,777	8,690,777	-	-	8,691,000	Five-Year	2021	80%	20%	6,952,800	1,738,200
W16	Rehabilitate	1,500	-	5,716,015	5,716,015	-	-	5,717,000	Five-Year	2021	80%	20%	4,573,600	1,143,400
W29A	New	1,500	7,208,559		7,208,559	-	-	7,209,000	Five-Year	2022	80%	20%	5,767,200	1,441,800
W40	Rehabilitate	1,500	-	7,208,559	7,208,559	-	-	7,209,000	Five-Year	2022	80%	20%	5,767,200	1,441,800
W43	New	3,500	3,000,000	-	3,000,000	-	-	3,000,000	Five-Year	2023	0%	100%	0	3,000,000
W44	New	3,500	3,000,000	-	3,000,000	-	-	3,000,000	Five-Year	2023	0%	100%	0	3,000,000
W45	New	3,500	3,000,000	-	3,000,000	-	-	3,000,000	Five-Year	2024	0%	100%	0	3,000,000
W46	New	3,500	3,000,000	-	3,000,000	-	-	3,000,000	Five-Year	2024	0%	100%	0	3,000,000
W7	Rehabilitate	2,100	-	50,000	50,000	-	-	50,000	Buildout	2029	0%	100%	0	50,000
W8A	Rehabilitate	2,400	-	3,288,359	3,288,359	-	-	3,289,000	Buildout	2029	0%	100%	0	3,289,000
W36	Rehabilitate	2,700	-	3,550,000	3,550,000	-	-	3,550,000	Buildout	2030	0%	100%	0	3,550,000
W51	New	3,000	-	11,311,441	11,311,441	-	-	11,312,000	Buildout	2036	0%	100%	0	11,312,000
W34B	New	2,000	-	2,920,864	2,920,864	-	-	2,921,000	Buildout	2040	0%	100%	0	2,921,000
W35C	New	2,000	-	2,920,864	2,920,864	-	-	2,921,000	Buildout	2040	0%	100%	0	2,921,000
W22A	Rehabilitate	1,500	-	5,716,015	5,716,015	-	-	5,717,000	Buildout	2042	0%	100%	0	5,717,000
				Subtotal - Groundwater Supply Improvements	**104,739,278**	**0**	**0**	**104,746,000**					**50,388,800**	**54,357,200**
Surface Water Supply Improvements[5]														
OPR WFF	New	16.0 mgd expansion		-	-	-	-	71,747,120	Five-Year	2022	0%	100%	0	71,747,120
				Subtotal - Surface Water Supply Improvements	**0**	**0**	**0**	**71,747,120**					**0**	**71,747,120**
Total Improvement Cost														
					Groundwater Supply Improvements	0	0	104,746,000					50,388,800	54,357,200
					Surface Water Supply Improvements	0	0	71,747,120					0	71,747,120
					Total Supply Improvement Costs	**0**	**0**	**176,493,120**					**50,388,800**	**126,104,320**

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Notes:

1. Baseline construction costs plus 25% to account for unforeseen events and unknown conditions.
2. Estimated construction costs plus 22% to cover other costs including: engineering design, project administration (developer and District staff), construction management and inspection, and legal costs.
3. Costs and contingencies shown provided by Kleinfelder, Inc.
4. Costs shown for new wells include both construction costs and costs for any potential treatment identified.
5.Costs shown prepared by Carollo Engineers and provided by District staff April 1, 2019.

Table 8.7 5-year Improvement Phasing
Water Facilities Master Plan
West Valley Water District

PRELIMINARY

CIP ID	Project Name	Project Description	Fiscal Year Improvement Phasing													
			FY 2018/19		FY 2019/20		FY 2020/21		FY 2021/22		FY 2022/23		FY 2023/24		Total Improvement Cost	
			Existing Users ($)	Future Users ($)	Existing Users ($)	Future Users ($)	Existing Users ($)	Future Users ($)	Existing Users ($)	Future Users ($)	Existing Users ($)	Future Users ($)	Existing Users ($)	Future Users ($)	Existing Users ($)	Future Users ($)
Pipeline Improvements																
Capacity Improvements																
Z2-P1	Bloomington Pipeline Replacement (Phase 4)	Construct new 24-inch transmission main in Eighth St							2,222,000						2,222,000	0
Z2-P2	Bloomington Pipeline Replacement (Phase 4)	Construct new 8-inch pipelines in Eighth St							850,000						850,000	0
Z2-P3	Bloomington Pipeline Replacement (Phase 5)	Replace existing 4-inch and 6-inch pipelines with new 8-inch pipelines in Ninth St									650,000				650,000	0
Z2-P4	Bloomington Pipeline Replacement (Phase 3)	Replace existing 4-inch and 8-inch pipelines with new 8-inch pipelines in Tenth St	650,000												650,000	0
Z2-P5	Bloomington Pipeline Replacement (Phase 3)	Construct new 8-inch pipelines in Eleventh St	400,000												400,000	0
Z2-P6	Bloomington Pipeline Replacement (Phase 3)	Replace existing 6-inch pipelines with new 12-inch pipelines in Maple St	650,000												650,000	0
Z2-P7	Zone 2 Santa Ana Transmission	Construct new 12-inch transmission main on Santa Ana Ave					380,000								380,000	0
Z2-P8	Zone 2 Santa Ana Transmission	Replace existing 12-inch pipelines with new 20-inch transmission main on Santa Ana Ave									3,794,000				3,794,000	0
Z2-P9	Zone 2 I-10 Crossing	Construct 24-inch transmission main crossing I-210					304,000								304,000	0
Z2-P9C	Zone 2 I-10 Crossing	Casing for pipeline crossing I-210					585,000								585,000	0
Z3-P4	Zone 3 Santa Ana Transmission	Replace existing 4-inch, 6-inch, and 12-inch pipelines with new 12-inch pipeline in Santa Ana Ave							1,484,000						1,484,000	0
Z3-P5	Zone 3 Santa Ana Transmission	Construct new 16-inch transmission main in Santa Ana Ave					462,000								462,000	0
Z3-P6	Valley Blvd Pipeline Replacements	Replace existing 2-inch, 4-inch, and 6-inch pipelines with 8-inch pipelines									517,000				517,000	0
Z3-P7	Valley Blvd Pipeline Replacements	Replace existing 4-inch and 6-inch pipelines with 8-inch pipelines									1,040,000				1,040,000	0
Z3-P8	Zone 3 Hydraulic Reliability	Construct a new 12-inch pipeline in Valley Blvd	50,000		160,000										210,000	0
Z3A-P1	Zone 3A Hydraulic Reliability	Construct a new 10-inch pipeline in Cactus Ave					35,000		108,500						143,500	0
Z7-P10	Zone 7 Transmission	Construct a new 18-inch transmission main in Segovia Ln from Sierra Ave to Citrus Ave												2,463,000	0	2,463,000
Z7-P16	Zone 7 Transmission	Construct a new 18-inch transmission main within future ROW from Citrus Ave to Lytle Creek Rd (includes casing for I-15 crossing)												1,006,000	0	1,006,000
BH-P1	Bunker Hill Well Field Transmission	From planned wells 43, 44, 45, and 46 to the Bunker Hill aeration tank						840,000							0	840,000
BH-P2	Bunker Hill Well Field Transmission	From Bunker Hill aeration tank to existing Pump Station 3A						5,277,000							0	5,277,000
		Subtotal - Capacity Improvements	**1,750,000**	**0**	**160,000**	**0**	**1,766,000**	**6,117,000**	**4,664,500**	**0**	**6,001,000**	**0**	**0**	**3,469,000**	**14,341,500**	**9,586,000**
			1,750,000		**160,000**		**7,883,000**		**4,664,500**		**6,001,000**		**3,469,000**		**23,927,500**	
Reservoir Improvements																
Z8-R8-3	Zone 8 Reservoir Replacement	Replace existing Zone 8 storage reservoir with new 2.1 MG reservoir	8,000	72,000	400,000	3,600,000									408,000	3,672,000
LR-R3-5	Lord Ranch Aeration Tank	Construct a new 1.0 MG aeration reservoir at Lord Ranch Facility		1,905,000											0	1,905,000
BH-AER	Bunker Hill Aeration Tank	Construct a new aeration tank at the Bunker Hill supply location					0	1,905,000							0	1,905,000
		Subtotal - Reservoir Improvements	**8,000**	**1,977,000**	**400,000**	**3,600,000**	**0**	**1,905,000**	**0**	**0**	**0**	**0**	**0**	**0**	**408,000**	**7,482,000**
			1,985,000		**4,000,000**		**1,905,000**		**0**		**0**		**0**		**7,890,000**	

Table 8.7 5-year Improvement Phasing
Water Facilities Master Plan
West Valley Water District

PRELIMINARY

CIP ID	Project Name	Project Description	Fiscal Year Improvement Phasing													
			FY 2018/19		FY 2019/20		FY 2020/21		FY 2021/22		FY 2022/23		FY 2023/24		Total Improvement Cost	
			Existing Users ($)	Future Users ($)	Existing Users ($)	Future Users ($)	Existing Users ($)	Future Users ($)	Existing Users ($)	Future Users ($)	Existing Users ($)	Future Users ($)	Existing Users ($)	Future Users ($)	Existing Users ($)	Future Users ($)
Pump Station Improvements																
Z4-PS4-3	Lord Ranch Pump Station	Construct new Pressure Zone 4 pump station at Lord Ranch Facility		3,000,000											0	3,000,000
Z7-PS7-2	New Zone 7 Pump Station	Construct a new pump station adjacent to existing PS 7-1					0	4,091,000							0	4,091,000
BH-PS	New Bunker Hill supply Pump Station	Construct a new pump station at the Bunker Hill supply location					0	7,406,000							0	7,406,000
		Subtotal - Pump Station Improvements	**0**	**3,000,000**	**0**	**0**	**0**	**11,497,000**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**14,497,000**
			3,000,000		**0**		**11,497,000**		**0**		**0**		**0**		**14,497,000**	
Pressure Reducing Valves Improvements																
Z6-PRV1	Zone 6 PRV	Construct new pressure reducing station on Sierra Ave		104,000											0	104,000
Z6-PRV2	Zone 6 PRV	Construct new pressure reducing station on Coyote Canyon Rd		104,000											0	104,000
Z7-PRV1	Zone 7 PRV	Construct new pressure reducing station within planned Lytle Creek Ranch development		104,000											0	104,000
Z7-PRV4	Zone 7 PRV	Construct new pressure reducing station on Lytle Creek Rd, northwest of planned Monarch Hills Development		104,000											0	104,000
		Subtotal - Pressure Reducing Valves Improvements	**0**	**416,000**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**416,000**
			416,000		**0**		**0**		**0**		**0**		**0**		**416,000**	
Supply Improvements																
W41	Well 41 Rehabilitation	Implement ion-exchange treatment for nitrate	440,000	110,000											440,000	110,000
W39	Well 39 Rehabilitation	Existing well drilled but not equipped			7,468,000	1,867,000									7,468,000	1,867,000
W7	Well 7 Rehabilitation	Existing well blind flanged						50,000							0	50,000
W8A	Well 8A Rehabilitation	Implement arsenic removal						3,289,000							0	3,289,000
W36	Well 36 Rehabilitation	Implement arsenic removal										3,550,000			0	3,550,000
W18A	Well 18A Rehabilitation	Implement ion-exchange treatment for nitrate			6,135,200	1,533,800									6,135,200	1,533,800
OPR WFF		Design and Construct OPR WFF expansion		500,000		71,747,120									0	72,247,120
W43		Construct new well						3,000,000							0	3,000,000
W44		Construct new well								3,000,000					0	3,000,000
W45		Construct new well										3,000,000			0	3,000,000
W46		Construct new well												3,000,000	0	3,000,000
		Subtotal - Supply Improvements	**440,000**	**610,000**	**13,603,200**	**75,147,920**	**0**	**6,339,000**	**0**	**3,000,000**	**0**	**6,550,000**	**0**	**3,000,000**	**14,043,200**	**94,646,920**
			1,050,000		**88,751,120**		**6,339,000**		**3,000,000**		**6,550,000**		**3,000,000**		**108,690,120**	
Other Currently Planned Projects																
Property Acquisition for Reservoir R3-4 (1.5 acres)		Purchase land for future reservoir R3-4								523,000					0	523,000
Property Acquisition for Reservoir R6-6 (1.5 acres)		Purchase land for future reservoir R6-6										523,000			0	523,000
Property Acquisition for Bunker Hill Supply		Purchase land for future Bunker Hill wells, pump station, and aeration reservoir				1,300,000									0	1,300,000
R7-5 Reservoir Site Investigation		Conduct site investigation for future reservoir R7-5				59,000									0	59,000
Grading, Fencing, and Paving at Lord Ranch Facility		Grade, pave, and erect fencing at Lord Ranch facility							700,000						700,000	0

Table 8.7 5-year Improvement Phasing
Water Facilities Master Plan
West Valley Water District

PRELIMINARY

CIP ID	Project Name	Project Description	Fiscal Year Improvement Phasing													
			FY 2018/19		FY 2019/20		FY 2020/21		FY 2021/22		FY 2022/23		FY 2023/24		Total Improvement Cost	
			Existing Users ($)	Future Users ($)	Existing Users ($)	Future Users ($)	Existing Users ($)	Future Users ($)	Existing Users ($)	Future Users ($)	Existing Users ($)	Future Users ($)	Existing Users ($)	Future Users ($)	Existing Users ($)	Future Users ($)
	Sierra Ave, Developer Pipeline Capacity Increase	Increase size of development required pipe to accommodate additional future development		120,000											0	120,000
	Cedar Pl, Developer Pipeline Capacity Increase	Increase size of development required pipe to accommodate additional future development		84,000											0	84,000
	Well 54 Deaeration Tank	Construct deaeration tank at existing well 54	330,000												330,000	0
		Subtotal - Other Currently Planned Projects	**330,000**	**204,000**	**0**	**1,359,000**	**0**	**0**	**700,000**	**523,000**	**0**	**523,000**	**0**	**0**	**1,030,000**	**2,609,000**
			534,000		**1,359,000**		**0**		**1,223,000**		**523,000**		**0**		**3,639,000**	
Total Improvement Costs																
		Existing/Future Users — **Fiscal Year Total**	$2,528,000	$6,207,000	$14,163,200	$80,106,920	$1,766,000	$25,858,000	$5,364,500	$3,523,000	$6,001,000	$7,073,000	$0	$6,469,000	-	
		Cumulative Total	$2,528,000	$6,207,000	$16,691,200	$86,313,920	$18,457,200	$112,171,920	$23,821,700	$115,694,920	$29,822,700	$122,767,920	$29,822,700	$129,236,920	**$29,822,700**	**$129,236,920**
		Combined Project Costs — **Fiscal Year Total**	$8,735,000		$94,270,120		$27,624,000		$8,887,500		$13,074,000		$6,469,000		-	
		Cumulative Total	**$8,735,000**		**$103,005,120**		**$130,629,120**		**$139,516,620**		**$152,590,620**		**$159,059,620**		**$159,059,620**	

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constructed in the near-term period. This table also includes currently planned projects identified by District staff that support the existing water system, such as land acquisition and site development. The projects included in this 5-year capital improvement program are based on current District priorities and may not include all improvements identified for construction within the 5-year development horizon.

8.3.4 Existing and Buildout EDUs

The calculation of total EDUs, under existing and future conditions, enables the District to effectively plan for capital improvement funding and to appropriately adjust water rates and impact fees as necessary. The calculation methodology for determining the existing, 5-year, and buildout EDU totals is briefly summarized as follows:

- **Existing:** Consistent with the 2012 WMP the existing number of EDUs were based on meter sizes of existing customers; the conversion factors utilized in determining the existing EDUs are summarized on **Table 8.8**. It should be noted the existing EDUs were based on 2016 account information provided by District staff.
- **5-year Development:** The additional EDUs added through the 5-year development horizon were based on development information summarized in **Table 2.5**.
- **Buildout Development:** The additional EDUs added through the Buildout development horizon were determined based on demand projections summarized in a previous chapter. The demand was converted to EDUs using a factor of 670 gpd/EDU, which is based on meter sizes and quantities, as provided by District staff, and using industry standard conversion factors.

The total number of EDUs at the existing, 5-year, and Buildout development horizons are summarized on **Table 8.9**.

Table 8.8 Water Meter EDUs

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Meter Size	Meter Type	Safe Maximum Operating Flow[1,2] (gpm)	EDU
5/8" & 3/4"	Positive Displacement Type	30	1.0
1"	Positive Displacement Type	50	1.7
1-1/2"	Positive Displacement Type	100	3.3
2"	Turbine Type	160	5.3
3"	Turbine Type	350	11.7
4"	Turbine Type	630	20.0
6"	Turbine Type	1,300	41.7
8"	Turbine Type	1,800	60.0

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4/2/2018

Notes:

1: Source: WVWD 2012 Master Plan

2. Flows are based on safe maximum operating flow per AWWA standards C701-15

Table 8.9 EDUs by Pressure Zone

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

Pressure Zone	Existing[1] (2016)	Total, 5-Year Projection[2]	Total, Buildout[3]
Zone 2	3,479	3,679	6,317
Zone 3	6,975	7,379	11,115
Zone 3A	2,120	2,170	2,227
Zone 4	3,209	3,269	3,675
Zone 5	3,232	4,232	4,522
Zone 6	5,051	6,858	10,506
Zone 7	4,199	6,611	10,293
Zone 8	91	481	1,081
Total	**28,356**	**34,679**	**49,736**

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4/5/2019

Notes :
1. Existing EDUs based on 2016 account information provided by WVWD staff.
2. Includes additional EDUs based on 5-year growth information provided by WVWD staff.
3. Includes additional EDUs based on demand projections, assuming 670 gpd/EDU

APPENDICES

APPENDIX A

Demand Unit Factor Comparison

Table 1 Average Daily Water Use Unit Factors

Water Facilities Master Plan
West Valley Water District

PRELIMINARY

2012 Water Master Plan[1]					2020 Water Facilities Master Plan	
Land Use Designation	Development Density (du/ac)	Persons/du	Water Use[2] (gpm/ac)	Water Use[2] (gpd/ac)	Land Use Designation[3]	Water Use[4] (gpd/ac)
Residential						
Estate Residential	1	5.9	0.82	1,181		
Low Density	3	3.8	1.58	2,275		
Rural Residential	2	5.0	1.39	2,002	Residential 2	990
Medium Density	4	3.8	2.10	3,024		
Single Family	4	3.8	2.00	2,880		
Planned Community	4.5	3.2	1.75	2,520		
Medium High Density	9	2.1	2.62	3,773	Residential 6	2,650
Medium Density	9	2.1	2.62	3,773		
High Density	12	1.7	2.83	4,075	Residential 12	4,580
Very High Density	*Not included in 2012 WMP*				Residential 21	5,630
Regional Mixed Use	-	-	2.62	3,773		
Non-Residential						
Office	-	-	2.43	3,500	Office	1,410
Community Commercial	-	-	2.43	3,500	Commercial	1,800
Commercial Recreation	-	-	2.08	3,000	Retail	1,890
Industrial Park	-	-	1.39	2,000	Industrial	1,000
General Industrial	-	-	2.08	3,000	Heavy Industrial	1,530
Light Industrial	-	-	1.39	2,000	Light Industrial	500
Landfill	-	-	1.00	1,440		
School	-	-	2.43	3,500	Educational	1,790
Institutional	*Not included in 2012 WMP*				Institutional	1,410
Public Facility	*Not included in 2012 WMP*				Public Facility	230
Park	-	-	2.43	3,500	Landscape Irrigation	2,690
Golf Course	-	-	2.43	3,500		
Open Space	-	-	0.00	0		
Agricultural	-	-	0.00	0		
Public Utility Corridor (Greenbelt)	-	-	2.43	3,500		
Right of way	-	-	0.00	0		
Wells, Reservoirs, Energy	-	-	1.39	2,000	Utilities	10

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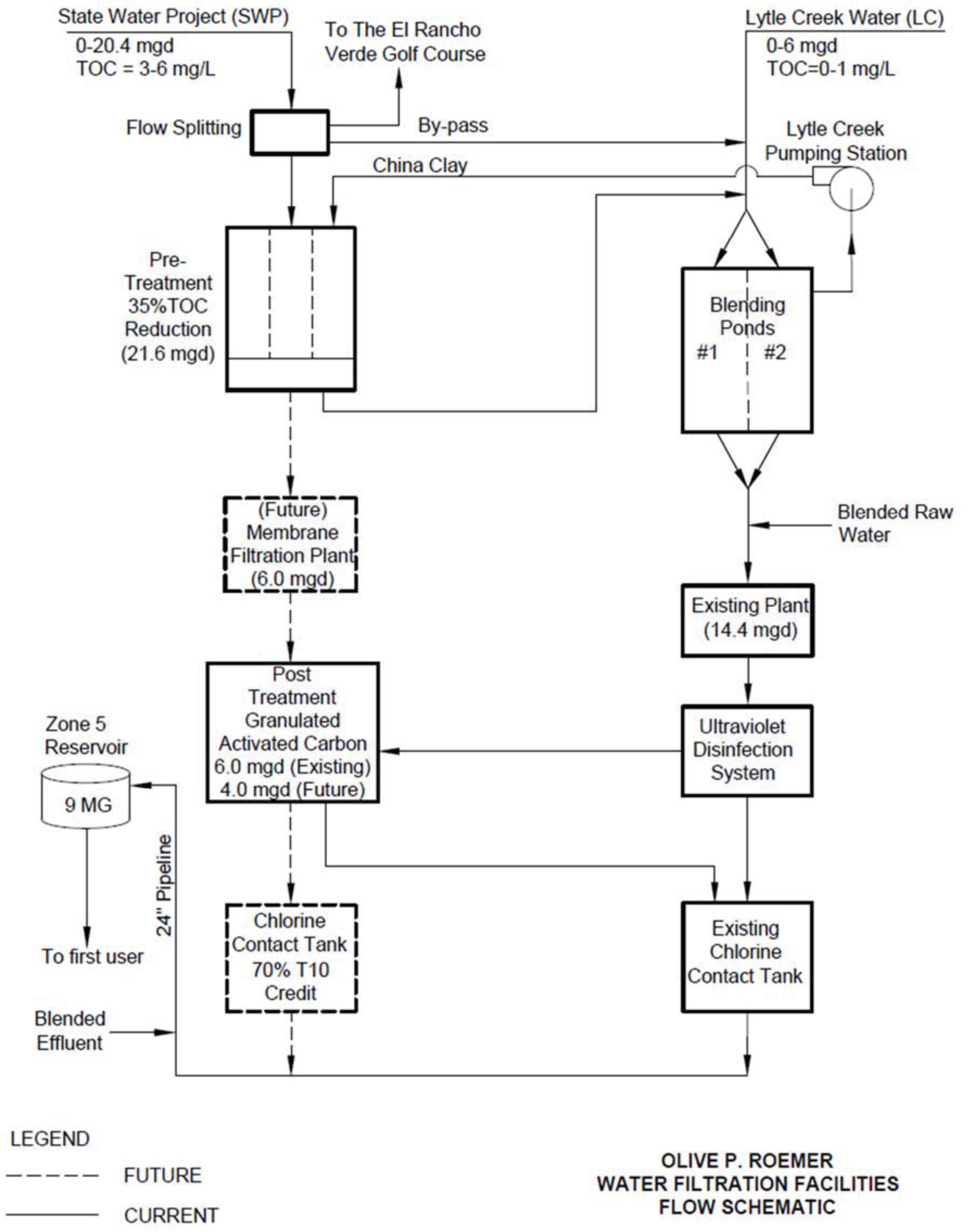
3/2/2018

Notes:
1. Land use designations and water use extracted from WVWD 2012 Water Master Plan, Table 5.1.
2. Residential water use factors calculated assuming 200 gallons per person per day.
3. Land use designations extracted from parcel database provided by WVWD staff July 5, 2017.
4. Water use factors calculated based on existing development and 2016 consumption records normalized to 2014 production minus 10%.

APPENDIX B

OPR Facility Flow Schematic

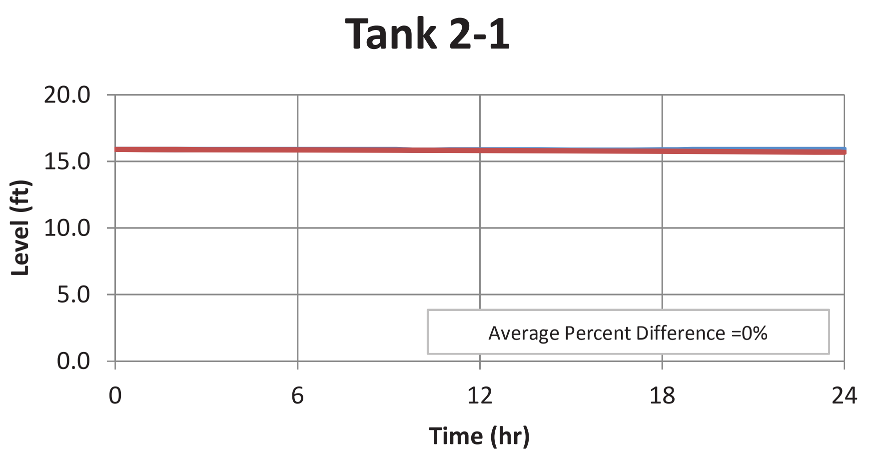


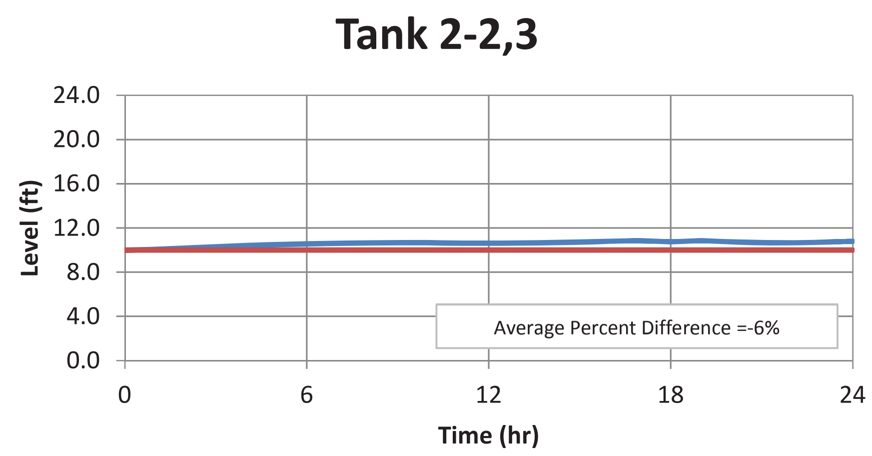
OLIVE P. ROEMER
WATER FILTRATION FACILITIES
FLOW SCHEMATIC

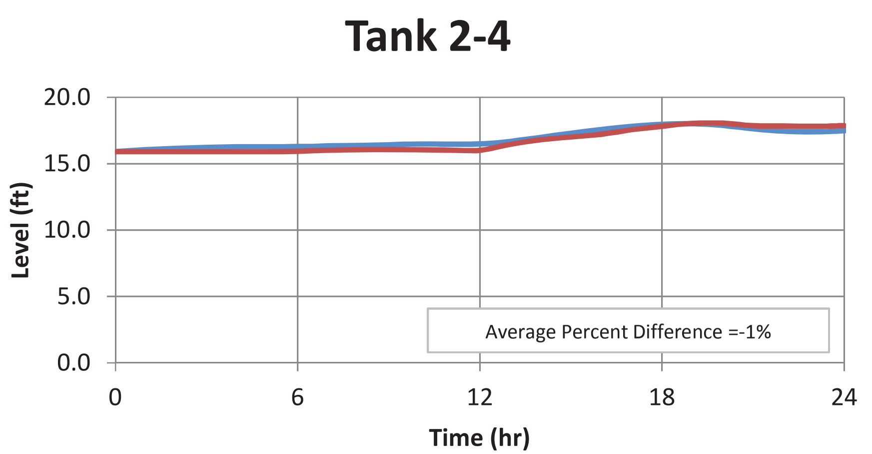
FIGURE 4.1 **(REVISED FIGURE 3.3 FROM 2012 WATER MASTER PLAN)**

APPENDIX C

Hydraulic Model Calibration







LEGEND

SCADA (July 9, 2017)
Hydraulic Model

PRELIMINARY

January 23, 2018

Figure 1
Tank Calibration

Water Facilities Master Plan
West Valley Water District

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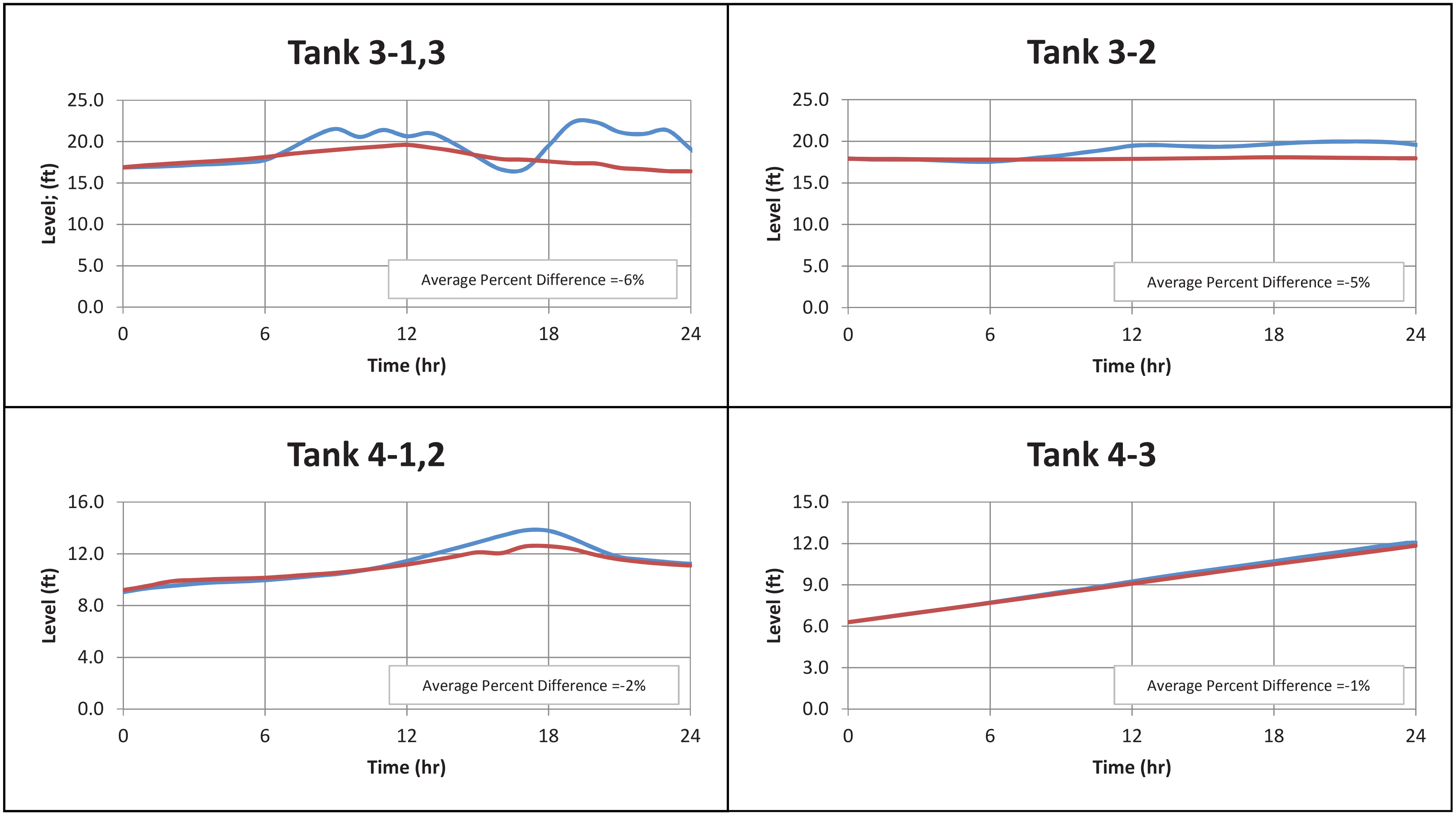


LEGEND

SCADA (July 9, 2017)

Hydraulic Model

PRELIMINARY

January 23, 2018

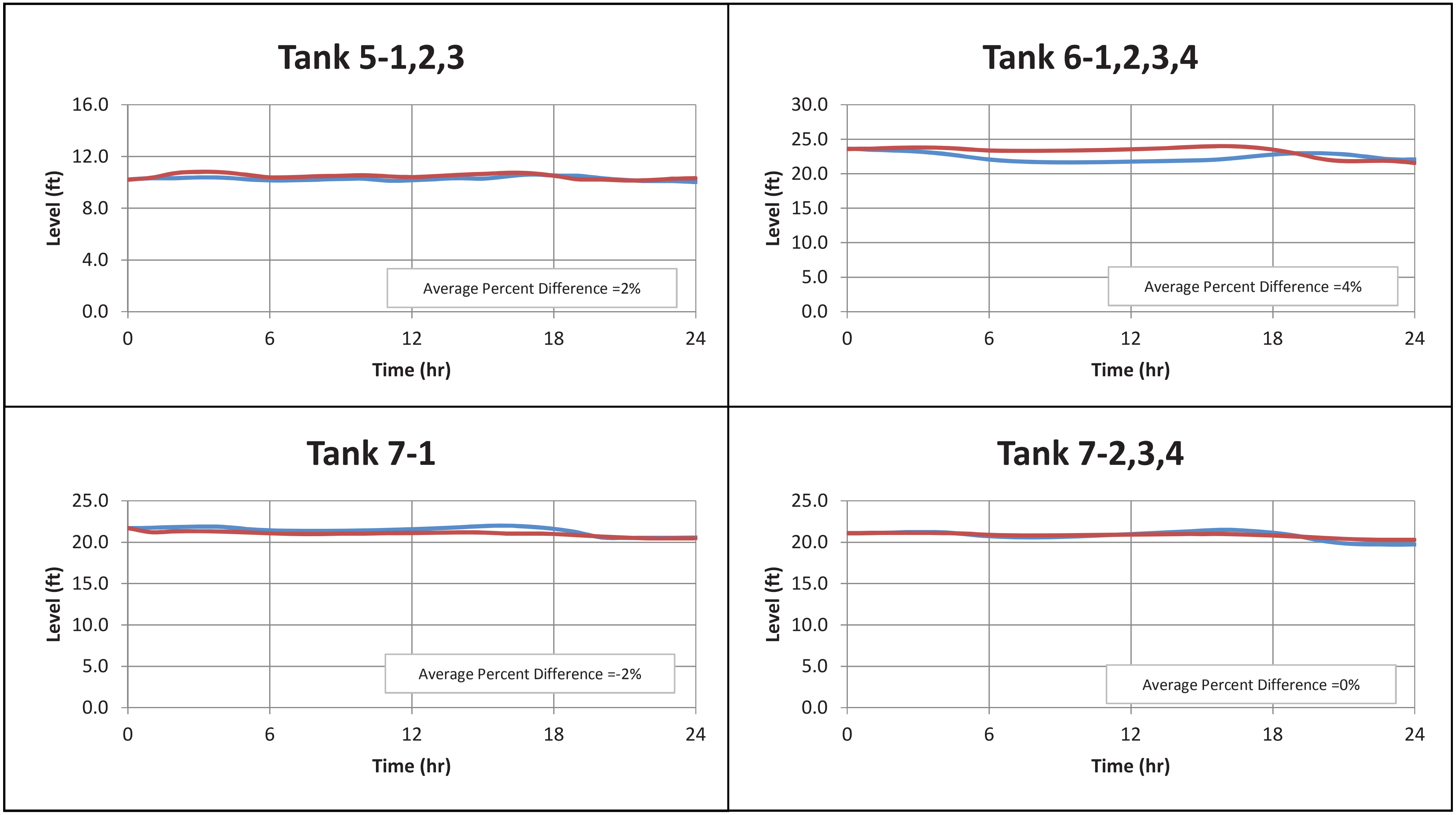
Figure 2
Tank Calibration

Water Facilities Master Plan

West Valley Water District

West Valley Water District

AKEL ENGINEERING GROUP, INC.



LEGEND

SCADA (July 9, 2017)
Hydraulic Model

PRELIMINARY

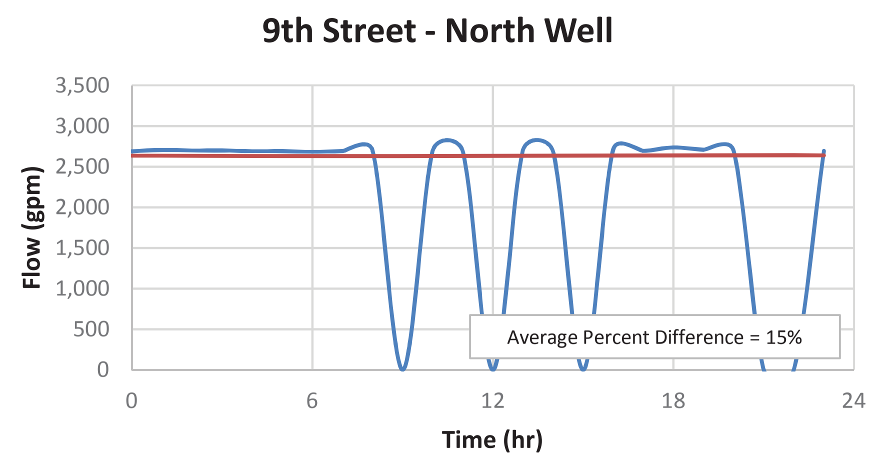
January 23, 2018

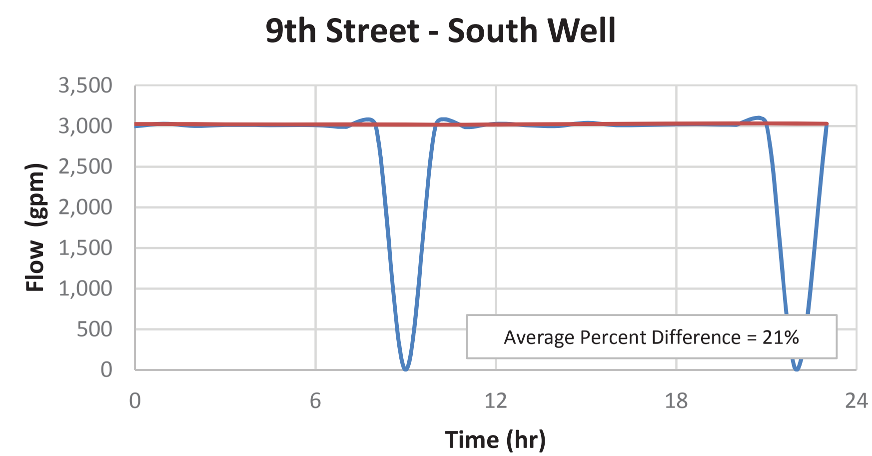
Figure 3
Tank Calibration

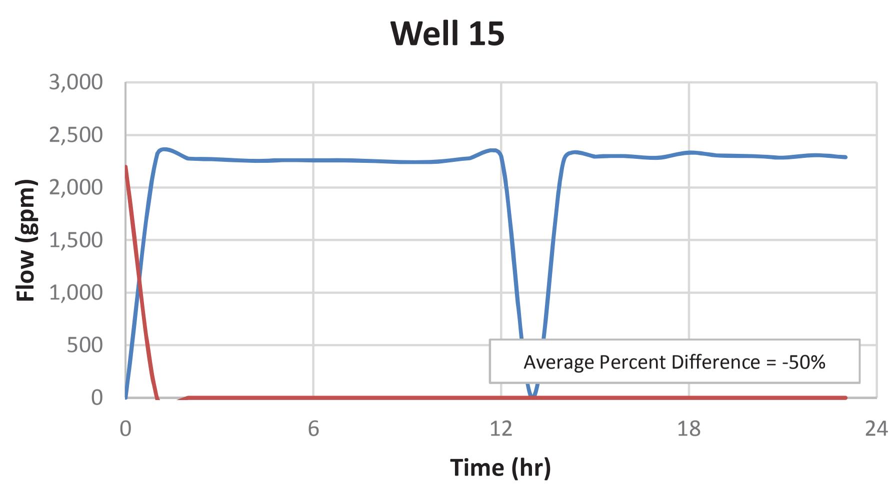
Water Facilities Master Plan
West Valley Water District

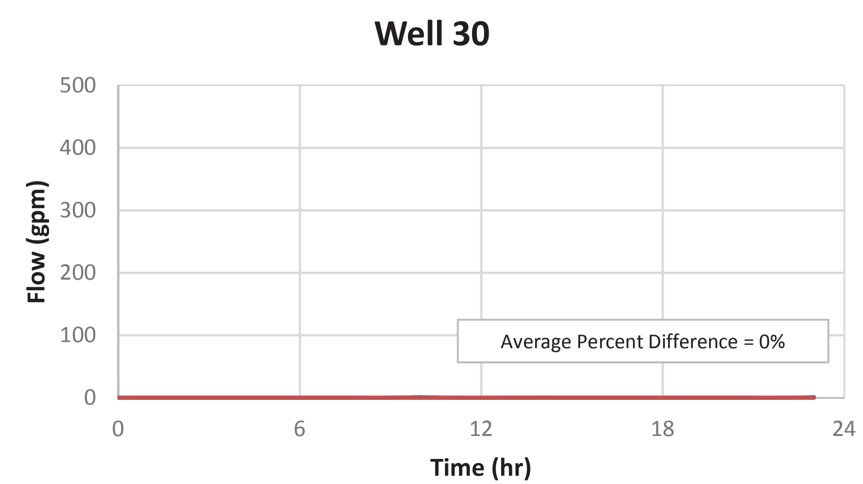
West Valley Water District

AKEL ENGINEERING GROUP, INC.









LEGEND

- SCADA (July 9, 2017)
- Hydraulic Model

PRELIMINARY

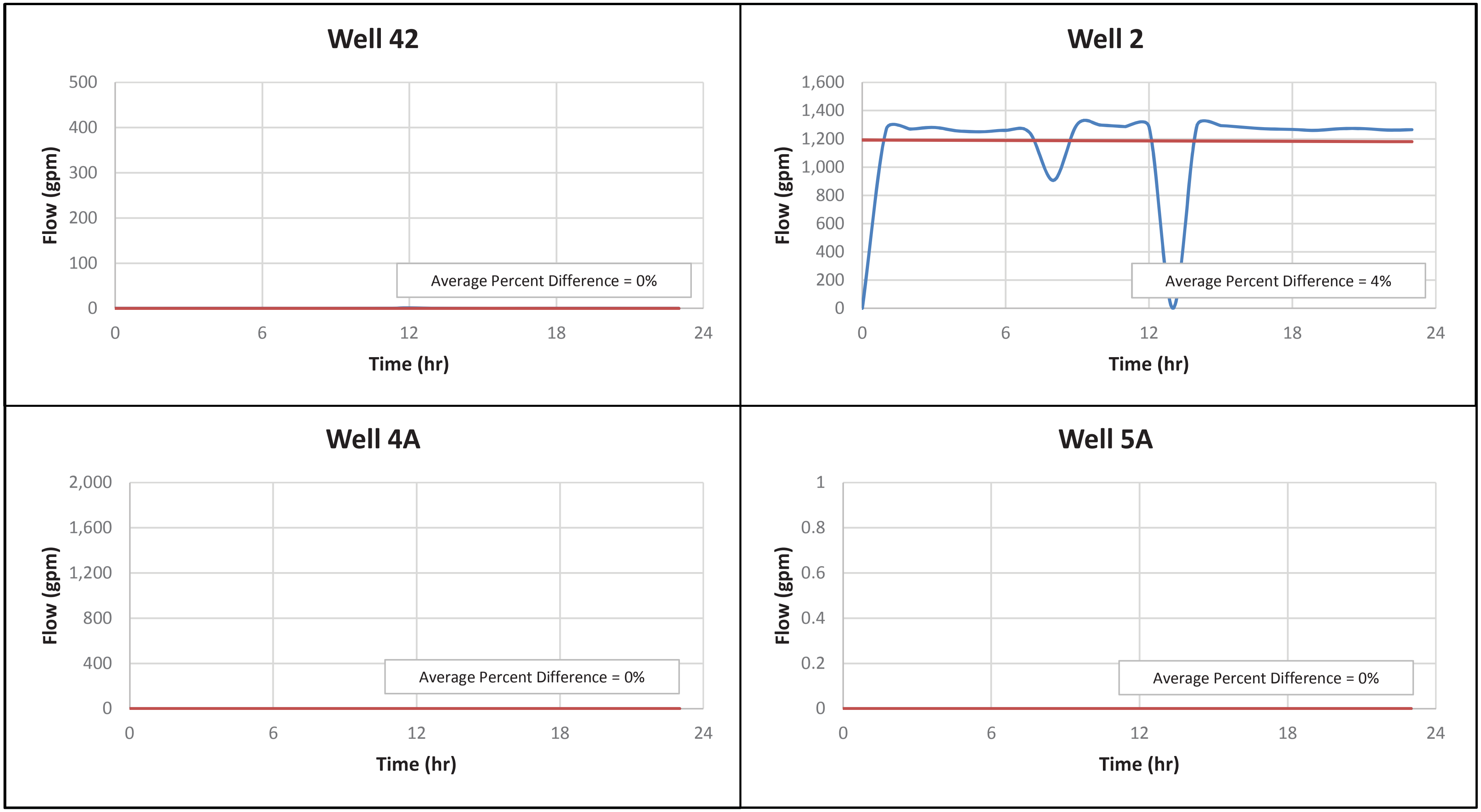
Note: Graphs showing zero flow indicate pump did not operate during calibration period

January 23, 2018

Figure 4
Well Calibration

Water Facilities Master Plan
West Valley Water District

AKEL ENGINEERING GROUP, INC.



LEGEND

SCADA (July 9, 2017)
Hydraulic Model

PRELIMINARY

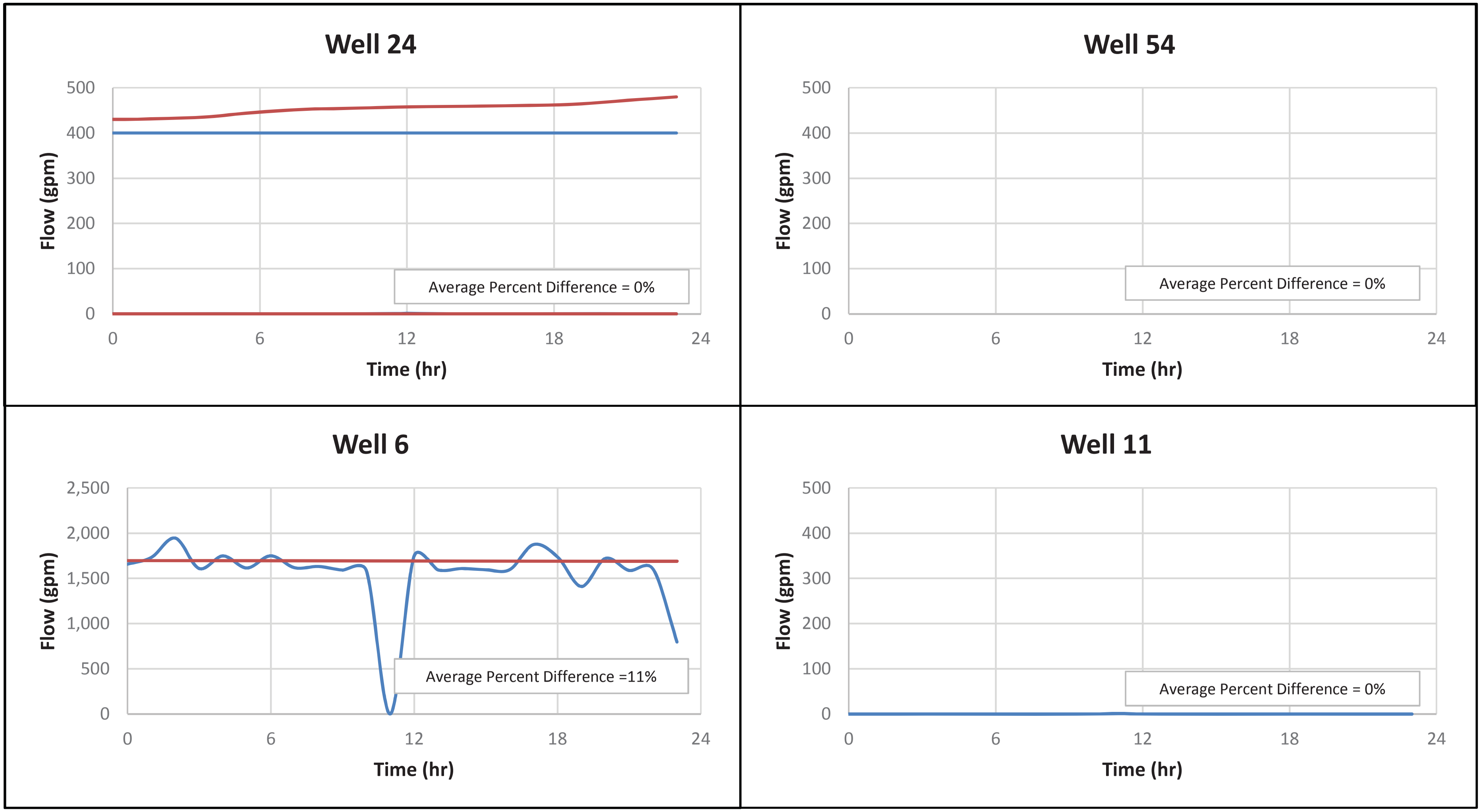
Note: Graphs showing zero flow indicate pump did not operate during calibration period

January 23, 2018

Figure 5
Well Calibration

Water Facilities Master Plan
West Valley Water District

AKEL ENGINEERING GROUP, INC.



LEGEND

SCADA (July 9, 2017)
Hydraulic Model

PRELIMINARY

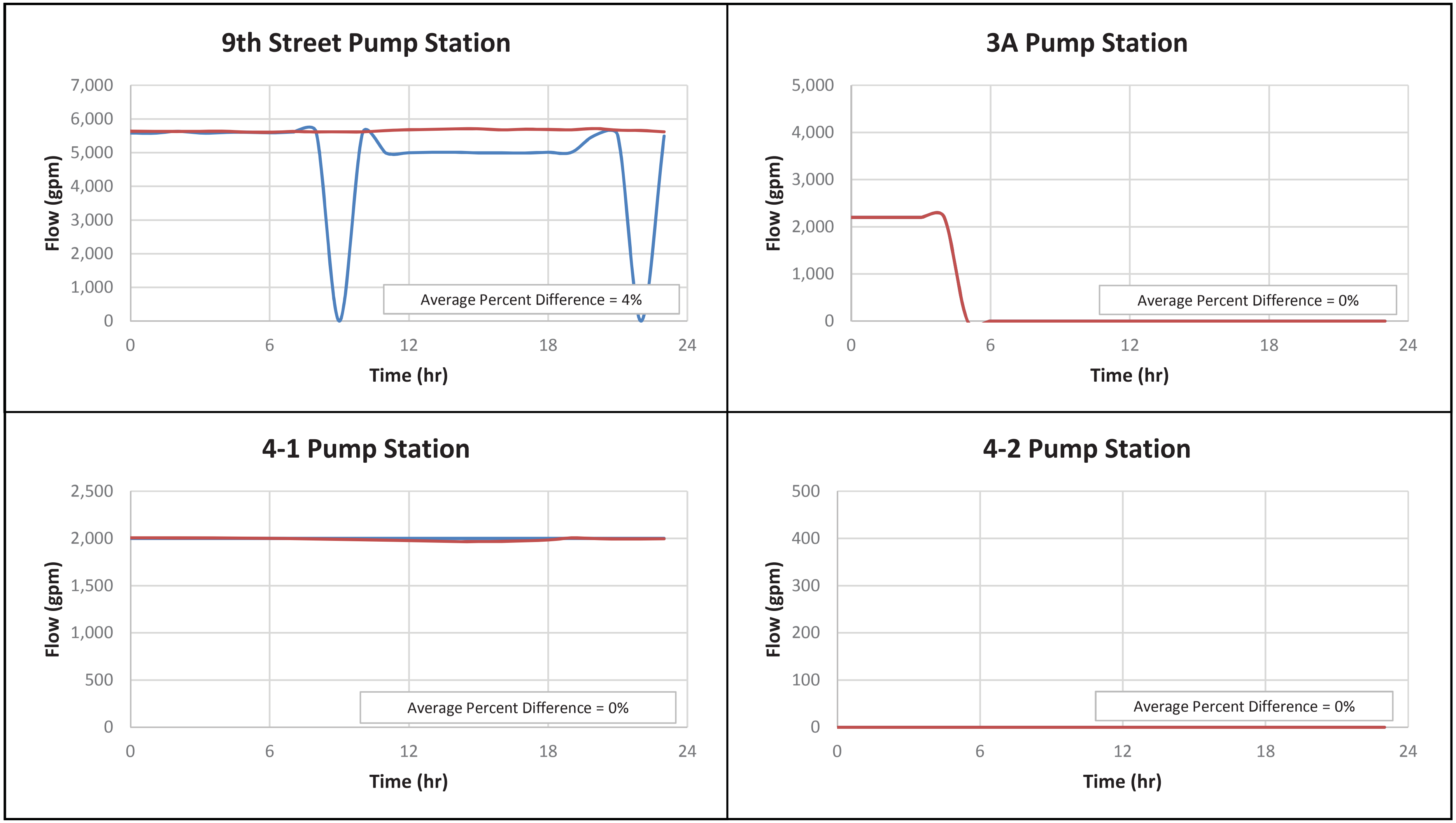
Note: Graphs showing zero flow indicate pump did not operate during calibration period

January 23, 2018

Figure 6
Well Calibration

Water Facilities Master Plan
West Valley Water District

AKEL ENGINEERING GROUP, INC.



LEGEND

- SCADA (July 9, 2017)
- Hydraulic Model

PRELIMINARY

Note: Graphs showing zero flow indicate pump did not operate during calibration period

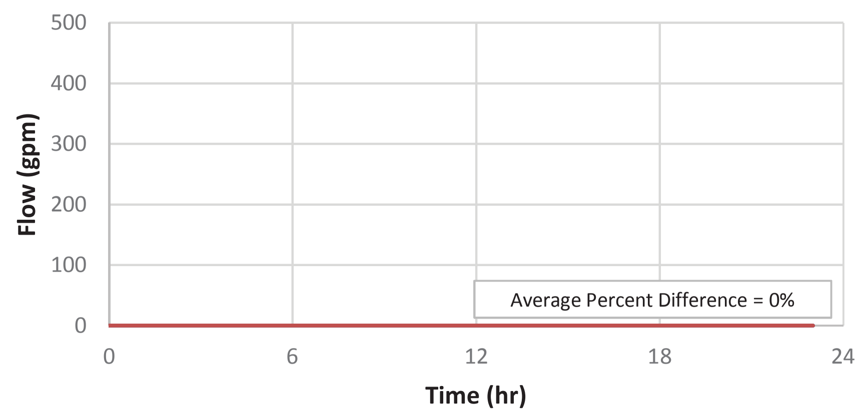
January 23, 2018

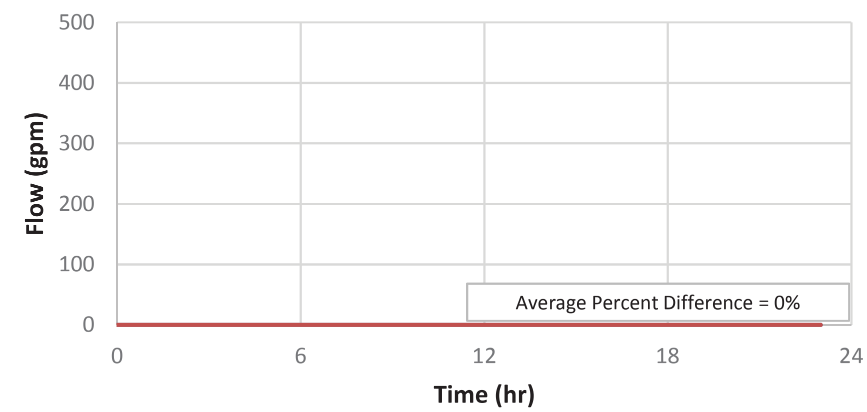
AKEL ENGINEERING GROUP, INC.

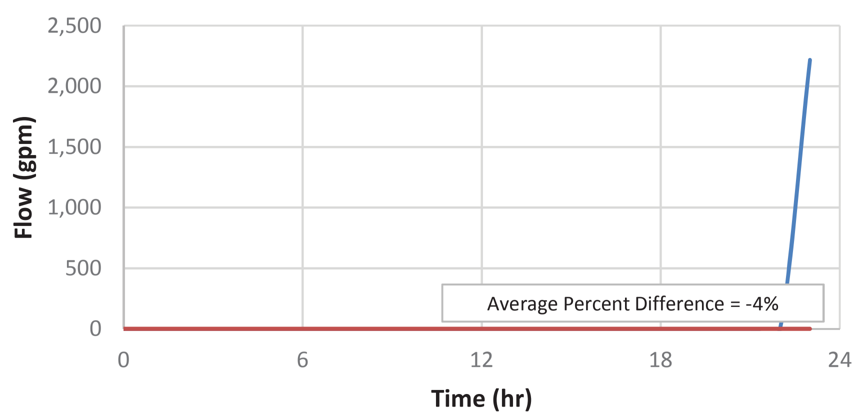
Figure 7
Booster Calibration

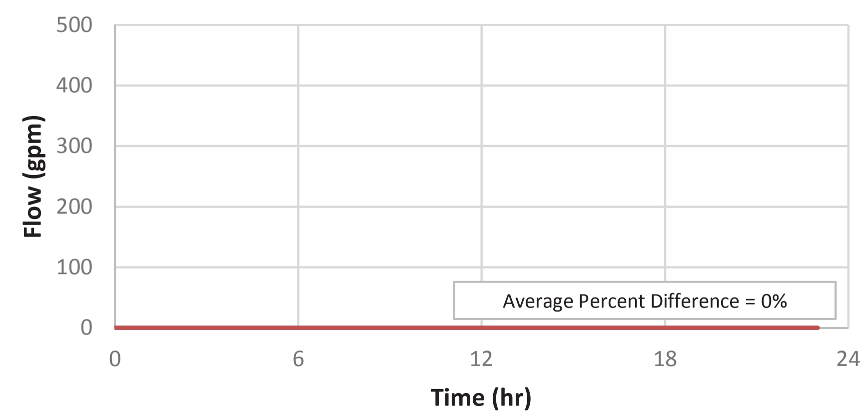
Water Facilities Master Plan
West Valley Water District

West Valley Water District









LEGEND

- SCADA (July 9, 2017)
- Hydraulic Model

PRELIMINARY

Note: Graphs showing zero flow indicate pump did not operate during calibration period

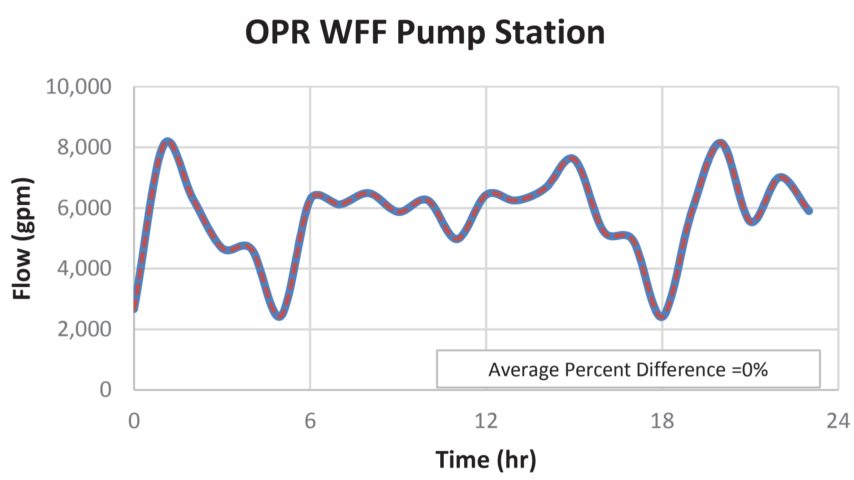
January 23, 2018

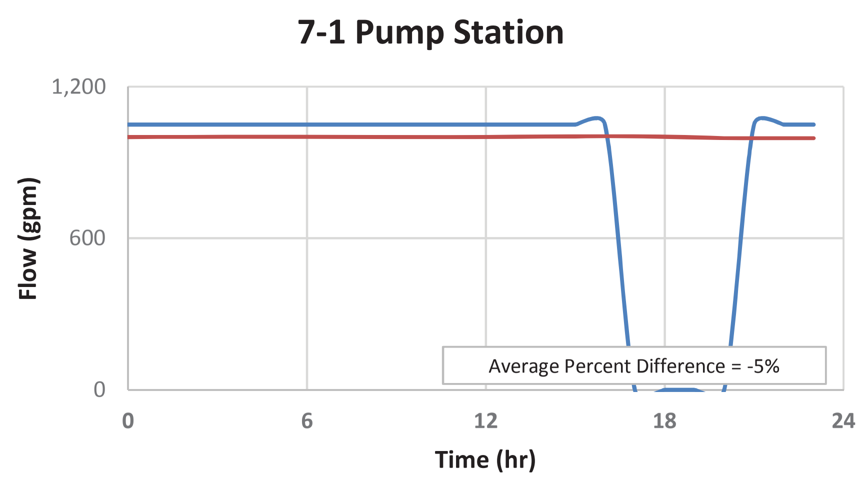
AKEL ENGINEERING GROUP, INC.

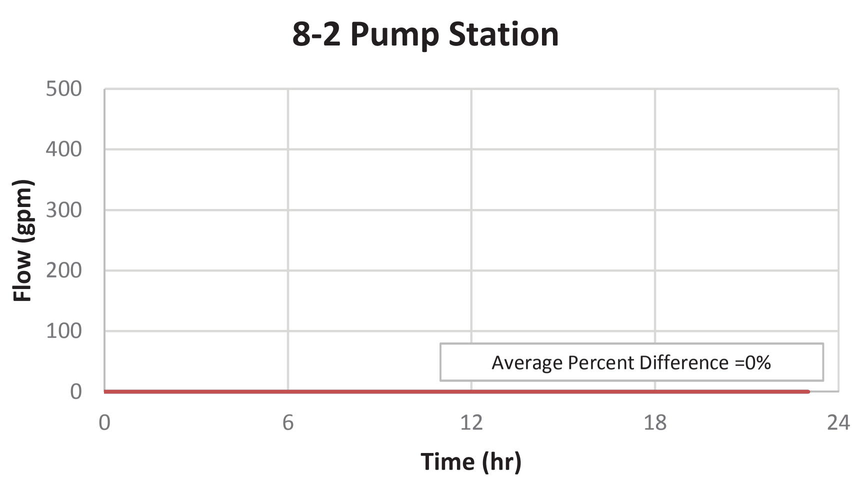
Figure 8
Booster Calibration

Water Facilities Master Plan
West Valley Water District

West Valley Water District







LEGEND

SCADA (July 9, 2017)
Hydraulic Model

PRELIMINARY

Note: Graphs showing zero flow indicate pump did not operate during calibration period

January 23, 2018

AKEL ENGINEERING GROUP, INC.

Figure 9
Booster Calibration

Water Facilities Master Plan
West Valley Water District

BOARD OF DIRECTORS
FINANCE COMMITTEE
STAFF REPORT

DATE: May 13, 2020

TO: Finance Committee

FROM: Clarence Mansell Jr., General Manager

SUBJECT: CONSIDER AN AGREEMENT FOR PROFESSIONAL SERVICES AND TASK ORDER NO. 1 WITH GHD INC. FOR PROFESSIONAL ENGINEERING SERVICES FOR THE 16MGD OLIVER P. ROEMER WATER FILTRATION FACILITY EXPANSION PROJECT

BACKGROUND:

Due to projected population growth, peak summer usage, and to provide a reliable long term water supply to supplement overdrafted groundwater basins, West Valley Water District ("District") is planning to expand treatment capacity at the Oliver P. Roemer Water Filtration Facility ("Roemer WFF") to allow the treatment of an additional 16 million gallons per day (MGD) of State Water Project water. It is understood that the Roemer WFF expansion will be constructed in phases, but that the ultimate 16 MGD Roemer WFF design will be completed as part of this expansion design project.

The increase in treatment capacity will require an analysis of existing facilities and an evaluation and recommendation of feasible and cost effective treatment methods and operational strategies. The delivery method will be a Design Build ("DB") that will utilize an integrated engineering and construction/contractor team to develop the final design and construct the initial phase of the Roemer Expansion Facility.

On December 4, 2019, the District posted a Request for Qualifications ("RFQ") on Planet Bids for qualified and experienced engineering firms to provide professional Engineering Design Services for the District's 16 MGD Roemer WFF Expansion Project. Interested firms where requested to submit their Statement of Qualifications ("SOQ") to present their expertise and experience associated with Professional Engineering Design services as it relates to the intended project.

On January 22, 2020 the District received two (2) SOQ's. The SOQs submitted where evaluated, scored, and ranked based on the criteria specified in the RFQ by a selection committee formed by the District. Following the evaluation, interviews with the two firms where conducted.

Based on technical qualifications and overall evaluation, it was determined that GHD Inc. best served the District's interest and needs for this project. They bring a senior team of individuals with extensive DB and treatment process experience. GHD Inc. is a leader in infrastructure engineering with more than 10,000 employees and 200 offices worldwide. They have had a local presence in

Southern California since 1951 and have offices in Moreno Valley, Los Angeles, Long Beach, Irvine and San Diego. They have a long history working with municipalities and agencies and have $1.3 billion in recent Southern California projects. Attached as Exhibit C is the Statement of Qualification submitted by GHD Inc.

On Thursday, March 19, 2020 at the regularly scheduled Board Meeting, the Board of Directors of the West Valley Water District authorized fee negotiations with GHD Inc. for Professional Engineering Services for the 16 MGD Roemer WFF Expansion Project.

Staff requested GHD to divide the scope of work into two (2) Phases since the treatment method and capacity of the first phase of the expansion project has not been determined. GHD was then requested to submit a fixed fee proposal for Phase 1 which includes treatment option evaluations and 30% design and a cost estimate for Phase 2 covering the construction oversight phase.

Below is a brief scope of work for each of the two (2) Phases.

SCOPE OF WORK

PHASE 1

1) Review Existing Information
a. Review available reports and data applicable to the project;
b. Evaluate existing treatment plant facilities and provide recommendations for rehabilitation, replacement and redundancy;
c. Conduct a functional stress test of the existing treatment plant to maximize and establish operational capacity.

2) Regulatory Compliance
a. Conduct an environmental review of the project and develop a permitting plan;
b. Attendance of Regulatory and Responsible Agency Meetings;
c. Prepare and Submit Permits on Behalf of the District.

3) Treatment Evaluations
a. Identify, evaluate and present reasonably feasible treatment technology alternatives;
b. Maximize existing process capacities and establish the most reliable and cost effective plan for the treatment plant expansion.

4) Develop 30% design documents under a progressive Design Build delivery model
a. Prepare a probable construction cost estimate based on the 30% design;
b. Prepare the project implementation schedule & potential phased project construction.

5) Develop the Design Build Request for Proposals package
a. Assist in advertising, obtaining, reviewing proposals;
b. Assist the District in the selection of the DB firm and in contract negotiations.

PHASE 2 – FUTURE

Act as the "Owners Agent" during the Design Build phase of the project, GHD will be responsible, as Owner's Agent, to review all of the DB work product and oversee construction, commissioning, post construction and warranty phase.

Fee negotiations have been ongoing over the past several weeks with GHD Inc. based on the Phase 1 scope of work. Attached as Exhibit A, is the negotiated fee proposal for the scope of work for Phase 1 $844,003 and includes a "budgetary" estimate of $1,879,018 which includes a 15% contingency for the Phase 2 scope of work. Once the treatment method is established and before the Design Build phase of the project commences, a fixed fee proposal for the Phase 2 scope of work will be negotiated and brought back to the Board of Directors for review and approval.

Attached as Exhibit D, is an Agreement for Professional Services with GHD Inc. and Attached as Exhibit B is Task Order No. 1. With GHD Inc. for the Phase 1 scope of work only. A detailed scope of work for Phase 1 is included in the Task Order.

FISCAL IMPACT:

The cost to perform Phase 1 of the professional engineering services related to the 16 MGD Oliver P. Roemer Water Filtration Facility Expansion Project as proposed by GHD Inc. is $844,003.00. This item was included in the Fiscal Year 2019/20 Capital Improvement Budget under project W19041 with a budget of $3,100,000.00.

STAFF RECOMMENDATION:

It is recommended that the Finance Committee approve an Agreement for Professional Services and Task Order No. 1 with GHD Inc. for Phase 1 of the Professional Engineering Services related to the 16 MGD Oliver P. Roemer Water Filtration Facility Expansion Project in the amount of $844,003.00, and have this item considered by the full Board of Directors at a future meeting.

Respectfully Submitted,

Clarence C. Mansell Jr.

Clarence Mansell Jr, General Manager

LJ:mm

ATTACHMENT(S):

1. Exhibit A - Fee proposal provided by GHD Inc.
2. Exhibit B - Task Order 1 with GHD Inc.
3. Exhibit C - GHD Inc. Statement of Qualifications
4. Exhibit D - Standard Agreement for Professional Services - GHD Inc.

EXHIBIT A

		Labor (hours) West Valley Water District Oliver Roemer Expansion Project																																Disbursements		
	Project Role	Project Manager/ (UV&Trident)	Project Advisor	Process Lead	Project Engineer/ Membranes	Plant Piping	Electrical and I&C	Structural	Design-Build Lead	Contract Documents	Constructability Review/Startup O&M	Cost Estimating	Resident Engineer Mechanical	Stormwater	CAD/BIMM	Technical Disciplines	Blue Ribbon Panel Chair	Conventional Treatment	Blue Ribbon Panel	Blue Ribbon Panel	Blue Ribbon Panel	Blue Ribbon Panel	Lead CEQA Environmental Documentation	Process Capacity Demonstration Testing	Membranes	Architectural	Geotechnical	Schedule/Cost Control	Lead/ Resident Engineer Construction	Electrical and I&C Inspection	Potholing	Geotechnical	Total Hours	Labor Total	Consumables Cost	Direct Cost and Markups	Project Total
	Staff	Jamal Awad	Hector Ruiz	Mark Donovan	Leila Munla	Ulysses Fandino	Mehdi Mardi	Francisco Andrade	Paul Hermann	Sri Sadasivan	Kevin Tirado	Mike Freid	Ryan Kristensen	Brandon Willnecker	Devin Brady	Senior Technical	Chris Hertle	Mike Chapman	James Borchardt	Bill Bellamy	Rhodes Trussell	Jim Vickers	John Robinson	Elaine Howe & Other Eng.	Charles Cruz	Samir Hijazi	Hashmi Quazi	Kirill Dolinsky	Jason Mate	Ed Macias	TBD	TBD					
	Hourly Rate	$270	$270	$250	$165	$250	$220	$220	$280	$270	$250	$190	$170	$250	$145	$240	$280	$270	$325	$250	$345	$260	$160	$250	$260	$185	$220	$182	$200	$165	$1	$1					
	PHASE 1																																				
	Task																																				
1	**Review Existing Information**																																				
1.1	Review Available Documents	20	8	12	20	6	6	6					10		7	10	4		4	4	4	4	7	36		4	7	18					197	$44,631	$654	$2,948	$48,233
1.2	Evaluate Existing Treatment and Provide Recommendations	22		12	12	18	12	6					12				4	4	4	4	4	4		90									208	$50,840	$612	$3,766	$55,218
1.3	Functional Stress Test to Maximize Operational Capacity	22		8	10								20				4	4	4	4	4	4		154									238	$58,410	$408	$5,686	$64,504
	Subtotal	***64***	***8***	***32***	***42***	***24***	***18***	***12***	***0***	***0***	***0***	***0***	***42***	***0***	***7***	***10***	***12***	***8***	***12***	***12***	***12***	***12***	***7***	***280***	***0***	***4***	***7***	***18***	***0***	***0***			***643***	***$153,881***	***$1,674***	***$12,940***	***$168,495***
2	**Regulatory Compliance**																																				
2.1	Environmental Review and Permitting Plan	14			12																		54										80	$14,400	$156	$1,537	$16,093
2.2	Attendance of Regulatory and Responsible Agency Meetings	14			12																		58										84	$15,040	$156	$1,614	$16,810
2.3	Prepare and Submit Permits on Behalf of WVWD	30			16																		156										202	$35,700	$276	$3,495	$39,471
	Subtotal	***58***	***0***	***0***	***40***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***268***	***0***	***0***	***0***	***0***	***0***	***0***	***0***			***366***	***$65,140***	***$588***	***$7,886***	***$73,614***
3	**Treatment Evaluations**																																				
3.1	Treatment Technology Evaluation Task Memorandum	12	8	32	64							8	48						8	8	8	8			44								248	$54,520	$1,032	$3,006	$58,558
3.2	Blue Ribbon Panel Reviews/Meetings/Workshops	18		16	18								18				16	8	28	28	28	28	64										270	$64,810	$564	$5,694	$71,068
	Subtotal	***30***	***8***	***48***	***82***	***0***	***0***	***0***	***0***	***0***	***0***	***8***	***66***	***0***	***0***	***0***	***16***	***8***	***36***	***36***	***36***	***36***	***64***	***0***	***44***	***0***	***0***	***0***	***0***	***0***			***518***	***$119,330***	***$1,596***	***$8,699***	***$129,625***
4	**30% Design Documentation**																																				
4.1	30% Design Document	40		60	60	60	88	40					60	40	200	60	8	12	8	8	8	8			40	130	24				$13,000	$20,000	954	$197,110	$4,368	$10,360	$244,838
4.2	Cost Estimate Update	8		8	8							80	12													12		20					148	$28,580	$696	$1,203	$30,479
4.3	Project Schedule Update	8		2																								20					30	$6,300	$60	$937	$7,297
4.4	Final 30% Design Documents	8		16	8	8	6	6			10	12		6	60											8	4						152	$29,460	$840	$783	$31,083
	Subtotal	***64***	***0***	***86***	***76***	***68***	***94***	***46***	***0***	***0***	***10***	***92***	***72***	***46***	***260***	***60***	***8***	***12***	***8***	***8***	***8***	***8***	***0***	***0***	***40***	***150***	***28***	***40***	***0***	***0***	***$13,000***	***$20,000***	***1,284***	***$261,450***	***$5,964***	***$13,284***	***$313,698***
5	**Design-Build Proposal**																																				
5.1	Develop DB RFP Package	20		6					80	56			36															8					206	$51,996	$1,188	$675	$53,859
5.2	Pre-Proposal Assistance/Negotiations	30			32				48	32			48															8					198	$45,076	$1,140	$675	$46,891
5.3	Selection Assistance								10	48		16	32															12					118	$26,424	$636	$762	$27,822
	Subtotal	***50***	***0***	***6***	***32***	***0***	***0***	***0***	***138***	***136***	***0***	***16***	***116***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***28***	***0***	***0***	***$0***	***$0***	***522***	***$123,496***	***$2,964***	***$2,112***	***$128,572***
5a	**Project Management**																																				
	Project Management for Tasks 1 through 5	176	6	6	48	8						8	8						4		4	4						4					276	$67,888	$1,560	$552	$70,000
	Subtotal	***176***	***6***	***6***	***48***	***8***	***0***	***0***	***0***	***0***	***0***	***8***	***8***	***0***	***0***	***0***	***0***	***0***	***4***	***0***	***4***	***4***	***0***	***0***	***0***	***0***	***0***	***4***	***0***	***0***	***$0***	***$0***	***276***	***$67,888***	***$1,560***	***$552***	***$70,000***
																																	Total for Tasks 1 through 5a				***$884,003***
	PHASE 2																																				
	Task																																				
6	**Design-Build Phase**																																				
6.1	Design Build Support Services	64		64	16				64	64	32															20		32	3078				3,434	$704,324	$1,824	$75,324	$781,472
6.2	Project Documentation			10	20																					8		12					50	$9,464	$180	$940	$10,584
6.3	Reporting				90								90																				180	$30,150	$1,080	$500	$31,730
6.4	Submittals				88	90	90	54					180													36		12					550	$108,144	$3,012	$1,561	$112,717
6.5	Clarification & Interpretation Support				90								252																				342	$57,690	$2,052	$500	$60,242
6.6	Construction Observation Services				90								72																	432			594	$98,370	$972	$9,054	$108,396
6.7	DB Payment Assistance			14	18								72															10					114	$20,530	$624	$718	$21,872
	Subtotal	***64***	***0***	***74***	***214***	***90***	***90***	***54***	***64***	***64***	***32***	***0***	***270***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***64***	***0***	***56***	***3078***	***0***	***$0***	***$0***	***5,150***	***$1,008,142***	***$9,120***	***$78,325***	***$1,127,013***
7	**Commissioning Phase**																																				
7.1	Review Documents	40		32	18				8	8	36		36															8					186	$42,746	$1,068	$675	$44,489
7.2	Meetings	40		36	16	16			6	6	36																			32			188	$44,020	$936	$1,134	$46,090
7.3	Coordinate Responses	100			22						36		36																	22			216	$49,380	$1,164	$936	$51,480
7.4	Oversee Startup	20		18		10			6		180																			88			322	$73,600	$1,404	$2,042	$77,046
	Subtotal	***200***	***0***	***86***	***56***	***26***	***0***	***0***	***20***	***14***	***288***	***0***	***72***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***8***	***0***	***142***	***$0***	***$0***	***912***	***$209,746***	***$4,572***	***$4,786***	***$219,104***
8	**Post Construction and Warranty Phase**																																				
8.1	Post-Construction	18		18	18	10					14		6						4	4	4	4				10		10	72				192	$42,140	$504	$3,235	$45,879
8.2	Warranty	18		36	18																					4							76	$17,570	$432	$589	$18,591
8.3	Operational Optimization	18	36	72	72																												198	$44,460	$1,188	$500	$46,148
	Subtotal	***54***	***36***	***126***	***108***	***10***	***0***	***0***	***0***	***0***	***14***	***0***	***6***	***0***	***0***	***0***	***0***	***0***	***4***	***4***	***4***	***4***	***0***	***0***	***0***	***14***	***0***	***10***	***72***	***0***	***$0***	***$0***	***466***	***104,170***	***2,124***	***4,324***	***$110,618***
9	**Project Management for Tasks 6 through 9**																																				
9.1	Meetings	192	14	12	26	26							26				6	4	10	10	10	10						20					366	$92,030	$1,836	$2,353	$96,219
9.2	Project Planning/Coordination/Execution	136										12																					148	$39,000	$888	$500	$40,388
9.3	Progress Reports and Invoices	96			80																												176	$39,120	$1,056	$500	$40,676
	Subtotal	***424***	***14***	***12***	***106***	***26***	***0***	***0***	***0***	***0***	***0***	***12***	***26***	***0***	***0***	***0***	***6***	***4***	***10***	***10***	***10***	***10***	***0***	***0***	***0***	***0***	***0***	***20***	***0***	***0***	***$0***	***$0***	***366***	***$170,150***	***$1,836***	***$2,353***	***$177,283***
9b	**Contingency; As-Needed per District Request**																																				
	Contingency; As-Needed per District Request																																				$245,000
	Subtotal	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***$0***	***$0***	***0***	***$0***	***$0***	***$0***	***$245,000***
																																	Total for Tasks 6 through 9b				***$1,879,018***
	Total	**1008**	**66**	**470**	**756**	**244**	**202**	**112**	**222**	**214**	**344**	**128**	**670**	**46**	**267**	**70**	**42**	**32**	**70**	**70**	**70**	**70**	**339**	**280**	**84**	**232**	**35**	**180**	**3150**	**142**	**$13,000**	**$20,000**	**10,227**	**$2,215,505**	**$30,438**	**$134,708**	**$2,763,021**

Packet Pg

EXHIBIT B

TASK ORDER NO. 1

PROFESSIONAL ENGINEERING SERVICES FOR THE 16 MGD OLIVER P. ROEMER WATER FILTRATION FACILITY EXPANSION PROJECT

This Task Order ("Task Order") is executed this ____ day of _____, 2020 by and between West Valley Water District, a public agency of the State of California ("District") and GHD Inc. ("Consultant").

RECITALS

A. On or about (____, 2020) District and Consultant executed that certain Agreement for Professional Services ("Agreement").

B. The Agreement provides that the District will issue Task Orders from time to time, for the provision of certain services by Consultant.

C. Pursuant to the Agreement, District and Consultant desire to enter into this Task Order for the purpose of setting forth the terms and conditions upon which Consultant shall render certain services to the District.

NOW, THEREFORE, THE PARTIES HERETO HEREBY AGREE AS FOLLOWS:

1. Consultant agrees to perform the services set forth on Exhibit "1" attached hereto and by this reference incorporated herein.

2. Subject to any limitations in the Agreement, District shall pay to Consultant the amounts specified in Exhibit "2" attached hereto and by this reference incorporated herein. The total compensation, including reimbursement for actual expenses, may not exceed the amount set forth in Exhibit "2," unless additional compensation is approved in writing by the District.

3. Consultant shall perform the services described in Exhibit "1" in accordance with the schedule set forth in Exhibit "3" attached hereto and by this reference incorporated herein. Consultant shall commence work immediately upon receipt of a notice to proceed from the District. District will have no obligation to pay for any services rendered by Consultant in advance of receipt of the notice to proceed, and Consultant acknowledges that any such services are at Consultant's own risk.

4. The provisions of the Agreement shall apply to this Task Order. As such, the terms and conditions of the Agreement are hereby incorporated herein by this reference.

[***SIGNATURES APPEAR ON FOLLOWING PAGE***]

IN WITNESS WHEREOF, the parties have caused this Task Order to be executed effective as of the day and year first above written.

DISTRICT:

WEST VALLEY WATER DISTRICT,
a public agency of the State of California

____
Clarence C. Mansell Jr., General Manager

____
Board Secretary

CONSULTANT:

GHD Inc.

By_____________________________________

Name___________________________________

Its_____________________________________

By_____________________________________

Name___________________________________

Its_____________________________________

EXHIBIT "1"

TO

TASK ORDER NO. 1

SCOPE OF SERVICES

INTRODUCTION

The purpose of the scope of services is to outline the tasks that are necessary to complete Professional Engineering Services for the 16 MGD Oliver P. Roemer Water Filtration Facility Expansion Project for West Valley Water District (District).

TASK 1 – REVIEW EXISTING INFORMATION

Task 1.1 - Review available documents

The Consultant shall review available reports and data applicable to the project. These documents may include:

- Preliminary design memorandum
- Drawings
- Historical operations data
- Historical and projected water delivery quantities
- Water Quality reports
- Other reports and studies related to proposed facilities
- Evaluate existing treatment plant facilities and provide recommendations for rehabilitation, replacement and redundancy
- Conduct a functional stress test of the existing treatment plant to maximize and establish operational capacity

TASK 2 – REGULATORY COMPLIANCE

Task 2.1 - Environmental Review and Permitting Plan

The Consultant shall conduct an environmental review of the project and develop a permitting plan. At a minimum, this task shall include:

- Prepare a permitting list to include specific agencies and specific permits required;
- Provide a schedule of permit phasing - including but not limited to: pre-meetings, permit deadlines, and realistic timelines for permit approvals;
- Identification of additional landowners and tenants for access and approvals;

- Review of Federal and State drinking water requirements for surface water sources, including disinfection requirements, as well as primary and secondary maximum contaminant limits (MCLs);
- Review of anticipated regulatory changes such as Unregulated Contaminant Monitoring Rule (UCMR) and Contaminants of Emerging Concerns (CECs).
- Engage with DDW on the project expansion goals and the required permits or permit amendments.

Task 2.2 – Attendance of Regulatory and Responsible Agency Meetings
The Consultant shall assume attendance at all permitting meetings in a support role. The Consultant shall prepare any necessary material for all permitting meetings.

Task 2.3 – Prepare and Submit Permits on Behalf of District
The Consultant shall prepare and submit permits including CEQA documents on behalf of the District. This shall include any necessary resubmittals or revisions to permits required on behalf of the agency. The District will pay all permit fees.

Deliverables:

- Permitting Plan Memorandum, including updated permitting list and permitting schedule.

TASK 3 – TREATMENT EVALUATIONS

Task 3.1 - Treatment Technology Evaluation Task Memorandum
The Consultant shall assemble a panel of experts to identify, evaluate and present reasonably feasible treatment technology alternatives, including membrane filtration. Factors to be considered in developing the Treatment Technology Evaluation Task Memorandum (TM) shall include taste and odor, clarifier turbidity, filter turbidity, Total Organic Compound (TOC) removal, treatment byproducts, log reduction, operation and maintenance flexibility/ease, future regulations, scalability, and reliability. Each alternative shall include any ancillary analysis of all treatment techniques or processes, applied to the worst existing and anticipated future influent water quality that will be required to meet effluent water quality objectives.

The panel will assist in guiding the project team to maximize existing process capacities and establish the most reliable and cost effective plan for the treatment plant expansion.

The Consultant shall conduct an economic evaluation of each proposed process alternative. The evaluation shall include an Estimate and Life-Cycle Cost (LCC) analysis and shall consider design, construction, operation, maintenance and overhead expenses.

The Treatment Technology Evaluation TM will include the recommended treatment process for the Project. The Consultant will submit a draft Treatment Technology Evaluation TM to the District for review and comment. The Consultant will submit a final Treatment Technology Evaluation TM addressing the District's comments.

TASK 4 - 30% DESIGN DOCUMENTATION

Task 4.1 - 30% Design Document

After the District's acceptance of the final Treatment Technology Evaluation TM, the District's selection of a treatment technology, and upon written authorization from the District, the Consultant shall develop 30% design documents which shall show or decscribe the character, scope and intent of the work to be completed by a contractor under a progressive Design Build delivery model.

- 30% design drawings;
- A Basis of Design report and specification, which shall include design objectives, constraints, type of layout, capacity, treatment plant performance criteria, effectiveness, efficiency, operability, flexibility, expandability/phasing of the project, and other requirements for the Project;
- Other graphic or written materials as necessary.

Task 4.2 - Cost Estimate Update

The Consultant shall prepare an Opinion of Probable Construction Cost (OPCC) estimate based on findings in the 30% design. The Consultant will submit a draft OPCC to the District for review and comments. The Consultant will submit the final OPCC addressing the District's comments.

Task 4.3 - Project Schedule Update

The Consultant shall prepare the project implementation schedule based on findings in the previous tasks to include all phases of the Project through the end of construction. The Consultant will submit a draft project schedules to the District for review and comment. The Consultant will submit a final project schedule addressing the District's comments.

Task 4.4 - Final 30% Design Documents

The Consultant shall combine all relevant documents into a final 30% Design Documents package. The Consultant will submit a draft 30% Design Document package to the District for review and comment. The Consultant will submit a final 30% Design Document package addressing the District's comments. The 30% Design Documents shall be sufficient in detail to issue a RFP for Design Build (DB) services.

TASK 5 - DESIGN-BUILD PROPOSAL

After the District's acceptance of the 30% Design Documents and upon written authorization by DISTRICT, the Consultant shall:

- Assist the District in developing the DB RFP package, including assembling the package and reviewing the RFP package for accuracy;
- Assist the District in advertising and obtaining DB proposals and conduct the pre-proposal conference;
- Document the pre-proposal conference meeting and prepare minutes, including any questions that were discussed;
- Assist the District in responses to pre-proposal requests for information and clarifications;
- Prepare addenda as appropriate to clarify or correct the RFP package;
- Determine the acceptability of substitute materials and equipment proposed;
- Consult with the District on the acceptability of prospective DB firms, engineers, subcontractors, suppliers, other persons and entities proposed by the DB firm for their respective portions of the work. Assist the District in evaluating the DB firm's proposals, including reference and background checks, shortlisting and scoring the DB firms;
- Preparing tabulation sheets;
- Assist the District in the selection of the DB firm and in negotiating a contract with the DB firm; and
- Assist the District in connection with any protests, re-bidding or re-negotiating of the DB firm's contract.

TASK 5a – PROJECT MANAGEMENT

Task 5a.1 - Meetings

The Consultant shall organize and attend a project implementation kick-off meeting within 2-weeks of the issuance of the Notice to Proceed. The meeting will be held at the District's office in Rialto, California.

The Consultant shall organize and attend regularly scheduled progress meetings with the District and necessary team members throughout the project. These meetings are in addition to other meetings (such as coordination meetings with regulatory agencies, construction meetings with DB firm or design review meetings). Based on the scope of work described herein, the Consultant shall propose the frequency of progress meetings needed to successfully complete this project. The Consultant's Project Manager and key project staff shall attend meetings. Consultant shall prepare meeting agendas and meeting minutes for each progress meeting.

Task 5a.2 - Progress Reports and Invoices

Each month, the Consultant shall submit a progress report along with an invoice for the work accomplished during the reporting period. The report shall describe in detail the progress made during the previous month and the hours spent on each task. Percentage completed and anticipated date of completion for each task shall be included. Invoices submitted shall be consistent with the monthly progress report format. The approved budget shall not be exceeded, unless previously authorized in writing by the District. The Consultant shall notify the District's Program Manager immediately upon reaching 50 and 75 percent of the project's budget.

At a minimum, each invoice shall contain the purchase order number and shall be itemized by task. A subtotal cost for each task shall be included. Names of persons, their job titles, hourly billing rates, actual hours worked during the billing period, and subtotal labor costs must be summarized in a table. The Consultant shall attach to each invoice any documentation for other direct costs in the form of receipts or print outs of time and/or costs, with the applicable costs identified, for such items such as telephone calls and number of copies. The District will provide reporting requirements to the Consultant and the Consultant shall prepare invoices that comply with the requirements. Failure to satisfy the reporting requirements may result in rejection of the invoices by the District.

EXHIBIT “2”

TO

TASK ORDER NO. 1

COMPENSATION

Task	Description	Cost
1	**Review Existing Information**	
1.1	Review Available Documents	$48,233
1.2	Evaluate Existing Treatment and Provide Recommendations	$55,218
1.3	Functional Stress Test to Maximize Operational Capacity	$64,504
	Subtotal	**$168,495**
2	**Regulatory Compliance**	
2.1	Environmental Review and Permitting Plan	$16,093
2.2	Attendance of Regulatory and Responsible Agency Meetings	$16,810
2.3	Prepare and Submit Permits on Behalf of WVWD	$39,471
	Subtotal	**$73,614**
3	**Treatment Evaluations**	
3.1	Treatment Technology Evaluation Task Memorandum	$58,558
3.2	Blue Ribbon Panel Reviews/Meetings/Workshops	$71,068
	Subtotal	**$129,625**
4	**30% Design Documentation**	
4.1	30% Design Document	$244,838
4.2	Cost Estimate Update	$30,479
4.3	Project Schedule Update	$7,297
4.4	Final 30% Design Documents	$31,083
	Subtotal	**$313,698**
5	**Design-Build Proposal**	
5.1	Develop DB RFP Package	$53,859
5.2	Pre-Proposal Assistance/Negotiations	$46,891
5.3	Selection Assistance	$27,822
	Subtotal	**$128,572**
5a	**Project Management**	
	Project Management for Tasks 1 through 5	$70,000
	Subtotal	**$70,000**
	Total	**$884,003**

		Labor (hours) — West Valley Water District Oliver Roemer Expansion Project																																Disbursements		
	Project Role	Project Manager/ (UV&Trident)	Project Advisor	Process Lead	Project Engineer/ Membranes	Plant Piping	Electrical and I&C	Structural	Design-Build Lead	Contract Documents	Constructability Review/Startup O&M	Cost Estimating	Resident Engineer Mechanical	Stormwater	CAD/BIMM	Technical Disciplines	Blue Ribbon Panel Chair	Conventional Treatment	Blue Ribbon Panel	Blue Ribbon Panel	Blue Ribbon Panel	Blue Ribbon Panel	Lead CEQA Environmental Documentation	Process Capacity Demonstration Testing	Membranes	Architectural	Geotechnical	Schedule/Cost Control	Lead/ Resident Engineer Construction	Electrical and I&C Inspection	Potholing	Geotechnical	Total Hours	Labor Total	Consumables Cost	Direct Cost and Markups	Project Total
	Staff	Jamal Awad	Hector Ruiz	Mark Donovan	Leila Munla	Ulysses Fandino	Mehdi Mardi	Francisco Andrade	Paul Hermann	Sri Sadasivan	Kevin Tirado	Mike Freid	Ryan Kristensen	Brandon Willnecker	Devin Brady	Senior Technical	Chris Hertle	Mike Chapman	James Borchardt	Bill Bellamy	Rhodes Trussell	Jim Vickers	John Robinson	Elaine Howe & Other Eng.	Charles Cruz	Samir Hijazi	Hashmi Quazi	Kirill Dolinsky	Jason Mate	Ed Macias	TBD	TBD					
	Hourly Rate	$270	$270	$250	$165	$250	$220	$220	$280	$270	$250	$190	$170	$250	$145	$240	$280	$270	$325	$250	$345	$260	$160	$250	$260	$185	$220	$182	$200	$165	$1	$1					
	PHASE 1																																				
	Task																																				
1	**Review Existing Information**																																				
1.1	Review Available Documents	20	8	12	20	6	6	6					10		7	10	4		4	4	4	4	7	36		4	7	18					197	$44,631	$654	$2,948	$48,233
1.2	Evaluate Existing Treatment and Provide Recommendations	22		12	12	18	12	6					12				4	4	4	4	4	4		90									208	$50,840	$612	$3,766	$55,218
1.3	Functional Stress Test to Maximize Operational Capacity	22		8	10								20				4	4	4	4	4	4		154									238	$58,410	$408	$5,686	$64,504
	Subtotal	***64***	***8***	***32***	***42***	***24***	***18***	***12***	***0***	***0***	***0***	***0***	***42***	***0***	***7***	***10***	***12***	***8***	***12***	***12***	***12***	***12***	***7***	***280***	***0***	***4***	***7***	***18***	***0***	***0***			***643***	***$153,881***	***$1,674***	***$12,940***	***$168,495***
2	**Regulatory Compliance**																																				
2.1	Environmental Review and Permitting Plan	14			12																		54										80	$14,400	$156	$1,537	$16,093
2.2	Attendance of Regulatory and Responsible Agency Meetings	14			12																		58										84	$15,040	$156	$1,614	$16,810
2.3	Prepare and Submit Permits on Behalf of WVWD	30			16																		156										202	$35,700	$276	$3,495	$39,471
	Subtotal	***58***	***0***	***0***	***40***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***268***	***0***	***0***	***0***	***0***	***0***	***0***	***0***			***366***	***$65,140***	***$588***	***$7,886***	***$73,614***
3	**Treatment Evaluations**																																				
3.1	Treatment Technology Evaluation Task Memorandum	12	8	32	64							8	48						8	8	8	8			44								248	$54,520	$1,032	$3,006	$58,558
3.2	Blue Ribbon Panel Reviews/Meetings/Workshops	18		16	18								18				16	8	28	28	28	28	64										270	$64,810	$564	$5,694	$71,068
	Subtotal	***30***	***8***	***48***	***82***	***0***	***0***	***0***	***0***	***0***	***0***	***8***	***66***	***0***	***0***	***0***	***16***	***8***	***36***	***36***	***36***	***36***	***64***	***0***	***44***	***0***	***0***	***0***	***0***	***0***			***518***	***$119,330***	***$1,596***	***$8,699***	***$129,625***
4	**30% Design Documentation**																																				
4.1	30% Design Document	40		60	60	60	88	40					60	40	200	60	8	12	8	8	8	8			40	130	24				$13,000	$20,000	954	$197,110	$4,368	$10,360	$244,838
4.2	Cost Estimate Update	8		8	8							80	12													12		20					148	$28,580	$696	$1,203	$30,479
4.3	Project Schedule Update	8		2																								20					30	$6,300	$60	$937	$7,297
4.4	Final 30% Design Documents	8		16	8	8	6	6			10	12		6	60											8	4						152	$29,460	$840	$783	$31,083
	Subtotal	***64***	***0***	***86***	***76***	***68***	***94***	***46***	***0***	***0***	***10***	***92***	***72***	***46***	***260***	***60***	***8***	***12***	***8***	***8***	***8***	***8***	***0***	***0***	***40***	***150***	***28***	***40***	***0***	***0***	***$13,000***	***$20,000***	***1,284***	***$261,450***	***$5,964***	***$13,284***	***$313,698***
5	**Design-Build Proposal**																																				
5.1	Develop DB RFP Package	20		6					80	56			36															8					206	$51,996	$1,188	$675	$53,859
5.2	Pre-Proposal Assistance/Negotiations	30			32				48	32			48															8					198	$45,076	$1,140	$675	$46,891
5.3	Selection Assistance								10	48		16	32															12					118	$26,424	$636	$762	$27,822
	Subtotal	***50***	***0***	***6***	***32***	***0***	***0***	***0***	***138***	***136***	***0***	***16***	***116***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***28***	***0***	***0***	***$0***	***$0***	***522***	***$123,496***	***$2,964***	***$2,112***	***$128,572***
5a	**Project Management**																																				
	Project Management for Tasks 1 through 5	176	6	6	48	8						8	8						4		4	4						4					276	$67,888	$1,560	$552	$70,000
	Subtotal	***176***	***6***	***6***	***48***	***8***	***0***	***0***	***0***	***0***	***0***	***8***	***8***	***0***	***0***	***0***	***0***	***0***	***4***	***0***	***4***	***4***	***0***	***0***	***0***	***0***	***0***	***4***	***0***	***0***	***$0***	***$0***	***276***	***$67,888***	***$1,560***	***$552***	***$70,000***
																																	Total for Tasks 1 through 5a				***$884,003***

EXHIBIT "3"

TO

TASK ORDER NO. 1

SCHEDULE

Schedule to be provided subsequent to Board approval of the contract.

EXHIBIT C

West Valley Water District

Statement of Qualifications

Professional Engineering Design Services for the 16 MGD Oliver P. Roemer Water Filtration Facility Expansion Project

Jamal Awad, PhD, PE
Project Manager
320 Goddard Way, Suite 200
Irvine, CA 92618

P 949.585.5235 F 949.648.5299
E Jamal.Awad@ghd.com

January 22, 2020

TAB A | COVER LETTER

A Cover Letter

January 22, 2020

Al Robles, Purchasing Supervisor
West Valley Water District
855 W. Base Line Road
Rialto, CA 92376

GHD Proposal No. 11207439

Statement of Qualifications - Professional Engineering Design Services for the 16 MGD Oliver P. Roemer Water Filtration Facility (WFF) Expansion Project

Dear Mr. Robles and Members of the Selection Panel:

The WFF Expansion Project (Project) will be a significant investment by the West Valley Water District (District) that will add 16 MGD of treatment capacity to accommodate projected population growth. The delivery method will be Progressive Design-Build (PDB) that will utilize an integrated team to develop the design and construct the facility. The Owner's Engineer (OE) will have a significant role in setting the design definition, evaluating alternatives, developing the 30% design documents, and driving the PDB process. An experienced, creative OE with the ability to capitalize on the unique features of the Plant while maintaining its reliability and redundancy will be critical to the success of the project.

The GHD team is comprised of PDB experts that have been on both sides of the equation as both OE's, and Design-Builders, so we fully appreciate and respect the process. This deep understanding allows us to help provide practical solutions that protect the District and are fair and reasonable to the PDB Entity thereby developing a true project partnership. This, of course, is the key to providing the District with the most cost-effective expansion that meets and exceeds the intended performance criteria. We relish the opportunity to participate in this journey and feel strongly that we can bring tremendous value to the District as your OE.

Unparalleled Team Experience in Progressive Design-Build

GHD is the preeminent OE Consulting Firm in California. We were OE on the recently completed WRD GRIP project and are currently OE on Doheny Desalination Plant, the Arcadia WTP expansion for the City of Santa Monica, and the completed Carlsbad Desalination Plant. We bring a senior team of individuals with extensive PDB experience, knowledge of regulations pertaining to current drinking water standards and constituents of concern, process expertise, an understanding of project risk, and the experience to coordinate design, construction, start-up and commissioning activities. In addition we have extensive experience in the planning and design of all treatment processes including the preliminary coagulation/flocculation/plate settling treatment, Trident System, Trojan UV, Calgon GAC, and MF/UF Membranes.

Our project team is comprised of local engineers and global experts with an extensive background in water treatment, regulatory requirements, alternative project delivery, construction, and operations and maintenance. Our proposed Project Manager, **Jamal Awad, PhD, PE,** was the Deputy OE/Technical Services Lead for WRD's recently completed $115M PDB GRIP AWTF and had significant responsibilities in establishing project technical requirements, coordinating technical reviews of the Design-Build Entity submittals, and negotiating DDW requirements for the project. He is a technical matter expert in both the Trident Treatment System (the subject of his PhD Thesis) and UV disinfection (being a founding member of the International UV Association). Jamal permitted the first UV for primary disinfection in California at Eastern Municipal Water District with the same UV reactor configuration to those at the WFF.

Mark Donovan, PE will be our proposed Design Manager and Senior Process Engineer. He brings over 20 years of experience in membrane-based water treatment system process design. He has provided full-scale system design, operations support, and treatment process improvement/optimization services to municipal and industrial membrane water treatment facilities worldwide. Mark also brings significant membrane manufacturing experience valuable during the membrane selection.

GHD Inc.
320 Goddard Way, Suite 200, Irvine, CA 92618
P 949 585 5200

Two additional senior level staff included **Hector Ruiz, PE,** and **Chris Hertle**. Hector was General Manager of the Trabuco Canyon Water District for over 10 years and has an extensive background in Operations & Maintenance and Asset Management and will serve as Senior Advisor. Chris is GHD's Global Market Lead for Water, and has significant experience in delivering OE services and detailed knowledge of GHD's global technical resources and will serve as the Blue Ribbon Panel Chair. All of these individuals above are based in Irvine, CA.

Blue Ribbon Panel of Experts

A Blue Ribbon Panel, led by Chris, will be comprised of Global experts that will provide insight and wisdom to the District and project team. Their early project guidance will be invaluable in setting a solid foundation for the project success. The panel includes a suite of experts from consulting engineering, academia, and operations with specialized knowledge in treating State Project Water. However, the composition of the Panel can be easily expanded based on project's needs and further discussions with the District.

Blue Ribbon Panel

Chris Hertle (Chair), MPhil – Adjunct Professor - Advanced Water Management Center Uni of Qld GHD Global Market Lead

Michael Chapman - GHD Lead Water Treatment Expert

Sun Liang, PhD, PE - MWD of Southern California Water Purification Engineer

James Borchardt, PE – Stantec Water Treatment Expert and Contributor to MWH Water Treatment Principles and Design (3rd Edition)

Bill Bellamy, PhD, PE - Adjunct Professor and Deputy Director of the Center of Excellence in Produce Water Management; University of Wyoming/Former CH2M HILL Water Treatment Expert

Rhodes Trussell, PhD, PE – Co-Author of MWH Water Treatment Principles and Design (3rd Edition)

Jim Vickers, PE – Membranes Expert and President of SPI

Maximizing the Use of Existing Facilities

GHD has completed a preliminary analysis of the existing WFF. Our preliminary findings indicate that there may be significant reliability and redundancy in the existing facility. These features are unmatched by any plant treating State Project Water and offer the District significant advantages in delivering this 16 MGD expansion. A few of our ideas for consideration to capitalize on some of these features, while maintaining overall reliability of the Plant, are described below.

Treatment Unit	Opportunity	Benefit	Additional Flow (MGD)	Detail
Preliminary Treatment	Excess capacity	Ability to treat additional flow	7.2 MGD	Plant was designed for extra 7.2 MGD
	Stress test to push more capacity	Treat more than the extra 7.2MGD	Additional 8.8 MGD	Achieve 30.4 MGD with existing facilities, if no significant impact on TOC removal
UV disinfection	Replace 6L24 with 4L24 reactors	Achieve target treatment capacity and reduce power consumption	16 MGD	Achieve target capacity of 30.4 MGD by simple reactor replacements
GAC adsorbers Currently treats1/3 flow ~ 5MGD	16 MGD	Achieve target capacity of	10 MGD	Change from series operation to parallel
New membrane filtration plant	30.4 MGD by simple reactor replacements	Significantly reduced Capital costs and simple operation	16 MGD	Install another 7 Trident filters

GHD is a global firm with a local team that is committed to successfully achieving the District's goals and acting as a seamless extension of your staff. We value our relationship with the District and believe that we are the right team for this project. It is our goal to exceed your expectations and we are fully dedicated to delivering the full suite of OE services to the District. GHD intends to adhere to the provisions described in this RFQ and certifies that the SOQ was prepared independently and was submitted without any collusion designed to limit competition or bidding. Thank you for the consideration and we look forward to serving your needs. Feel free to contact Jamal at 949.585.5235 or Jamal.Awad@ghd.com to answer any questions.

Sincerely,

GHD Inc.

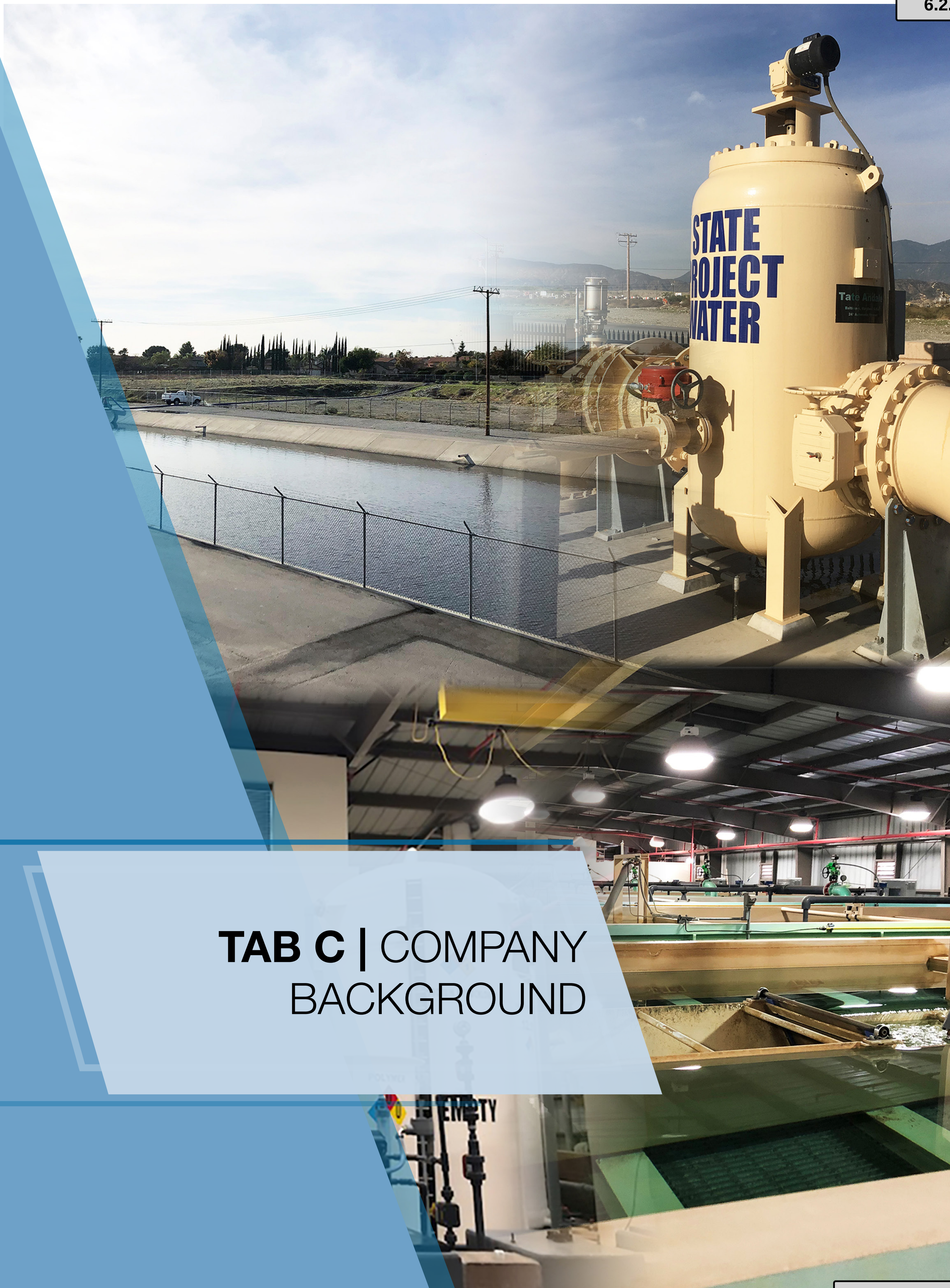
Jamal Awad

Jamal Awad, PhD, PE
Project Manager

Paul Hermann, CPEng
Principal/Vice President

TAB B | TABLE OF CONTENTS

B Table of Contents



TAB C | COMPANY BACKGROUND

C Company Background

GHD is at the forefront of the water industry, delivering sustainable water solutions across the globe. We assist water and wastewater utilities, City departments, and others who provide water services to optimize infrastructure and adapt to environmental changes in ways that balance the needs of our communities.

GHD California Office Locations

- Cameron Park
- Concord
- Emeryville
- Eureka
- Fresno
- Irvine
- Long Beach
- Los Angeles
- Moreno Valley
- Redding
- Roseville
- San Diego
- San Francisco
- San Jose
- San Luis Obispo
- Santa Rosa
- West Valley

About GHD

GHD is a leader in infrastructure engineering with more than 10,000 talented professionals and 200 offices worldwide. We have been a provider of multi-disciplined engineering services for over 90 years, through an internationally recognized network of engineers, environmental scientists, and other professionals who together provide high quality environmental and infrastructure engineering. Backed by over 4,000 staff in North America, we deliver complex infrastructure projects of all types, excelling in all forms of water and wastewater civil infrastructure, inclduing pipelines and treatment facilities.

GHD has a positive impact on all of the communities in which we live and work. GHD has had a local presence in Southern California since 1951, and has a long history of success working collaboratively with municipalities and agencies. GHD's Southern California offices currently include Moreno Valley, Los Angeles, Long Beach, Irvine, and San Diego, with a Pasadena office expected to be completed and open by mid 2020. We offer a local presence and a long history of success in the region.

GHD is at the forefront of the water industry, delivering sustainable water solutions across the globe. We assist water and wastewater utilities, City departments, and others who provide water services to optimize infrastructure and adapt to environmental changes in ways that balance the needs of our communities. Our water and wastewater engineering experience of more than 85 years in California includes the planning, required regulatory coordination and permitting, design and construction of water and wastewater projects. Our experienced team works with engineering and operations personnel as well as community stakeholders to understand each site-specific situation to minimize downtime and increase public acceptance.

REGISTERED COMPANY FOR
ISO 9001
ENGINEERING DESIGN

We are passionate about improving safety, enhancing mobility, and preparing a healthy environment for the community at large. The GHD Sustainability Policy provides strategic direction for how we integrate social, economic and environmental issues into core business practices. A member of the World Business Council for Sustainable Development, GHD operates under a Practice Quality Management System, ISO 9001:2015 and an Environmental. Management System, ISO 14001:2015 which are certified by Lloyds Register Quality Assurance.

Today, GHD is one of the world's top engineering firms and is recognized by ENR as the 10th largest pure design firm globally, and ranked **#25 on ENR's 2019 Top 500 Design Firms** list.

TAB D | PROJECT TEAM & ORGANIZATION

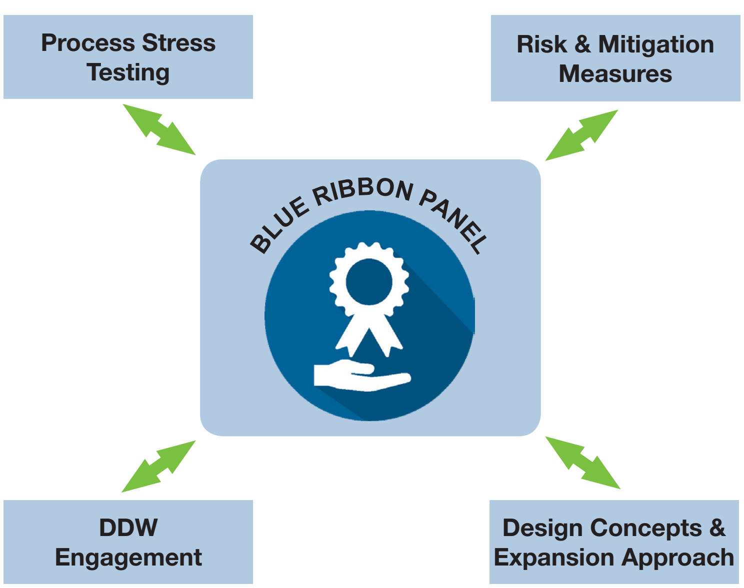
D Project Team & Organization

The Right Team

Our project team members have been carefully selected to meet the project requirements of experience and work approach to achieve the District's vision.

Our Project Manager, **Jamal Awad, PhD, PE,** will serve as the District's main point of contact. Jamal is uniquely qualified to serve in this role, as demonstrated by his current role as the **Deputy Project Manager/Technical Lead for the GRIP AWTF OE for the Water Replenishment District of Southern California (WRD).** Jamal led the preparation of the Design Criteria Report which established all the technical requirements for the proposed facilities with enough details for the PDB Entity to develop the guaranteed maximum price (GMP) for the project. The design requirements cover both the design and construction phases as well as the 4-year Transitional Operation Period to be performed by the DB Entity. He is also a technical matter expert in both the Trident Treatment System (the subject of his PhD Thesis) and UV disinfection (being a founding member of the International UV Association). Of note, Jamal permitted the first UV system for primary disinfection in California at Eastern Municipal Water District with the same UV reactor configuration to those at the Oliver P. Roemer Water Filtration Facility.

In support of Jamal will be our Project Advisor, **Hector Ruiz, PE,** who will bring technical insight from a client perspective, having been a **former Head of Engineering and General Manager at Trabuco Canyon Water District.** There will also be **Chris Hertle, MPhil,** the Blue Ribbon Panel Chair, who is **GHD's Global Market Lead for Water,** and has significant experience in delivering OE services and detailed knowledge of GHD's global technical resources.



Our Blue Ribbon Panel will benefit the District to assist in guiding the Project Team to maximize existing process capacities and establishing the most reliable and cost effective plan for the 16 MGD expansion.

The Blue Ribbon Panel will include the following key members:

1. Chris Hertle (Chair), MPhil – Adjunct Professor Advanced Water Mangment Center, University of Queensland; GHD Global Market Lead
2. Michael Chapman, CPEng - GHD Lead Water Treatment Expert
3. Sun Liang, PhD, PE - MWD of Southern California Water Purification Engineer
4. Bill Bellamy, PhD, PE - Adjunct Professor and Deputy Director of the Center of Excellence in Produce Water Management; University of Wyoming/Former CH2M HILL Water Treatment Expert
5. James Borchardt, PE – Stantec Water Treatment Expert and Contributor to MWH Water Treatment Principles and Design (3rd Edition)
6. Rhodes Trussell, PhD, PE – Co-Author of MWH Water Treatment Principles and Design (3rd Edition)
7. Jim Vickers, PE – Membranes Expert and President of SPI

These Panel members are lead water treatment experts with significant knowledge in treating State Project Water. Their early Project guidance will be invaluable in setting a solid foundation for the Project success. The composition of the Panel can be easily expanded based on Project's needs and further discussions with the District.

The biography summaries of key team members provided on the following pages highlight the multi-disciplined professionals within our project team and identify the project role and responsibilities assigned to them. Each individual on our team was selected based on their capability and experience in achieving success on similar projects.

Detailed resumes for all team members are included in **Appendix 1.**

Our organizational chart on the following page identifies each member of our team structure.

West Valley Water District

Blue Ribbon Panel

Chris Hertle, MPhil - *Chair*
Mike Chapman
Sun Liang, PhD, PE[7] - *MWD Water Purification Engineer*
James Borchardt, PE[9]
Bill Bellamy, PhD, PE[2]
R. Rhodes Trussell, PhD, PE, BCEE, NAE[10]
Jim Vickers, PE[8] – *Membranes*

Project Manager

Jamal Awad, PhD, PE

Project Advisors

Hector Ruiz, PE

Project Services

Permitting/Regulatory Compliance

John Robinson[4] – *Lead/CEQA/ Environmental Documentation*
Jamal Awad, PhD, PE – *DDW Coordination*
Emily Owens-Bennett, PE, BCEE[10] – *DDW Coordination*
Homayoun (Omar) Moghaddam, PE, CPP

Treatment Evaluations & 30% Design Documentation

Mark Donovan, PE – *Process Lead*
Leila Munla, PhD – *Membranes*
Mark Waer, PhD – *Process & GAC*
Jamal Awad, PhD, PE – *UV & Trident*
Charles Cruz, PE[8] – *Membranes*
Casey Raines, PE – *Pipeline / Infrastructure*
Mike Chapman – *Conventional Treatment*

Design-Build Services

Paul Hermann, CPEng – *Lead*
Sridhar (Sri) Sadasivan, PE, SE – *Contract Documents*
Duncan Findlay, JD – *Legal*
Mike Fried – *Cost Estimating*
Kevin Tirado, PE – *Constructability Review*
Kirill Dolinskiy, PMP[5] – *Document/ Schedule Control*

Construction Observation Services

Jason Mate,CMAA, CPII[6] – *Lead / Resident Engineer*
Ed Macias[6] – *Electrical and I&C*
Mark Waer, PhD– *Process Support*
Kevin Tirado, PE – *Startup and O&M*
Ryan Kistensen, PE – *Resident Engineer Mechanical*

Optional Tasks

Roop Lutchman, PEng, PMP – *Asset Management*
Matt Winkelman, PE - *Digital Integration*
Jamal Awad, PhD, PE - *Process Capasity Demonstration Testing*
John Kennedy, PE[10] - *Process Capasity Demonstration Testing / Pilot Testing*
Leila Munla, PhD - *Pilot Testing*

Technical Resources

Samir Hijazi, Assoc. AIA[1] – *Architectural*
Jeff Knauer, PE, ME, NACE CP Specialist – *Corrosion/Material*
Larry Tortuya, PE – *Stormwater*
Nathan Towlerton, PE, QSD/QSP – *WQ Management Plan*
Chris Richards, PE – *Telemetry*

Erel Betser, PE – *Fire Protection*
James Taylor – *Safety/HIS*
Devin Brady – *CAD/BIMM*
Andrew Peek – *Durability/Corrosion*
John McLaughlin, PE – *Security*
Nick Alvaro – *Drone Survey*
Mehdi Mardi, PE - *Electrical and I&C*

Francisco Andrade, SE, PE - *Structural*
Hashmi Quazi, PhD, GE[3] - *Geotechnical*
Jonathan Linkus, AICP, LEED AP – *LEED*
Ulysses Fandino, PE – *Plant Piping*

Sub Key		
1 ARCHISSANCE	5 KRD Management Consulting, LLC	9 Stantec
2 Bellamy and Sons, LLC	6 MNS	10 Trussell Technologies, Inc.
3 Converse Consultants	7 MWD of Southern California*	
4 John Robinson, LLC	8 SPI	

** MWD of Southern California's participation to the Project will be non-chargeable.*

Subconsultants

Each subconsultant was selected to increase the benefits to this contract and to enhance its successful delivery both within budget and on schedule. GHD has a successful teaming track record with each of the subconsultants listed below.

ARCHISSANCE | ARCHISSANCE is a multi-disciplined design firm offering a wide range of architectural, engineering, interiors, and project management services. Their staff includes licensed architects, professional engineers, interior architects, computer-aided designers, and project managers. The firm has worked closely with GHD on a number of water/wastewater related projects such as the Anaheim Lenain WTP and Water Replenishment District of Southern California GRIP AWTF

Bellamy and Sons, LLC | William Bellamy is an adjunct Professor of Practice and Deputy Director of the Center of Excellence in Produce Water Management at the University of Wyoming. William spent 40 years with organizations such as CH2M Hill, Texaco Inc., US Army Environmental Hygiene Agency, US EPA, and adjunct positions at the Colorado State University and University of Colorado. He has been responsible for the assessment, development, and application of new water, wastewater, and reuse technologies. He specializes in research and application of sustainability principles as applied to proven and developing technologies for industrial, government, and municipal clients throughout the globe. Most recently, he has been involved in assisting with the development of solar and conventional desalination, water purification, advanced biological systems, and unique alternative energy use and energy storage.

Converse Consultants | In 1946, Professor Frederick J. Converse established Converse Consultants (Converse) in Pasadena, California to provide the construction industry with geotechnical engineering and geological services. Converse is an employee-owned corporation, with 9 offices and more than 150 employees throughout the United States – California (Monrovia, Redlands, Costa Mesa, Palm Desert and Palmdale), Nevada (Las Vegas, Reno, and Elko), and Pennsylvania.

John Robinson, LLC | John Robinson Consulting, Inc. is a general consulting firm offering a range of services including a Small Business Enterprise (SBE) certification. We are a small firm with big experience. John Robinson has over 25 years of consulting and management experience in the private sector for cities, ports, special districts, water districts, wastewater clients and industrial clients.

KRD Management Consulting, LLC | KRD Management Consulting, LLC provids clients with program and project management, scheduling, cost estimating, reporting, data management, earned value management, construction management services for engineering and construction project and programs. In addition to servicing local clients in South California (San Diego Metro Area, Los Angeles Metro Area, Inland Empire), KRD Management Consulting staff service clients throughout continental United States.

MNS Engineers, Inc. | Established in 1962 as a C-Corporation, MNS Engineers, Inc. (MNS) provides quality infrastructure consulting services to the water resources, transportation, and government service markets throughout California. Specializing in the core services of construction management, civil engineering, and land surveying, MNS' reputation has been built on clear and direct communication and quality services.

Separation Processes Inc. | SPI is an SBE firm providing development and application of membranes and advanced processes for municipal and industrial water and wastewater treatment. SPI has provided engineering services for over 20 membrane bioreactor systems and continues to refine the procurement and design process to adapt to the changes in the MBR marketplace. SPI is in a unique position to help with the membrane system prescreening and pre-selection of a membrane system supplier and can refine the process to ensure the District gets the best value for the membrane equipment, which is one of the single most expensive systems on a project.

Stantec | Stantec started in 1954 as a one-person firm, and today, the Stantec community unites approximately 22,000 employees working in over 400 locations across 6 continents. They are designers, engineers, scientists, and project managers, innovating together at the intersection of community, creativity, and client relationships. Trussell Technologies | Trussell Technologies is an environmental engineering firm passionate about developing the best process and water quality solutions. They provide safe and sustainable solutions in water, wastewater, reuse, and desalination for clients and partners and take projects from concept through implementation using past experience, applied research and treatability expertise, proven regulatory insight, cutting-edge treatment system design, and real-world operational knowledge.

Trussell Technologies | Trussell Technologies is an environmental engineering firm passionate about developing the best process and water quality solutions. They provide safe and sustainable solutions in water, wastewater, reuse, and desalination for clients and partners and take projects from concept through implementation using past experience, applied research and treatability expertise, proven regulatory insight, cutting-edge treatment system design, and real-world operational knowledge.

949.585.5235
Jamal.Awad@ghd.com
Irvine, CA

Jamal Awad, PhD, PE | Project Manager

Jamal has over 30 years of extensive experience in water quality, water and wastewater treatment planning, and engineering. He is sought after nationally to support creative implementation of engineering solutions and innovative technologies assessments. Currently, Jamal is the Deputy OE/Technical Lead for the $115M WRD GRIP AWTF PDB project and has also managed the delivery of the Formatting of the IEUA Front-End Contract Documents and IEUA Engineering Design Guidelines Project which had significant stakeholders' involvement and multiple Workshops to establish IEUA design preferences. In addition to conventional water treatment experience, Jamal is a subject matter expert in both the Trident and Trojan UV treatment systems.

30 Years Experience

Professional Engineer: California, Wisconsin, Illinois, Texas, Arizona
CA # C50719

PhD, Environmental Engineering, Marquette University; MS, Civil and Environmental Engineering, UW-Madison; BS, Civil Engineering, Louisiana Tech University

949.585.5256
Hector.Ruiz@ghd.com
Irvine, CA

Hector Ruiz, PE | Project Advisor

Hector has more than 25 years' experience in water/wastewater engineering, including the oversight and management of water resources and supplies for a water district. As former Head of Engineering and General Manager of Trabuco Canyon Water District, Hector brings the experience of having worked for many years with water and wastewater operators and maintenance technicians in effectively planning and managing the rehabilitation, upgrade, and replacement of an agency's assets, and as such, understands the importance of effective project delivery from an owner's perspective. Hector's experience includes life cycle cost analysis, design, and operation of conventional surface water treatment systems similar to West Valley Water District's Oliver P Roemer WTP, facilities and newer membrane treatment systems for surface water treatment.

25+ Years Experience

Master of Science, Civil and Environmental Engineering and Science, Stanford

University; Bachelor of Science, Civil Engineering, California State Polytechnic University, Pomona

949.585.5270
Chris.Hertle@ghd.com
Irvine, CA

Chris Hertle, CPEng, BE, MPhil | Blue Ribbon Panel

Chris is a Chemical Engineer with over 35 years' experience in municipal and industrial water and wastewater management. This has covered investigations, pilot plants, design, specification, tendering, installation, commissioning and operations. He has particular interest in the cost effective resource recovery from wastewater. Chris has been involved in the process design of a number of water treatment and water recycling facilities involving the use of micro and ultra-filtration and reverse osmosis. He has presented many papers at national and international forums His extensive experience in delivering OE services will be a significant benefit to the District.

35 Years Experience

Bachelor of Engineering, Chemical (Hons), Master of Philosophy, Environmental and Biological Sciences, Adjunct Professor – Advanced Water Management Centre - University of Queensland

949.585.5251
Mark.Donovan@ghd.com
Irvine, CA

Mark Donovan, PE | Treatment Evaluation & 30% Design Documentation and Process Lead

Mark is a Senior Process Engineer with over 20 years of experience in membrane-based water treatment system process design. He has provided full scale system design, operations support, and treatment process improvement/ optimization services to municipal and industrial membrane water treatment facilities worldwide. Mark has also worked closely with CA Division of Drinking Water engineers to exchange ideas and achieve the ultimate goal of protecting public health while maintaining practical treatment plant design and operational considerations. Mark aslo brings significant membrane manufacturing experience valuable during the membrane selection.

20+ Years Experience

CA#CH6292

MS, Engineering (Chemical), California State University, Long Beach, California,

BS, Chemical Engineering, University of New Hampshire, Durham, New Hampshire

626.375.9389
jrobinson@
johnrobinsonconsulting.
com
Pasadena, CA

John Robinson | Permitting & Regulatory Compliance Lead *(John Robinson, LLC)*

John's over 25 years of environmental engineering experience has focused exclusively on water reclamation, wastewater engineering, and wastewater master plan projects for municipalities in California and Arizona. He has been the Principal-in-Charge or Project Manager for infrastructure projects that include feasibility/master studies and planning, preliminary and final design, bidding, construction management and commissioning. His project experience includes 15 new water reclamation and wastewater facilities, 4 groundwater treatment projects, 300 miles of sewer, potable water and recycled water pipeline designs, 15 pump stations, 12 groundwater wells and 10 reservoirs and 45 master plans for water, sewer and recycled water. He has also served as both a principal in charge as well as program manager for approximately fifty (50) environmental documentation projects.

25 Years Experience

Engineer in Training - CA

BS, Civil Engineering, California State University, Long Beach

949.585.5217
Paul.Hermann@ghd.com
Irvine, CA

Paul Hermann, CPEng | Design-Build Services Lead

Paul is a lead water/wastewater engineer in GHD's Irvine Water Division, with extensive design and construction experience in water/wastewater infrastructure, including large conveyance pipelines, pumping stations and treatment facilities. He has been a design lead engineer for wastewater treatment plant projects that required augmentation and upgrading; with tasks ranging from hydraulic optimizations and design, to equipment replacement and refurbishment. This has involved treatment facilities, inlet works, pre-treatment, pump stations, contact tanks, and drying beds. Paul is currently the OE/Project Manager for the $115M WRD GRIP AWTF PDB project and the OE Teams Technical Lead on the City of Santa Monica's Arcadia WTP Expansion PDB project.

20 Years Experience

CPEng; RPEQ 09419

Bachelor of Engineering – Civil, Environmental, Queensland University of Technology, Australia

858.633.4814
Sridhar.Sadasivan@ghd.
com
Moreno Valley, CA

Sridhar Sadasivan, PE, SE | Design-Build Services - Contract Documents

Backed by over 15 years of hands-on experience in design and construction of facilities for environmental projects, Sridhar has been involved in planning, design, and construction of reservoirs, treatment plants, pipelines, pumping stations, and other facilities Delivery methods have included alternate delivery processes, as well as design-bid-build and roles have included Project Manager, Design Manager, Lead Civil Engineer, and Lead Structural Engineer. Sri has provided construction support and inspection services for several infrastructure projects, including resident engineering services for water infrastructure projects.

16 Years Experience

Professional Civil Engineer: CA #73525
Professional Structural Engineer: CA #6039

MS, Structural Engineering, University of Cincinnati

BS, Civil/Environmental Engineering, University of Bombay, India

805.722.0059
jmate@mnsengineers.com
Westlake Village, CA

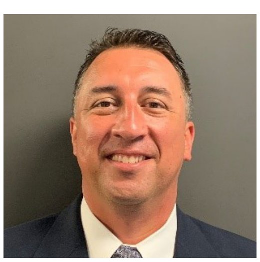
Jason Mate, CMAA, CPII | Construction Observation Services Lead / Resident Engineer *(MNS)*

Jason has more than 12 years of experience in environmental and civil engineering. Jason's roles have ranged from project engineer, resident engineer, to project manager for several large-scale $500M+ projects involving water/wastewater resources, transportation, and solar energy. Jason has worked directly with GHD for the last few years on the GRIP project, in his role as Resident Engineer.

12 Years Experience

Certified Construction Manager, CMAA; Certified Public Infrastructure Inspector, APWA

BEng, Environmental Engineering, minor in Civil Engineering (Honors), Griffith University, Queensland, Australia



1.562.206.7990
Kevin.Tirado@ghd.com
Long Beach,CA

Kevin Tirado, PE | Design-Build Constructability Review

Kevin is committed to streamlining processes and procedures to ensure maximum cost-effectiveness and efficiency. Dedicated professional who builds lasting, productive relationships with leaders of public organizations, private entities, and stakeholders. Technically skilled leader who brings a depth of engineering knowledge to complex business challenges and communicates effectively with "white collar" leadership and "blue collar" teams. Motivational coach and mentor who empowers employees to outperform expectations. Kevin has accepted a position with GHD effective January 27.

28 Years Experience

CA Civil #C72958

BSCE - University of California, Davis

Committed GHD Team

All team members are available immediately and for the duration of the project. GHD is committed to meeting our proposed project schedule and all milestones. The key individuals listed and identified will be performing the work and will not be substituted with other personnel or reassigned to another project without the District's prior approval.

Team Member	Role	% Dedicated to Current Workload	% Available to 16 MGD Oliver P. Roemer Water Filtration Facility Expansion Project
GHD			
Jamal Awad, PhD, PE	Project Manager	40%	60%
Hector Ruiz, PE	Project Advisor	60%	40%
Chris Hertle, Mphil	Blue Ribbon Panel	75%	25%
Mark Donovan, PE	Treatment Evaluations & 30% Design Documentation - Process Lead	50%	50%
Paul Hermann, CPEng	Design-Build Services Lead	50%	20%
Sridhar (Sri) Sadasiva, PE, SE	Design-Build Services - Contract Documents	10%	10%
Kevin Tirado, PE	Design-Build Services - Constructability Review / Construction Observation Services - Startup & OM	10%	90%
Subconsultants			
Samir Hijazi (ARCHISSANCE)	Technical Services - Architectural	50%	50%
Bill Bellamy (Bellamy and Sons, LLC)	Blue Ribbon Panel	40%	60%
Hashmi Quazi, PhD, GE (Converse Consultants)	Geotechnical	50%	50%
John Robinson (John Robinson, LLC)	Permitting/Regulatory Compliance Lead / CEQA/Environmental Documentation	40%	60%
Kirill Dolinskiy, PMP (KRD Management Consulting, LLC)	Design-Build Services - Document/ Schedule Control	60%	40%
Jason Mate, CMAA, CPII (MNS)	Construction Observation Services - Lead/ Resident Engineer	20%	80%
Ed Macias (MNS)	Construction Observation Services - Electrical and I&C	70%	30%
Jim Vickers, PE (SPI)	Treatment Evaluations & 30% Design Documentation - Membranes	70%	30%
Charles Cruz, PE (SPI)	Treatment Evaluations & 30% Design Documentation - Membranes	50%	50%
James Borchardt (Stantec)	Blue Ribbon Panel	70%	30%
R. Rhodes Trussell, PhD, PE, BCEE, NAE (Trussell Technologies, Inc.)	Blue Ribbon Panel	70%	30%
Emily Owens-Bennett, PE, BCEE (Trussell Technologies, Inc.)	Regulatory Compliance - DDW Coordination	60%	40%
John Kennedy, PE (Trussell Technologies, Inc.)	Optional Tasks - Process Capasity Demonstration Testing / Pilot Testing	50%	50%

TAB E | EXPERIENCE & RECORD OF PAST PERFORMANCE

Tab E

E Experience & Record of Past Performance

> Through our "One GHD" concept, we are able to draw on expertise from our 10,000+ employees from around the world. Our size, coupled with our global connectivity brings unique value to the District by providing the right people with the right experience; throughout the life of the project.

The GHD Team Features Unparalleled Local OE Experience

GHD is helping clients deliver some of the most significant water system projects in the world. The following projects represent our relevant, recent experience in applying our team's technical expertise to water treatment projects locally in California. This experience will provide the District with a comprehensive and thorough project based on our established processes and lessons learned over time.

Our project team members have been carefully selected to meet the project requirements for experience and work approach to achieve the District's vision. Our OE Services Manager, ***Jamal Awad,*** will serve as the District's main point of contact. ***Jamal is uniquely qualified*** to serve in this role, as demonstrated by his current role as the Deputy Project Manager/Technical Lead for the $115M GRIP AWTF OE for the Water Replenishment District of Southern California (WRD). Jamal led the preparation of the Design Criteria Report which established all the technical requirements for the proposed facilities with enough details for the PDB Entity to develop the guaranteed maximum price (GMP) for the project. The design requirements cover both the design/construction and the 4-year Transitional Operation Period to be performed by the DB Entity. Many of the project team members had significant roles on the GRIP AWTF OE Project as well.

Because the 16 MGD expansion of the District's WFF include significant existing process capacity determination, process selection (Trident versus membranes), and DDW engagement, ***we have assembled a Blue Ribbon Panel of leading experts in all relevant areas for State Water Project water treatment for the benefits of the District. The experience of the Panel members is unmatched by any other team in Southern California.*** Our approach includes meaningful workshops with the District staff and the Panel members early in Project implementation in order to maximize such benefits. The District will have the flexibility to add specialty skills to the GHD Team.

As OE's on previously successful projects, one of GHD's first tasks is to work with Owner's staff and Legal Counsel to develop key project milestones with specific budgets. These milestones typically include the following:

- Process Evaluation and Selection
- DDW Engagement and Permitting Plan
- Environmental Documentation
- Project Schedule
- Expression of Interest Documentation
- Statement of Qualifications Documentation
- Design Criteria Report Development
- Concept and / or Preliminary Design
- Project Specific GMP Guidelines
- RFP Documentation
- Design-Build Entity Selection Criteria and Guidelines
- Contract Language Development and Support

Once these milestones are complete, they provide the ground rules for the entire program and essentially serve as the roadmap.

Many of the GHD's Team members and the Blue Ribbon Panel are local and reside within 60 miles from the District offices and WFF, with the Irvine office having the majority. This physical proximity allows for maximum team interactions and provides considerable accessibility to the District staff.

We have included an Experience Matrix table with project attributes relevant to those required for the District's 16 MGD WFF Expansion Project. The table is followed by project experience sheets for more in-depth descriptions specific reference projects for the District's consideration.

Experience Matrix

The GHD team has unmatched OE experience in southern California in the planning, execution, and delivery of both large and small scale water treatment plants and associated infrastructure.

Projects	Project Management - OE and/or Detailed Design	Progressive Design-Build / Alternative Delivery Project	GMP Development	UV Process Design	Surface Water & Groundwater Process Treatment Design	Permitting (City, other stakeholder, etc)	Regulatory Assistance (DDW, etc)	Project Funding	Environmental Documentation Support	Engineering Design Requirements	Contract Documents/ Legal Support	Schedule Control	Constructability Reviews	Construction Cost Estimates	Technical Reviews / Support - All Engineering Disciplines	Construction Management	Pilot Testing	Risk Register and Development	Asset Management	Startup & Commissioning
OE for GRIP AWTF, Water Replenishment District of Southern California	●	PDB	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
OE for Doheny Desalination Project, South Coast Water District	●	ADP			●	●	●	●	●	●		●		●			●	●		
OE for Carlsbad Ocean Water Desalination Plant, Poseidon Resources	●	ADP	●			●	●		●				●	●	●	●	●	●	●	●
On-Call Engineering Services, Inland Empire Utilities Agency	●				●					●	●				●				●	
OE for Olympic Well Field Restoration and Arcadia Water Treatment Plant Expansion, City of Santa Monica	●	PDB	●	●	●	●	●		●	●	●		●		●		●	●	●	●
Lenain WTP Master Plan & Rehabilitation and Expansion, City of Anaheim	●				●	●	●		●			●	●	●	●	●	●		●	●
DB for Otay Water Treatment Plant, Orion Construction	●	ADP			●	●	●					●	●	●	●					●
Reverse Osmosis Water Treatment Plant Rehabilitation, City of Beverly Hills	●				●	●					●		●	●	●	●				
OE for Huntington Beach Seawater Desalination, Poseidon Resources	●	ADP	●		●	●	●		●				●	●				●		
Carbon Canyon Water Reclamation Plant, Inland Empire Utilities Agency	●				●							●		●	●					
Sustainable Water Infrastructure Project (SWIP) AWTF, City of Santa Monica (SPI Project)		PDB			●										●					
Vista Canyon Water Factory, City of Santa Clarita (MNS Project)						●						●	●	●		●				●
Pure Water Monterey Project, Monterey One Water (Trussell Technology Project)	●			●		●	●		●	●		●		●	●		●			●
Santa Cruz, Graham Hill Water Treatment Plant (Trussell Technology Project)					●		●			●				●	●		●			●

OE for Groundwater Reliability Improvement Program Advanced Water Treatment Plant, Water Replenishment District of Southern California

Pico Rivera, CA

Role
Prime since June 2015

Client
Water Replenishment District of Southern California
4040 Paramount Blvd, Lakewood, CA 90712

Reference
Robb Whitaker, PE
General Manager
562 921 5521
rwhitaker@wrd.org

Project Budget
Projected: $110M
As-Completed: $115M

Project Schedule Milestones
Office Co-Location
RFI
Design Criteria Report
SOQ
RFP
DB Entity Selection
GMP
Contract Negotiation
DDW Engineering Report
3rd Party Coordination (SCE; Water Board Permits)

All milestones were scoped with WRD and were completed on schedule and within budget.

Team Members
Jamal A, Mark D, Paul H, Jason M, Roop L, Leila M, Mark W, Casey R, Samir H, Andrew P, Mehdi M, Francisco A

Relevance
- Progressive Design-Build Contract Delivery Method
- Design Criteria & GMP Development MF, RO, UVAOP Process
- Onsite Groundwater Injection & Monitoring Wells
- Permit Coordination & Title 22 Engineering Report
- Constructability & Operations Reviews

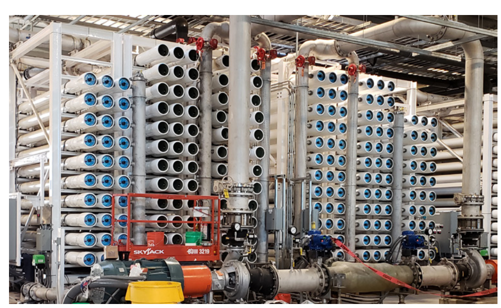
GHD, led by Paul Hermann, with Deputy assistance from Jamal, is currently serving as the OE for the Water Replenishment District of Southern California's (WRD's) GRIP Advanced Water Treatment Facility (AWTF) and has served in this capacity for the past 4+ years. The AWTF, with an initial capacity of 13 MGD and an ultimate capacity of approximately 25 MGD, will treat tertiary effluent from the LACSD using ultrafiltration (UF) and reverse osmosis (RO) followed by ultraviolet advanced oxidation (UVAOP). Effluent from the AWTF will be used for groundwater recharge of local drinking water supply. The plant is now online achieving a significant milestone for WRD's water independence from imported water. The project is being delivered via PDB contract delivery, with a construction value of $115 million. GHD is currently providing construction close out and transitional operations period assistance.

The GRIP UVAOP utilizes chlorine as an oxidant to significantly simplify operations and reduce cost.

As the OE for the project, GHD prepared all contractual and engineering documents for the selection of the Design-Build (DB) Entity. The engineering documents established the technical and design requirements with enough details for the DB Entity to develop a guaranteed maximum price (GMP) for the proposed project. The design requirements cover both the design/construction and 4-year Transition Operation Period (2 year minimum). The Design Criteria also incorporated the requirements of the District's SCADA Master Plan and the Enterprise Asset Management Master Plan, which was also completed by GHD. These requirements bring significant uniformity and consistency across various District's assets and design and operation of future facilities.

Other **innovative** aspects of this project delivery include:

- A collaborative process to select the DB Entity, during which the shortlisted DBEs submitted preliminary proposals and indicative cost estimates and then participated in several workshops with WRD to refine and enhance their approach. This PDB approach and structure was orchestrated and implemented by the GHD led OE team.
- An architectural design competition that allowed WRD Board and project stakeholders to select the theme for the proposed facility
- The use of innovative "Open-Platform" MF/UF Systems to give the owner greater options for membrane selection in the future and the implementation of a 3rd Stage RO System to maximize plant recovery while allowing for operational flexibility.



OE for Doheny Desalination Project, South Coast Water District

Dana Point, CA

Role
Prime since October 2015

Client
South Coast Water District
31592 West St, Laguna Beach, CA 92651

Reference
Rick Shintaku,
General Manager
949 499 4555
rshintaku@scwd.org

Project Budget
Projected: $100M
As-Completed: ~$100M

Project Schedule Milestones
Preliminary Design Report
EIR Engineering Support
Successful Grant Funding Support
Water Quality in Distribution System

All milestones were scoped with SCWD and were completed on schedule and within budget.

Team Members
Mark D, Paul H, Jamal A, Hector R, Mark W, Casey R

Relevance
- System Integration Considerations
- Cost Estimating
- Project Delivery Analysis/ Value for Money Analysis
- Subsurface Geological Investigations and Water Quality Analysis
- Technical Support for All Engineering Disciplines
- Environmental Documentation Preparation & Assistance
- Preliminary Design
- Permitting Identification & Development

GHD, led by Mark Donovan, is currently the OE/Program Manager for South Coast Water District for this 5 -15 MGD ocean desalination project. This ocean desalination project will utilize the California Ocean Plan preferred technologies of a slant well subsurface intake system as well as comingling of RO concentrate with a nearby wastewater ocean outfall for brine disposal. GHD's OE role during this current planning stage of the project includes preparation of the Preliminary Design Report and Project Cost Estimate (including all process elements), site layout and architectural renderings, managing and preparing the Environmental Impact Report and numerous supporting technical studies, and managing the Permitting process. GHD is also leading ongoing discussions with Local and State regulators regarding Ocean Plan Compliance and mitigation requirements, as well as working on local permit requirements.

GHD also provided an evaluation of Project Delivery Methods for the project including development of the project financial model, project risk register and Value for Money Analysis, with several public Board Workshops dedicated to this topic. GHD team members Paul Hermann and Tyler Abercrombie were key contributors to this effort.

Once the project moves into the execution phase, GHD's tasks will include the following:

- Prepare bid documents
- Evaluate all DB/EPC teams
- Perform Construction Management and OE duties through start up and operation
- Assist the District in executing all contracts (up to 3 depending on final risk assessment & Board outcomes {intake wells, conveyance pipeline, plant and discharge pipeline})

As Owner's Engineer, GHD is working with the District to determine the best Alternative Project Delivery model to meet project goals.

Role
Prime since October 2008

Client
Poseidon Water
5780 Fleet Street, Suite 140, Carlsbad, CA 92008

Reference
Patrick Crain,
Project Manager
760 889 2975
pcrain@poseidonwater.com

Project Budget
Projected: $1B
As-Completed: $1B

Project Schedule Milestones
Design Criteria Development
Design Submittal Reviews
EPC Proposal Review
EPC Scope and Fee Review
Startup/Commissioning Support
3rd Party Coordination (DDW, SDG&E, NRG)

All milestones were scoped with Poseidon and were completed on schedule and within budget.

Team Members
Paul H, Mark D, Andrew P, Mark W, Casey R, Mehdi M, Francisco A

Relevance
- Design and Cost Estimating
- Pilot Plant Operation
- Project Delivery Evaluation and Risk Management
- Asset Management
- Construction Management
- Regulatory Compliance Works, including DDW
- Environmental Impact Report and Permitting
- Process Design Reviews
- Risk Register
- Technical Support for All Engineering Disciplines

OE for Carlsbad Ocean Desalination Plant, Poseidon Water

Carlsbad, CA

GHD in collaboration with Butier Engineering Inc. were selected by Poseidon Water to provide OE services for the development, construction and commissioning of the 50 MGD Carlsbad Seawater RO Desalination Plant. Poseidon selected the OE team based on a combination of their technical capabilities and past experience in regard to large scale seawater desalination and extensive knowledge of the southern California water infrastructure market.

Early project development work by GHD included evaluation of project cost estimates, evaluation of project risks, and Value Engineering for project optimization.

During the construction phase, GHD provided general oversight and independent assessment of the performance of the Engineering Procurement Construction (EPC) Contractor relative to the contract documents. GHD team members Paul Hermann, Mark Donovan, and Tyler Abercrombie were instrumental in the various phases of this project, including project delivery and risk management, contract development, and execution of this project.

The project was successfully completed in 2015 and the Plant now provides approximately 8% of the water demand for San Diego County. It has become the first large scale desalination plant on the West Coast of the United States. GHD continues to provide an array of ongoing services to Poseidon and SDCWA on this project, including compliance with California Ocean Plan for the new wedgewire screen intake system under development, operations troubleshooting, and CMMS Audit assistance.

GHD Project Team's scope included:

- Early project development works including financial assessment, project delivery optimization, risk management, and contract negotiations
- Technical input to Environmental Impact Report and Environmental Permitting
- Technical works on both the Plant and Conveyance Pipeline
- Desalination facility layout refinement and Value Engineering/Cost Estimating
- Cost model and procurement works
- Process design reviews and extensive approval works with California DDW
- Materials/durability/asset life assistance and compliance reviews
- Pre-treatment pilot testing focused on algal blooms
- Design verifications and Commissioning works
- System integration with other projects/contracts and stakeholder facilities

Role
Prime since August 2018

Client
Inland Empire Utilities Agency

Reference
Jerry L. Burke
Manager of Engineering
(909) 993-1548
jburke@ieua.org

Project Budget
Projected: $670k
As-Completed: $670k to date

Project Schedule Milestones
Each Task Order has its own scope and schedule to complete. All milestones for each Task Order were scoped with IEUA and were completed on schedule and within budget.

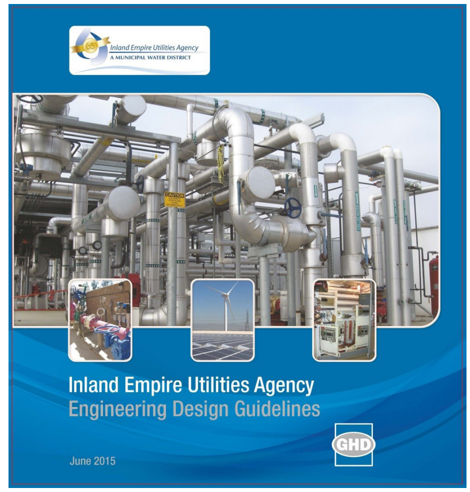
Team Members
Jamal A, Ryan K, Roop L, Hector R, Casey R, Mehdi M, Francisco A, Duncan F, Mike Fried, Leila M

Relevance
- Plant Rehabilitation
- Condition Assessment
- Asset Management
- Collection Systems
- Condition Assessment
- Contract Documents
- Engineering Design Guidelines
- Owner Engineering Services

On-Call Engineering Services

Chino, CA

GHD, led by Jamal Awad as the contract manager, is providing engineering services in support of IEUA's water and wastewater programs on an On-Call basis for a three year period. GHD is performing the task orders in accordance with IEUA's Engineering Design Guidelines, which were also created by GHD. The scope of the task orders encompasses the preparation of design, plans, specifications, cost estimates, and contract documents for capital projects including electrical/instrumentation, process controls, structural design, sewer improvements, water & recycled water improvements and wastewater improvements, constructability reviews, as well as Asset Management. Example task orders performed or being performed under this contract include:



- Technical review of valve submittal for specification compliance (Completed)
- Asset Management Gap Analysis for IEUA (Ongoing)
- Training of IEUA Project Managers on Engineering Design Guidelines and updated Front End Documents (Ongoing)
- Specialty inspections of sewer constructions and CCTV reviews (Ongoing)
- Collection System Asset Management program management support (Ongoing)
- IEUA Engineering Standard Details development (Ongoing)
- Development of asset management specification and spare parts strategy for RP-5 Liquid Treatment System Expansion and RP-5 Solids Treatment Facility Design Services (Ongoing)
- RP-1 modifications to hypochlorite feed facilities (Ongoing)

Much of the services being delivered under this Contract are being delivered in a fashion similar to OE Services and extensions of IEUA staff. Cost and schedule controls, invoicing and status reporting are being performed on each task order for tracking and QA/QC purposes.

Role
Prime since July 2019

Client
City of Santa Monica

Reference
Sunny Wang
Water Resources Manager
310.458.8230
sunny.wang@smgov.net

Project Budget
Projected: TBD; Still in GMP Negotiation
As-Completed: $TBD

Project Schedule Milestones
Environmental Documentation Support
Selection of DBE
Durability and Asset Life Requirements
Project Schedule Development

All milestones were scoped with City and were completed on schedule and within budget.

Team Members
Paul H, Mark D, Jamal A, Mark W, Ryan K

Relevance
- Progressive Design-Build Contract Delivery Method
- Risk Register
- Environmental Permitting Assistance

OE for the Olympic Well Field Restoration and Arcadia Water Treatment Plant Expansion

Santa Monica, CA

The City of Santa Monica intends to become water self-sufficient by 2023 through a combination of demand reduction, water conservation and efficiency programs, and the addition of local water supplies as outlined in the City's Sustainable Water Master Plan (SWMP). The SWMP includes the following key components to achieve water self-sufficiency. Component 1 – Continuing and increasing water conservation efforts to permanently reduce water demand (approximately 3,100 acre-feet per year [AFY] in water demand reduction); Component 2 – Develop sustainable and drought resilient alternative water supplies (approximately 2,860 AFY); Component 3 – Expand local groundwater production within sustainable yield limits (approximately 2,100 AFY). GHD is currently serving as OE focusing on components 2 and 3 for the Olympic Well Field AWTF and Arcadia WTP Expansion project which includes: Upgrade and Expansion of the Arcadia WTP; Restore Olympic Well Field; Construct a new dedicated Olympic Well Field pipeline; Construct a new AWTF for Olympic Well Field flows; and Construct two new Groundwater Injection Wells in the Olympic Well Field.

As OE for this PDB project, GHD is representing the Owner on all technical issues throughout the design process, reviewing all documents pertaining to design and construction, and coordinating other contracts to ensure that all projects operate in a seamless way.

To date, while still very early in the project, GHD has undertaken the following tasks:

- Assisted GMP language and negotiation assistance and PDB contract approach guidance
- Provided durability plan/asset life design criteria
- Analyzing technical viability of incorporating ROTEC and desalitech proprietary systems.
- Engineering assistance to the City's environmental subconsultant for all relevant environmental permits.
- City of CA permit assistance (plant is City of CA, not City of Santa Monica)

We have included additional project experience showing our capabilities in providing detailed design services for drinking water treatment plants. Our thorough understanding of the design and construction phases will greatly benefit the District when providing OE services.

Lenain WTP Master Plan & Expansion

Anaheim, CA

GHD developed a comprehensive Facility Master Plan and detailed design including cost and schedule for the replacement and rehabilitation (R & R) of facilities as well as expansion of the Lenain Water Treatment Plant (LWTP) from 15 to 20 MGD. Planned improvements originally proposed under the Facility Master Plan were designed by GHD and included upgrades related to regulatory compliance, safety and security, water quality, plant reliability and plant expansion. GHD has also established and implemented the Asset Management framework at the LWTP.

Key attributes of the project included:

- North Inlet and Reservoir Structure Manhole and Valve Replacements
- Boat Ramp Rehabilitation
- New Reservoir Outlet Structure Building
- 36-inch CML&C Steel Influent and Effluent Pipeline Improvements
- Bypass Structure Valve Improvements
- Treatment Plant Process Improvements
- Washwater Recovery Facility Improvements
- DDW Involvement

Otay WTP Disinfection Conversion

San Diego, CA

GHD provided detailed design services as part of a Design-Build team with Orion Construction. The project involved the replacement of chlorine gas storage & feed equipment with an on-site Sodium Hypochlorite Generation system. The change from chlorine gas to sodium hypochlorite also requires a modification to the existing Chlorine Dioxide Generator to accommodate the new chemical.

GHD designed the power and instrumentation cabling and power and control interfaces between the existing plant and the various pieces of new equipment as well as piping and mechanical interfaces and complete structural design for accommodating the new tanks and containment areas.

Key attributes of the project included:

- Sodium Hypochlorite Generation system
- Conversion to Liquid Ammonium Sulfate
- Civil, mechanical, structural, electrical and process and instrumentation
- Engineer design of record for the following disciplines

- Civil, Mechanical, Structural, Electrical, Process, I&C

TAB F | ADDITIONAL COMMENTS

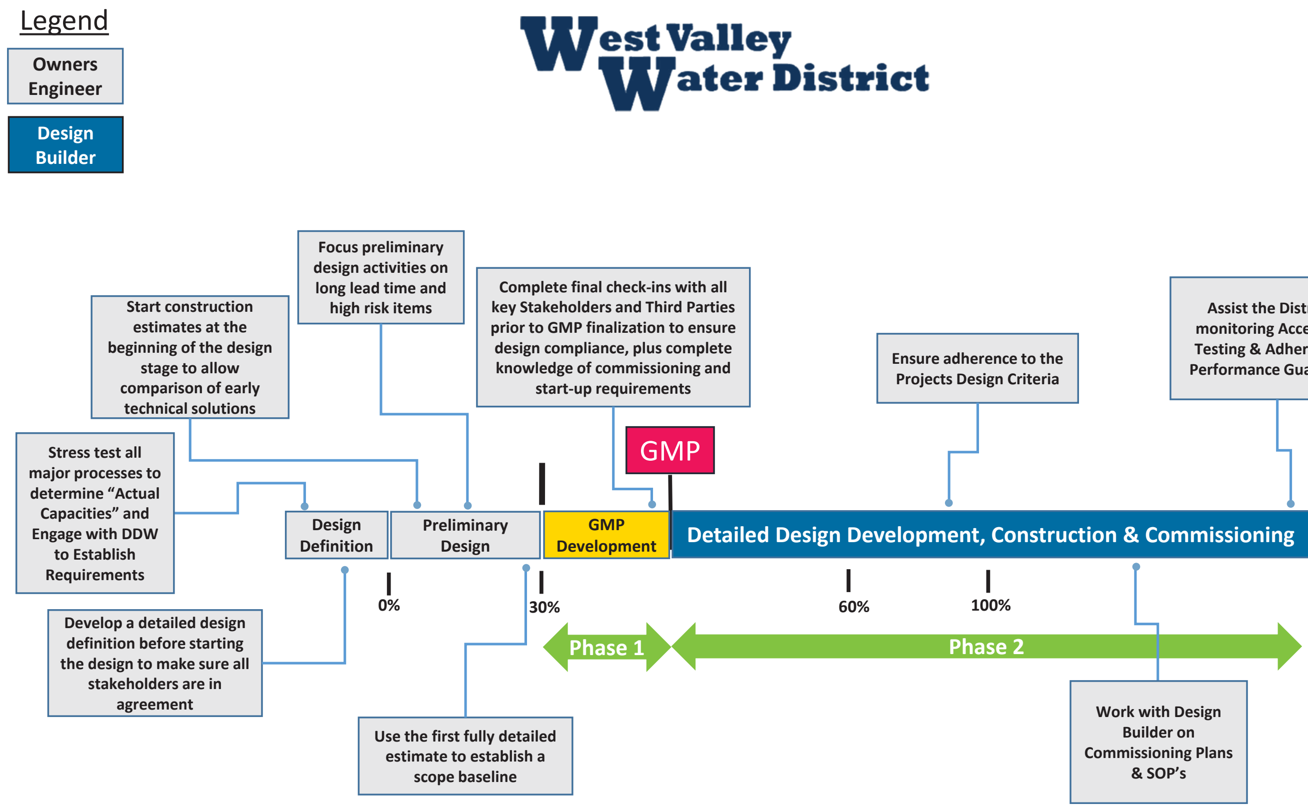
F Additional Comments & Project Approach

This section highlights critical aspects of our team's approach, based on GHD's extensive experience with PDB projects and as an OE throughout Southern California. The implementation of this approach is based on the "Top 10 Success Factors" we have learnt from our experience and will significantly streamline the WFF Expansion Project and reduce overall cost.

Progressive Design-Build Top 10 Success Factors

	Owner's Engineer Involvement	Benefit to the District
1. Close coordination of contract documents	Work with the DB Entity, the District Legal Counsel, and lead Consultants to identify all interface areas, the drivers of those interfaces, and continually monitor progress	Everyone is focused on best for project approach, Minimizes the potential for schedule and cost exceedances
2. Choose the qualified people you want to work with	Fine tune the selection process to ensure the District's requirements, risks and pain points, are addressed	Use our similar project experience and knowledge of PDB to provide accurate assessments of the DB Entities and refine the selection criteria
3. Consider the approach presented by the potential DB Entity	Review the approaches provided by each DB Entity. Maintain competition among DB Entities for as long as possible	Verification of the DB Entity's project approach, cost estimate; and its alignment with the District's goals and requirements
4. Establish process for the Project to promote "spot on" decision-making	Facilitate decision-making meetings to accurately respond to the District's requirements and establish expansion approach	Validation of decisions by industry leading experts on Blue Ribbon Panel
5. Involve key regulators (DDW) early in the process	Organize and assist in meetings with Stakeholders, including DDW, and use the our Subject Matter Experts including Blue Ribbon Panel	Leverage relationships with DDW and incorporate regulatory constraints early in the design process
6. Senior DB Entity and District Management to Partner to review project status and issues	Raise key issues and track those that impact schedule & cost, determine the resolution process, timeline for resolution, and record progress	Potential issues are resolved early so as to not impact budget, schedule, and / or quality
7. Jointly address permitting issues, track them, and press agencies for action	Identify and track required permits and action items needed to achieve approvals from Regulatory Agencies	Receive permits from Regulatory Agencies in the anticipated timeframe built into the schedule
8. Integrate the District's goals into the Project Implementation Plan and the Design-Build Entity's Project Execution Plan	Work with the District and DB Entity to understand, maintain and appropriately address risks in the DBE's scope and GMP, and monitor continuously	District's goals and project drivers are met
9. Incentivize the project results you wish to accomplish, e.g. on-time Project Completion	Identify major milestones to meet and results to be achieved by the Design-Build Entity, along with the appropriate incentives	DB Entity is incentivized to in achieving, and hopefully exceeding, the District's goals
10. Celebrate interim success milestones	Public Outreach notifying the public and arranging events to celebrate project successes	Public sees the Project as a success and builds trust with District

These key success factors have been incorporated our "Roadmap" as shown in the graphic below.



Design Definition

The key to Project success is to make "critical" decisions early on; thus the significance of the Blue Ribbon Panel. The GHD OE team has managed project cost, schedule, and has successfully achieved project outcomes for similar sized water treatment projects in order to meet contract requirements. Our OE team is composed of professionals with the experience to understand and identify potential design, construction, operations and maintenance issues and provide ideas on how to solve or mitigate them. Our experience has always been in fast-paced dynamic environments where time is of the essence and the accurate prediction of construction issues and schedule impacts is critical.

> Accurate definitions of expansion approach and process capacities result in achieving significant schedule and cost savings.

Further, we have already had several discussions with equipment vendors to establish expansion concepts and validated these discussions with DDW. These efforts have been undertaken to demonstrate our technical creativity, key understanding of the Project, and commitment to the District and are presented in below and on the following graphic.

Stress Test Existing Processes to Establish Actual Capacity

The Oliver P. Roemer Water Filtration Facility has significant reliability and redundancy features that with further evaluation can lead to opportunities for significant cost savings and improved reliability. GHD's approach includes creative ideas for consideration to capitalize on some of these features.

> Stress test the Preliminary Treatment to establish hydraulic and process capacities.

These redundancy and reliability features are unmatched by any plants treating State Project Water and offer the District significant advantages in delivering this 16 MGD expansion. In addition, there is extra capacity in the Preliminary Treatment and yard piping in preparation for the 6 MGD plant expansion that was not implemented.

The Preliminary Treatments indicates a current extra capacity of 7.2 MGD, constructed in anticipation of the previously mentioned 6 MGD expansion. Running the three parallel treatment trains at higher than their design capacity of 21.6 MGD would be critical to establish the extent of needed infrastructure. **It is expected that operating at flows greater than 21.6 MGD would have a minimal impact on total organic carbon (TOC) removal and results in an increase in settled water turbidity.** Establishing these performance values at flows up to 30.4 MGD allows for very efficient expansion of the Oliver P. Roemer Water Filtration Facility.

Evaluate Multiple Expansion Alternatives based on Cost, Reliability, and meeting Regulatory Requirements

Conceptual designs for both the Trident process and Microfiltration/Ultrafiltration (MF/UF) for a 16 MGD plant expansion are provided below and illustrated in the following graphic:

1. Replacing existing Trojan UV reactors with new more efficient models. The existing reactors represent first generation equipment with significant spare parts and efficiency issues. **In fact, the existing Trojan UV SWIFT 6L24 reactors can be replaced by the new 4L24 reactors that has the same physical dimensions and achieve the 30.4 MGD target treatment capacity.** This would be a very cost-effective approach for expanding the UV disinfection facility from both capital and O&M perspectives. Preliminary design drawings for the Trojan UV reactor replacements are attached at the end of this section for your reference.

We have confirmed this creative upgrade of the UV process with Trojan and received a conceptual bid for the new equipment.

2. Operate the GAC filtration adsorbers in parallel mode. Based on information provided by Plant Operations during the tour on December 11, 2019, the GAC replacement frequency is considerably low, which easily allows for a change from in series to in parallel mode operation without reducing process efficiency. This would double their capacity, without any additional capital investment.

We have discussed this option with DDW and they were receptive with that approach.

Base on equipment alone, using MF/UF instead of continuing with the Trident packaged system, would be almost 3 times the cost ($10M versus $3.5M).

Pilot and Demonstration Testing

Our team has significant pilot and demonstration testing experience in support of regulatory discussions with DDW to establishing process capacity as the case for the Preliminary Treatment process at the Oliver P. Roemer Water Filtration Facility. **Our team has also conducted many demonstration testing for DDW to allow higher filtration rates than the 6 gpm/sf granted for conventional filters.** This experience benefit the District in establishing the regulatory discussion early on with the DDW to focus the preliminary design activities based on an approved process testing protocol. **Further, looking specifically at the members of the Blue Ribbon Panel, no other team in southern California can come close to matching the pilot and demonstration testing experience that exists on this Panel.**

30 Percent Design Package

GHD proposes to employ a proven design development process with effective control methods that:

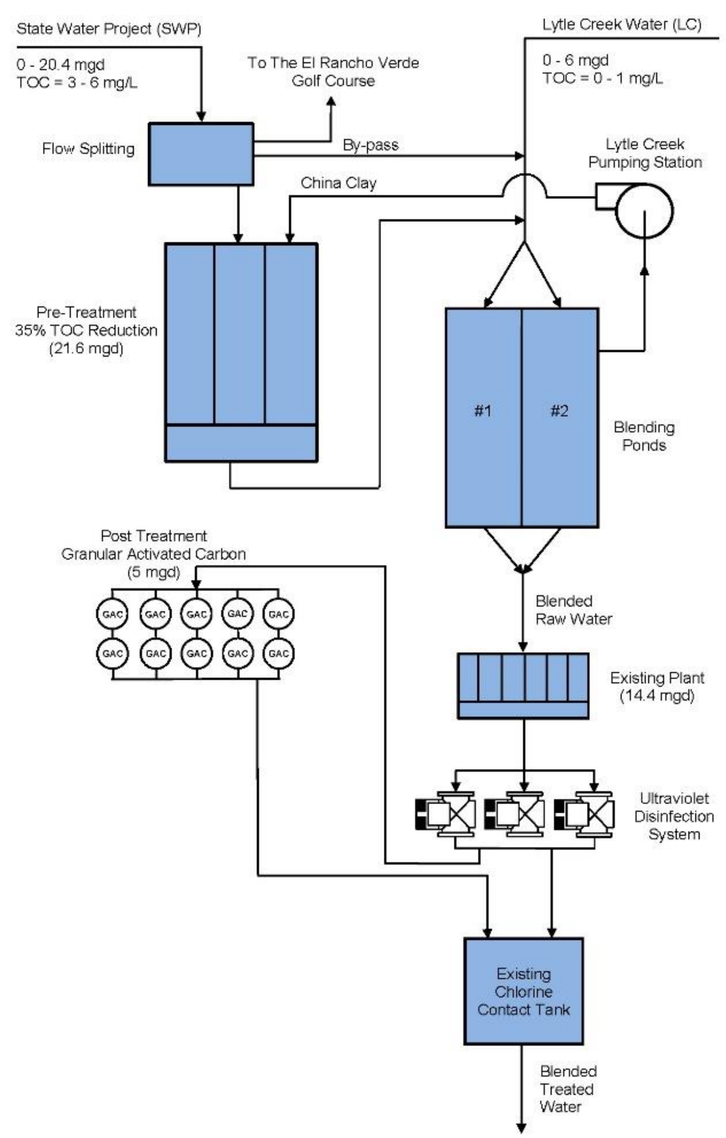
1. Leads to early Project clarity and definition of District's critical needs while ensuring the right balance between CAPEX or OPEX (i.e., lowest life-cycle cost for the Project);
2. Does not shift additional risk to the District.

It is critical that these potential impacts are quantified and discussed during the design development process as opposed to during the detailed design.

The level of detail required for a 30% PDB Design package is not an industry standard.

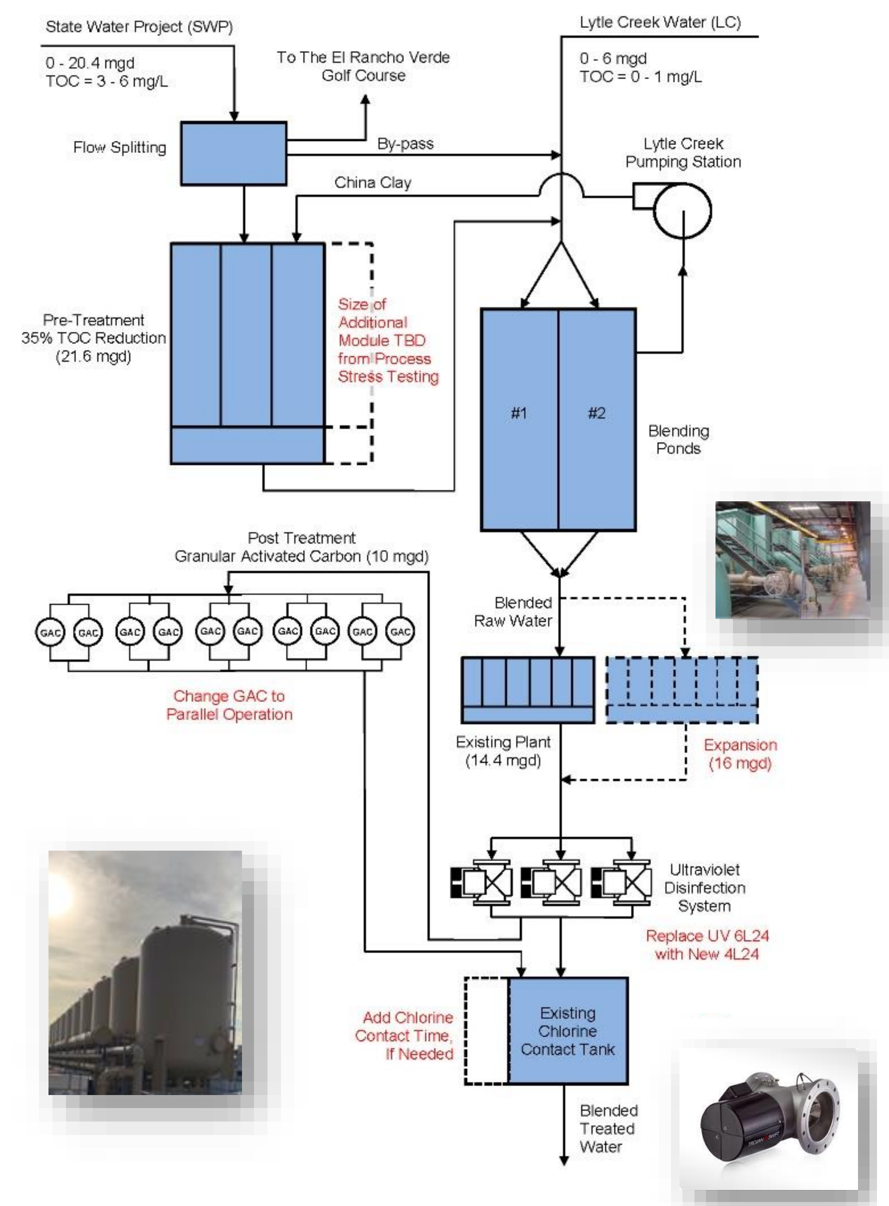
Work Element	30 Percent Level
Design Information	
Equipment Sizing Calculations	For Major Equipment Only
Proposed Equipment Suppliers	For Major Equipment Only
Geotechnical Baseline Report	Complete
Potholing Results	Draft
Fire Protection Report	Illustrative
Asset List (Retired and New)	Complete
Shop Drawings Submittal List, for preselected equipment	Complete
Arc Flash	Draft
Facility O&M	
Operating Philosophies	Draft
O&M Staffing Requirements	Illustrative
SCADA Graphic Screens	Illustrative
Electrical	
Electrical System Analysis Report	Illustrative
Lighting Calculations	Illustrative
Cable Pulling Tension Calculation	Not Required
Duct bank cable derating and cable fill calculations	Not Required
Conduit Schedule	Not Required
Quantify and determine electrical area classification for the basis of design	Illustrative
Electrical Load Criticality Ranking Table	Illustrative
Load List	Illustrative
Electrical Master Plan Concept Report Update	Draft
Standby Generator Sizing Calculations	Complete

Existing WFF Redundancy and Reliability



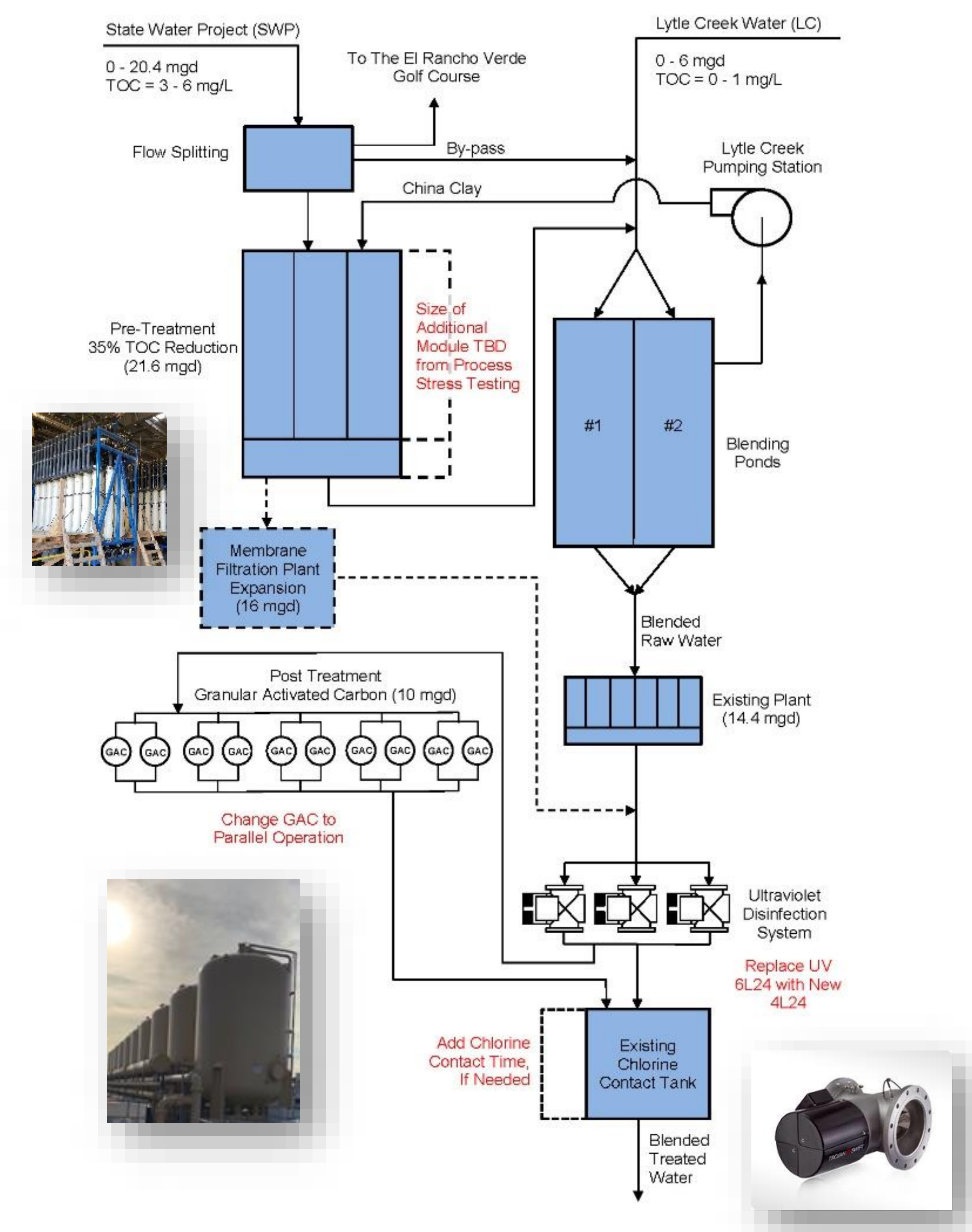
- Dual coagulation/flocculation/sedimentation for State Project Water
- Multi-barrier disinfection processes with UV (most effective for Cryptosporidium and Giardia) and chlorine (most effective for virus)
- GAC filtration in series of up to 1/3 of treated water for additional TOC removal
- Blending ponds of source waters to further optimize treatment
- Significant excess capacity of filter backwash recovery and solids handling
- Availability of significant areas within the fence for any expansions/modifications

Capacity Expansion with Trident System



- Add 7 Trident Package Treatment Systems Replacing existing Trojan UV reactors with new more efficient models.
- Operate GAC Adsorbers in Parallel Mode
- Stress Test the Preliminary Treatment to establish Hydraulic and process capacities

Capacity Expansion with MF/UF Membranes



- Add 6 MGD of MF/UF treatment capacity
- Replace existing UV reactors with new more efficient models
- Operate GAC adsorbers in parallel mode
- Stress test the Preliminary Treatment to establish hydraulic and process capacities.

Too much detail may be overly prescriptive while not enough may not provide a clear understanding of the project goals and objectives Our OE Project Manager, Jamal Awad, has managed several Design-Build projects and will develop specific project expectations leading to better definitions for deliverables, focused reviews, and successful projects. Jamal recently completed WRD's successful $115M GRIP PDB project and will bring the same approach for the Oliver P. Roemer Water Filtration Facility expansion.

GHD has established, documented, implemented, and maintained a Quality System for its North American operations in accordance with ISO 9001:2015 under the ANAB accreditation system. As part of this, key documents that GHD maintains are the Quality System Overview, Quality System Procedures Manual and Quality Work Instructions.

DB Entity Selection and Contract Negotiation

GHD has prepared the contractual documents required for selecting the DB Entity. The following highlights examples of matters to consider during contract negotiation with the DB Entity.

Shared Savings clauses work extremely well. We have found that sharing cost savings, which may be available when final contract costs fall below the GMP, with the DB Entity is an outstanding motivator for most contractors to come up with smart ideas and deliver projects on time. As the OE, GHD will develop a shared savings program that sets up a "win-win" situation for both the District and the DBE.

The Southern California labor market is extremely tight. The availability of competent tradespeople is a major challenge in this robust construction market. A tight labor market is a risk that has potential negative impacts on costs, schedule, quality, and safety. In such markets, GHD has learned that constructability of the design and labor availability are the key elements in resolving this risk. A careful pre-qualification process will help identify those firms and their potential subcontractors who have sufficiently available tradespeople to meet the schedule KPIs for the project at reasonable cost.

GMP

Requiring a Guaranteed Maximum Price (GMP) in PDB projects brings inherent risks associated with design development and the unknowns. As the OE, GHD will provide its technical expertise and project management experience to minimize the differences in scope and price, and manage this risk so that District financial, schedule, and performance expectations are maintained.

DB Design Packages

The announced percentage of completion by the designer is generally less than actual. We have learned that when the DB Entity declares that a particular design has reached an overall percentage of completion, in most cases, the electrical and instrumentation and control design lags far behind the declared percentage completion of the overall design. As the OE, GHD will monitor design progress to ensure that all elements of the design are at their target completion to avoid expensive rework.

Constructability

Constructability reviews, if done at all, are completed too late in the design process. This often, neglected, or failed process is a missed opportunity and causes the loss of the substantial benefits derived from a rigorous constructability review process. As the OE, the GHD team will provide experienced construction managers to monitor the design process to synergize with the design development.

Contract language such as "reasonably inferred" to cover the inevitable gaps in the design that exists when asking for pricing before 100% design does not work. As OE, GHD's approach would be to identify significant design gaps and define them.

Operations Involvement

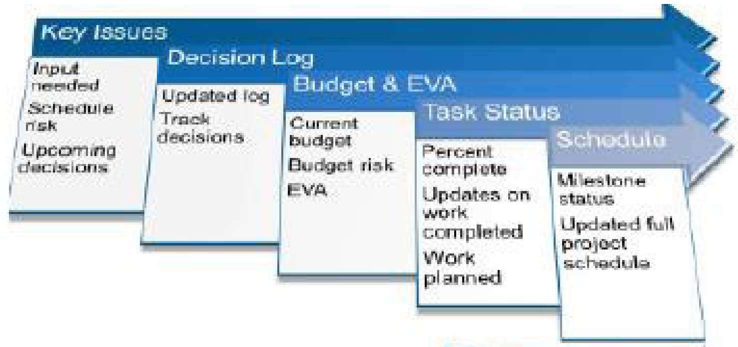
Plant operations input during design development is not as effective as it may appear. While these efforts are well-intentioned and begin with great gusto, most often the pressure of time on both the design and operations teams cause this process to break down, and momentum is lost and rarely regained. We have also found that many plant operators, while expert in the successful operation of their respective treatment facilities, have limited time and knowledge sometimes required to effectively and efficiently review engineering drawings, standards, and specifications. The use of advanced technology such as BIM can be useful to develop project drawings, and other graphics to ensure that the operator's input is based on more than just contract drawings. This process, further enhanced by facilitated workshops or review sessions led by the OE team's operations specialists using HAZOP approach has been proven to be an effective method of soliciting operator input.

"Ready to Move" means the GHD Team has commenced on some preliminary items to start work today

Our core team members have made a commitment to dedicate themselves to the Oliver P. Roemer Water Filtration Facility expansion.

Further, to enable our project team to meet the District's expectations with respect to staff skills, resources and schedule, a Rapid Start Binder will be delivered to the District 15 & 30 days after project award. This will include, as a minimum, the following:

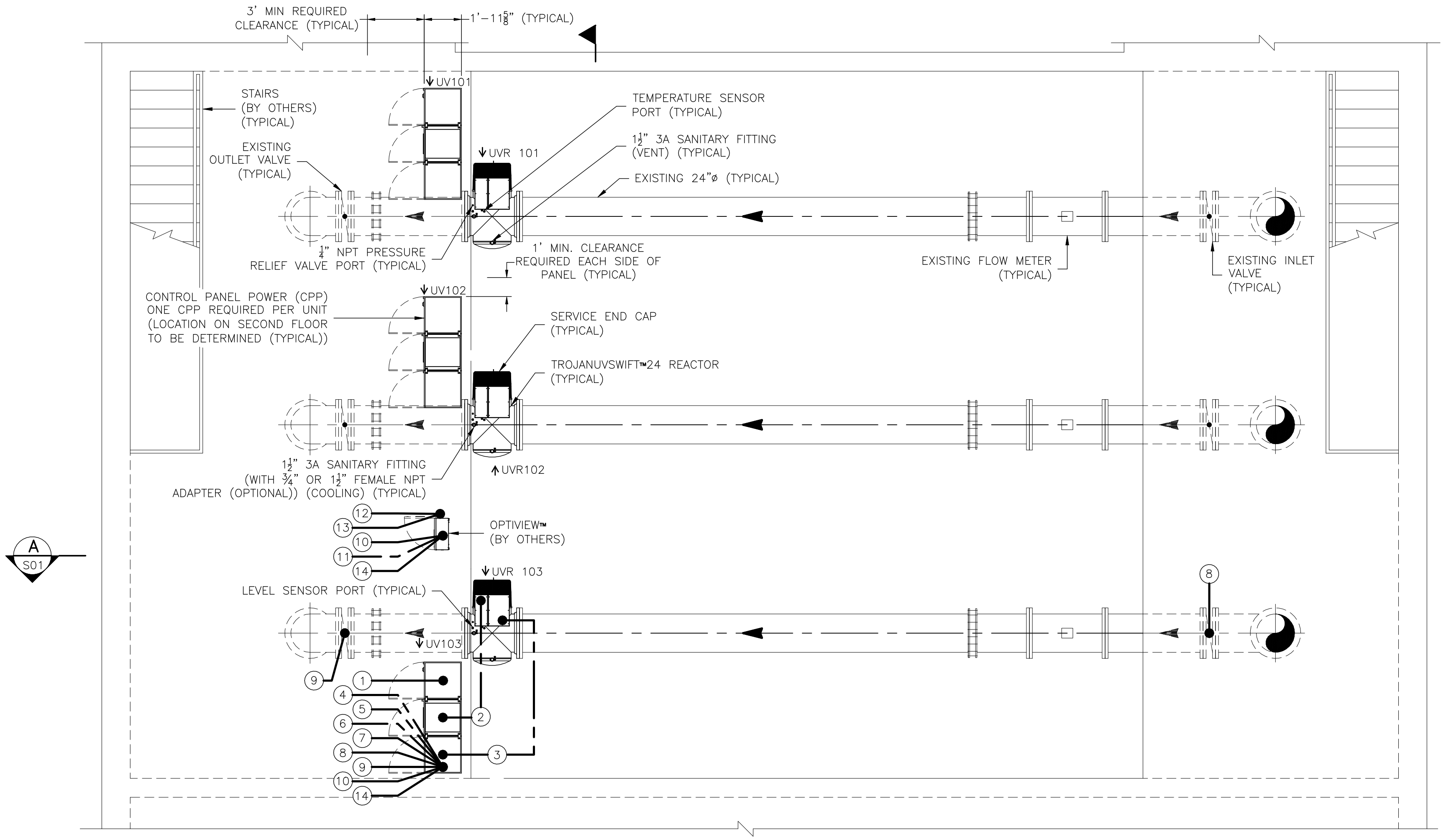
- Environmental Documentation and Permitting: Reviews and next steps
- DDW Engagement: Development of Agenda and Project Initiation meeting
- Existing Process Evaluation: List of opportunities
- Project Risk Register: Detailed list of Preliminary Risks, Risk Factor, and Risk Allocation
- Permit Matrix: All-encompassing list for the entire project
- GMP Development Work: Schedule and Deliverables outline
- Document Control: Outline of Protocols and Filing Structure
- Project Schedule: Draft Schedule, incorporating Key Milestones from Contracts 1 & 2
- DB Entity Evaluation: Templates and Criteria related to the Selection Process
- Monthly Report: Template of outline and content



Rapid Start Schedule* – "The First 30 Days"

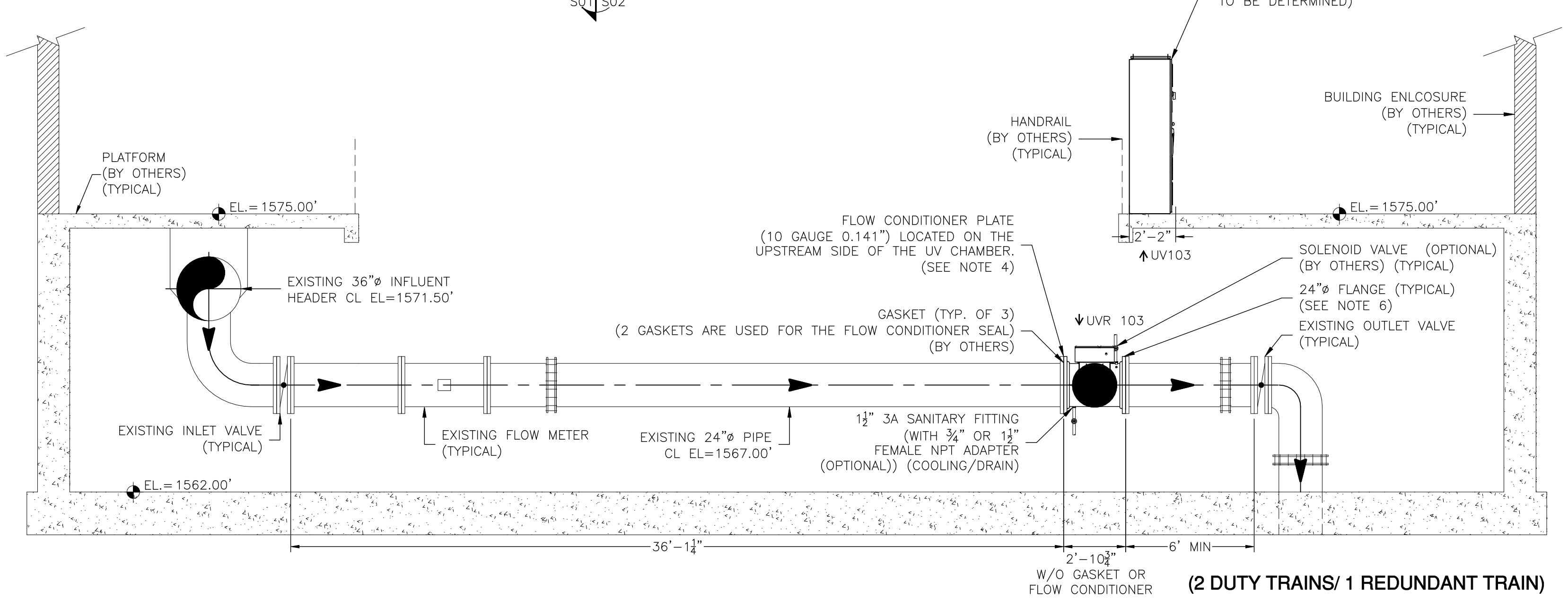
	Environmental Doc's & Permitting	DDW Work	Existing Process Evaluation	Risk Register	Permit Matrix	GMP Development Work	Document Control	Project Schedule	DB Entity Evaluation	Monthly Report
0 - 15 Days	Reviews and Next Steps	Develop Agenda for Project Meeting with DDW	Perform Baseline Capacity Evaluation	Detailed List of Preliminary Risks, Risk Factor, Risk Allocation	All Encompassing List for Entire Project	Schedule & Deliverables Outline	Outline of Protocols & Filing Structure	Draft Schedule incorporating Key Milestones from Contracts 1 & 2	Templates & Criteria Related to the Selection Process	Template of Outline and Content
15-30 Days	Kick-off Meeting with City's Environmental Consultant	Meet with DDW	Develop Physical Stress Testing Protocol for Specific Processes	Risk Workshop with City	Fully Loaded Document outlining Permit Req, Responsible Party, etc…	Project Specific Templates of Associated Deliverables	Implementation & Demonstration of Document Control Tools & Processes	Development of Other Schedule Tracking Tools Suitable for PDB Projects	Detailed Schedule of DB Entity Selection Period Process	Finalized Version Incorporating All of the City's Requirements

*Components of this will be incorporated into the Project Implementation Plan (PMP) with a Draft completed within 90 days after NTP



PLAN VIEW

SCALE: AS SHOWN
NOTE: INTERCONNECTS SHOWN FOR ONE (1) TRAIN ARE TYPICAL FOR ALL



(2 DUTY TRAINS/ 1 REDUNDANT TRAIN)

SECTION

A S01 SCALE: AS SHOWN

PRELIMINARY, NOT FOR CONSTRUCTION
VERIFY DIMENSIONS BEFORE COMMENCING CIVIL OR DESIGN WORK

TROJANUVSWIFT™

EQUIPMENT INTERCONNECTIONS

No.	DESCRIPTION	FROM	TO
1	CONTROL POWER PANEL (CPP) POWER SUPPLY 480VAC, 3 PHASE, 3 WIRE + GROUND (MUST BE FED FROM 3PH GROUNDED WYE SUPPLY OR TRANSFORMER) 42.5 kVA BALANCED LOAD MAX 53 AMPS PER PHASE	DISTRIBUTION PANEL (DP) (BY OTHERS) (NOT SHOWN)	CPP (TOP OR BOTTOM OF PANEL) MUST BE SPECIFIED BY CUSTOMER
2	UV CHAMBER POWER SUPPLY (HV CONDUIT) MINIMUM 12AWG, 10kV XLPE INSULATION (COLOR BLACK) (1 PER LAMP) MINIMUM 12AWG, 10kV XLPE INSULATION (COLOR WHITE) (1 PER LAMP) + GROUND (MINIMUM 8/19 AWG) (CABLING PROVIDED BY TROJAN)	CPP (BOTTOM OF PANEL ONLY)	UV CHAMBER JUNCTION BOX
3	UV CHAMBER CONTROLS (LV CONDUIT) UV SENSOR: 22AWG x 10 CORE + GROUND SHIELD CABLE WITH DRAIN WIPER MOTOR: 16AWG x 2 CORE + GROUND SHIELDED CABLE WITH DRAIN CONTROL SIGNALS: 16AWG x 11 WIRE + GROUND	CPP	UV CHAMBER JUNCTION BOX
4	DISCRETE UV SYSTEM STATUS INFORMATION SYSTEM ON/OFF STATUS – 2 CONDUCTORS SYSTEM READY STATUS – 2 CONDUCTORS COMMON CRITICAL ALARM – 2 CONDUCTORS COMMON MAJOR ALARM – 2 CONDUCTORS COMMON MINOR ALARM – 2 CONDUCTORS REMOTE ON/OFF CONTROL – 2 CONDUCTORS	CPP	PLANT PLC (BY OTHERS) (NOT SHOWN)
5	FLOW METER ANALOG INPUT (VIA ETHERNET) (BY OTHERS)	PLANT SCADA (BY OTHERS) (NOT SHOWN)	CPP
6	UV INTENSITY ANALOG OUTPUT (VIA ETHERNET)	CPP	PLANT SCADA (BY OTHERS) (NOT SHOWN)
7	ETHERNET/IP COMMUNICATION SHIELDED CAT5E CABLE CONNECTORS RJ45	CPP	PLANT SCADA (BY OTHERS) (NOT SHOWN)
8	DISCRETE INLET VALVE OPEN CONTROL OUTPUT – 2 CONDUCTORS DISCRETE INLET VALVE CLOSE CONTROL OUTPUT – 2 CONDUCTORS DISCRETE INLET VALVE OPEN STATUS INPUT – 2 CONDUCTORS DISCRETE INLET VALVE CLOSE STATUS INPUT – 2 CONDUCTORS DISCRETE INLET VALVE LOCAL/REMOTE MODE INPUT – 2 CONDUCTORS	CPP CPP INLET VALVE (BY OTHERS) INLET VALVE (BY OTHERS) INLET VALVE (BY OTHERS)	INLET VALVE (BY OTHERS) INLET VALVE (BY OTHERS) CPP CPP CPP
9	DISCRETE OUTLET VALVE OPEN CONTROL OUTPUT – 2 CONDUCTORS DISCRETE OUTLET VALVE CLOSE CONTROL OUTPUT – 2 CONDUCTORS DISCRETE OUTLET VALVE OPEN STATUS INPUT – 2 CONDUCTORS DISCRETE OUTLET VALVE CLOSE STATUS INPUT – 2 CONDUCTORS DISCRETE OUTLET VALVE LOCAL/REMOTE MODE INPUT – 2 CONDUCTORS	CPP CPP OUTLET VALVE (BY OTHERS) OUTLET VALVE (BY OTHERS) OUTLET VALVE (BY OTHERS)	OUTLET VALVE (BY OTHERS) OUTLET VALVE (BY OTHERS) CPP CPP CPP
10	OPTIVIEW™ 4–20mA ANALOG INPUT	OPTIVIEW™ (BY OTHERS)	CPP (TOP OF PANEL)
11	OPTIVIEW™ POWER SUPPLY 120V, 1 PHASE, 2 WIRE+ GROUND, 0.1 kVA, 0.8 AMPS	DP (BY OTHERS) (NOT SHOWN)	OPTIVIEW™ (BY OTHERS)
12	WATER SUPPLY TO OPTIVIEW™ (INLET) (SEE SPECS ON UNIT FOR REQUIRED FLOW RATE AND LINE SIZE)	DP (BY OTHERS) (NOT SHOWN)	OPTIVIEW™ INLET (BY OTHERS)
13	OPTIVIEW™ TO DRAIN (OUTLET) (SEE SPECS ON UNIT FOR REQUIRED DRAIN SIZE)	OPTIVIEW™ OUTLET (BY OTHERS)	DP (BY OTHERS) (NOT SHOWN)
14	UV TRANSMITTANCE METER ALARM DISCRETE INPUT	OPTIVIEW™ (BY OTHERS)	PLANT SCADA (BY OTHERS) (NOT SHOWN)

NOTES:

: ANCHOR BOLTS ARE NOT SUPPLIED BY TROJAN TECHNOLOGIES.
: SYSTEM CONDUIT, WIRING, DISTRIBUTION PANELS & INTERCONNECTIONS BY OTHERS.
: ELECTRICAL REQUIREMENTS SHOWN ARE TO SUPPLY TROJAN UV EQUIPMENT ONLY. ELECTRICAL INRUSH FACTOR TO BE ADDED AS PER LOCAL CODE.
: CONTRACTOR TO REVIEW ALL TROJAN TECHNOLOGIES INSTALLATION INSTRUCTIONS PRIOR TO EQUIPMENT INSTALLATION.

UV CHAMBER NOTES:

1. CHAMBER MATERIAL TO BE TYPE 316L STAINLESS STEEL.
2. MAXIMUM OPERATING PRESSURE TO BE 150 PSI.
3. TROJAN RECOMMENDS THAT VALVES ARE USED TO ISOLATE THE UV CHAMBER FROM PLANT FLOW FOR SERVICING. ALL VALVES ARE TO BE SUPPLIED BY OTHERS.
4. FLOW CONDITIONER MUST BE IN PLACE BEFORE INSTALLING UV CHAMBER INTO PIPE. SEE INSTALLATION INSTRUCTIONS FOR CORRECT ORIENTATION.
5. UV CHAMBER WEIGHT = DRY 1500lbs WET 2240lbs

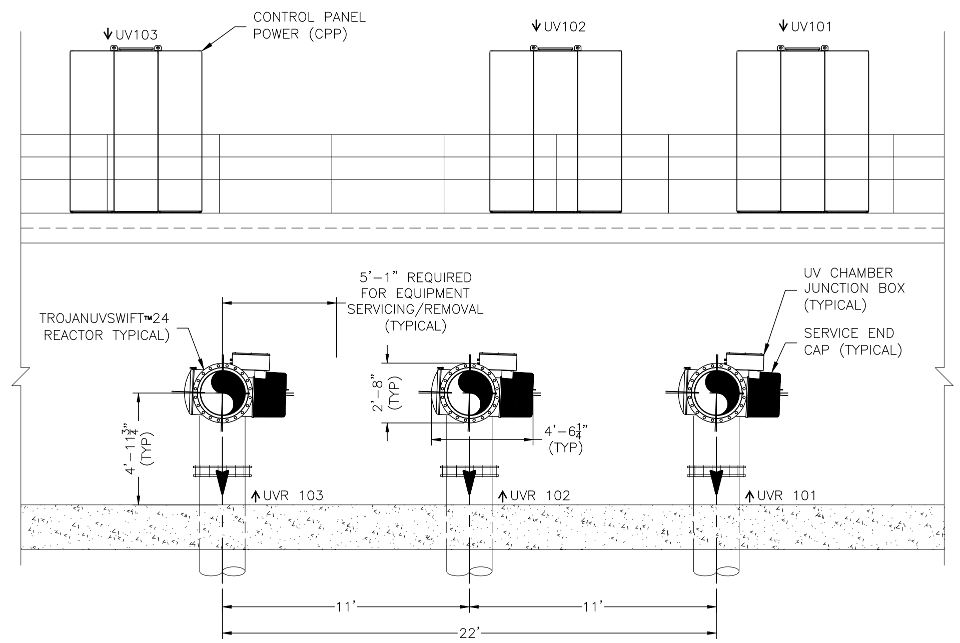
CONTROL POWER PANEL (CPP) NOTES:

1. CONTROL POWER PANEL TO BE E-COAT POWDER COATED RAL7035 (LIGHT GREY) OR SIMILAR. MATERIAL IS TO BE MILD STEEL, NEMA 12, VENTILATED AND PANEL IS TO BE FLOOR MOUNTED
2. CONDUIT TO BE SUPPLIED BY OTHERS. ALL CONDUIT TO BE RIGID, METAL FLEX CONDUIT OR EQUIVALENT ACCORDING TO LOCAL CODE.
3. CABLING DISTANCE BETWEEN CONTROL POWER PANEL AND UV CHAMBER SHALL BE NO GREATER THAN 72'.
4. PANEL WEIGHT = 1353lbs

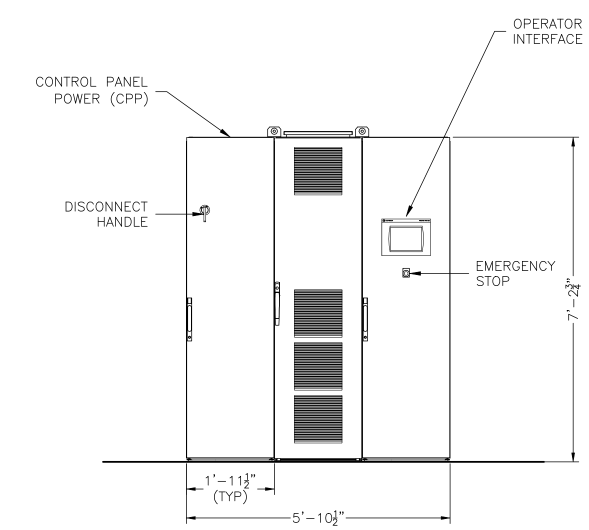
DESIGN CRITERIA		
	PEAK FLOW	30.40 MGD
	TARGET CONTAMINENTS	3– LOG CRPTOSPORIDUM
	HEADLOSS	3.5"
	U.V TRANSMITTANCE	89%

TROJANUV
A TROJAN TECHNOLOGIES BUSINESS
CONFIDENTIALITY NOTICE

DESCRIPTION: LAYOUT, TROJANUVSWIFT WEST VALLEY WATER DISTRICT REPLACEMENT CA		QUOTE NO. 222946	
DRAWN BY : MJU	DATE : 20JA15	PROJECT NO. N/A	
CHECKED BY : MC	DATE : 20JA20		
APPROVED BY : NDB	DATE : 20JA20	DWG NO. S01	REV. A
SCALE (11x17) : 1/8"=1'-0"	LOG NUMBER : N/A		



B SECTION
S01 S02 AS SHOWN
NOTE: STAIRS NOT SHOWN FOR CLARITY.



FRONT VIEW OF CPP
SCALE: NOT TO SCALE

CONTROL POWER PANEL (CPP) NOTES:

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TROJANUV
A TROJAN TECHNOLOGIES BUSINESS

DESCRIPTION: LAYOUT, TROJANUVSWIFT WEST VALLEY WATER DISTRICT REPLACEMENT CA		QUOTE NO. 222946	
DRAWN BY : MJU	DATE : 20JA15	PROJECT NO. N/A	
CHECKED BY : MC	DATE : 20JA20		
APPROVED BY : NDB	DATE : 20JA20	DWG NO. S02	REV. A
SCALE (11x17) : 1/8"=1'-0"	LOG NUMBER : N/A		

TABS G, H, & I

TAB G | CONFLICT OF INTEREST

TAB H | OTHER INFORMATION

TAB I | WWD STANDARD AGREEMENT FOR PROFESSIONAL SERVICES

G Conflict of Interest

We hereby acknowledge that GHD, individuals employed by the GHD, or firms employed by or associated with GHD, including subconsultants/subcontractors, do not have a conflict of interest with the WFF Expansion Project.

H Other Information

Insurance Requirements

GHD acknowledges that we will meet the insurance requirements per Section 14 of the District's standard Agreement for Professional Services (PSA).

Litigation

GHD trusts the District will appreciate that due to the commercial sensitivity and confidentiality of any litigation in which GHD may be presently involved, GHD is not at liberty to disclose the information sought. However, we point out that as a component of its prudent risk management practices, GHD obtains high quality professional liability insurance in the world market, and domestically in the U.S., to provide cover in the industries in which it operates. As a consequence of engaging in business, there are sometimes claims asserted which may or may not give rise to litigation. The details and progress of any such claims are by necessity commercially sensitive and remain in confidence. We are able to inform you that there have been claims notified in the normal course of business, none of which we believe are material to the services which are the subject the WFF Expansion Project. There are however presently no significant ongoing contract failures, no criminal matters, and there have been no judgments against GHD Inc. within the last 5 years.

Contract Default

GHD has not defaulted on any professional contract.

Q&A's and Addenda

GHD hereby acknowledges the Questions & Answers posted to the PlanteBid site. We also acknowledge that no Addenda were released as part of this procurement.

I Standard Agreement for Professional Services

GHD hereby accepts all the terms and conditions specified in the standard PSA.

TAB J | RATE SHEET

J Rate Sheet

HOURLY RATE SCHEDULE

Effective through June 30, 2023

GHD PERSONNEL	**$/Hour**
Duncan Findlay, JD - Legal	$290.00
Chris Hertle, MPhil - Blue Ribbon Panel Chair	$280.00
Matt Winkelman, PE - Digital	$280.00
Paul Hermann, CPEng - Design-Build Services Lead	$280.00
Roop Lutchman, PEng, PMP - Asset Management	$280.00
Hector Ruiz, PE - Project Advisor	$270.00
Homayoun (Omar) Moghaddam, PE, CPP - Permitting/Regulatory Compliance	$270.00
Jamal Awad, PhD, PE - Project Manager	$270.00
Mike Chapman - Blue Ribbon Panel/Conventional Treatment	$270.00
Sridhar (Sri) Sadasivan, PE, SE - Design-Build Contract Documents	$270.00
Erel Betser, PE - Fire Protection	$250.00
Andrew Peek - Durability/Corrosion	$250.00
Jeff Knauer, PE, ME, NACE CP Specialist - Corrosion/Material	$250.00
John McLaughlin, PE - Security	$250.00
Kevin Tirado, PE - Constructability Review	$250.00
Mark Donovan, PE - Treatment Evaluation & 30% Design Documentation Process Lead	$250.00
Ulysses Fandino, PE - Plant Piping	$250.00
Larry Tortuya, PE - Stormwater	$230.00
Mark Waer, PhD - Treatment Evaluation Process & GAC/Construction Observation Process Support	$230.00
Casey Raines, PE - Pipeline/Infrastructure	$220.00
Francisco Andrade, PE - Structural	$220.00
Mehdi Mardi, PE - Electrical and I&C	$220.00
Chris Richards, PE - Telemetry	$210.00
James Taylor - Safety/HIS	$190.00
Mike Fried - Cost Estimating	$190.00
Nathan Towlerton, PE, QSD/QSP - WQ Management Plan	$190.00
Nick Alvaro - Drone Survey	$180.00
Jonathan Linkus, AICP, LEED AP - LEED	$170.00
Ryan Kristensen - Resident Engineer Mechanical	$170.00
Leila Munla, PhD - Membranes/Pilot Testing	$165.00
Devin Brady - CAD/BIMM	$145.00

SUBCONSULTANTS

R. Rhodes Trussell (Trussell Technologies, Inc.) - Blue Ribbon Panel	$345.00
James Borchardt (Stantec) - Blue Ribbon Panel	$325.00
Bill Bellamy (Bellamy and Sons, LLC) - Blue Ribbon Panel	$250.00
Charles Cruz, PE (SPI) - Membranes	$260.00
Jim Vickers, PE (SPI) - Blue Ribbon Panel	$260.00
Emily Owens-Bennett, PE, BCEE - Permitting/Regulatory Compliance - DDW Coordination	$230.00
John Kennedy, PE - Process Capacity Demonstration Testing/Pilot Testing	$230.00
Hashmi Quazi, PhD, GE (Converse Consultants) - Geotechnical	$220.00
Jason Mate (MNS) – Resident Engineer	$200.00
Samir Hijazi (ARCHISSANCE) – Architectural	$185.00
Kirill Dolinskiy, PMP (KRD Management Consulting, LLC)	$182.00
Ed Macias (MNS) – Electrical and I&C	$165.00
John Robinson (John Robinson, LLC) - Permitting/Regulatory Compliance Lead	$160.00
Sun Liang, PhD, PE (The Metropolitan Water District of Southern California) - MWD Water Purification Engineer	Non-Chargeable

Employee time will be billed in accordance with the rate schedule listed above. These rates are effective through June 30, 2023. Expenses and subconsultants and other similar project related costs are billed out at cost plus 12%. Our rates are $6.00/hr for office consumables.

APPENDICES

APPENDIX 1. RESUMES

APPENDIX 2. ACCEPTANCE LETTER

Jamal Awad, PhD, PE

Project Manager

Education: PhD, Environmental Engineering, Marquette University; MS, Civil and Environmental Eng., UW-Madison; BS, Civil Engineering, Louisiana Tech University.

Professional Registration: Professional Engineer: California, Wisconsin, Illinois, Texas, Arizona

Connected: American Water Works Association; International UV Association-Americas Regional Vice President.

PE Civil CA (Issued: July 16, 1993; Expiration Date: September 30, 2021)

PE Civil TX (Issued April 23, 2012; Expiration Date: March 31, 2020)

Years with GHD: 6 | Home Office Location: Irvine

Professional Qualifications: Dr. Awad has over 25 years of experience with extensive experience in water quality, water treatment planning and engineering. Jamal is sought after nationally to support creative implementation of engineering solutions and innovative technologies assessments. An example of Jamal's leadership and is his work for the Blue Ribbon Panel that assisted the California DDW in the development of guidelines for Title 22 UV disinfection.

Distinguished Qualifications

- International UV Association-**Founding Member**, former **Regional Vice President**-Americas, and current **Board Director**
- Member of the **Blue Ribbon Panel** that assisted the California Department of Public Health in the development of guidelines for **Title 22 UV disinfection**
- Past **Chair of the Water Quality Division, AWWA California-Nevada Section**
- Technical Consultant for **AWWARF Research Advisory Council** on 2003 Project Funding
- Water Quality Manager for the Long Beach Water Department (**34th largest City in the US**).

Awards

- AWWA CA-NV Section; 1998 Chair's **Award for dedication and leadership** in providing ongoing training to Section members.
- AWWA CA-NV Section; 2002 **Section's Service Award** for service as Water Quality Chair.

Feature Projects

Deputy Project Manager/Technical Lead, Owner Engineer for GRIP AWTF, Water Replenishment District of Southern California | Lakewood, CA

Technical Services Lead as the Owner Engineer for the Water Replenishment District of Southern California's (WRD's) GRIP Advanced Water Treatment Facility (AWTF). The AWTF, with an initial capacity of 15 mgd and a maximum capacity of approximately 30 mgd, will treat tertiary effluent from the LACSD using microfiltration (MF) and reverse osmosis (RO) followed by ultraviolet advanced oxidation (UVAOP) using chlorine as an oxidant. Effluent from the AWTF will be used for groundwater recharge. The initial phase is under startup, and it will achieve a significant milestone for WRD's water independence from imported water. Alternative Project Delivery is being used to implement the AWTF with an estimated construction value of $115 millions.

As the Owner Engineer for the project, GHD prepared all contractual and engineering documents for the selection of the Design-Build (DB) Entity. The engineering documents establish the technical and design requirements with enough details for the DB Entity to develop a guaranteed maximum price (GMP) for the proposed project. The design requirements cover both the design/construction and the 4-year Transition Operation Period to be performed by the DB Entity.

Technical Consultant and Task Lead, Groundwater Recovery Enhancement and Treatment (GREAT) Program's APWF Project, City of Oxnard | Oxnard, CA

Dr. Awad served as technical consultant for this project, the focus of which is to use existing water resources more efficiently. A major component of the GREAT program is the use of recycled water for multiple beneficial uses including irrigation of edible food crops, landscape irrigation, injection into the groundwater basin that forms a barrier to seawater intrusion, and other possible industrial uses. The recycled water for reuse will be generated by the new AWPF. The AWPF will treat the secondary water using a multiple-barrier treatment train consisting of microfiltration/ultrafiltration, reverse osmosis, and **UVAOP processes using peroxide as the oxidant**. In addition to the key objective of producing purified water, the AWPF will be open to the public and have educational, visitor, and research functions.

Jamal performed detailed evaluations of current UV photolysis equipment and recommended the selected equipment for the project. He also established the regulatory requirement with the CDPH regarding the advanced oxidation facilities.

Other Selected UV Projects

- **Technical Consultant and Design Lead** for the Cedar Rapids' J-Avenue (42 mgd) and Northwest (40 mgd) WTPs UV disinfection facilities. The UV reactors (**Trojan 30" Diameter)** are **first** to be designed for **virus inactivation** under EPA UVDGM requirements.
- Reviewer of **UV Photolysis** and **UV/peroxide Advanced Oxidation** for **Aurora's** 50-mgd purification to provide **South Platte River Supply** multiple treatment barriers. UV advanced oxidation selected to provide *Cryptosporidium* inactivation, micro-pollutant control, and destruction of taste and odor causing compounds and NDMA.
- Technical Consultant for the **Gibson Island UV Photolysis** and **UV/peroxide Advanced Oxidation**. The UV process was designed for the removal of **NDMA** (1-log) and **1,4-dioxane** (0.5-log). The initial capacity is 50 Ml/day and the ultimate capacity is 100 Ml/day. Trojan UVPhox^{TM} LPHO was selected for the UV process.
- **Technical Consultant, AWT Demonstration Plant,** Water Repurification Project and Indirect Potable Reuse/Reservoir Augmentation Demonstration Project, City of San Diego, CA for the Advanced Oxidation aspects of the project. Based on the results from the AWT Plant pilot testing program, the City proceeded with the next phase of the program – design and construction of 1-mgd demonstration project. In particular, provided assistance in the development of the Testing and Monitoring Plan and with regulatory permitting.
- **Technical Director and Design Lead** for the Elsinore Valley MWD 9-mgd Canyon Lake WTP UV facilities (**Calgon 24" Reactor**) to meet the disinfection requirements of Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) and the disinfection byproducts requirements of the Stage 2 Disinfectants and Disinfection Byproduct Rule (Stage 2 DBP Rule). The **Provided complete functional controls of the new disinfection system to the SCADA integrator**.
- **Technical Consultant** and Process Lead for the San Francisco Public Utilities Commission (SFPUC) 315-mgd **UV disinfection for its unfiltered Hetch Hetchy Aqueduct (HHA) supply** in compliance with the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR). The **Calgon's 12-Chevron reactors** are grouped into two independent 160-mgd treatment trains, to optimize system hydraulics and facility maintenance.
- Project Manager of the Alternative Analysis and Conceptual Design for the expansion of the **SFPUC's SVWTP from 120 to 160 mgd** sustained capacity. Project Manager for the Conceptual Design of the effluent Chlorine Contact Basin, future UV facility, and Storage reservoir. Assisted the **Value Engineering** team based on the preliminary design of the proposed facilities.
- **Technical Lead for Validation and Acceptance Testing, Winnipeg WTP, Canada**. Conducted on-site validation and acceptance testing for the 132-192-mgd UV disinfection facility. The UV facility was designed to meet current and future water quality and flowrates, initially for an **unfiltered supply** (UVT of 75 percent), then for a filtered supply after the WTP is constructed (UVT of 90 percent). The **UV system, supplied by Calgon, consists of six Sentinel 48 inch UV reactors**. The design flexibility allowed the City to implement the UV Disinfection Facility ahead of the WTP construction. The onsite validation testing included a total of 38 system runs involving multiple flowrates, UVT levels, lamp power settings and number of lamps plus blanks and other QC samples. The selected UV reactor was operated with either 2 or 3 lamp banks. The resulting RED varied from 12 to 54 mJ/cm^2.
- Task Lead for process design, preliminary design, equipment selection, final design, and regulatory approval for Eastern Municipal Water District's 50-mgd UV disinfection facility **(Trojan 24" Reactor)** and North Shore Water Commission's 18-mgd UV disinfection facility **(Trojan 24" Reactor)**. The facilities are first to be approved for primary disinfection with *Cryptosporidium* and *Giardia* credits in California and Wisconsin
- **Preliminary Designs Lead and Senior Consultant** for the Clayton County Water Authority (CCWA)-three surface WTPs **(Wedeco K-143 Reactor)**– Hooper (20 mgd), Smith (12 mgd) and Freeman (10 mgd).
- **Technical Consultant** for the LADWP 600 mgd LAAFP UV Disinfection project. The UV disinfection facility would bring the LAAFP into compliance with the LT2 requirements for unfiltered water supplies.
- **Technical Consultant** for the Long Beach Water Department (LBWD) Demonstration Testing of UV and Chlorine Dioxide for Biogrowth Control and Pathogen Inactivation Systems as Pretreatments for **Seawater Desalination NF/NF Prototype**.

Hector Ruiz, PE

Project Advisor

Education: Master of Science, Civil and Environmental Engineering and Science, Stanford University; Bachelor of Science, Civil Engineering, California State Polytechnic University, Pomona

Memberships/Affiliations: American Water Works Association; California Water Environment Association

PE Civil CA (Issued: February 9, 1996; Expiration Date: June 30, 2020)

Years with GHD: 1 | Home Office Location: Irvine

Professional Qualifications: Hector has more than 25 years' experience in water and wastewater engineering and management, including design, construction, and operation of improvement and upgrades to water booster pump stations, lift stations, pressure reducing stations, water distribution and transmission mains, gravity sewer mains, and sewage force mains. Hector's experience with water and wastewater systems includes working side-by-side with maintenance and operations personnel on the upgrade, retrofit, condition assessment, and replacement of an agency's vertical and horizontal assets. Hector's experience in the public sector includes the oversight and management of water and wastewater treatment personnel and facilities for a public agency in South Orange County. As a former head of engineering and as a general manager of a public agency, Hector brings the experience of having worked for many years with water and wastewater operators and maintenance technicians in effectively planning and managing the rehabilitation, upgrade, and replacement of an agency's assets, and as such, understands the value of asset management from an owner's perspective.

Asset Management, Engineering, and Operations – Public System General

Hector Ruiz managed the Trabuco Canyon Water District, a California public water utility with a five-member Board of Directors providing retail water, wastewater, and recycled water services. Hector was responsible for the overall management of assets for the agency's water/wastewater/recycled water facilities and infrastructure including a wastewater treatment and recycling plant, a surface water treatment plant, a groundwater treatment plant, several miles of water transmission and distribution mains, several miles of gravity and force mains, water and sewerage pump stations, water storage reservoirs, and various pressure reducing stations and two open reservoirs with earthen dams.

Annually and as required throughout the fiscal year, Hector worked with staff and consultants in the preparation of the agency's budget, capital improvement program (CIP), rates, and reserves. Specifically, Hector's water supply, treatment, and conveyance experience includes:

- Managed water operations and distribution staff responsible for seven above grade reservoirs, eight water booster pump stations and multiple pressure zones serving elevations from 1,000 to 1,600 feet.
- Daily management and oversight of operations/maintenance staff responsible for:
  - The Dimension Water Treatment Plant a surface water treatment facility, supplied with untreated/imported water from the Colorado River.
  - Groundwater treatment facility supplied with seasonal untreated water under the influence of surface water.
  - Recycled water treatment facilities producing and distributing recycled water.
  - Urban runoff/capture/reuse systems for supplementing the recycled water system.
  - Worked with the maintenance department in replacing a legacy CMMS system.
- Worked closely with engineering, operations and maintenance departments in effectively troubleshooting various issues/problems/ and inefficiencies related to:
  - Potable water treatment, storage, and distribution system; including pressure reducing station and booster pump station failures and water main breaks.
  - Wastewater collection and pumping system, including pump station failures, sewer overflows and spills, and force main breaks.
  - Recycled water production, pumping, and distribution system operation and maintenance.
  - Management of a legacy Supervisory Control and Data Acquisition (SCADA) system that interfaced with multiple communication technologies (internet, low frequency radio, and broadband radio).
- Worked closely with engineering to design and construct various projects utilizing in-house resources. Projects included CEQA, FEMA grant funds, Prop 84 funds, and SRF funds.

- Successfully led the procurement of FEMA funds for projects totaling over $3M. The projects involved complex environmental constraints and construction within creeks, streambeds, and public and private properties. Negotiated the procurement of 3 public and three private easements for the FEMA funded sections.

Project Management and Engineering Experience

Over the span of approximately 18 years, Hector has managed several water and wastewater projects, and led project teams with staff ranging from 2 to up to 50+ people and projects that ranged from $25,000 to over $1 million in consulting fees. Hector's Project Management and engineering experience includes:

- Design/Build Experience. Lead project and process engineer for $10 million Design Build improvements to various wastewater and recycled water facilities. As the prime contractor, worked directly with the mechanical, electrical, and controls subcontractors, and vendors in construction of the various plant upgrades and improvements.
- Water Treatment Projects. Design Engineering and Operations of a groundwater treatment facility including pilot and full-scale operation, testing, and maintenance of various unit treatment process including ozone, conventional treatment technologies, dissolved air flotation, GAC, and membranes.
- Recycled Water Treatment Projects. Master planning and evaluation for the expansion of water reclamation facilities, including facilities with reverses osmosis, lime saturation for pH control, concentrate disposal, and micro-filtration of secondary effluent.
- Wastewater Treatment Projects. Project management and engineering for the design, and construction of water treatment, wastewater treatment, and water recycling facilities ranging up to 15 MGD. Performed various design/construction management services for upgrades, expansions, and rehabilitation projects to wastewater facilities in Southern California and Arizona. Projects included rehabilitation and expansion of unit treatment facilities and pump stations. Various plant improvements included conversion of reactors to flow through activated sludge systems with nitrogen removal, and increasing treatment and hydraulic capacity.
- Sewer System Projects. Project management and engineering for the design and rehabilitation of major sewer gravity trunk lines and force mains, including use of HDPE pipe. Trunk line sizes ranged from 16-inch to 27-inch diameter. Rehabilitation projects for gravity sewer mains ranging from 14-inch through 22-inches and force mains of up to 12-inches. Rehabilitation technology included HDPE force main designs, bridge crossings, and creek crossings requiring significant permitting and approval by various local, state, and federal agencies.

Operations Management Experience

Over the span of approximately 18 years, Hector has worked on projects that involved hands on operation of facilities at a pilot scale and full scale level. Hector's operation's experience includes:

Operations Engineer – Groundwater Treatment Facility, Orange County, CA

Design Engineer and Operations lead for year-long operation of groundwater treatment facility that evaluated pilot and full-scale operation, testing, and maintenance of various unit treatment process including ozone, conventional treatment technologies, dissolved air flotation, GAC, and membranes, and ion-exchange resins.

Results from the project were used to construct a full-scale groundwater treatment facility utilizing nano-filtration membranes.

Project Manager and Operations Engineer – Groundwater Treatment Facility, Orange County, CA

Prepared design criteria for increasing the operational efficiency of groundwater treatment facility. Scope of service included the collection and treatment of concentrate produced and being disposed with membranes. The treated concentrate was blended with the main facility's product water and the "new" brine was disposed of to the sewer. The project increased well production while decreasing discharge of flows to the sewer resulting in significant costs savings.

Prepared test protocols and trained agency water treatment plant operators in the proper evaluation, cleaning, loading and unloading of ultra-filtration membranes at a full-scale treatment facility. Evaluation included development of standard operating procedures (SOP) and training video for use by the agency's operators.

Project Engineer - Advanced Water Recycling Treatment Plant Upgrades and Improvements, El Segundo, CA.

Master planning and evaluation for the expansion of water reclamation facilities, including facilities with reverses osmosis, lime saturation for pH control, concentrate disposal, and micro-filtration of secondary effluent.

Completed design, construction management, and startup of lime saturation for control of hardness and calcium carbonate buildup at injection wells.

Chris Hertle

Blue Ribbon Panel Chair

Qualified: Bachelor of Engineering, Chemical (Hons), Master of Philosophy, Environmental and Biological Sciences, Adjunct Professor – Advanced Water Management Centre - University of Queensland

Connected: Fellow, International Water Association; Fellow, Engineers Australia; Member of Research Advisory Committee –Australian Water recycling Centre of excellence; Member American Water work Association; Member WateReuse; Member, Australian Water Association; Member, Water Environment Federation, Member, International Desalination Association.

Registrations: CA#CH6292 Issued September 2007, Expires December 2019

Years with GHD: 26 | Home Office Location: Irvine, CA

Professional Summary: Chris is a Chemical Engineer with over 35 years' experience in municipal and industrial water, wastewater and solid waste management, particularly with innovative solutions for resource recovery schemes that recovery water, carbon and nutrients. This has including media and membrane filtration, ion exchange and advanced oxidation systems This has covered investigations, pilot plants, design, specification, tendering, installation, commissioning and operations. Chris has been involved in numerous water reuse schemes and projects including the Western Corridor Recycled Water Scheme, the first membrane bioreactor in Australia and the world's first water recycling facility in a brewery at Fosters. Chris has a passion for challenging designs and coming up with alternative approaches that are cost effective. Chris has written more than 40 technical publications in the water and wastewater field.

Project manager | Mt Crosby and North Pine WTPs Alum Sludge management strategy | Brisbane, Australia

Study manager for alum sludge residue management at the 3 largest water treatment plants in Brisbane.

Process engineer | Glenmore WTP | Rockhampton, Australia

Study manager for Glenmore WTP capacity and quality assessment. Recommendations included on-line monitoring of raw water to control coagulant dosage automatically, replacement of the lime slaking system, implementation of a filter to waste and clean out of the sludge lagoons.

Process engineer | Glenmore WTP | Rockhampton, Australia

Study manager filter to waste study. Utilised particle counting technology to implement a filter to waste strategy for the dual media after backwash. The outcome was more reliable turbidity for filtered water through the whole filtration cycle.

Process engineer | Molendinar WTP | Gold Coast, Australia

Study manager for Molendinar WTP chlorine disinfection assessment. Comparison of alternative chlorination options. Compared existing chlorine gas dosing to sodium hypochlorite and onsite hypo production. The preferred alternative was to change to NaOCl dosing using delivered product.

Process engineer | Molendinar WTP | Gold Coast, Australia

Study manager filter to waste study. Utilised particle counting technology to implement a filter to waste strategy for the dual media after backwash. The outcome was more reliable turbidity for filtered water through the whole filtration cycle.

Process Design | Western Corridor Recycled Water Scheme I Brisbane, Australia

Process team lead for GHD in developing the concept for the WCRWS. This lead to the construction of a $2.4 billion scheme providing 60mgd of purified recycled water from 3 AWRFs to South East Queensland power stations, industry, agriculture, and Wivenhoe dam system.

Project Director, The Smiths Snack Food Company | Brisbane, Australia

Concept Design and Tender Phase Services, Treated Wastewater. Concept design and tender phase services of water management plant for The Smiths Snackfood Company. Allows recycle of treated wastewater for non-product contact uses (anaerobic, aerobic treatment followed by membrane filtration and reverse osmosis).

Design Manager, Lion Nathan XXXX Milton Brewery | Brisbane, Australia

Concept design and project management of the design and construct of water management plant for Lion Nathan XXXX Milton brewery. Allows recycle of treated wastewater for non- product contact uses (anaerobic, aerobic treatment followed by membrane filtration, reverse osmosis, UV and chlorine dioxide disinfection).

Process Design Carlton & United Breweries | Yatala, Australia

Concept design of water management plant for Carlton & United Breweries Yatala brewery. Allows recycle of treated wastewater for non- product contact uses (anaerobic, aerobic treatment followed by DAF, membrane filtration, reverse osmosis and chlorine disinfection).

Project director, peer review, Pacific Beverages | Warnervale, Australia

Concept Design and Tender Phase Services.
Concept design and tender phase services of water management plant for Pacific Beverages (CCA, SABMiller) Warnervale brewery. Allows recycle of treated wastewater for non- product contact uses (anaerobic, aerobic treatment followed by MBR and reverse osmosis).

Project Director, Australian Country Choice | Brisbane, Australia

Abattoir recycled water assessment –Assessed options for treatment and recycle of treated effluent for reuse on site in excluding processing area.

Process engineer, JBS Swift | Brisbane

Assessed option and prepared concept design for treating wastewater at abattoir to allow total recycle into the works at large beef abattoir in SE Queensland. Including HACCAP & risk assessment.

Lead Process design, Confidential | China

Conducted options study, concept design and specification of preferred option to treat wastewater from large barn style dairies in China. The plant has to achieve very low levels of COD and nutrients. Plant includes sand removal, fine screening, high rate anaerobic treatment Anaerobic flotation reactor, activated sludge. Anammox and Fenton's reagent.

Coal Seam Gas Water management Training

Prepared and delivered over 10 papers and technical training courses in Australia and overseas on water and salt management in the coal seam gas sector.

Coal Seam Gas Salt Management

Conducted extensive review of options for salt management in the coal seam gas sector including brine concentration, crystallisation and selective salt recovery.

Options Assessment Brine management, Coal Seam Gas QLD Australia

Review of options for management of brine from coal seam gas .associated water reverse osmosis plant. Options included enhanced wind evaporation, batch operated RO to increase recovery, thermal systems (brine evaporators and crystallisers), recovery of commodity chemicals (soda ash, hydrochloric acid).

Wastewater Treatment and Disposal Options, Paper Plant Swanbank, Australia

Process review of treatment and disposal options for wastewater from the proposed Swanbank Paper plant. Options involved the reuse of water from the Bundamba Sewage Treatment Plant and development of a Zero Liquid Discharge option.

Study of Water Use and Wastewater Production,CSBP Wesfarmers, WA Australia

Detailed study of water use and wastewater production from a fully integrated chemical and fertiliser manufacturing facility. Design of reuse and treatment options to aim for zero discharge of heavy metals and nutrients.

Mark Donovan, PE

Treatment Evaluations & 30% Design Documentation Process Lead

Qualified: MS, Engineering (Chemical), California State University, Long Beach, California, BS, Chemical Engineering, University of New Hampshire, Durham, New Hampshire

Connected: Member – American Institute of Chemical Engineers, American Membrane Technology Association, WateReuse Association

PE Chemical CA (Issued: September 21, 2007; Expiration Date: December 31, 2021)

PE Civil HI (Issued: December 10, 2013; Expiration Date: April 30, 2020)

Years with GHD: 7 | Home Office Location: Irvine

Professional Summary: Mark is a Senior Process Engineer with over 20 years of experience in membrane-based water treatment system process design. Mark has provided full scale system design, operations support, and treatment process improvement/optimization services to municipal and industrial water treatment facilities worldwide. Furthermore, Mark is very well versed in the Owner Engineer role for collaborative, Alternative Delivery water projects, serving this role in several prominent projects in Southern California. Mark's unique blend of detailed design and Owner's Engineer experience makes him ideal for this role.

Senior Process Engineer - Owner Engineer for GRIP AWTF Water Replenishment District of Southern California, Lakewood, CA

Senior Process/Membrane Engineer on **Owner's Engineer** team for the Water Replenishment District of Southern California's (WRD's) GRIP Advanced Water Treatment Facility (AWTF), delivered under a **Progressive Design Build contract**. The AWTF, with an initial capacity of 12 mgd and a maximum capacity of approximately 25 mgd, will treat tertiary effluent from the LACSD using ultrafiltration (UF) and reverse osmosis (RO) followed by ultraviolet advanced oxidation (UVAOP). As the Owner Engineer for the project, GHD prepared all contract and engineering documents for the selection of the Design-Build (DB) Entity, performed design review, and is currently overseeing the commissioning process.

Program Manager – Senior Process Engineer Doheny Desalination Project, South Coast Water District | Dana Point, CA

GHD is currently the Program Manager/**Owner's Engineer** for South Coast Water District for this 5 -15 mgd ocean desalination project. GHD's role for the current planning stages of the project includes preparation of the Preliminary Design, managing and preparing the Environmental Impact Report and numerous supporting technical studies, managing the Permitting process, evaluation of Project Delivery Methods including development of the financial model and Value for Money Analysis, and managing the Public Outreach process. Once the project moves into the **Design Build Operate Maintain** execution phase, GHD will prepare bid documents, and perform CM and OE duties on behalf of the District.

Senior Process Engineer Seawater Desalination Plant, Poseidon Resources | Carlsbad, CA

GHD performed the **Owner's Engineer** role for the 50 million gallons per day seawater reverse osmosis desalination facility delivered under an EPC/**Alternative Delivery** contract. Provided technical review of all aspects of the seawater desalination plant process design. Coordinated and provided technical support for obtaining the DDW Drinking Water Permit, which is a first in California for a seawater desalination plant of this magnitude.

Senior Process Engineer Seawater Desalination Plant, Poseidon Resources | Huntington Beach, CA

Currently performing the **Owner's Engineer** role for the 50 MGD seawater desalination project, which will be delivered under an EPC/**Alternative Delivery** contract . Recent work included collaborative process design reviews, and detailed review of bids and assessment of the contractors Guaranteed Maximum Price.

Senior Process Engineer - Owner Engineer Seawater Desalination Plant, Confidential Client, Texas

Currently performing the **Owner's Engineer** role for a 25 MGD seawater desalination project, which will be delivered under an EPC/**Alternative Delivery** contract . Mark's role includes process design criteria review for the contract documents and collaboration with the Design team on value engineering.

Senior Process Engineer / Project Manager City of Beverly Hills, RO Water Treatment Plant Rehabilitation | Beverly Hills, CA

The City of Beverly Hills engaged GHD for the detailed design of their RO Water Treatment Plant Rehabilitation Project. The 3 MGD RO plant, which was delivered under a **Design-Build-Operate-Finance** agreement in 2003 and taken over by the City in 2008, was in need of various repairs and improvements.

Mark lead the design team through many upgrades and improvements to the plant focused on addressing corrosion, various treatment process improvements, enhancing operator safety and control, enhancing plant reliability, evaluation of possible plant expansion, and ensuring suitable finished water quality. Coordination with DDW and other permitting agencieswas also required as part of the plant improvements.

Senior Project Engineer
Lenain WTP Facility Master Plan, Utilities Department | Anaheim, CA

GHD developed a comprehensive Facility Master Plan including cost and schedule for the replacement and rehabilitation (R & R) of facilities as well as expansion of the LWTP from 15 to 20-22 mgd. This work included performing significant treatment optimization studies including Jar testing of various coagulants and hydraulic assessments of plant and distribution system. Also established the Asset Management framework for the City and implementing the framework at the LWTP. Also performing detailed facility condition assessments at the plant.

Senior Process Engineer / Project Manager
City of San Diego, Otay Water Treatment Plant Chlorine Conversion | San Diego, CA

The Otay Water Treatment Plant is a surface water treatment plant located adjacent to the Lower Otay Reservoir, and has a capacity of 34 mgd. The treatment process includes a chlorine dioxide contact chamber, flocculation and sedimentation, and media filtration, followed by chloramination. GHD recently completed a Design/Build project for the conversion from chlorine gas to Onsite Sodium Hypochlorite, including upgrades to the chlorine dioxide generators.

Mark lead an interdisciplinary team of engineers to complete the process, mechanical, electrical, I&C, and civil/structural design modifications required for the conversion. Additionally, Mark has coordinated with Operations Staff and the Contractors to keep the plant operational during all construction activities.

Project Engineer
West Basin Municipal Water District | CA, USA

Provided operations support and performance assessment of three separate advanced water treatment facilities utilizing MF, RO and Advanced Oxidation to produce four different grades of recycled water totaling over 25 MGD. Conducted R&D studies to improve plant performance, and provided management and operations staff recommendations regarding system operating conditions, membrane cleaning, troubleshooting, maintenance, and process optimization.

Project Engineer
BP-Carson Refinery | CA, USA

Assessed and optimized performance of industrial RO system treating water from nearby AWTF for use in the oil refinery. Designed RO system upgrades to increase RO system capacity. Provided RO system monitoring reports and recommendations regarding operating conditions and system optimization.

Senior Process Engineer
City of Palo Alto, AWTF Feasibility Study and Preliminary Design | Palo Alto, CA

Mark was Senior Process Engineer for the City of Palo Alto's Feasibility Study and subsequent Preliminary Design for an Advance Water Treatment Facility utilizing MF and RO to improve the quality of recycled water for the local area. Mark lead the development of various plant layouts, brine disposal options, and cost estimates.

Membrane/Membrane System Manufacturing Sector

With 10 years of experience in the membrane and membrane system manufacturing sector, Mark designed and manufactured dozens of large scale membrane systems treating various water sources for municipalities and various industrial markets. Mark also performed on-site system start-up and troubleshooting services, and pilot testing in a variety of applications.

Paul Hermann, CPEng

Design-Build Services Lead

Qualified: Bachelor of Engineering – Civil, Environmental, Queensland University of Technology, Australia

Connected: Institution of Engineers, Australia

Years with GHD: 19 | Home Office Location: Irvine

Professional Summary: Paul is a lead water/wastewater engineer and GHD's Water Market for the west region. He has extensive design experience in water and wastewater infrastructure, including large conveyance pipelines, pumping stations, and treatment facilities. Paul was the Owner's Engineer/Project Manager for the $115M WRD Albert Robles Center (ARC) Advanced Water Treatment Facility (AWTF) Progressive Design Build project, and he played a key role in the successful delivery of the Carlsbad SWRO Desalination Plant Pipeline and Western Corridor Recycled Water Project.

Owner Engineer/Project Manager
Albert Robles Center Advanced Water Treatment Facility | WRD | Lakewood, CA

Owner's Engineer and Project Manager for the Water Replenishment District of Southern California's (WRD) Albert Robles Center $115 million advanced water treatment facility. The Progressive Design-Build (DB) delivery of the project has very unique aspects including a collaborative process to select the DB Entity and establish a Guaranteed Maximum Price (GMP). Paul led the development of the project design criteria which communicated all technical requirements to the DB Entities in a creative format to facilitate submittals of proposals, the collaborative discussions, and the evaluations of the proposals. During project execution, Paul led the integration of the DBE with the multidisciplinary teaming partners and subcontractors to deliver an award-winning, innovative treatment plant and injection well system.

Project Director
Carlsbad SWRO Desalination Plant Pipeline | Poseidon Water/San Diego County Water Authority | Carlsbad, CA

Performed in the role as the Owner's Engineer for the project, which comprised the engineering, procurement, and construction of both the 50 MGD seawater reverse osmosis desalination facility, in addition to approximately 10 miles of new 54-inch steel conveyance pipeline. He was the primary contact for the owner's team with respect to technical services and provided general oversight and independent assessment of various aspects of the project. Key tasks completed include project and site coordination activities, scope book and specification reviews, drawing and design reviews, materials/durability/ asset life reviews, consultation with local authorities and utilities, and providing general project management and technical assistance to the client. Works also included the coordination and development of compliance documentation with the California Department of Public Health, and Pilot Plant development, compliance and oversight.

Post Plant Operation: While the Desalination Plant has been operational for a few years now, Paul still maintains involvement through the Owner's obligation to make project modifications to accommodate changes in legislation and/or permitting requirements. At present, Paul manages for Poseidon the upcoming wetlands restoration, new Plant intake structure and discharge modifications, and the detailed design of a new pilot system required to replicate the operation of the proposed new intake structures.

Technical Services Lead
Doheny Desalination Project | South Coast Water District | Dana Point, CA

GHD is currently the Program Manager/Owner's Engineer (OE) for South Coast Water District for this 5 -15 mgd ocean desalination project. GHD's role for the currentplanning stages of the project includes the completion of the Preliminary Design, development and completion of the Environmental Impact Report and numerous supporting technical studies, managing the Permitting process, evaluation of Project Delivery Methods including development of the financial model and Value for Money Analysis, and managing the Public Outreach process. Once the project moves into the execution phase, GHD will prepare bid documents, and perform CM and OE duties on behalf of the District.

Project Manager
Seawater Desalination Plant, Confidential Client | USA

Currently performing the Owner's Engineer role for a 25 MGD seawater desalination project, which will be delivered under an EPC/ Alternative Delivery contract. Paul is currently managing the development of contract documents, preliminary cost estimating, and project scheduling while completing the preliminary design - as required to satisfy both permitting and financial/funding requirements. Further, GHD is responsible for all environmental permitting for the project.

Project Director
Western Corridor Recycled Water Project | Department of Infrastructure, Queensland Government | Queensland, Australia

Performed the role of owner's engineer for both the Eastern Pipeline Alliance and Western Pipeline Alliance. The system, at a cost of ~AU$2.4B, involved the construction of three advanced water treatment plants (AWTP) (Bundamba, Luggage Point, and Gibson Island), which provide purified recycled water to Swanbank and Tarong Power Stations whilst enabling excess to be discharged to Wivenhoe Dam. The combined conveyance system was approximately 125 miles of up to 60-inch diameter pipeline and 9 pumping stations with capacities ranging between 1.85 to 45 MGD. The primary role was to ensure that the owner/client had involvement in the design process; ensuring compliance occurs with the scope of work and technical criteria and that best engineering and construction practice was implemented and maintained. Another significant role was to ensure that the interfaces between all five Alliances occurred fluently as both of the pipeline Alliances had significant interfaces with all three AWTPs. Eastern Pipeline Alliance provide the pump stations and transfer pipe work between the AWTPs whilst Western Pipeline Alliance has interfaces with all five Alliances as it is responsible for the communications network in addition to providing pump stations and transfer pipe work.

Principal-in-Charge
Strategic Infrastructure Management | Port of San Diego

Principal overseeing the complete targeted data collection (new field data and currently held as-builts and condition survey reports), asset register development, risk-based preventative maintenance and renewals plan, long-term financial forecast and budget optimization strategy for all Port owned and maintained waterfront, parks, roads and building assets.

Owner Engineer/Project Manager
GRIP AWTF WRD | Lakewood, CA

OE and Project Manager for WRD's Groundwater Reliability Improvement Program (GRIP) $100-million advanced water treatment facility (AWTF). The Progressive DB delivery of the project has very unique aspects including a collaborative process to select the DB Entity and establish a Guaranteed Maximum Price (GMP). Lead the development of the project design criteria which communicated all technical requirements to the DB Entities in a creative format to facilitate submittals of proposals, the collaborative discussions, and the evaluations of the proposals. The selection of the DB Entity with a single GMP was completed in April 2016, and final contract is currently being prepared. The project is scheduled to be completed mid-2018.

Another unique aspect of the project is the co-location of GHD key technical staff with WRD staff. The key DB Entity staff will also join the team enhance the delivery of the project. The OE services will include CM services, startup and commissioning, and supervision of the transitional operation of the facility.

Project Manager
Private Client | Seawater Reverse Osmosis Desalination Plant in the Lana'i, Hawaii.

Currently performing the role of Project Manager for GHD on this project. The private client has engaged GHD as part of the project team for the design and construction of a seawater reverse osmosis desalination facility with the plant to be developed in 2.5 MGD stages, to an ultimate capacity of 10 MGD.

- GHD's current role includes key components of the desalination project, including the following:
- Pilot Plant design and construction guidance, and analysis;
- Analysis of numerous contract vehicles, and the determination of the optimal option noting the key criteria of location, plant size, seasonal demand requirements and constraints, development / retail sale opportunities, etc.
- Design of the treatment process, including the coordination with the Department of Health, and chemical usage considerations.
- Cost benefit analysis of different processes, in terms of both upfront capital and ongoing long term operation & maintenance expenditure.
- Power supply requirements,
- GHD is the Designer of Record for the seawater reverse osmosis treatment process.

Project Director
100 MGD Seawater Reserve Osmosis Desalination Plant, Private Client | Northern America

Currently part of the team supporting our client with project planning, project strategy, and procurement advice, and with the concept development and concept design for a Seawater Reverse Osmosis Desalination Plant with an ultimate capacity of 100 MGD. This includes associated infrastructure including the intake and outfall, power supply, etc. The end intent is the production of a documentation package suitable for financing, signing and executing an Engineering, Procurement and Construction (EPC) Project.

Sridhar Sadasivan, PE, SE

Design-Build Services – Contract Documents

Qualified: B.S. Civil/Environmental Engineering, University of Bombay, India, 2002; M.S. Structural Engineering, University of Cincinnati, 2004; Professional Civil Engineer: CA; Professional Structural Engineer: CA

PE Civil CA (Issued July 31, 2008; Expiration Date: December 31, 2020)

PE Structural CA (Issued December 18, 2013; Expiration Date: December 31, 2021)

Years with GHD: 0.5 | Home Office Location: San Diego

Professional Summary: Backed by over 15 years of hands-on experience in design and construction of facilities for environmental projects, Sridhar has been involved in planning, design, and construction of more than ten treatment plants, 50 reservoirs, ten pipelines, 15 pumping stations, and eight chemical facilities, as well as in the siting/design of four administration buildings. This work typically involves design-bid-build and alternate delivery processes, serving in such roles as Project Manager, Design Manager, Lead Civil Engineer, and Lead Structural Engineer. Additionally, he is an asset in the field, having provided construction support and inspection services for several infrastructure projects, including resident engineering services at a wastewater treatment plant and at several sewer pipeline construction sites.

Project Engineer / Lead Structural Engineer
Longfellow Recycled Water Tank and Pipeline | Eastern Municipal Water District | Winchester, CA

Sridhar served as the project engineer, lead structural design engineer, and lead civil engineer during the design and construction of a 5-million-gallon (MG) welded steel tank, 4,000 linear feet (LF) of 36-inch diameter steel pipeline, and 25,000 cubic yards (CY) of excavation, as well as for miscellaneous sitework.

Project Manager
Daily II Reservoir and Pipeline Design | Eastern Municipal Water District | Menifee, CA

Sridhar served as the project manager, lead structural design engineer, and lead civil engineer during the preliminary and final design of a 2 MG welded steel tank, 2,000 LF of 12-inch PVC pipeline, and 18,000 CY of excavation, as well as for miscellaneous sitework. Preliminary design involved a siting study for a 2 MG welded steel reservoir with evaluation of potential sites primarily based on operations and geotechnical considerations.

Project Engineer
Benton Recycled Water Storage Tank and Pipeline | Eastern Municipal Water District | Perris, CA

Sridhar served as the project engineer and lead structural design engineer during the design and construction of a 2 MG welded steel tank, 9,000 LF of 24-inch steel pipeline, and 65,000 CY of excavation, as well as for miscellaneous sitework.

Project Manager
Seismic Study of Reservoirs | Fallbrook Public Utility District | Fallbrook, CA

Sridhar served as the project manager and lead structural design engineer for this seismic evaluation of eight (8) welded steel reservoirs (0.5MG to 8MG) in accordance with AWWA D-100, as well as for preliminary geotechnical investigations.

Structural Engineer
Tank Seismic Improvements | City of Burbank Water and Power, CA

Sridhar served as structural engineer for a comprehensive seismic, structural, corrosion, and safety assessment of 22 flat bottom steel tanks (18 potable water and four recycled water), ranging from 0.2 MG to 10 MG, performed on 14 different sites. The assessment included observation and inspection to record damage and document deficiencies, and then the development of recommendations for the seismic rehabilitation of the tanks. The City is in the process of implementing the recommendations of the corrosion study. Seismic deficiencies in 12 tanks were identified. Engineering services entailed cost evaluation for retrofit alternatives for the tanks, design of the retrofit, and construction administration support.

Project Manager
Garfield Reservoir and Pump Station Replacement Project | City of South Pasadena, CA

Sridhar managed the preliminary design, final design, and engineering services during construction for replacement of the Garfield Reservoir and Pump Station and Administration Building. The site is in a residential neighborhood and the design required landscaping and noise analysis. The project also included a 6,000 SF administration building and permanent treatment of site stormwater run-off prior to discharging to a flood control channel. Project features involve:

- Site specific ground motion analysis (site 100-feet away from active Raymond Fault Line)
- 2-3.5 MG partially buried cast-in-place concrete reservoirs
- 2,500-gallons-per-minute (GPM) booster station with two (2) 100-HP and one (1) 50-HP vertical turbine pumps with an on-site chlorination system including three chlorine metering pumps and multiple chlorine residual analyzers
- 6,000 SF two-story administration building with offices, shower/lockers, garage, conference room, and multi-purpose room

Project Engineer
Chevy Chase 968 Reservoir and Booster Pump Station | City of Glendale, CA

Sridhar served as the project engineer and structural design engineer during final design and construction of a 15 MG buried cast-in-place concrete reservoir underneath a golf course and a 2,400 GPM tri-level booster pump station in a residential neighborhood. During construction, Sridhar managed the office services provided, including attending weekly progress meetings and structural observation.

Design Manager
North Interceptor Sewer Project | City of Bend, OR

The North Interceptor Sewer Project (NISP) consists of the design and construction of a sewer transmission pipeline to accommodate the City's growth plans and policies, incorporate redundancy into the system, and replace aging infrastructure. Project features include:

- System Alternative Analysis: evaluating pump station wet well configuration, pump configurations, pipeline hydraulics and material, operational and maintenance considerations, and capital and life cycle costs
- 37 MGD (expandable to 74 MGD) pump station at WRF
- Six (6) major utility crossings. including open trench crossing across the North Unit Irrigation District (NUID) canal under Bureau of Reclamation jurisdiction, and trenchless crossings under Central Oregon Irrigation District pipeline, Swalley Irrigation District Pipeline, BNSF Railroad, Hwy 97 (ODOT), and Hwy 20 (ODOT)
- 10,500 LF of 54-inch pipeline, 17,000 LF of 30-inch pipeline, and 9,500 LF of 12-inch to 24-inch pipelines
- Vortex drop structure
- Easement acquisitions

Project Manager
Lift Station 1 and Emergency Storage Reservoirs | Rainbow Municipal Water District | Rainbow, CA

Sridhar managed the planning and design of two lift stations (3,000 GPM and 700 GPM), one mile of 14-inch diameter force main, and two miles of 24-inch diameter gravity transmission main. The project also included two below grade, cast-in-place concrete emergency storage reservoirs (0.5 MG and 0.25 MG).

Project Manager
Morrow Tank Retrofit | Rainbow Municipal Water District | Rainbow, CA

The Morro Tank is the lone source of storage in one of Rainbow Municipal Water District's (RMWD) water distribution system pressure zones. A structural and geotechnical analysis of the tank discovered the tank sits on unstable soil, which would require significant investment to rectify. Sridhar managed a hydraulic analysis to determine alternative means of providing storage and pumping facilities for the pressure zone.

Structural Engineer
Water Supply Stabilization Program | Antelope Valley-East kern Water Agency | Palmdale, OR

The WSSP2 is a groundwater basin banking project that will increase the reliability of the Antelope Valley Region's water supplies through construction of the necessary infrastructure to store excess water available from the State Water Project (SWP) during wet periods and recover and serve it to customers during dry and high demand periods or during a disruption in deliveries from the SWP. Sridhar was responsible for the structural design of the two 4 MG welded steel reservoirs and a single story masonry operations building.

Kevin Tirado, PE

Design-Build & Construction Observation Services

Qualified: BSCE - University of California, Davis

Connected: State of California Registered Professional Civil Engineer No. C72958 (Issued: July 2008, Expires December 2020); California State Water Resources Control Board T2 Water Treatment Operator No. 32230; California State Water Resources Control Board Grade D2 Water Distribution Operator No. 38693; American Water Works Association; WateReuse Association; Southwest Membrane Operator Association

Years with GHD: < 1 yr | Home Office Location: Long Beach, CA

Professional Summary: Kevin is committed to streamlining processes and procedures to ensure maximum cost-effectiveness and efficiency. Dedicated professional who builds lasting, productive relationships with leaders of public organizations, private entities, and stakeholders. Technically skilled leader who brings a depth of engineering knowledge to complex business challenges and communicates effectively with "white collar" leadership and "blue collar" teams. Motivational coach and mentor who empowers employees to outperform expectations.

Project Manager
Black & Veatch | Los Angeles, CA | 2019-2020

Led business development initiatives in Los Angeles and surrounding areas. Led proposal teams pursuing regional water, wastewater, recycled water treatment plant upgrade projects. Collaborated with project team and disciplines to develop project approach, proposed scope of services, engineering cost estimates, and understanding of projects for regional project proposals.

Project Manager
Black & Veatch | Asset Inventory Project | Coachella Valley Water District | Coachella, CA | 2019-2020

Ensured scope, schedule, and budget are maintained for $4M project budget for CVWD's asset inventory project. Regularly monitored project progress and budget. Coordinated with finance to department for timely submission of monthly project invoices.

Engineering Manager
SUEZ – North America | West Basin Municipal Water District | El Segundo, CA | 2015-2019

Lead engineering resource that provided technical support and services for the 40 MGD+ Edward C. Little Water Recycling Facility, 1 pump station, and 3 satellite treatment plants. Directed Engineering/Process Optimization team to perform process engineering work and provided process control expertise supporting plant operation. Focused on optimum plant performance of ozone, MF, RO, UV, clarifiers, filters, and solids handling systems by continuous review and assessment of plant operating data from field data collection reports, SCADA, and process control data management systems to ensure compliance with water quality objectives. Coordinated management of the District's CIP program, internal small-scale capital improvements, research and development studies, red-lining, asset management program assistance, and EH&S engineering support. Assisted District personnel with project scoping documentation, RFPs, consultant panel interviews, review of design plans and specifications, construction meetings, and operational coordination during construction activities. Developed and reviewed monthly sales reports, energy usage, billing reports and strategized with District management to review project financial and water quality reporting to identify cost savings measures.

Facility Supervisor
Ocean Water Desalination Demonstration | West Basin Municipal Water District | Redondo Beach, CA | 2012-2014

Directed all operational and maintenance activities at the 0.5 MGD Ocean Water Desalination Demonstration Facility. Collaborated with District, engineering consultant, laboratory, contractor, vendor, and regulatory personnel to ensure the completion of research and data acquisition needed for the permitting, design, construction, and operation of a full-scale treatment facility. Responsible for the successful 24/7 continuous operation of the facility through consistent monitoring, assessment, and evaluation of plant performance while ensuring water quality compliance. Completed operational activities such as UF and RO cleanings, equipment troubleshooting, and implemented intensive data collection/analysis, equipment inspections, and water quality compliance sampling activities to evaluate pretreatment disc filtration, UF, and RO equipment.

Project Engineer/O&M Specialist
SUEZ – North America | West Basin Municipal Water District | El Segundo, CA | 2003-2012

Worked closely with District teams, engineering consultants, contractors, vendors, manufacturers, refinery, and regulatory agency staff to address, improve, and resolve plant process issues. Provided guidance to O&M teams and revised process control SOPs to address changing water quality and plant conditions. As the capital improvement projects engineering liaison, collaborated with District, engineering consultant, contractor, and vendors for the design, construction and completion of capital improvement projects ranging from $500K - $20M including new chlorination system, membrane cleaning system modifications, water storage tank rehabilitation, dechlorination systems, pump station expansion, plant expansions, and biological aeration filter rehabilitation projects. Directed numerous MF and RO pilot studies and contributed to seawater desalination, media filter, and membrane qualification pilot studies including startup commissioning, system equipment operation and maintenance, water quality sampling, demonstration testing, and decommissioning activities. Spearheaded MF and RO membrane management program to track prolonged useful life and necessary warranty replacements for 15,000+ membranes. Utilized and evaluated manufacturer test data, load/unload, membrane repair, membrane backwash, cleaning data logs, and raw and normalized data to establish operational baseline and performance metrics. Contributing member of Asset Management program initiative group, corporate Front Line Leadership group, and served as project Health & Safety Committee Chair.

Design Engineer
CDM Smith | Aquifer Storage and Recovery Project | Calleguas Municipal Water District | Thousand Oaks, CA | 2002 - 2003

Lead design resource responsible for the design and construction oversight of the Las Posas Feeder Unit 3, a 3.5 mile long, 72-inch diameter bi-directional water pipeline. Completed design/hydraulic calculations, located utility conflicts, established pipeline alignments and profiles, located and sized system appurtenances, assisted with permit completion, developed engineering cost estimate, and reviewed contractor submittals and shop drawings during construction phase.

Environmental Project Manager
CDM Smith | New School and Modular Addition Environmental Site Assessment | Los Angeles Unified School District | Los Angeles, CA | 2001 - 2002

As part of the District's Environmental Management Program, coordinated with District staff, environmental consultants, regulatory agencies, and stakeholders to address environmental issues for proposed new school and modular additions. Managed multiple Phase 1 environmental site assessment and preliminary endangerment assessments for proposed construction projects. Developed and tracked project schedules, monitored project budgets, facilitated public hearings, and coordinated with environmental teams to ensure CEQA compliance.

Field Coordinator
CDM Smith | Cerro Grande Fire Cleanup | County of Los Alamos | Los Alamos, NM | 2001 - 2001

Post-disaster recovery debris removal joint effort with Los Alamos County and FEMA. Coordinated staff scheduling for monitoring stations for contractor debris removal oversight. Conducted post-debris removal site walks and interviews with property owners.

Project Engineer
CDM Smith | Carlsbad, CA | 1996 - 2000

Contributed to multiple projects including but not limited to projects for Calleguas Municipal Water District, Los Angeles Unified School District, Orange County Sanitation District, California Department of Transportation, City of San Juan Capistrano, City of San Diego, Los Alamos County (New Mexico), US Navy (San Diego), US Marines (Oceanside), and Los Angeles World Airports.

Nick M. Alvaro

Drone Survey

Qualified: B.S., Environmental Science, 2003

Connected: Industrial Environmental Association IEA); San Diego Environmental Professionals (SDEP)

Years with GHD: 7 | Home Office Location: Irvine

Professional Summary: Nick has over thirteen years of professional experience working within the environmental industry with a primary focus on investigation and assessment, health & safety, compliance, and case management. His project experience includes Phase I and II site assessments, environmental compliance reviews, permitting, contractor oversight, site conceptual modeling, agency coordination, field project planning and execution, health & safety audits, and full cycle project management. He has worked at a variety of facilities and completed various projects impacted by a multiple contaminants including petroleum hydrocarbons, chlorinated solvents, pesticides, and heavy metals.

Field Geologist
Reclaimed Water Conveyance United States Marine Corps | Camp Pendleton Oceanside, California | 2017

Performed soil logging and installation of multiple groundwater monitoring wells to a depth of 200 feet below ground surface per San Diego County Department of Environmental Health, Land and Water Quality Division, and Monitoring Well Program specifications and permit. Work included coordination with base officials and monitors for biological and cultural concerns.

Phase I ESA Assessor
Various Clients | Southern California | 2010 - Current

Responsible for conducting site inspections per ASTM regulatory standards in order to complete Phase I environmental site assessments and transaction screens for a variety of clients. Extensive experience in completing historical desktop research, database reviews, and final report preparation. Over 50 assessments completed at facilities that include:

- Carpet manufacturing facilities in Southern California
- Auto dealership facilities in Southern California
- Aerospace supply distribution center in Torrance, CA
- Steel manufacturing plant in Adelanto, CA
- Warehouse facility in Redlands, CA
- Nursing home facilities in Orange County, CA
- Farm equipment manufacturing in Holtville, CA
- Soil hauling facilities in Southern California
- Electric motor repair facility in Colton, CA

CA Prop 65 Review and Guidance
Gibraltar Industries, Inc. | Buffalo, NY | 2018

Assisted with CA Proposition 65 compliance evaluations for client's full product inventory. Responsibilities included chemical classification, analytical testing, and label identification to meet state requirements.

Stormwater Pollution Prevention Plan (SWPPP)
Barnes & Thornburg LLP | Southern California 2018

Prepared site-specific SWPPPs for multiple automotive customization facilities. Responsibilities included site inspections, document and compliance reviews, recommendations of best management practices (BMPs) and/or protocol improvements to meet No Exposure Certification (NEC), and full SWPPP document preparation.

Stormwater Pollution Prevention Plan (SWPPP)
Water Replenishment District of Southern California | Pico Rivera | 2018

Assisted with third-party review of the site's draft SWPPP. Provided recommendations and updates to document in order to meet state requirements and ensure facility compliance.

Spill Prevention, Control, and Countermeasure (SPCC) Plans | Shell Oil | Southern California | 2017

Assisted with the preparation of SPCCs at multiple oil refineries and bulk distribution facilities. Responsible for secondary containment calculations, inventory reviews, and full document preparations.

EHS Support | Saint Gobain | Southern California | 2018

Conducted in-facility EHS support for two window film manufacturing facilities. Responsibilities included conducting routine compliance inspections for hazardous waste and permitting requirements, lead safety briefings, observed facility personnel and identify unsafe behavior trends/procedures, support incident and near miss investigations, and provide employee mentoring.

Noise Assessment | Inland Empire Utility Agency | Ontario | 2018

Completed site evaluation of various facility operations that require ear protection during use. Targeted areas were monitored and modeled to provide recommendations to client on proper health & safety requirements and procedures.

Environmental Scientist
Various Projects | Shell Oil US and Exxon Mobil Southern California | 2005 – 2016

Completed over 50 investigation and assessment projects at various retail gasoline service stations. Projects include soil boring drilling and sampling, groundwater well installation and destruction, groundwater monitoring, soil vapor probe installation and sampling, and remedial feasibility testing/extraction events. Responsibilities included the oversight of multiple subcontractors, vendors, and field staff simultaneously while keeping project goals on track and within budget. Continual focus on identifying unsafe trends and provided positive correction actions that lead to safe behavior and injury free work environments.

Project Coordinator
Soil and Groundwater Investigation | Ashford, Inc | Costa Mesa, California | 2016 - ongoing

Assisted with site strategy development in order to assess historical impacts to soil and groundwater from previous retail service station. Project activities to date include an extensive land and geophysical survey due to complex site features to adequately assess former UST features, Phase II ESA, groundwater monitoring well installation, and routine groundwater sampling. Additional responsibilities have included municipal file reviews, site characterization, coordination of fieldwork, and preparation of technical documents.

Project Coordinator
Phase II ESA | Brithinee Electric | Colton, California | 2018

Developed and completed Phase II ESA to adequately assess potential impacts from current and former site operations, as identified through a Phase I ESA. Project activities included a geophysical survey to identify a former UST cavity, and the drilling and sampling of ten soil borings.

Environmental Technician
Groundwater Assessment | Daytom Enterprises Santa Ana, California | 2016 -2017

Performed groundwater monitoring activities and oversight of subcontractors for volatile organic compound (VOC) impacted site. Assisted with pre-drilling activities for additional phases of soil/groundwater assessment and remedial feasibility testing.

GC/MS Technician
Laboratory Analysis | Irvine, California | November 2004 – August 2005

Prepared and analyzed soil, groundwater, and air environmental samples. Responsible for evaluating analytical data and quality control parameters.

UAV Data Collection

FAA-certified unmanned aerial vehicle (UAV) pilot for commercial applications. Responsible for conducting all aspects of commercial UAV operations, including pre-flight evaluation, safety review, piloting various UAV aircraft, and post-flight data evaluations. UAV services offered include videography, photography, topographic mapping, orthomosaic imagery, and emergency response. Recently completed projects include:

- Communications tower in San Bernardino, CA
- Street restoration projects in Southern California
- Stormwater retention basin in Pico Rivera, CA
- Water treatment facility in Anaheim, CA
- Active mining facility in Corona, CA

Other related areas of interest

Recognized (Certifications/Trainings)

- OSHA 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER)
- RCRA Hazardous Management / DOT Hazardous Materials Shipping
- Transportation Work Identification Credential (TWIC)
- eRailSafe System Badge
- American Heart Association First Aid CPR AED
- Federal Aviation Administration (FAA) Part 107 Certification (small UAS)

Francisco Andrade, SE, PE

Structural Engineer

Qualified: Bachelor of Science, Civil Engineering (BSc/2007); Master of Science, Structural Engineering (MEngSc/2013); Structural Engineer: CA #6345; Civil Engineer: CA #76742

Connected: Member of American Society of Civil Engineers, Structural Engineers Association of Southern California, American Concrete Institute, American Institute of Steel Construction

PE Civil CA (Issued: July 16, 2010; Expiration Date: December 31, 2020)

PE Structural CA (Issued: June 14, 2016; Expiration Date: December 31, 2020)

Years with GHD: 1 | Home Office Location: Irvine

Professional Summary: Francisco has over 10 years of experience in civil and structural design, engineering, and project management for numerous complex projects and the ability to professionally and effectively interact with clients, contractors and other professionals. Knowledgeable in planning, code design standards, and construction inspection. Responsible for supervising, overseeing and coordinating lead project engineers and designers. Engineer of record and engineer in charge for multiple national and international projects.

Lead Engineer
Pier A West | Tidelands | Port of LA, CA

Lead engineer responsible for the design and coordination of a 35 acre industrial development project that included: regrading of entire site, a new drainage system to collect storm water and pump it out to adjacent channel, and new office buildings on deep pile foundations. In addition, performed Structural Observations during construction phase and provided support to facilitate construction and reduce cost

Engineer in charge of structural design of:

- 40 feet long x 35 feet wide x 30 feet deep below grade concrete retention/treatment basin
- Catch basins and manholes of different sizes and depths
- Deep Pile foundation system for buildings
- Energy dissipater structure at drainage system outlet
- Additional responsibilities
  - Review of underground utility lines for compliance with traffic loads
  - Specifications for Prefabricated Office Building
  - Shop drawings review
  - Coordination between disciplines such as: mechanical, civil, and electrical

Lead Engineer
Valero Terminal | Valero| Fontana, CA

Lead engineer responsible for the design of a new fuel terminal. Scope consisted of the design of Pier/Mat type foundations for electrical, mechanical, and prefabricated metal buildings for structural support and to mitigate static and dynamic settlements due to on site soils, steel canopies for the support of piping systems and retaining walls. Structural support was also provided during the construction phase of the project

Engineer in charge of structural design of:

- Pier and mat foundations for electrical and mechanical equipment.
- Pier foundation system for prefabricated metal buildings
- Steel canopies and foundations for piping systems support for loading and offloading of fuel tank semi-trailers
- Retaining walls
- Additional responsibilities
  - Shop drawings review
  - Coordination with mechanical and electrical engineers
  - Specifications for Prefabricated Metal Buildings

Project/Design Engineer
Downey Promenade | Architects Orange | Downey, CA

Structural engineer in charge for the design of a segment of the multi acre development for a new commercial/retail plaza in the City of Downey. Responsible for the design of new buildings, architectural features, electrical and mechanical equipment supports and foundations, and retaining walls. In addition, responsible for providing structural support during the construction phase of the project

Engineer in charge of structural design of:

- Concrete Masonry (CMU) buildings with roof Panelized Systems and Roof Steel Joist System
- Wood Building
- Buildings' Foundations
- Architectural Features
- Retaining walls
- Electrical and mechanical equipment supports and foundations
- Additional responsibilities
  - Shop drawings review

- Coordination with mechanical and electrical engineers, and contractors
- Structural Observations/Inspections during construction phase
- Structural RFI Responses

Lead Engineer
Medical Building | Trapani | Roseville, CA

Structural engineer responsible for the design of a new medical office building for radiation treatment. The building's framing design consisted of concrete bearing walls with a concrete roof, and thickened concrete sections of the building to act as a radiation barrier. The project scope also included the design of foundations and structural supports for vibrations sensitive medical equipment.

Engineer in charge of structural design of:

- Building's concrete bearing/shear wall system for vertical gravity loads support and lateral force resistance
- Building's concrete roof for vertical gravity loads support and as a rigid diaphragms
- Foundations and structural support for vibrations sensitive medical equipment
- Additional responsibilities
  - Coordination between disciplines such as: architect, mechanical engineer, electrical engineer
  - Material Specifications

Engineer of Record
BP Cherry Palm Springs Terminal | British Petroleum| Palm Springs, CA

Civil/Structural Engineer of record for a new Oil facility terminal. Scope of project included: regrading of the site including an earthen secondary spill containment system for above ground storage tanks, new drainage system, new office buildings, and new loading and offloading terminal areas

Engineer in charge of structural design of:

- Foundations for above and below ground storage tanks
- Multiple office buildings' foundations
- Steel racks and bridges for piping systems
- Mechanical, electrical, and piping equipment foundations and supports
- Retaining walls to divert floodwater due to site being located in flood zone area
- Additional responsibilities
  - Coordination between disciplines such as: mechanical, civil, and electrical
  - Materials Specifications

Lead Engineer
New Steel Building for Commercial Use | PK Architecture | Indio, CA

Structural engineer in charge for the design of a new steel building for commercial use. The building's framing design consisted of steel moment and braced frames with curtain walls, and a steel beams/joist roof system with metal deck. Structural support was also provided during the construction phase of the project.

Engineer in charge of structural design of:

- Building's structural framing system, which included moment and braced frames
- Building's structural roof system
- Additional responsibilities
  - Shop drawings review
  - Structural RFI Responses
  - Coordination between disciplines such as: architectural, mechanical, civil, and electrical

Other areas of expertise

- Structural design for new construction, retrofit, and alterations to existing hot rolled steel, cold formed steel, concrete, masonry and wood single and multi-story buildings and structures
- Structural field surveys and assessment reports of existing buildings and structures
- Seismic retrofit
- Structural design of supports for electrical, mechanical, and architectural components in mid-rise building
- Development of structural specifications and cost estimates

Other Affiliations

- Tau Beta Pi Engineering Honor Society
- Chi Epsilon Civil Engineering Honor Society

Erel Betser, PE

Fire Protection

Qualified: M.S. Fire Protection Engineering, 2010, Worchester Polytechnic Institute, B.S. Mechanical Engineering, 1999, Tel-Aviv University

Connected: Licensed Professional Engineer - Fire Protection Engineering (FPE) (CA - FP1880), Licensed Professional Engineer - Mechanical Engineering (ME) (CA - ME37116)

Member, Group I-3 (Institutional) Occupancy Code Development Task Force, California State Fire Marshal (CSFM), 2017-2018

SFFD Approved 3rd Party Smoke Control Reviewer

President, Northern California Nevada (NCN) Chapter, Society of Fire Protection Engineers (SFPE), 2014-2016

Member – SFPE, NFPA, ICC East Bay Chapter

PE Fire Protection CA (Issued: January 27, 2015; Expiration Date: June 30, 2021)

PE Mechanical CA (Issued: June 27, 2014; Expiration Date: September 30, 2020)

PE Mechanical and Fire Protection DE (Expiration Date: September 30, 2020)

Years with GHD: 3 | Home Office Location: Emeryville

Professional Summary: With over 18 years of experience, Erel has successfully managed teams and supervised complex fire protection engineering projects specializing in identifying critical project issues and implementing innovative solutions. Erel brings a unique blend of building and fire code consulting including fire protection/alarm systems design, egress plans, engineering judgements, alternate means and methods, smoke control design and commissioning, fire modeling and performance based design with services ranging from the early stages of design to final construction period. Erel has worked on several Court Buildings and is has a good record track with design approvals at the Office of the California State Fire Marshal.

Project Manager/Senior FPE
Former Fort Ord Ground Water Treatment Plant | Marina, CA

Project Manager responsible for providing fire protection engineering design services to the new groundwater cleanup operations plant. Services included planning sessions, hydrant flow tests, detailed fire sprinkler design, approval by U.S. Army Corps of Engineers, review of water supply options, and response to RFIs.

Project Manager/Senior FPE
Port of San Francisco | San Francisco, CA

Project Manager/Senior Fire Protection Engineer responsible for providing fire protection engineering and code consulting services to the Port of San Francisco. Services included design of fire sprinkler and standpipe systems for Pier 19, Pier 23, Pier 28, Pier 33, and Pier 50 development of code approach letters for multiple piers based on occupancy types and space usage, and presentations to Port officials and Fire Marshal.

Project Manager/Senior Consultant
San Francisco International Airport (SFO) Terminal 3 West Renovation | San Francisco, CA

Project Manager/Senior Consultant responsible for providing fire protection engineering and code consulting services for the $500 Million, design-build, project scheduled to be completed in 2022. Services includes leading code meetings during planning phase, delivering Fire Protection/Life Safety Code Approach reports and egress plans for the different phases/stages, construction support for enabling projects, site surveys to review and assess existing conditions, and developing and presenting to the BICE and SFFD.

Project Manager
Santa Clara County Valley Medical Center (SCCVMC) | San Jose, CA

Project Manager responsible for providing fire protection engineering and code consulting services for a 574 bed hospital. Services included on-going engineering and consulting services, fire protection systems design, fire alarm design reviews, life safety surveys, discussions with Office of Statewide Health Planning and Development (OSHPD) and Santa Clara County Fire Marshal, testing and commission, and preparation of life safety plans.

Project Manager/Senior FPE
California Franchise Tax Board Campus | Sacramento, CA

Project Manager/Senior Fire Protection Engineer responsible for providing fire protection engineering services for the Fire Sprinkler and Fire alarm Systems upgrades as part of the California Department of General Services (DGS) Facilities Management Division (FMD) Deferred Maintenance Construction Program. Services include: Assessment of existing fire alarm systems and network, design of new fire alarm network and workstations, assessing sprinkler deficiencies, developing design documents, cost estimate, and providing construction administration services.

Project Manager/Senior FPE
Elihu M. Harris State Building | Oakland, CA

Project Manager/Senior Fire Protection Engineer responsible for performing fire protection systems due diligence survey and recommendation as part of the California Department of General Services (DGS) Facilities Maintenance Division (FMS) Deferred Maintenance construction Program. Provides fire protection engineering and code consulting services for the 22-story, high-rise, building. Services include: Fire Protection systems assessment, sprinkler coverage and protection, fire pump room evaluation, and developing and presenting to the Authority Having Jurisdiction (CSFM).

Project Manager/Senior Consultant
San Francisco International Airport (SFO) Terminal 1 Redevelopment | San Francisco, CA

Project Manager/Senior Consultant responsible for providing fire protection engineering and code consulting services for the $2.4 Billion, design-build, project scheduled to be completed in 2024. Services included leading code meetings, delivering Fire Protection/Life Safety Code Approach reports and egress plans for the different phases/stages, construction support for enabling projects, site surveys to review and assess existing conditions, and developing and presenting to the local Authority Having Jurisdiction (BICE and SFFD) creative solutions to address existing non-conforming conditions.

Project Manager/Senior FPE
Shasta County, New Redding Courthouse | Redding, CA

Project Manager/Senior Fire Protection Engineer responsible for providing fire protection engineering and code consulting services for the new 165,000 SF, high-rise, courthouse building consist of 14 courtrooms. Services provided from the Schematic Design Phase through Bidding and included design of fire sprinkler and fire alarm systems, smoke control analysis and design, egress plans, building and fire codes analysis report, drawing review, developing alternate means and methods and presentations to the California State Fire Marshal (CSFM).

Senior FPE
Operational Readiness Training Complex | Fort Hunter Liggett, CA

Senior Fire Protection Engineer responsible for providing fire protection review and design of fire sprinkler systems at the new complex that will consist of three barracks to accommodate over 800 soldiers, a battalion headquarters building, a company headquarters building, dining facility and vehicle maintenance facility. Services included detailed fire sprinkler design, approval by U.S. Army Corps of Engineers, and review of water supply options.

Project Manager/Senior FPE
Alameda County, East County Hall of Justice | Dublin, CA

Project Manager/Senior Consultant responsible for providing fire protection engineering and code consulting services for a new 146,000 SF complex which includes a courthouse tower and county office building. Services included building and fire codes analysis report, smoke control design for windowless portion of the building (Central holding), drawing review, Engineering Judgements preparation and reviews, developing alternate means and methods and presentations to the State of California Fire Marshal.

Project Manager/Senior Consultant
New Yolo County Courthouse | Woodland, CA

Project Manager/Senior Fire Protection Engineer responsible for providing fire protection engineering and code consulting services for the new 163,000 SF building comprised of 14 courtrooms and 415 parking spaces. Services included building and fire codes analysis report, fire modeling and performance based design approach for Central holding facility and accessibility consulting services.

Senior Fire Protection Engineer
California Pacific Medical Center, Cathedral Hill hospital | San Francisco, CA

Fire Protection Engineer responsible for providing fire protection consulting services for a new 700,000 SF hospital. Services included the development of a fire protection code approach to allow the placement of oil fuel at the basement level of the hospital, this approach was presented and approved by OSHPD.

Project Manager/Senior FPE
University of California Davis Chemistry and Chemistry Annex Buildings Safety Improvements | Davis, CA

Project Manager/Senior Fire Protection Engineer responsible for providing fire protection design and code consulting services for the two existing chemistry department, non-sprinklered, buildings. Services included the design of new fire protection systems (sprinkler, standpipe, fire pump), reviewed of existing conditions, and developed plans for the installation of sprinkler system in existing building.

Project Manager/Senior FPE
Stanford, McMurtry Building for the Arts | Stanford, CA

Project Manager/Senior Fire Protection Engineer responsible for providing fire protection engineering code consulting services for the new 96,000 SF interdisciplinary hub for the arts. Services included drawing reviews, code approach reports, developing alternate means and methods of construction request, review of design details and preparation of engineering judgements.

Devin Brady
CAD/BIMM

Qualified: A.S Computer Aided Drafting

Professional Summary: Senior CAD designer proficient in Civil 3D, InfraWorks, ReCap and the other various Autodesk products for Infrastructure projects. Always looking to expand knowledge and experience in new and rising technologies, innovative alternative design approaches. I'm outgoing and enthusiastic person who loves troubleshooting and enjoy new and challenging projects.

Design Coordinator & BIM Management
Rialto Bioenergy Facility | Anaergia | Rialto, CA

Devin advises engineer & drafter with all designs of the project along with doing clash detection between the different disciplines on the project through the design build process. Coordinated drafter packages for permitting on the project.

Michael Chapman

Blue Ribbon Panal / Conventional Treatment

Qualified: Bachelor of Science, Monash University, 1974, Bachelor of Chemical Engineering, RMIT, 1985

Connected: Water Research Association – Scientific Advisory Committee. Australian Water Recycling centre of Excellence – Industry Representative, National Protocol Development Committee (Recycled Water Treatment Processes). Author 'Water Treatment Plant Design" (2012) AWWA/ASCE- Ch. 9; High rate granular media filtration

Years with GHD: 23 | Home Office Location: Melbourne, Australia

Professional Summary: Mike is a Chemical Engineer of 39 years' experience in the water industry. He is a water treatment and water supply specialist and has extensive experience in new water & recycled treatment design, review / upgrade of treatment plants, risk assessment and pilot plant studies. He previously was the Global Leader for Water Treatment and Desalination Service Line, which means he was the Australian and international technical leader for this area for GHD. He was also previously Manager for Water Quality and Asset Management for all water treatment facilities operated by Melbourne Water..

Process Design Lead
City of Anaheim | USA | 2015

Lead for pilot plant work and full scale testing of 11no different coagulant options (e.g. PAC, polymers, ferric salts) and revision of existing treatment process to uprate this 56ML/d plant to 76ML/d. the existing process train is coagulation/lamella plate clarification/ozonation/deep bed gravity filters. Testing for filtration speeds up to 20m/hr with alternative coagulant was successful (2015)

Process Design Lead
North Pine WTP SEQWater | Qld | 2016

Detailed Process design for addition of a new washwater management and sludge dewatering system at 250MLD WTP. Included lamella plate thickeners, jet mixed sludge tank and 2 no centrifuges for dewatering up to 18 tonnes dry sludge per day. Work included revisions to concept design, Process Flow Diagram, P&IDs design criteria table and equipment data sheets and review of suppliers submissions (2016).

Process Design lead
Charters Towers Regional Council | Qld | 2016

Upgrade options for existing clarifier/filtration plant (18MLD) to achieve >22MLD capacity, including hydraulic, process and general arrangement options and cost estimation. (2016).

Process design Jar Testing
Hamilton City Council | NZ | 2016

Comprehensive week long jar testing to assess future coagulation/flocculation/settling treatment chemical options for a 40MLD augmentation of the existing 110MLD Waiora clarifier/filtration WTP. (2016).

Process Design Lead
Coliban Water | Vic | 2016

Comprehensive week long jar testing to assess future coagulation/flocculation/settling treatment chemical options for a 40MLD augmentation of the existing 110MLD Waiora clarifier/filtration WTP. (2016).

Process Design Lead
Coliban Water | Vic | 2015

Review of 14No exiting water treatment plants operated by CW for a future water treatment strategy assessing what upgrade works are needed for the next 25 years including replacement with pipelines. WTP processes reviewed include DAFF, Clarification/filtration, Ozone/GAC and MIEX for plant capacities ranging from 0.5ML/d to 35ML/d (2015).

Design Lead
Automation of East bank and West Bank WTPs

SEQWater | Qld | 2015

Risk assessment and gap analysis for the 650MLD clarification/filtration plant and the 250MLD clarification/DAF/filtration plant that together supply the bulk of treated water to Brisbane. Automation works and implementation strategy/priorities were developed based on shifting from 24hr per day site attendance down to 8 to 12 hour per day site attendance (2015).

Design Lead
SEQWater | Qld | 2014

Concept design for Upgrade/automation works for conversion of existing Conventional East Bank WTP (680MLD) and sedimentation/DAFF West Bank WTP (250MLD) from 24hr (3 shift) attendance to 1 shift attendance including process audit, risk assessment and improvement works program (2014).

Design Lead
Townsville RC | Qld | 2014

Completion of quantitative Cryptosporidium risk modelling for Ross River dam and then assessment of log removal capability of the associated Douglas WTP (232MLD) followed by concept design of 100MLD capacity new lamella plate clarifier plus 232MLD UV disinfection treatment barriers to achieve required log removal requirements (2014).

WTP Design Lead
Dadu WTP | Pakistan | 2013-2014

Design Lead for process, hydraulic, control philosophy and layout concept for a turbidity, hardness removal then brackish water desalination WTP (98MLD) for Pakistan Water & Power Development Authority. The treatment process included React water clarifiers, Fluidized Bed Pellet Reactors (hardness removal), Gravity Filtration then Reverse Osmosis and associated chemical systems. The project is currently being tendered for a Design & Construct Contract (2013/14).

Jar Testing and Process Designer
Western Water | VIC | 2013-2014

Full scale and jar test work evaluation and then process design including P&IDs, control philosophy and equipment data sheets for D&C contract for Powdered Activated Carbon, prelime and fluoride dosing upgrade for Rosslynne WTP(35MLD DAFF process) for manganese oxidation, THM control and fluoridation (2012) and follow up advice during commissioning (2013/14).

Process Design Lead
Cairns Regional Council | QLD | 2013-2014

40MLD Mulgrave Aquifer WTP Process Design Lead for aeration, manganese/iron oxidation and DAFF or MF treatment including treatment process definition and siting/hydraulic assessment leading to future Early Contractor Involvement and development in a detailed D&C contract (2010)

Drinking Water stabilization strategy for Cairns Region at 13No water supply source points to minimize high/low pH and corrosion risks (2010).

Process Design Lead
SEQ Water | QLD | 2009-2010

Joint Pilot plant program development with Hunter Water, then ongoing adjustment of pilot plant program and then review of results for Process Design Lead for Concept and detail design for 180MLD Wyaralong WTP consisting of softening using Reactivators, dual media filtration, Ozone/BAC, UV and chlorination then chloramination for Brisbane water supply (2009/2010).

Project Manager & Process Designer
Townsville City Council | QLD | 2002-2009

Townsville Water Quality Improvement Project (2002/09) Project Manager for concept design for Townsville City Council and then later completing successful GHD detail work in BOOT project (with Trility and Brookfield-Multiplex). Work included water quality risks, water quality standards, pilot plant study for direct filtration treatment process, all aspects of concept and then detail design (process, hydraulics, layout and controls) for now operational new 40 ML/d WTP (Ultrafiltration/ chlorination process upgradeable to 60ML/d) and upgrade work for the existing 232ML/d conventional and direct filtration processes at Douglas WTP.

Process Designer
Coffs Harbour Water | NSW | 2007-2009

Water Quality risk assessment, treatment plant process design and detailed hydraulic, layout, equipment sizing and commissioning work for the Coffs Harbour WTP (56ML/d DAFF/UV). The filters are designed for future GAC retrofit and plant is designed for, and has operated in, both Direct Filtration and DAFF mode. Process includes manganese removal by pot permanganate oxidation (2007/09).

Ulysses Fandino, PE

Plant Piping

Qualified: MS in Civil Engineering, California State University, Long Beach; BS in Civil Engineering. California State Polytechnic University, Pomona;

Connected: Professional Civil Engineer State of California CA/C64558

PE Civil CA (Issued: January 23, 2003; Expiration Date: June 30, 2021)

Years with GHD: 4 | Home Office Location: Irvine

Professional Summary: Ulysses Fandino is a civil engineer more than 20 years of total experience as project manager and project engineer in planning, design, and construction of sanitary sewer and water pipeline projects. His expertise also includes master planning and condition assessment for gravity sewers and storm drains, design of potable water pipelines, trenchless design of sanitary sewers via bore-and-jack and pilot-tube microtunneling, sanitary sewer rehabilitation, potholing utilities, and permitting.

Project Manager
Otay 1st & 2nd Pipelines West of Highland Avenue | City of San Diego Public Works Department | San Diego, CA | 2015-Current

This water transmission pipeline replacement project for the City of San Diego replaces 5 miles of 16-inch through 42-inch water transmission pipelines and approximately 2.3 miles of 8-inch through 12"-inch water distribution mains. The project includes a new PRV station and a new control valve station at the University Heights Reservoir. The project also includes Caltrans permitting for three (3) trenchless 60-inch tunnel crossings of the I-805 freeway. The project will overlay streets with new AC pavement, replace approximately 140 new ADA curb ramps and upgrade accessible parking along several neighborhood streets. The construction is scheduled to begin in 2018.

Project Manager
30th Street Pipeline | San Diego, CA | 2015-2017

This project includes the replacement over 5.8 miles of 24-inch through 42-inch transmission mains and 8-inch through 16-inch distribution mains. Tasks for the project include development of technical pipe specifications and pipe design calculations.

Project Manager
Master Plan of Sanitary Sewers for the West Anaheim Area 2015 | City of Anaheim Public Works Department | Anaheim, CA | 2015-Current

Prepare the master plan update for the West Anaheim Area sewer systems. The project involves wet weather flow monitoring, using H2O Map hydraulic modeling and ArcGIS software to identify sewer lines requiring rehabilitation and/or replacement, preparing cost estimates for sewer lines needing improvements for the existing and build-out land use conditions, and determining the financial plan for obtaining the funding sources on building the proposed sewer improvements.

Project Manager
Newport Coast Sewer Lift Station Rehabilitation Project | Irvine Ranch Water District, Newport Beach, CA | 2015-Current

Serve as the Design Manager for the complete rehabilitation design of a 500-gpm regional sewer lift station that includes the recoating of the wet well, new CIPP lining for the 12-inch DIP sewer force, new wet well washer system, and sewer bypass pumping during the wet well and dry well rehabilitation. The dry well rehabilitation involves a new innovative discharge header that doubles back on itself, a new 30-foot deep underground stairwell for improved ingress/egress to the dry well, and improved ventilation. The project also includes constructing a new CMU block electrical building with new PLC and MCC equipment, and a new chemical odor control system.

Project Manager
San Diego Programmatic Wastewater Pipeline Condition Assessment Project | San Diego, CA | 2015-Current

Provide technical writing services for the preparation of reports for twenty-three gravity and force main sewer facilities as part of the San Diego Programmatic Wastewater Pipeline Condition Assessment project led by Tran Consulting Engineers. The reports include discussion of CCTV, geotechnical, corrosion, hydraulic, groove inspection and physical inspection activities.

Design Manager
City of Culver City | Culver City, CA | 2015-Current

Tunneling design of a series of new trunk sewers to consolidate up to 5 local sewer pumping stations into a single regional facility. This resulted in the design of approximately 11,500 lineal feet of new 8-inch to 15-inch trunk sewers. To mitigate impacts to/from shallow groundwater, private properties, Caltrans rights-of-way, and traffic approximately 4,500 lineal feet of trunk sewers were installed via microtunneling construction methods.

Project Manager
Alamitos Barrier Improvement Project, Orange County Water District | Seal Beach, CA | 2013-2014

Managed the preparation of engineering design reports, plans, specifications, and cost estimate for the wellhead installation of 17 new injection wells and 4 new monitoring wells along the Los Alamitos Channel in Seal Beach to augment injection capacity along the north-south reach of the Alamitos Barrier. Other design elements include design of 24-foot high temporary noise barriers (sound walls), phasing and planning of well construction activities, and well telemetry/SCADA design coordinated with Orange County Flood Control District and Los Angeles County Department of Public Works.

Project Engineer
Truckee River Interceptor Rehabilitation, Tahoe-Truckee Sanitation Agency | Truckee, CA | 2014

Completed the design plans, specifications, and engineer's construction cost estimate for the CIPP trenchless rehabilitation of 1,250 LF of 24-inch RCP and DIP sanitary sewer. Tasks include alternatives analysis, rehabilitation design, bypass design, environmental review and permitting. The project alignment passed under the Truckee River twice, through a private condominium complex, and along a heavily traveled recreational bike trail.

Project Manager
Water System Replacement Design Project, Air Force Civil Engineering Center (AFCEC) | Pillar Point Air Force Station (AFS), CA | 2012-2013

Completed the design plans, specifications, and construction cost estimate for the replacement of the existing 3-inch potable water system at Pillar Point AFS. The replacement design included a comprehensive Basis of Design report, hydraulic modeling, surveying, geotechnical analysis, a new booster pump station, and coordination for sensitive habitat and archeological areas. and existing condition infrastructure evaluations.

Project Manager
35% Preliminary Design Water System Replacement Phase 1 North | Air Force Civil Engineering Center (AFCEC) Vandenberg Air Force Base (VAFB), CA | 2012-2013

Completed the preliminary design plans, specifications, and construction cost estimate for approximately 65,000 linear feet of new HDPE potable waterlines at North VAFB. The preliminary design included a comprehensive Basis of Design report, extensive hydraulic modeling analysis, trenchless design under the existing UPRR railroad, and coordination for underground explosive ordnance and sensitive habitat areas.

Project Manager
Fire Protection System Deficiency Study for Canon Air Defense Complex (CADC) Naval Facilities Engineering Command (NAVFAC) SW | Marine Corps Air Station (MCAS) Yuma, AZ | 2012-2013

Conducted a study to determine the deficiencies of fire flow supply within the existing water distribution system. The fire protection study included valve and fire hydrant testing, and leak detection testing via acoustic listening devices. The existing MCAS Yuma GIS database was updated to develop improvements to the current water system to meet fire flow demand. The final report of the study will recommend solutions to improve the deficiencies with engineering cost estimates according to the Department of Defense estimating standards.

Project Engineer
Citywide Sanitary Sewers Improvement Program (CSSIPP) Groups 1 through 5 | City of Anaheim, Public Works Department | Anaheim, CA | 2006-2011

Completed the final design plans, specifications and engineer's construction cost estimates for 11 separate design packages of replacement 10- to 27-inch vitrified clay pipe (VCP) gravity sewers within the City of Anaheim. The design of replacement sewers included analysis of alternative alignments, implementing trenchless technology (microtunneling and bore-and-jack methods), new right-of-way acquisition, and positioning new sewers close to existing utilities.

Project Engineer
Combined West Anaheim Area Master Plan of Sanitary Sewers and Combined Central Anaheim Area Master Plan of Sanitary Sewers | City of Anaheim Public Work Department | Anaheim, CA | 2001-2006

Prepared the final master plans for the Combined West Anaheim Area and Combined Central Anaheim Area sewer systems. Utilized Hydra modeling software to identify sewer lines requiring rehabilitation and/or replacement. Prepared cost estimates for sewer lines needing improvements for the existing and build-out land use conditions. Assisted in preparing the financial plan for obtaining the funding sources on building the sewer improvements.

Duncan Findlay, JD

Legal

Qualified: Juris Doctorate, Willamette University, 1973; Bachelor of Arts, Political Science, University of Washington, 1969

Admitted to Practice: Supreme Court of the State of Washington, United States Federal District Courts of Eastern and Western Washington.

Washington State Bar Association (Issued: October 18, 1973)

Years with GHD: 11 | Home Office Location: Phoenix

Connected: Washington State Bar Association American Council of Engineering Companies (ACEC), Phoenix Rotary 100, Co-Chair, Engineering Firms Sector, King County United Way Campaign, 2001 Campaign Year.

Career History

- General Counsel, GHD Inc. (present)
- Chief Operating Officer, PB Telecom, Inc. (2004-2007)
- Vice President, Professional Service Industries, Inc. (2002-2004)
- Partner, Lane Powell Spears Lubersky, LLP (2001-2002)
- Board of Directors, Shannon & Wilson, Inc. (1994-2002)
- President, Seattle Branch Manager, General Counsel, Western Region Director, Director of Human Resources and Director of Risk Management, Shannon & Wilson, Inc. (1994 - 2001)
- President, Tewell & Findlay, Inc. P.S. (1989 - 1994)
- Board of Directors, Cascade Testing Laboratory, Inc. (1984-2002)
- Managing Partner, Tewell & Findlay, Inc. P.S. (1980 - 1994)
- Partner, Loucks & Lamb (1973 - 1978)

Contract Negotiation Experience

- Systemwide Agreement for on-call engineering services with the Union Pacific Railroad. Annual aggregate fee NTE $1M.
- Systemwide Agreement for on-call engineering services with the Southern Pacific Transportation System. Annual aggregate fee NTE $1M.
- Systemwide Agreement for on-call engineering services with the Burlington Northern Railroad. No aggregate annual fee limit.
- Subconsultant Agreement with URS Consultants for remedial planning activities at uncontrolled hazardous substances disposal sites in EPA Regions IX and X.
- Subconsultant Agreement with URS Consultants for program management and technical environmental services in support of the Navy's Environmental Engineering Program at activities under the cognizance of Western Division, Naval Facilities Engineering Command (Navy CLEAN). $9 to 10M over ten years.
- Agreement with Consolidated Rail Corporation (Conrail) for design engineering services for clearance improvements at seven Pennsylvania Tunnels. Approximately $1M.
- Subconsultant Agreement with Sverdrup Corporation for Washington State Department of Transportation for a design report and access plan for S.R. 509 east-west corridor. >$.5M.
- Agreement with the Washington State Convention and Trade Center for the conversion and expansion project to provide geotechnical design and inspection services.
- Agreement with Sound Transit for Geotechnical Investigation for Link Light Rail tunnel, Seattle, Washington ($7M).
- Agreement with Southeast Corridor Constructors for geotechnical support for certain sectors of I-25 (T-REX) improvements, Denver, Colorado.
- Agreement with Battelle Memorial Institute for low-level radioactive waste disposal site characterization studies for the Geff and Martinsville, Illinois sites (1989). $3 to $4M in services over 2 1/2 years.
- A/E subcontract with PB/MK for geotechnical investigation and design services for the Superconducting Super Collider Project, Ellis County, Texas (1991). $1.5M.

- Subcontract with Gannett Fleming for geotechnical investigation and design services related to the Boston Central Artery (I-90) Project. The total project scope exceeds $15 billion.

Design/Build Projects

- DM&E Railroad, Wyoming (Kiewit)
- Virginia Avenue Tunnel, Wn. D.C. (Kiewit)
- Whittier Access Tunnel, Whittier Alaska (VECO)
- I-25 S.E. Corridor, Denver, Colo. (SECC)
- Tacoma Narrows Bridge, Gig Harbor, WA (TNC)
- Seattle Monorail Project

Speaking Engagements& Publications:

- Electronic Signatures – Implications for the Design Professional, ASFE, Boston, Massachusetts (April 2001)
- Limitation of Third Party Liability, ASFE, Boston, Massachusetts (April 2001)
- Contract Negotiation—Case Histories, ASFE, Tucson, Arizona (October 2000)
- Marketing Materials Liability, ASFE (April 2000)
- “Toxic Mold, The Fungus Among Us Goes to Court,” Summer 2002 Edition of “Environs, Recent Developments in Environmental Law”, Lane Powell Spears Lubersky, LLP
- Contributing Author, Washington State Chapter, ABA Deskbook on the Design/Build laws, 2002 revised edition
- Contributing colleague, “The Care and Feeding of Individual Consultants and Their Clients,” Dunnicliff and Parker, Geotechnical News, June and September issues, 2003
- Co-Editor, “State-by-State Guide to Construction Contracts and Claims”, Aspen Publishers, Inc. 2006

Michael Freid

Cost Estimating

Qualified (Education): ASU Center for Environmental Studies, Hazardous Materials Handling, 1992; California State University, Water Treatment Plant Operation, 1992; Rio Salado College, Management and Productivity, 1989; Phoenix College, Undergraduate Studies, 1979; Associated General Contractors of America (AGC) Supervisory and Project Management.

Years with GHD: 20 | Home Office Location: Phoenix

Professional Summary: Mike Freid has been with GHD since 1999 and offers more than 30 years of local construction experience. He specializes in cost estimating, constructability review, construction inspection, dispute resolution, and contract negotiations and management of water and wastewater related projects. Mike's background includes providing construction and commissioning services for water and wastewater treatment facilities, water mains, water supply/storage, well pumps, booster pumps, sewer lift stations, reinforced concrete structures, steel fabrication, and installation of large and small diameter collection and distribution pipeline projects.

Senior Construction Project Manager
Evergreen Well | Global Water Resources | Buckeye, AZ | 2012

Well site construction, including installation of a well pump, pipe, valves, controls, and site improvements at a potable water well site. Mike oversaw the construction while monitoring schedule, costs, and quality. He also helped secure project funding through the American Recovery and Reinvestment Act of 2009 (ARRA).

Senior Construction Project Manager
Frank Lloyd Wright Arsenic Treatment System | Frank Lloyd Wright Foundation | Scottsdale, AZ | 2013

Mike managed a design/build well head Arsenic treatment system for Taliesin West, Frank Lloyd Wright's Scottsdale, Arizona architectural school and museum. He provided constructability review during design, provided value engineering, managed site construction, startup, and commissioning. Mike also helped the client achieve drinking water compliance with the Maricopa County Department of Health Services.

Senior Construction Project Manager
34th Street Groundwater Treatment System | Freescale Semiconductor | Phoenix, AZ | 2013

Mike was responsible for the design/build of a groundwater treatment system. He provided constructability review during the design phase and managed plant construction, including staffing, vendor procurement, scheduling, planning, and cost tracking to assist the client with contamination containment.

Senior Construction Project Manager
Ruth Fisher Tank and Well | Saddle Mountain Unified School District | Tolleson, AZ | 2015

Saddle Mountain Unified School District in Tonopah, Arizona needed to replace its existing potable well and water storage tank at the Ruth Fisher Elementary School. Mike was responsible for all construction-related activities; staffing, quality control, subcontractor selection and oversight, scheduling, planning, and cost tracking. He provided high quality system installation and integration with the existing distribution system. Water quality of the new well resulted in a substantial reduction in operating costs of the existing electrodialysis reversal (EDR) water treatment system.

Senior Construction Project Manager
Casa Grande Water System Rehab | City of Casa Grande | Maricopa, AZ | 2011

The City of Casa Grande is located approximately 50 miles southeast of Phoenix, Arizona. The City entertained open bidding for the rehabilitation of its hydro-pneumatic distribution system. The project award was based on an alternative system proposal created by a Senior Construction Project Manager. Mike was responsible for the management of tank, pipe, pump, and programmable logic controller (PLC) panel installation along with integration, subcontractor selection and management, scheduling, planning, cost tracking and startup and commissioning.

Senior Construction Project Manager
Buckeye Ranch Arsenic Treatment System | Global Water Resources | Maricopa County, AZ | 2011

This was a Design/Build project. Mike provided constructability review during the design phase and provided value engineering. He was responsible for management of construction activities, the installation of equipment, staffing, planning, cost tracking, system commissioning and start up.

Senior Construction Project Manager
Sweetwater Well Site Arsenic Treatment

System | Global Water Resources | Buckeye, AZ | 2007

On this Design/Build project, Mike provided constructability review during the design phase, provided value engineering, was responsible for management of construction activities; the installation of equipment, staffing, planning, cost tracking, system commissioning and start up.

Senior Construction Project Manager
Sonoran Vista Well Site Arsenic Treatment System | Global Water Resources | Buckeye, AZ | 2008

During this Design/Build project, Mike provided constructability review during design phase, provided value engineering, was responsible for management of construction activities, the installation of equipment, staffing, planning, cost tracking, system commissioning and start up.

Sr. Construction Project Manager
Well Site Sodium Hypochlorite Disinfection Systems | Global Water Resources | Buckeye, AZ | 2007

Mike was responsible for the design, construction startup, and commissioning of 17 disinfection systems at 17 separate locations for a major potable water provider in the greater Phoenix metropolitan area to replace problematic existing systems.

- Sweetwater 2
- 7th and Alarcon
- 4th and Baseline
- Blue Hills
- Rancho Vista
- Dixie Well Site
- Sun Valley
- Hacienda Ares
- Garden City
- Roseview
- West Phoenix 1
- West Phoenix 6
- West Phoenix 7
- Bulfer Primrose
- Buckeye Ranch
- Sonoran Ridge
- Sunshine

Senior Construction Project Manager
Apache Lift Station | City of Mesa | Mesa, AZ

Mike's responsibilities with this project included the rehabilitation of a large multi-pump sewage lift station comprised of the increase in overall height and volume, new interior lining, and inter-connective pump piping for this City of Mesa site project.

Senior Construction Project Manager
IBWC Wastewater Treatment Plant Rehabilitation | International Boundary Water Commission | Rio Rico, AZ | 2003

The International Boundary Water Commission (IBWC) sought to complete a traveling bridge sand filter rehabilitation. The facility provides sewage treatment primarily for the city of Nogales, Arizona, and its sister city, Nogales, Mexico. The scope of work for this project included the rehabilitation of five traveling bridge sand filters.

- Removal of existing treatment media (650 tons).
- Removal of Original Equipment Manufacturer (OEM) media support system (7,520 square feet).
- Removal of 15 existing pumps and related piping.
- Repairs to existing fiberglass cell dividers.
- Modifications to existing skimmer hoods.
- Value Engineering and installation of a US Filter Gravisand™ system.

In addition to completing the work in a timely manner, Mike received the highest possible rating (A) on the contractor performance review by the IBWC's Contracting Officer Representative (COR).

Other related areas of interest

Recognized (Certifications/Trainings)

- Arizona Class 1 Wastewater Treatment Plant Operator
- Arizona Class 1 Water Treatment Plant Operator
- Eljen Wastewater Treatment Systems Installer
- 8 Hour Arizona Mine Safety and Health Administration Refresher, 2013
- 24 Hour Arizona Mine Safety and Health Administration, 2011

Jeff Knauer, PE, ME, NACE CP Specialist

Corrosion/Material

Qualified: M.S. Mechanical Engineering, University of California, San Diego; B.S. Mechanical Engineering, University of California, Los Angeles

Connected: Subject Matter Expert for Civil Engineering – California Board of Professional Engineers; Chapter Board of Directors (2008-2010) – Concrete Repair Institute, Northern California; NACE Institute International Certification Review Committee (2015-present); National Association of Corrosion Engineers; Bay Area Water Works Association; San Francisco Post Officer (2016-present) - Society of American Military Engineers.

PE Mechanical CA (Issued: January 25, 2002; Expiration Date: June 30, 2020)

PE Civil CA (Issued: June 24, 2005; Expiration Date: September 30, 2021)

PE Civil HI (Issued: July 30, 2013; Expiration Date: April 30, 2020)

PE Civil WA (Issued: November 21, 2013; Expiration Date: March 12, 2020)

NACE CP Specialist (Issued June 9, 2000)

Years with GHD: 3 | Home Office Location: Emeryville

Professional Summary: Mr. Knauer has extensive experience with corrosion risk assessment and mitigation design for conveyance and distribution pipelines, pump stations, storage facilities and various water related infrastructure; marine and offshore structures; and oil and natural gas storage and conveyance systems. Mr. Knauer has designed numerous cathodic protection systems and has been involved as the corrosion engineer and corrosion engineering design team leader for municipal and federal marine projects throughout the Western United States and the Pacific Islands. Mr. Knauer is licensed in civil engineering (CA, HI, WA), mechanical engineering (CA, WA) and is a NACE certified Cathodic Protection Specialist. Mr. Knauer has experience with design of corrosion control solutions in challenging environments and is an accomplished task leader for large scale corrosion assessment and rehabilitation projects and provides expert witness services.

Senior Corrosion Engineer
Carlsbad Desalination Plant Shut Down Assessments | Poseidon Water | Carlsbad, CA, USA

Senior Corrosion Engineer for the cathodic protection system assessments for systems installed on plant infrastructure as a part of the first annual plant shut down.

Project Principal
Stray Current Corrosion Investigation and Mitigation Design | Cal Water Services | San Mateo, CA, USA

Project Principal for analysis of potential stray current interference between a proposed pipeline installation/existing cathodic protection systems and design of stray current corrosion mitigation measures.

Program Manager
Benicia Wastewater Treatment Plant | City of Benicia | Benicia, CA, USA

Program Manager to develop various cathodic protection design alternatives for the City of Benicia's Waste Water Treatment Plant Plant-Wide Corrosion Upgrade project.

Program Manager
Santa Clara Water Pollution Control Plant | City of San Jose | San Jose, CA, USA

Program Manager for multi-year corrosion engineering services and design contract to assess, maintain and upgrade corrosion control infrastructure.

Program Manager
As-Needed Corrosion Engineering Services | San Francisco Public Utilities Commission | San Francisco, CA, USA

Program Manager for a 3-year 1M as-needed corrosion engineering contract encompassing services including field survey and cathodic protection design.

Program Manager
Davis Wastewater Treatment Plant | City of Davis | Davis, CA, USA

Cathodic protection and corrosion control design for infrastructure associated with major treatment plant expansion.

Project Engineer
Water Treatment Plant Improvements | East Bay Municipal Utility District | Oakland, CA, USA

Project Engineer for Claremont Tunnel Outage, Sobrante, San Pablo and Upper San Leandro Water Treatment Plant improvements.

Program Manager
Campus-Wide Utility Fitness for Service Evaluation | Hitachi Global Systems Technology | San Jose, CA, USA

Program Manager for a campus wide-utility infrastructure Fitness for Service Evaluation to assess the risk of corrosion related failure and recommend corrosion mitigation alternatives.

Lead Corrosion Engineer
Campus-Wide Utility Fitness for Service Evaluation | Lawrence Berkeley National Laboratory | Berkeley, CA, USA

Lead Corrosion Engineer for a campus wide-utility infrastructure Fitness for Service Evaluation to assess the risk of corrosion related failure and design of impressed current cathodic protection systems for corrosion control of utility piping.

Corrosion Control Design Team Leader
P1-102 Plant 1 Upgrade Project | Orange County Sanitation District | Fountain Valley, CA, USA

Corrosion Control Design Team Leader for Orange County Sanitation District as part of 170M Secondary Activated Sludge Facility 2 at Plant No. 1 Project.

Corrosion Engineer
Trinity River Pump Station | Coastal Water Authority | Houston, TX, USA

Corrosion Engineer for the Trinity River Pump Station corrosion control assessment and cathodic protection design for pump station intake piping and associated structures including agency coordination and assistance during construction.

Corrosion Engineer/Design Manager
Southside Transmission Main Phases 4, 4A, and 5 | City of Corpus Christi | Corpus Christi, TX, USA

Corrosion Engineer and Corrosion Design Manager for Southside Transmission Main Phases 4, 4A, and 5 corrosion control investigation, cathodic protection system design, protective coating recommendations and technical assistance during construction and for several miles of large diameter water transmission main in the immediate vicinity of the Gulf of Mexico.

Corrosion Engineer
Water Storage Tank Design | Dublin San Ramon Services District | Dublin, CA, USA

Corrosion Engineer responsible for impressed current and galvanic cathodic protection system design for various potable and recycled water storage tanks.

Other related areas of interest

Registrations CA Civil, C68329. CA Mechanical, M31977. HI Civil, 15589. WA Mechanical, 50938. WA Civil, 50938. NACE CP Specialist, Cert. No. 9181.

Presentations

- NACE International Corrosion Risk Conference "Fitness for Continued Service: A Risk Management Approach to Assessing Corrosion and Prioritizing Infrastructure Improvements" Houston, TX, May 2016.
- NACE DOD Corrosion Conference, "The Critical Role of Consistent Facilities-Wide Corrosion Control Design Criteria and O&M Practices to Facilities Asset and Risk Management", La Quinta, CA, August 2011.
- NACE Western Area Conference, "Corrosion of Reinforced Concrete Structures in the San Francisco Bay", October 2008.
- AWWA Annual Conference, "The Critical Role of Consistent Corrosion Control Criteria as Part of Comprehensive Asset and Risk Management Planning" Poster Presentation, San Diego, CA, June 2009.
- AWWA Distribution Systems Symposium, "The Critical Role of Consistent Distribution System Wide Corrosion Control Criteria as Part of Comprehensive Asset and Risk Management Planning" Poster Presentation, Reno, NV, September 2009.
- CWEA Annual Conference "Corrosion Control and Cathodic Protection" Santa Clara, CA, April 2014.
- Nevada Rural Water Association "Corrosion Control and Cathodic Protection Fundamentals" Reno, NV, March 2014
- AWWA Cal-Nevada Fall Conference "Corrosion and Corrosion Control Fundamentals" Sacramento, CA, October 2013.
- AWWA Annual Conference "Corrosion Control and Cathodic Protection for Water Conveyance, Storage and Treatment Facilities" Las Vegas, NV, August 2013.
- NACE Western Area Conference, "Corrosion of Reinforced Concrete Structures in the San Francisco Bay" San Francisco, CA, November 2012.
- AWWA Cal-Nevada Spring Conference "Fitness for Continued Service: A Risk Management Approach to Assessing Corrosion and Prioritizing Infrastructure Improvements" Sacramento, CA, March 2016.
- NACE Western Area Conference, "Delamination Rate Analysis of Reinforced Concrete Structures in Marine Environments", December 2016.

Ryan Kristensen, PE

Resident Engineer - Mechanical

Education: MS, Civil Engineering – Hydrology and Water Resources Engineering, University of California, Los Angeles, 2013; BS, Earth and Environmental Engineering, Columbia University, 2012; BA Management-Engineering, Claremont McKenna College, 2010

Professional Registration: Professional Civil Engineer – CA – C85173, Qualified Stormwater Pollution Prevention Plan Developer (QSD)

PE Civil CA (Issued: December 20, 2015; Expiration Date: March 31, 2020)

Years with GHD: 2 | Home Office Location: Long Beach

Professional Qualifications: Mr. Kristensen has served as a project engineer on feasibility assessments and conceptual studies, facility master plans and capital improvement programs, preliminary and final design drawings, engineering services during construction, and has obtained compliance with regulations and permitting requirements. Through his involvement in rehabilitation and improvement projects, Mr. Kristensen has developed experience tracking assets, performing condition assessments, and focusing improvement efforts to maximize the benefits of capital improvement programs. As Project Engineer for the 3A Water Reclamation Plant Improvements, Mr. Kristensen's initial efforts will categorize areas of improvement across the plant. The focus will be to package improvements based on construction sequencing that will minimize disruption to the plant's operations. Mr. Kristensen will serve as the point person for technical expertise across GHD and will engage specialists as necessary. Mr. Kristensen is available for co-location to support MNWD staff with the development of Requests for Proposals for each improvement package and will be involved in daily discussions and decisions at Plant 3A.

Project Engineer
Lenain WTP Expansion and Rehabilitation | Anaheim Public Utilities Department | Anaheim, CA

Serving as Project Engineer for the Design of Rehabilitation and Expansion at the Lenain Water Treatment Plant. GHD developed a comprehensive Facility Master Plan including cost and schedule for the replacement and rehabilitation (R & R) of facilities as well as expansion of the LWTP from 15 to 20-22 mgd. Performed treatment optimization studies and optimization including Jar testing of various coagulants and hydraulic assessments of plant and distribution system. GHD established the Asset Management framework for the City of Anaheim and is implementing the framework at LWTP. Performed detailed facility condition assessments at the plant and consequence analyses. The project includes significant pipe treated water pipe modifications to allow the delivery of the additional treated capacity into the distribution system.

Completed the preliminary and final designs for the selected improvements and assisted in bidding and Contractor selection. The proposed improvements at LWTP are recommended to maintain Regulatory Compliance and Safety, Water Quality, Plant Reliability, and Flexibility for Plant Expansion. Currently providing engineering services during construction and specialty inspection/resident engineering and startup/commissioning services. Construction is scheduled to be completed by end of 2019. Existing influent and effluent pipelines at LWTP will be upsized from 24" to 36" and will be co-located in the LWTP Secondary Access Road. This new location of the influent and effluent pipelines will increase accessibility for maintenance. Additionally, the Secondary Access Road will be widened to facilitate the flow of vehicles at LWTP. It is anticipated that the cost of the Secondary Access Road improvements will be partially offset by the plan to install new Influent and Effluent pipelines in the road.

Select electrical equipment at LWTP and Walnut Canyon Reservoir will be upgraded to comply with current standards. To increase reliability, a temporary electricity generator that has been in operation since 2004 will be replaced with a permanent backup generator. Two (2) Electrical Vehicle Charging Stations will be constructed to support the City's goal to make it easier to recharge electric vehicles throughout the City.

Project Engineer
Engineering Design Guidelines | Inland Empire Utilities Agency | Chino, CA

Serving as project engineer for the development of the Engineering Design Guidelines. The Engineering Design Guidelines communicate design preferences of the Inland Empire Utilities Agency (IEUA) to its consulting engineers/designers to improve consistency and efficiency of project deliveries. Significant workshops and staff interactions were utilized to build consensus regarding Guidelines format.

The Guidelines were developed in tabulated forms to improve their read and ease of future modifications and/or additions. The level of completeness and usefulness of these Guidelines will improve with their use and updates. The level of details included in the Guidelines was targeted to the 30-percent design level. The tabulated format will be helpful to incorporate into Preliminary Design/Basis of Design documents. The level of details/requirements were developed with emphasis on technical areas that are common sources of inconsistencies during designs. Currently updating the Guidelines and adding new technical sections and coordinating its content with the IEUA Front End Contract Documents that have been recently updated by GHD. The updated Guidelines are scheduled for publication in late 2018.

Project Engineer, Carbon Canyon Water Recycling Facility Asset Management and Improvements Package III | Inland Empire Utilities Agency | Chino, CA

Serving as Project Engineer for the CCWRF Asset Management and Improvements Project. IEUA launched three (3) CCWRF Asset Management and Improvement packages in order to improve a number of processes at CCWRF based on input from Operations, Maintenance, Engineering, O&M Documents, and Asset Management Plans. GHD is providing design services for Package III of Asset Management and Improvements at CCWRF. GHD is completing the detailed design for the following improvements: Replace Leaky Influent and Effluent Tertiary Filter Weirs; New Flocculation Basin Overflow Weir; Demolish Abandoned Chlorine Disinfection System; Replace Filter LCP with a new PLC and integrate to SCADA; Refurbish Corroded Monorails; Refurbish and/or Replace Filter Backwash Troughs; Refurbish or Replace Cast Iron Tertiary Filter Gates; Extend Concrete Lining at the Emergency Storage Lagoon; New Flow Meters at the CCB; Increase Reliability of Plant Utility Water System; Replace Drain Valves and Plug Valves at CCB and Tertiary Filters.

Project Engineer
Cryogenic Facility Condition Assessment | Los Angeles Bureau of Sanitation | Los Angeles, CA

Served as a project engineer for the condition assessment of cryogenic facilities at the Los Angeles Bureau of Sanitation's Hyperion Water Treatment Plant (HWTP). This project included assessments of the structural condition of cryogenic facilities and identified the process upgrades required to maintain safe and reliable operations at the HWTP. Recommendations generated as an outcome of this project provide a basis for Capital Improvement Projects set to occur the HWTP.

Project Engineer
American Honda Motor Company Recycled Water Retrofit | West Basin MWD | Torrance, CA

Provided engineering services during construction for the recycled water retrofit project at the American Honda Motor Company campus in Torrance, CA. The project consisted of converting portions of the 101 acre campus to serve recycled water for irrigation purposes. Developed a plan for Division of Drinking Water (formerly CDPH) cross-connection testing at the campus for minimal impact to routine operations. Prepared record drawings for West Basin Municipal Water District and the American Honda Motor Company.

Project Engineer
Weymouth and Jensen Water Treatment Plant Solar Facilities | Metropolitan Water District of Southern California | Los Angeles, CA

Developed civil design drawings for the Metropolitan Water District of Southern California's Weymouth and Jensen Treatment Plant Solar facilities, filed the LADWP Solar Incentive Program Reservation Request and Solar-Powered Customer Generation Interconnection Agreement for a 1MW solar facility at the Jensen Treatment Plant. Completed the SCE California Solar Initiative Reservation Request, Exporting Generating Facility Interconnection Request, and Renewable Energy Self-Generation Bill Credit Transfer Interconnection Agreement for a solar facility at the Weymouth Treatment Plant. Provided engineering services during construction and reviewed and responded to RFI's and Shop Drawing submittals during the construction of the Weymouth Water Treatment Plant Solar Facility.

Other related areas of interest

Recognized (Certifications/Trainings)

- CA Professional Engineer – C85173
- Qualified Industrial Stormwater Practitioner (QISP)
- Envision Sustainability Professional (ENV SP)

Jonathan Linkus AICP, LEED-AP

LEED

Qualified: Bachelor of Architecture (BArch 2008), University of Southern California; Master of Architecture in Urban Design (MAUD 2011), Harvard University
Connected: American Institute of Certified Planners (AICP); LEED-Accredited Professional
Years with GHD: 1 | Home Office Location: Irvine
Professional Summary: Jonathan is an urban design + planning professional whose 8 years delivering public and private planning projects are based on thoughtful client and stakeholder relationships and integrated thinking across urban scales. Jonathan's role ranges from detail-oriented designer to managing large multi-disciplinary master planning efforts. His work pioneers innovative place-making and which have garnered 8 regional, state, and national planning awards as lead planner or PM. His project types include university campus LRDPs, mixed-use district and streetscape concepts, transit-oriented specific plans, living waterfronts with coastal resiliency, and airport-connected projects.

Lead Planner/Urban Designer
Canberra City Centre Transit Oriented Study | City Renewal Authority | Canberra, ACT | Current
Urban concept that integrates transit infrastructure and walkable mixed-use development to activate the heart of Canberra as a national crossroads. | 12 Ac. Study Area

Lead Planner/Urban Designer
Caesars East-Side Live/Work/Play Master Plan | Caesar's Entertainment | Las Vegas, CA | 2018
Prepared district mixed-use and open space options that introduce a walkable living and workplace setting adjacent to the famed Strip.* | 3.46M GSF, 106 Ac. Study Area

Team Planner/Urban Designer
Vision 2045: Downtown Las Vegas Master Plan | City of Las Vegas | Las Vegas, NV | 2015 - 2017
Prepared site plans for Symphony Park mixed-use residential and arts district, one of the eight transit-oriented hubs.* | 3.46M GSF, 106 Ac. Study Area

Team Planner/Urban Designer
Eau Claire West: Mixed-Use Urban Village | GWL Realty Advisors | Calgary, AB | 2012
Multi-function open space proposals within a mixed-use hotel and residential project. Prepared yield summaries and solar impact studies.* | 2.0M GSF, 6.5 Ac. Study Area

Team Planner/Urban Designer
Dominion Bridge at Ramsay Exchange | New Urban | Calgary, AB | 2011 - 2013
Site plan options and mixed-use development yield summaries. Architectural façade concepts, and outreach presentation graphics.* | 1.5M GSF, 18 Ac. Study Area

Lead Planner/Urban Designer
Bridgeville Community Center Vision | Bridgeville CCC | Humboldt Co, CA | Current
Space needs analysis, public outreach events, building design, pricing, and conceptual site layout. | 3 Acres

Team Planner/Urban Designer
Australian War Memorial 50-Year Master Plan | Australian War Memorial | Canberra, ACT | 2018
Proposed long-range adaptation scenarios in a memorial development framework with campus visioning. | 35 Acres

Lead Planner/Urban Designer
UHWO Long Range Development Plan | University of Hawaii | Kapolei, HI | 2017 – 2018
Developed conceptual site plan options and preferred space need analysois, multi-day workshop, public outreach for Hawaii's fastest growing 4-year university.* | 500 Acres, 20k FTE Students

Co-Project Manager/Lead Planner
CSUSB Palm Desert Campus Major Master Plan | CSUSB | Palm Desert, CA | 2015 - 2017
Directed a multi-disciplinary long range integrated master plan effort, developed plan concepts and outreach material for 4 workshops.* | 169 Acres, 8k FTE Students

Co-Project Manager/Lead Planner
CSUSB Major Master Plan | CSUSB | San Bernardino, CA | 2015 - 2017
Directed a multi-disciplinary long range integrated master plan effort, developed plan concepts and outreach material for 6 workshops.* | 422 Acres, 25k FTE Students

Co-Project Manager/Lead Planner
CSUSB Major Master Plan | CSUSB | San Bernardino, CA | 2015 - 2017
Directed a multi-disciplinary long range integrated master plan effort, developed plan concepts and outreach material for 6 workshops.* | 422 Acres, 25k FTE Students

Project Manager/Lead Planner
Amazon HQ2 Nevada | Las Vegas Economic and Urban Development Department | Las Vegas, NV | 2017 - 2018
City-sponsored conceptual design entry for new 50,000-employee Amazon headquarters across three downtown sites.* | 8.07M GSF, 70 Acres

*Work perfomed with previous employer

Lead Planner/Urban Designer
Embarcadero Center Redevelopment | Boston Properties | San Francisco, CA | 2013
Prepared interactive "urban patio" designs, public art, lighting, collaborative digital workstations.* | 56K GSF

Project Manager/Lead Planner
Peachtree Corners Innovation Hub Master Plan | City of Peachtree Corners | Peachtree Corners, GA | 2017
Developed two mixed-use gateway districts, prepared adaptive reuse/infill and transit framework as land use subconsultant.* | 8.27M GSF, 950 Ac. Study Area

Assistant Project Manager
Airport Compatible Land Reuse Strategy (ACLReP Phase 2) | City of Phoenix | Phoenix, AZ | 2017 - 2018
Prepared 9 subcontracts, fee-by-task breakdown, and accounting structure for $5.5M planning fee. Project-winning interview participation.* | 2 mi^2 Study Area

Lead Planner
Ekurhuleni Aerotropolis Master Plan | Municipality of Ekurhuleni | Ekurhuleni, Gauteng | 2013 - 2015
Regional coordination strategy for airport-related industry sectors in 14 communities as land use subconsultant.* | 1,030 Ac. of Site Design, 760 mi^2 Study Area

Lead Planner
Burbank Airport B-6 Master Planning Study | Airport Authority | Burbank, CA | 2013 - 2014
Site planning with entitlement and Part-77 exhibits for mixed-use workplace and flex-industrial airport-connected development.* | 2.35M GSF, 60 Ac. Study Area

Lead Planner
Memphis Aerotropolis Airport City Master Plan | City HCD + Chamber | Memphis, TN | 2012 - 2014
Comprehensive Plan and district designs supporting key economic sectors, with significant public and stakeholder outreach participation.* | 10.89M GSF, 60 mi^2 Study Area

Certifications

- American Institute of Certified Planners (AICP) | American Planning Association | #30431
- Leadership in Energy and Environmental Design Accredited Professional (LEED-AP) | Green Business Certification Inc. (GBCI)

Awards

- Outstanding Initiative | Peachtree Corners Innovation Hub Master Plan | American Planning Association - GA Chapter | Sep 2018*
- Best Practices Award of Excellence | Mission Creek Sea Level Rise Adaptation Study | American Planning Association - CA Chapter | Sep 2017*
- Innovation in Green Community Planning Award of Excellence | Mission Creek Sea Level Rise Adaptation Study | American Planning Association – Northern CA Chapter | Jun 2017*
- Best Practices Merit Award | 2016 CSUSB Palm Desert Campus Master Plan | American Planning Association – Inland Empire Section | Apr 2017*
- (Awards Continued on Next Page)
- Urban Design Award | 2016 CSUSB Palm Desert Campus Master Plan | American Planning Association – Inland Empire Section | Apr 2017*
- National Planning Award 2016: Municipality Ekurhuleni Aerotropolis Master Plan | South Africa Planning Institute (SAPI) | Jul 2016*
- National Planning Award 2016: Professional Ekurhuleni Aerotropolis Master Plan | South Africa Planning Institute (SAPI) | Jul 2016*
- Outstanding Planning Award For a Plan | Memphis Aerotropolis Airport City Master Plan | American Planning Association – TN Chapter | Aug 2014*

*Work perfomed with previous employer

Roop Lutchman, P.Eng, PMP

Asset Management

Qualified: MBA, 2003; MSc., 1987; B.Sc. (Hons), 1981

Connected: Registered Professional Engineering (P.Eng.) in Ontario; Project Management Professional (PMP), certified by the Project Management Institute; Member of the Water Environment Federation (WEF), Plant Engineering and Maintenance Association of Canada (PEMAC), and the American Society of Mechanical Engineers (ASME)

P.Eng (Issued: September 4, 1996; Expiration Date: September 30, 2020)

Years with GHD: 8 | Home Office Location: Mississauga

Professional Summary: Roop has 36 years of experience in various engineering industries, with 17 years of experience in business consulting. Focused on helping clients minimize business costs and a thought leader in the asset management (AM) field, Roop brings a global perspective to projects from his work with the Water Services Association of Australia on international AM benchmarking projects. Additionally, Roop has significant experience across North America in the water/wastewater, public works, electric, and oil and gas industries. With his focus on strategy, assets, people, processes, and technology, Roop has successfully implemented many practical and effective business consulting solutions for clients.

Roop is a Principal and Global Leader for Asset Management based in GHD's Mississauga office. He has 36 years of combined management consulting and industry experience. A professional engineer and recognized industry expert in the management consulting field, Roop focuses on strategic planning, business optimization, asset management, organizational development, operations and maintenance, and the use of technology to enable business processes. He is the author of three books on these subjects, published by DESTech Publishers: *Computerized Work Management Systems for Utilities and Plant Operations* (2003), *Sustainable Asset Management* (2006), and *Creating and Managing Sustainable Organizations* (2011). He is an endorsed assessor and auditor for PAS55 asset management. Additionally, Roop is a member of the WEF Plant Operations and Maintenance and Utility Management Committees, member of the American Water Works Associations (AWWA), and former director of PEMAC.

AM Technical Lead
WRD Southern California | Ongoing Since 2015

Development of an asset management plan – gap analysis, develop AM roadmap, governance model and technology enablers consistent with ISO 55000 requirements. Also, includes piloting AM concepts, development of asset risk profiles and implementation of the AMS (Assetic) /CMMS (Cityworks) at the Leo Van de Lans Plant - ongoing.

AM Technical Lead
City of Anaheim | Ongoing Since 2015

Leading practices AM education, asset hierarchy and data attributes definition. Ongoing guidance on development of AM development consistent with ISO 55000 requirements. Also, includes development of asset risk profiles and lifecycle strategies and an O&M review (in line with leading AM practices) of the Lenain Water Treatment plant.

AM Technical Lead
Western Municipal Water District |
Ongoing Since 2015

Development of an asset management plan – gap analysis, develop AM roadmap, governance model and technology enablers consistent with ISO 55000 requirements. Also, includes review and update of the INFO EAM CMMS asset hierarchy and data attributes.

Project Manager/Risk Management Advisor
Water and Wastewater Linear Infrastructure |
Metro Vancouver | Ongoing Since 2017

Development of a risk framework, risk profiles and risk mitigation plans for linear infrastructure. The approach is based on the on leading asset management practices, risk management methodology and ISO 31000 Risk Management Standard. We will be leveraging data from the GIS, CMMS and Hydraulic models systems for risk analysis. Lifecycle Management Strategies will be developed for a pilot asset class and this will be used to guide rollout of the overall risk program to the rest of the operations.

Project Manager/AM Strategic Advisor
Toronto Water AMS | Ongoing Since 2014

Development of an asset management solution, technology enablers (including SAP Plant Maintenance, Hansen and Avantis) and AM roadmap for Toronto consistent with ISO 55000 requirements. This project has kicked off in August 2014 work is currently in progress to achieve the project objectives. Project outcomes will be AM Roadmaps (W/WW – Vertical & Linear and Storm Water assets) based on a gap analysis using GHD's TEAMQF tool, and data management standards/software solutions to support AM decision making. The City is employing a unique approach of an Industry scan of leading practices as well as engagement of a Peer review group of global municipalities in identifying relevant leading practices. An AM Governance Model has been developed to support implementation and sustenance at the City.

Project Manager & Strategic Advisor
Asset Management Program | Region of York | Ongoing Since 2014

Development of an asset management solution for the Environmental Services Department to help improve capital planning and maintenance of the Region's aging infrastructure. Project outcomes are AM Roadmaps (/WW – Vertical & Linear, Waste management and Green infrastructure assets together with a supporting AM governance model) based on a gap analysis using GHD's TEAMQF tool.

Project Manager and Strategic Advisor
Asset Management Program | City of Ottawa | Ongoing Since 2014

Development of data, systems and asset knowledge as part of the City's ongoing AM development effort. This includes updating the asset data attributes, integration requirements, asset hierarchy, knowledge areas, and a development of a guide for assessing and implementing technology assets solutions. This assignment required a review of SAP Plant Maintenance, Maximo and RIVA Solutions. At the end of the project, the City will achieve consistency, in its data model, configured software systems to support its AM business processes, and the right information and knowledge to support AM related decision making.

Project Manager/AM Strategic Advisor
Risk Management for Water, Wastewater Linear Infrastructure | Region of Peel | Ongoing Since 2011

Development of a risk framework, risk profiles and risk mitigation plans for the Lake Based water Supply System based, Trunk Sewers, Collections and Distribution systems. The approach used is based on the on leading asset management practices and the AWWA RAMCAP risk methodology and ISO 31000 Risk Management Standard. Lifecycle Management Strategies are being developed for each asset class to mitigate high risk assets. Project also included an AM gap analysis based on a gap analysis using GHD's TEAMQF tool. Outcomes were a comprehensive risk profile and validate Capital program, AM roadmap and AMP for the transmission and sub-transmission mains. We leveraged data from the GIS, Hansen and Hydraulic models systems for risk analysis.

Lead Asset Management Reviewer
Asset Management Benchmarking Program | Water Services Association of Australia | 2012

This program is done every 4 years on the behalf of the International Water Association. It covers the areas of: corporate policy and business planning, asset acquisition, asset operation, asset maintenance/rehabilitation and business support systems. For the 2012 benchmarking initiative, forty global utility participants are currently enrolled and going through the benchmarking process. Roop is accredited in the use of Aquamark benchmarking software and as a lead reviewer, provide guidance to utilities in developing their maturity scores and improvement roadmaps. Roop also facilitated workshops at the leading practices conference helping Utilities share knowledge on key asset management areas.

AM Strategic Advisor
Asset Management Program | Columbus Department of Public Utilities | OH | 2009 – 2011

Development and implementation of a utility wide (Water and Wastewater) asset management program aimed at helping the utility sustain service levels in a cost effective manner in the face of growth, deteriorating infrastructure and resource constraints. Phase 1 is focused on vision, development of AM philosophy/model, current situation analysis, LOS, organization redesign to support AM, training plan development, Oracle WAM CMMS support, AM education, AM roadmap and improvement Initiatives.

Other related areas of interest

Publications

- Lutchman, R., 2011, "*Creating and Managing Sustainable Organizations*", Book, DESTech Publishers Inc., ISBN: 978-1-932078-041-9
- Lutchman, R., 2006, "*Sustainable Asset Management*", Book, DESTech Publishers Inc., ISBN: 978-1-932078-47-9
- Lutchman, R., 2003, "*Computerized Work Management Systems for Utilities and Plant Operations*." Book, DESTech Publishers Inc., ISBN: 1-932078-30-4
- Lutchman, R, *Risk Managed,* Water Canada Magazine March 2014
- Lutchman, R., 2003, 2004, "*Asset Management, CMOM, GASB, What Does it All Mean*?" Communicator Magazine, 2 part series

Presentations

- Lutchman R, "Asset Management for Green Infrastructure" Ontario Coalition for Green Infrastructure, Pioneer Village, Ontario, 2016
- Lutchman R, "Asset Management Fundamentals for Decision makers" South Florida Chamber of Commerce , 2016

Mehdi Mardi, PE

Senior Electrical and I&C Lead

Qualified: B.S. Electrical Engineering (Control & Power), Tehran Sharif University, IRAN February 1991; B.S. Applied Physics, Ferdowsi University, IRAN November 1988

Registrations: CA#C20033

PE Electrical CA (Issued: June 1, 2012; Expiration Date: September 30, 2020)

Years with GHD: 2 Home Office Location: Irvine

Professional Summary: Mehdi is a Professional electrical engineer with over 20 years of experience in the Electrical, Instrumentation and Control (I&C) fields in various type of industry like as Water and Waste Water, Oil & Gas, Petrochemical, Cryogenic and Industrial Gases. Mehdi has been involved in Electrical and I&C design, construction and commissioning on various projects including pump stations, desalination and water and wastewater treatment plants, Industrial Gas production, Hydro Power Generation, Land Field Gas, Oil and Gas field projects. He has experience in Medium and low voltage motor controls and distribution, as well as instrumentation design.

Anaheim – Lenain Water Treatment Plant | Anaheim, CA

This scope of project at this job site is to improve the plant reliability and water quality, increase the capacity and regulatory compliance. The electrical and instrumentation scope of work is detailed design and engineering related to replacement of the portable generator with a stationary generator, modify the existing switchboard and adding ATS, enhance the area lighting, HVAC and CCTV. Replacing some control panels and control valves and instruments, and integration into SCADA system.

Electrical Engineer
Philadelphia Force Main Improvement | IEUA | San Bernardino, CA

This project scope of work is to modify the existing lift station and add VFD to the third pump and prepare the electrical and instrumentation packages. Make recommendations for improving the electrical design and operation. The project is still in progress.

Electrical Engineer
Ground Water Recovery Improvement Program | Water Replenishment District | Pico Rivera, CA

The scope of project at this job site is to be the client's engineer for a Design-Build project. Review of the drawings and specifications during the design period, and during the construction to review contractor submittals for conformance with drawings and specifications and respond to RFIs and site visit are part of weekly task.

The project is in construction now and it is due to be commissioned in 2019.

Electrical Engineer

Electrical Engineer
Upgrading the Fire Monitors and Control System in Sail Room | San Diego Convention Center | San Diego, CA

This project scope of work was detailed design and engineering related to replacement of the Old hydraulic operating Fire monitors with new Electric control Monitors supplied by Elkhart Brass. Also installing New Aspiration Smoke detection (ASD) system, Protectowire Heat detection and installation of New Siemens XLS control panel. Coordination of design with San Diego Fire department and city of San Diego was part of the Engineering task.

Electrical Engineer
Land Fill Gas Recovery system Phase V | Stanton Energy Center | Orlando, FL

This project scope of work was detailed design and engineering related to phase V of increasing the capacity of Gas Recovery and addition of New Gas Compressors. The Electrical and instrumentation Design was to prepare all Detailed Electrical Drawing plus Automation and PLC panels, it included single line diagrams, plot plans, Hazardous area Classification, Lighting plan, and Lighting plan. Updating the Etap Model and preparing Short circuit study Report and the Arc Flash label was part of Scope of work.

Electrical Engineer
Ground Water Remediation system | P66-Wilmington Refinery | Long Beach, CA

This project scope of work was detailed Electrical and control design and engineering related to drilling of Ten New Ground Water wells around Wilmington Refinery. Scope of work include preparing detailed Electrical and Control drawing package, including Hazardous Area Classification, Emergency shut down panel, preparing IFC and inquiring city permit.

Electrical Engineer
New Filter and Bag House |Gerdau Steel Mill | Rancho Cucamonga, CA

This project scope of work was to help SMS S.P.A (Italian Engineering/Contractor) in preparing the Electrical design and make it in compliance with local, National Codes, and inquiring city permit. The electrical package include the plot plans, MV and LV Single line diagram and MV & LV switchgears, Hazardous Area Classification, Cable and conduit Routing and Schedule and details.

Electrical Engineer
Additional Desalination System | Southern California Edison- Pebbly Beach | Catalina Island, CA

This project was increasing the capacity of existing water treatment units and addition a Desalination unit to the existing units. The scope of work was detailed Electrical and control design and engineering related to installation of new GE RO unit, installing new Transformer and metering unit, New MCC and PLC Panel. Construction support, start up and commissioning was added to the scope of work later.

Electrical Engineer
Oil Transfer Pump | CRC- Freeman and Chaffee Island | Long Beach, CA

This project was increasing the capacity of existing Oil Transfer Pump from Freeman and Chaffee Island by replacing the existing Oil Transfer Pump with larger Pumps. The scope of work was detailed Electrical and control design and engineering related to installation of new OTP pumps. It required adding new Switchboard, MCC and VFDs. Updating the Etap Model and preparing Short circuit study Report and the Arc Flash labels were part of Scope of work. After completion of the design, Construction support, start up and commissioning were added to the scope of work.

Electrical Engineer
Hose Room | P66- Lube Oil | Los Angeles, CA

This project involved Modifying all the piping in Hose Room, adding new metering skid and adding new pumps to each product Tank. Scope of work was detailed Electrical and control design and engineering related to installation of new pumps, modifying MCCs, preparing the conduit routing and cable and conduit schedules, preparing the I/O list and control panels. Updating the Etap Model and preparing Short circuit study Report and the Arc Flash label was part of Scope of work.

Electrical Engineer
Vapor Recovery Booster Compressor | CRC-Freeman Island | Long Beach, CA

This project was increasing Efficiency of Vapory Recovery system by adding a Booster compressor to Existing Vapor Recovery System.

The scope of work was detailed Electrical and control design and engineering related to installation of new Booster Compressors. It required adding new feeders to existing MCC and Modifying the PLC panels.

Electrical Engineer
Upgrading the Oil Field Power Distribution Switchyard | CHEVRON | Bakersfield, CA

This project was improving the quality of the existing Power distribution switchyard by replacing the 115KV Disconnect switches with no protection with ABB Circuit breaker and providing the Protection relays for these feeders by SEL. The scope of work was detailed Electrical and control design and engineering related to installation of these two new ABB low oil Circuit Breakers and SEL feeder protection Relay and protection Relays. It was also included Commissioning and Startup of the Switchyard after installation.

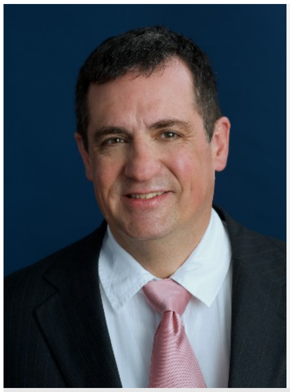
Other related areas of interest

Recognized (Certifications/Trainings)

- Control and instrumentation, PETKIM Petrochemical Co., Izmir/ Turkey
- Supply chain Management course (by APICS) at Gaiser tool Company, Ventura/ CA
- Intermediate/Advance programming of Automation Direct PLC, Irvine/ CA

Mark A. Waer, PhD

Process & GAC / Construction Observation Process Support



Education: PhD, Environmental Engineering, University of Illinois; MS, Water Resources Engineering, Villanova Univ.; BS, Pre-Medicine, Pennsylvania State Univ.

Connected: American Water Works Association

Years with GHD: 2 | Home Office Location: Irvine

Awards: Abel Wolman Doctoral Fellowship. Samuel Arnold Greeley Award.

Professional Qualifications: Extensive experience in physical-chemical and biological water treatment process design/optimization, applications research, and water plant operations. Skilled in meeting plant construction, commissioning/start-up, operations training, and support needs of both municipal and industrial clients. Adept at elevating quality while minimizing capital and operating expenses by identifying outside-the-box applications for conventional/new technologies. Knowledgeable regarding water quality standards and regulations. Communicates effectively with all levels of stakeholders, including superintendents, engineers, and executives.

Senior Water Process Engineer
GRIP AWTF | Water Replenishment District of Southern California | Lakewood, CA

The GRIP AWTF is a 30 MGD Advanced Water Treatment Facility designed to purify tertiary treated wastewater from the San Jose Creek WWTF to an indirect potable reuse standard for groundwater replenishment. The processes include ultrafiltration, reverse osmosis, and advanced oxidation using ultraviolet irradiation. GHD's role as an owner's engineer for the Water Replenishment District includes review of the design and specifications, delivery of regulatory documents, commissioning, startup and operations support. Mark has been particularly involved in the membrane systems (UF and RO) and the chemical handling systems.

Senior Water Process Engineer | Aguas Antofagasta Seawater Desalination Plant | Antofagasta, Chile

In one of the driest regions on earth, Aguas Antofagasta, a Chilean provider of potable water, is in need of a second desalination plant in the north section of Antofagasta called La Chimba. The plant will incorporate ultrafiltration and reverse osmosis along with remineralization using calcite. Mark is serving as the senior reviewer in the Basis of Design and Conceptual Design stages of this project.

Lead Process Engineer | El Morro Desalination Plant | Santiago, Chile

The El Morro Desalination Project was a 740 L/s seawater desalination plant located on the coast of Chile to serve a copper mine located near Vallenar, Chile. The process consisted of dissolved air flotation, ultrafiltration, reverse osmosis, and remineralization. Mark was lead process engineer preparing vendor packages for the process. He led the bid evaluation team through vendor selection, then worked with bid conditioning, P&ID development and revision, and through detailed design. The project was cancelled at this point due to social and environmental concerns.

Lead Process Engineer | Minera Escondida Desalination Plant | Santiago, Chile

Minera Escondida Desalination Plant was a 3200 L/s seawater desalination plant to serve a copper mine near Antofagasta, Chile. The process consisted of dissolved air flotation, two stages of media filtration, reverse osmosis, and remineralization. Reviewed conceptual design, basis of design, P&IDs, pilot plant planning and construction, and vendor selection. The project was later postponed.

Lead Process Commissioning Engineer and Operations Lead | Bundamba AWTP | Bundamba, Queensland, Australia

Bundamba Advanced Water Treatment Plant is a purified recycled water facility located in Southeast Queensland near Brisbane. The plant receives secondary effluent from several wastewater facilities and applies coagulation, flocculation, sedimentation, microfiltration, reverse osmosis, advanced oxidation with ultraviolet light and peroxide, re-mineralization, and disinfection, as well as the waste streams. The plant was built in 2 phases. During the first phase, Mark was in charge of commissioning the various processes. There was a severe drought at that time and the commissioning team was under a great deal of pressure to bring the plant online. The water was needed to offset water taken from the public water supply dam at Wivenhoe Dam for power plant use. The team was innovative and resourceful and the plant, despite innumerable issues, was brought online on schedule. During the second phase of the project, he was asked to return to provide operational support for the plant as the second phase was brought online.

Lead Process Engineer | Lake Pleasant WTP | Phoenix, AZ

Lake Pleasant WTP is an 80 MGD design-build-operate-maintain (DBOM), green-field water treatment plant employing ACTIFLO® Ballasted Flocculation, ozone, deep-bed granular media filtration, granular activated carbon (GAC) post contactors, and UV disinfection. The plant included its own GAC regeneration furnace. Since this plant was to serve areas that overlapped other City of Phoenix plants service area, the City required a very strict set of water quality goals for the LPWTP. He was involved from the Basis of Design through the Performance Test. He developed the startup plan for the utility. He also developed the compliance strategy for the enhanced regulations imposed by the City of Phoenix; trained the operations staff in the new technologies; and c consulted on issues ranging from poor coagulation to GAC furnace operation.

Lead Process Commissioning Engineer | Seymour-Capilano Filtration Plant | Metro Vancouver, North Vancouver, BC

Seymour-Capilano WTP is an 1800 MLD (475 MGD) direct filtration plant which was constructed to provide filtered water to the downtown Vancouver area and beyond. SCFP includes coagulation, flocculation, filtration, UV disinfection, corrosion control, and chlorination. Also, the plant has backwash recovery, sludge dewatering, and effluent treatment. The filters are rated at 15 m/hr (6 gpm/sf). Issues during startup included flow control, filter aid polymer feed problems, problems with the backwash recovery system, lime feed difficulties, and issues with the belt presses for sludge dewatering. One requirement of the contract was to have the plant in service in time for the Vancouver Winter Olympics in 2010. Working with his team, he helped develop solutions to these issues and the goal was met. After startup, Mark stayed on with the plant to aid in operator training, working on-shift with the operators.

Chandler Surface Water Treatment Expansion | Lead Process Engineer | City of Chandler | Chandler, AZ

The goal of this project was to expand the capacity of the Chandler Surface Water Treatment Plant from 45 to 60 MGD, and to make improvements in product water quality including improved filtered water turbidity and distribution system disinfection by-products to meet upcoming regulations. Mark was the lead process engineer for this project from the original kick-off meeting through its commissioning and beyond. He organized and presented workshops for the operational staff to evaluate existing and upcoming regulations, evaluate plant data in comparison to the requirements, introduce the options for technology in the expanded plant, present a decision making model for selection of process technology, and operator training.

Other Areas of Interest

- Past Chair of the AWWA Taste and Odor Committee.
- Past Chair of the AWWA Activated Carbon Standards Committee.
- Member of the AWWA Standards Committee on Water Treatment Plant Operations and Management
- Director of Water, Project Mega Agua, AdapTec SA, Santiago, Chile.
- Former Consultant with Blue Planet Society, Carl Hayden High School, Phoenix, AZ.

John McLaughlin, PE

Security

Qualified: Bachelor of Science, Civil Engineering, Virginia Polytechnic Institute, 1979.Science/Bachelor of Business (BSc/BBus)

Connected: North Carolina AWWA-WEA, National Society of Professional Engineers, Professional Engineers of North Carolina, NC AWWA-WEA Broad of Trustees Chair (2012-13)

Professional Summary: Over 30 years of water and wastewater consulting experience, including planning, design, and construction of all aspects of water and wastewater systems. He is adept at group facilitation and consensus building. John also has an extensive background in emergency management, disaster preparedness and response, and vulnerability assessments for intentional malevolent acts.

Job Manager
CMUD Security Vulnerability Assessment | Charlotte-Mecklenburg Utility Department | Charlotte, North Carolina

John was the job manager on this extensive security Vulnerability Assessment for one of the largest utilities in the Southeast. What made it unique was that it focused on the unmanned facilities in the water distribution system, thus requiring additional focus on proper response protocols and procedures. This process helped inform the client with respect to better emergency response.

Job Manager
DC WASA (now DC Water) Combined Sewer Vulnerability Assessment | District of Columbia Water and Sewer Authority | Washington, DC

John was the job manager on this security Vulnerability Assessment for the combined sewer system for our nation’s capital. The project required coordination between 3 different consultant team members, the various departments within DC WASA and all the police and response agencies within the national capital region. Our team was able to blend the best aspects of the RAM-WTM and Vulnerability Self-Assessment Tool VSAT) methodologies while providing the client with new policies and procedures that took into account the sensitive nature of the locations of many of their most critical facilities.

Technical Adviser and Trainer, Honolulu Board of Water Supply (BWS) Security Vulnerability Assessment | Honolulu BWS | Honolulu, Hawaii

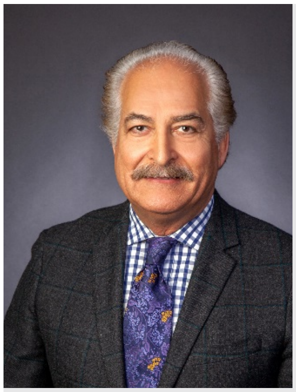
John served as the technical adviser and also provided training during two separate training events for BWS staff and the consultant team in the RAM-WTM methodology. The assessment looked at over 400 remote facilities within a water system that serves the entire island of Oahu and is made up of over 90% groundwater with numerous unmanned facilities.

Recognized (Certifications/Trainings)

- Professional Engineer in NC and SC

H.R. (Omar) Moghaddam, PE, CPP

Permitting/Regulatory Compliance



Qualified: Postgraduate studies in Mechanical Engineering and Thermal Sciences, University of Southern California, 1984; M.S. Mechanical Engineering, University of Southern California, 1981; M.S. Petrochemical Engineering, University of Southern California, 1979; B.S. Chemical Engineering, Abadan Institute of Technology, 1976

Connected: Member, California Association of Sanitation Agencies (CASA); Member, California Water Environment Association (CWEA); Member, Southern California Alliance of Publicly Owned Treatment Works (SCAP); Member, Water Environment & Reuse Foundation (WE&RF); Member, Water Environment Federation (WEF), WEF Residual & Biosolids Committee, Bioenergy Technology Subcommittee, and Carbon Resource & Recovery Subcommittee; Member, South Coast Air Quality Management District (SCAQMD) Streamlining Task Force, SCAQMD Hearing Board Advisory Committee; Member, California State Polytechnic University – Pomona Industry Advisory Council; Former member, University of California – Los Angeles Luskin Advisory Board Member

PE Mechanical CA (Issued: February 24, 1983; Expiration Date: December 31, 2021)

Certified Permitting Professional (Issued 1992)

Years with GHD: 2 | Home Office Location: Irvine

Professional Summary: Omar has over 35 years of experience in the design, development, permitting, management, and operation of innovative, sustainable, and complex systems in water, wastewater, stormwater, AWTF water reclamation and purification, and groundwater remediation, watershed management, and water-energy nexus. With a technical advisory and leadership background, Omar pays particular attention to the cost-effective implementation and prudent operation and maintenance (O&M) of environmental projects for the water emphasizing regulatory compliance and energy efficiency. As a Certified Permitting Professional (CPP), he is skilled in coordinating with project owners and operators, regulatory and permitting agencies, environmental constituencies, and stakeholders to secure air quality and water quality permits, NPDES, MS4, and UIC permits. Additionally, Omar was Principal-In-Charge for the development of a comprehensive greenhouse gas (GHG) and criteria pollutants inventory and related reduction strategy platform for the City of Los Angeles's Sustainability pLAn.

Senior Strategic Advisor

Provided strategic coordination and advice for key clients, municipal agencies including LADWP, LASAN Wastewater Program, OCSD regulatory and permitting agencies, environmental constituencies, and community stakeholders on permitting, regulatory affairs, and design and development of technologies related to water/wastewater and Advanced Water Treatment Facilities.

Client Account Manager

Coordinated projects, business development, and marketing strategies for Geo-Environment Technologies and AECOM on clients: LADWP, City of Los Angeles Bureau of Sanitation (LASAN), City of Los Angeles Mayor's Office of City Services and Infrastructure, City of Los Angeles Mayor's Office of Sustainability, Orange County Sanitation District, Los Angeles County Sanitation District, and liaison to the California Association of Sanitation Agencies.

Project Director
Regional Resource Recovery and Carbon Sequestration Facility | Los Angeles, CA

Directed the development of a regional resource recovery and carbon sequestration facility focusing on food waste, total maximum daily loads (TMDLs), bio-slurry, and brine.

Project Director
Power Plant Consulting | Orange County Sanitation District (OCSD) | Orange County, CA

Directed the development of a training program for the operations management team for their on-site central power generation at Plants 1 and 2.

Division Director
Regulatory Affairs and Renewable Resources | City of Los Angeles Bureau of Sanitation | Los Angeles, CA

Lead role in negotiating the discharge permits, NPDES, air quality and biosolids permits, and development of CEQA/EIR for the wastewater treatment and solid waste facilities. Lead role in the development of CHP; advanced water treatment (MF/RO, UV, AOP) and recycled water facilities and brine management; bio-slurry and biogas technologies; air pollution control and de-ammonification.

Project Director
Compressed Natural Gas (CNG)/Liquid Natural Gas (LNG) Facilities Safety Evaluation | City of Los Angeles Bureau of Sanitation | Los Angeles, CA

Directed the development of a comprehensive safety analysis, including electrical, mechanical, and structural; Cal/OSHA, and station safety for five CNG/LNG facilities and safety assessment of the CNG/LNG vehicles.

Project Director
Terminal Island AWTF Brine Management| City of Los Angeles | Los Angeles, CA

Directed the development of the first-in-the-nation deep injection of biosolids and AWTF's brine management project at the City's Terminal Island Water Reclamation Plant; negotiated three rounds of Class V UIC permit with USEPA; secured over $10M grants from the Department of Energy, and directed the preparation of the environmental documents CEQA, EIR, Coastal Commission permits.

Program Manager
Marketing and Design Pursuits | City of Los Angeles Bureau of Sanitation | Los Angeles, CA

Coordinated marketing strategy, consultant partnering, and engineering advisory across all company work areas including sewer designs, sewer condition assessments, recycled water designs, solid resource pursuits, operational support, stormwater TMDL compliance, energy management, and treatment plant operation enhancements.

Project Manager
Water System Resiliency Study | Los Angeles Department of Water and Power (LADWP) | Los Angeles, CA

In coordination with a teaming consultant, developed a resiliency study for the LADWP water system for high water demand during a major earthquake and fire with the focus on hospitals, medical facilities, natural gas and LNG storage facilities, refineries, and hazardous waste management facilities.

Division Director
Energy and Applied Research | City of Los Angeles Bureau of Sanitation Hyperion | Los Angeles, CA

Negotiated a 20-year energy exchange agreement between L.A. Public Works and LADWP for import of steam and power in exchange for the export of renewable digester gas for Hyperion. This contract brought upward of $500 million savings to the City.

Project Director
Terminal Island Water Reclamation Plant Biosolids Management | City of Los Angeles | Los Angeles, CA

Provided the following services for each component of this project:

- **Deep-well Injection of Biosolids and Brine**: Directed the development, UIC permitting, and implementation of the first-in-the-nation, full-scale implementation of the deep-well placement of biosolids and brine at the City of Los Angeles' Terminal Island Water Reclamation Plant. In addition to its biosolids management technique, this project has offered tremendous carbon sequestration effect.
- **Class A Biosolids**: Directed the R&D, and then full implementation of the largest in the U.S. thermophilic, anaerobic digestion, and production of Class 'A' biosolids, in compliance with the EPA's CFR 40, Part 503, for the City of Los Angeles' Hyperion and Terminal Island plants.
- **National Biosolids Partnership Certification**: For 10 consecutive years, lead a team of operators, engineers, and scientists to successfully complete the requirements of the audits in maintaining the NBP's Tier 4 platinum certification of the Environmental Management System Program for the City of Los Angeles, and in advancing the environmentally sound and sustainable biosolids management practices. This program was jointly designed by EPA, WEF, and NACWA.

Director of Energy and Applied Research
Hyperion Class A Biosolids | City of Los Angeles Bureau of Sanitation | Los Angeles, CA

In producing Class "A" Exceptional Quality (EQ) biosolids in conformance to the CFR 40, Reg. 503, directed the implementation of the largest-in-the-U.S. thermophilic anaerobic digestion at the Hyperion Treatment Plant and Terminal Island Water Reclamation Plant.

Leila Munla, PhD

Membranes/Pilot Testing

Qualified: PhD, Environmental Engineering, University of Waterloo, Waterloo, Ontario, Canada 2013; BSc, Environmental Science, University of Waterloo, 2006; Civil/Environmental Engineering Technology, Humber College, Toronto, Ontario, Canada 2005.

Connected: American Water Works Association CA-NV Section; Water Reuse, Orange County

Years with GHD: 2 | Home Office Location: Irvine

Professional Summary: Five years of project engineering experience in water and wastewater process design and treatment. Currently, Leila is performing project engineering on Inland Empire's Carbon Canyon Water Recycling Facility and the Rialto Bioenergy Facility, which includes managing permitting, process design, and equipment selection. Leila also has 7 years of experience in membrane filtration systems with a focus on fouling mitigation and quantification, membrane system design and operation.

Project Engineer
Lenain WTP Master Plan and Asset Management | Utilities Department | Anaheim, CA

Serving as a project engineer for the development of a comprehensive Facility Master Plan including cost and schedule for the replacement and rehabilitation (R & R) of facilities as well as expansion of the LWTP from 15 to 20-22 mgd. The project includes significant pipe treated water pipe modifications to allow the delivery of the additional treated capacity into the distribution system.

The proposed improvements are recommended to maintain Regulatory Compliance and Safety, Water Quality, Plant Reliability, and Flexibility for Plant Expansion. Currently providing engineering services during construction and specialty inspection/resident engineering and startup/commissioning services. Construction is scheduled to be completed by end of 2019. Existing influent and effluent pipelines at LWTP will be upsized from 24" to 36" and will be co-located in the LWTP Secondary Access Road. This new location of the influent and effluent pipelines will increase accessibility for maintenance. Additionally, the Secondary Access Road will be widened to facilitate the flow of vehicles at LWTP. It is anticipated that the cost of the Secondary Access Road improvements will be partially offset by the plan to install new Influent and Effluent pipelines in the road.

Project Engineer
Engineering Design Guidelines | Inland Empire Utilities Agency | Rialto, CA

Project engineer for the development and update of the Engineering Design Guidelines to communicate design preferences of the Inland Empire Utilities Agency (IEUA) to its consulting engineers/designers to improve consistency and efficiency of project deliveries. Significant workshops and staff interactions were utilized to build consensus regarding Guidelines format.

The Guidelines were developed in tabulated forms to improve their read and ease of future modifications and/or additions. The level of completeness and usefulness of these Guidelines will improve with their use and updates. The level of details included in the Guidelines was targeted to the 30-percent design level. The tabulated format will be helpful to incorporate into Preliminary Design/Basis of Design documents. The level of details/requirements were developed with emphasis on technical areas that are common sources of inconsistencies during designs. Currently updating the Guidelines and adding new technical sections and coordinating its content with the Front End Contract Documents that have been recently updated by GHD. The updated Guidelines are scheduled for publication in late 2018.

Project Engineer
3A Water Recycling Plant Improvement Projects | Moulton Niguel Water District | Mission Viejo, CA

Serving as Project Engineer for the Moulton Niguel Water District 3A Water Recycling Plant Improvement/Upgrade Projects. GHD is providing Owner Engineering services for plant rehabilitations and replacements required to reliably meeting its rated capacity of 6 mgd. Initial efforts are focusing on facility condition assessments; project definitions; budgetary cost estimations; and prioritizing of plant improvements. Major improvements to the plant include equipment rehabilitation, process optimization, development of standard operating procedures and enhancements, technology evaluations, and site subsidence mitigation. GHD is working on developing RFPs for improvements and upgrades to the solids and liquid treatment train processes including initial technology assessments and evaluations of alternatives to better define design efforts for the required improvements/upgrades. GHD efforts include guiding design efforts to be performed by others and reviewing all submittals for these improvements/upgrades. The total construction cost for the plant rehabilitations and replacements is estimated to be in the order of $15M.

Project Engineer
Carbon Canyon Water Recycling Facility – Asset Management and Improvements Package III | Inland Empire Utilities Agency | Chino, CA

Serving as Project Engineer for the CCWRF Asset Management and Improvements Project. IEUA launched the CCWRF Asset Management and Improvement projects in order to improve a number of processes at CCWRF based on input from Operations, Maintenance, Engineering, O&M Documents, and Asset Management Plans. GHD is providing design services for Package III of Asset Management and Improvements at CCWRF.

GHD is completing the detailed design for the following improvements: Replace Leaky Influent and Effluent Tertiary Filter Weirs; New Flocculation Basin Overflow Weir; Demolish Abandoned Chlorine Disinfection System; Replace Filter LCP with a new PLC and integrate to SCADA; Refurbish Corroded Monorails; Refurbish and/or Replace Filter Backwash Troughs; Refurbish or Replace Cast Iron Tertiary Filter Gates; Extend Concrete Lining at the Emergency Storage Lagoon; New Flow Meters at the CCB; Increase Reliability of Plant Utility Water System; Replace Drain Valves and Plug Valves at CCB and Tertiary Filters.

Permitting Manager and Process Design
Rialto Bioenergy Facility (RBF) | Confidential | Rialto, CA

Expediting permitting for the RBF project with the City of Rialto including demolition, rough/precise grading and building permit issuance. Also serving as a project engineer for the development of the process design and P&IDs.

GHD is providing preliminary and detailed engineering service including civil, water quality and hydrological design for a 2,000 ton per day waste processing facility on 6.5 acres. Half of the incoming material is biosolids and the remaining from large post-consumer food waste slurries. The site will be developed for material receiving, storage, anaerobic digestion involving 3.5 million gallon digesters, two belt dryers for the digestate and biosolids, biogas upgrading to fire onsite appliances, biogas upgrading to RNG quality, CHP units with net 5 MWe, 3MWe transfer switch for net electrical export, use of CHP jacket heat, CHP exhaust heat, battery for peak-electrical use shaving, and a pyrolysis unit to burn dried pellets into a biochar complete with syngas cleanup and firing of onsite appliances. In total, the site is estimated to produce 14 MW of electrical and thermal renewable energy.

Project Engineer
CalFire Greywater Treatment System and Rainwater Capture | CalFire | San Diego, CA

Designed the greywater treatment system and rainwater harvesting for a CalFire station requiring additional water supply for fire truck washing and irrigation. Optimized tank storage and daily disinfection process for stored water. Created design templates for larger scale CalFire stations. This project served as a benchmark in both design and regulatory precedent to be applied at other CalFire stations.

Project Engineer
Catalina Island Conservancy Trailhead Visitor Center | Catalina Island Conservancy | Catalina Island, CA

Designed the water treatment and reuse processes for desalination and rainwater harvesting and storage for Catalina Island's first LEED certified building. Quantified storage including tank size and location required for rainwater and desalinated water as well as designing the delivery process system.

Process Engineer
San Diego Gas and Electric Substation Fire Storage | SDG&E | Otay, CA

Upgraded a water storage tank and associatd piping and valves for fire protection at an SDGE substation. Replaced old valves and refurbished the inside of the tank due to aging and corrosion. Designed a mixing and automated chlorine dosing disinfection system to maintain water quality.

Other related areas of interest

Recognized (Certifications/Trainings)

- Current Chair of the Women's Leadership Committee, AWWA California-Nevada Section.
- Past Vice-Chair of the Leadership Development Committee, AWWA California-Nevada Section.

Awards

- AWWA CA-NV Section 2015 Chair's Award for dedication and leadership in organizing and facilitating women's networking and professional development workshops at the Section conferences.
- Submitted to the University of Waterloo for a Graduate Research Scholarship for research on ceramic membranes for surface water treatment. The submission was accepted and approved for funding of the PhD research project.

Andrew Peek

Durability and Corrosion

Qualified: MSc (Applied Chemistry) Curtin University of Technology, BAppSc (Chemistry) Western Australian Institute of Technology, Chartered Chemist.

Connected: Member of the Concrete Institute of Australia's National Concrete Durability Committee Task Group TG6, co-author of Recommended Practice Z7/07 "Performance Tests to Assess Concrete Durability", also a reviewer and contributor to Z7/02 "Durability Exposure Classification" and Z7/05 "Modelling of Reinforcement Corrosion in Concrete Structures".

Years with GHD: 18 | Home Office Location: Perth, Western Australia

Professional Summary: Over 30 years' experience in durability, deterioration, protection and testing of construction materials related to the performance of conventionally, pre- and post-tensioned reinforced concrete structures in marine and hypersaline exposures and other aggressive environments such as mining/mineral processing, desalination plants, water and wastewater handling and treatment, transport infrastructure and heavy industry. His experience includes durability planning and specification for new installations, condition assessment and remedial works, failure investigation, and the design and implementation of materials performance test programs. Andrew has provided these services to a diverse range of clients in Australia, New Zealand, Singapore, Hong Kong, Malaysia, Vietnam, Indonesia, USA and UAE.

Durability Design Lead
Neerabup GWTP Upgrade
Westforce-Sacyr JV | Perth, WA, Australia

Preparation of Durability Plan, durability design support and construction support to upgrade 100 ML/d ground water treatment plant (GWTP) to 150 ML/d.

Lead Durability Consultant
Mundaring WTP and Pump Station C
Brookfield Multiplex | Mundaring, WA, Australia

Durability consultant to head contractor for the first Water Corporation public private partnership (PPP) project in WA ($360M). Construction of 160 ML/d expandable to 240 ML/d potable water treatment plant and pump station providing all potable water to the Goldfields and Agricultural Region Water Supply Scheme (GAWS). GAWS is the largest water supply network by area in the southern hemisphere. Detail design and construction phase implementation of durability plan for key structures comprising DAFF tank, BAC filters and rinse/supernatant tank, flocculation chamber, back wash water tank, balancing and chlorination tanks, clear water tanks, wash water balance tank, sludge tank and pump station.

Owner's Engineer Durability Consultant
Onslow WTP Upgrade
Water Corporation WA | Onslow, WA, Australia

Owner's Engineer review of proposed materials to meet durability requirements for construction of a new ground water treatment plant for the Onslow town supply in conjunction with construction of the Wheatstone LNG plant.

Owner's Engineer Principal Durability Consultant
Kwinana SWRO Desalination Plant
Water Corporation WA | Kwinana, WA, Australia

Member of owner's independent review panel on concrete durability and protection for D&C tender and detail design submissions for 150 ML/d SWRO desalination plant. Technical support regarding protective coatings and linings, sealants, and deterioration modelling durability services covering design brief, review of tender design, review of detailed design and technical support on request during construction. Materials technology assessment included compliance with the Durability Plan, coatings application, sealant application, chloride ingress deterioration modelling and support on request for durability consultant input. Structures included seawater intake, permeate and drinking water tanks, limewater tank, brine effluent structures and backwash tanks, and buildings containing the desalination process.

Owner's Engineer Durability Consultant
Carlsbad SWRO Desalination Plant
Poseidon Water | Carlsbad, California, USA

Provided durability advice for Carlsbad 50 million US gallon per day (mgd) (~190 ML/d) SWRO desalination plant for concrete structures, including technical review of durability modelling at design stage, advice on feasibility of retaining existing former power station outfall structures, and technical review of remediation proposals for repair of construction defects.

Owner's Engineer Durability Consultant
Huntingdon Beach WWRO Desalination Plant
Poseidon Water | Huntingdon Beach, California, USA

The new Huntingdon Beach Wastewater Desalination Plant treats wastewater for injection into a freshwater aquifer, which is used in the Los Angeles municipal water supply, to mitigate seawater intrusion. Provided durability advice for concrete structures including repair of construction defects, and advice on feasibility of retaining existing former power station outfall structures.

Specialist Corrosion Consultant
Newman WTP Reject Brine Disposal
BHP Billiton Iron Ore | Newman, WA, Australia

Corrosion resistance study of mineral processing plant construction materials to assess feasibility of reject brine disposal from two inland RO desalination plants (Newman town supply and Yarnima Power Station) by blending with mine dewatering to use as process water in minesites and ore processing plant. Included modelling of effects of various current and predicted future flow and brine composition scenarios on the blended water chemistry, demonstrating technical feasibility of the proposal.

Principal Durability Consultant
Alkimos WWTP
Brookfield Multiplex | Alkimos, WA, Australia

Tender and detail design stage durability planning for Alkimos WWTP, initial 20 ML/d expandable to 160 ML/d full future capacity. Largest WWTP structures in WA at that time. Concrete and protective coatings specifications and materials evaluation. Construction technical support.

Durability Consultant
Mackay Water Recycling Project
Cleaner Seas Alliance | Mackay, Queensland, Australia

Interpretation of laboratory test data for assessment of condition and provision of durability advice for two wastewater treatment plants and two wastewater pump stations proposed for upgrade in Mackay Water Recycling Project.

Specialist Durability Consultant
Asbestos-Cement Water Mains Replacement
Charters Towers Regional Council | Charters Towers, Queensland, Australia

Condition assessment, diagnosis of deterioration mechanisms, and remaining life modelling of municipal asbestos-cement potable water mains. Both supply mains from the Burdekin River source to the treatment plant, and town distribution mains, were assessed for current pressure rating and likely time to replacement. The condition assessment was made through petrographic and SEM/EDX examination of hot-tapped core samples retrieved from the pipes while the system was live. Current pressure capacity was estimated from the dimensions of the remaining sound cross-section, with likely remaining service life estimated using deterioration rate constants calculated from the age and depth of deterioration.

Durability Design Presenter
Durability Design in Desalination Plants
USA and Australia

Preparation and delivery of presentations on durability engineering and plant reliability to US water authorities (El Paso TX and Irvine CA) and Department of Trade hosted delegation of US water asset owners (Perth).

Other related areas of interest

- **Published.** Over 40 conference and journal papers, presentations to professional societies, and presentations to government-sponsored industry events.
- **Recognised.** Twice awarded the A.C. Kennett Award for Best Paper on Corrosion of Non-metallic Materials, and awarded the David Whitby Review Paper Award, for papers published at the Australasian Corrosion Association's international peer-reviewed conferences. Concrete Institute of Australia 2017 National Excellence in Concrete Award – Technology & Innovation for the remaining life assessment of the Wandoo B offshore concrete gravity structure.
- **Memberships.**
  - Royal Australian Chemical Institute.
  - Australasian Corrosion Association.
  - Concrete Institute of Australia.
  - National Association of Corrosion Engineers.
  - Society for Protective Coatings.
  - American Concrete Institute.
  - Surface Coatings Association of Australia.

Casey Raines, PE

Pipeline/Infrastructure

Qualified: California State Polytechnic University, Pomona, CA. Bachelor of Science in Civil Engineering, 2007

Registrations: CA#C76713 Issued July 2010, Expires December 2020

Connected: California Water Environment Association, North American Society for Trenchless Technology, Orange County Water Association

Years with GHD: 6 | Home Office Location: Irvine

Professional Summary: Ms. Raines is a registered professional civil engineer with extensive experience in the design, planning and rehabilitation of domestic water, recycled water and wastewater pipelines. Her emphasis has been in drafting, hydraulic system modeling, master planning, and design of plans for pipelines pump stations, wells and reservoirs. Her experience in hydraulic system modeling has included regional and citywide water and sewer distribution master plans using both steady state and extended period simulations; fire flow assessments and sewer capacity studies for new developments; pump station and discharge piping improvement studies; and reservoir capacity analyses. Ms. Raines is NASSCO certified in the evaluation of CCTV inspections and assessment of pipe conditions. This certification has resulted in the expertise with various rehabilitation methods including CIPP and point repairs.

Project Engineer
Carlsbad Ocean Water Desalination Conveyance Pipeline | Poseidon Resources, CA

Project engineer for the design review of the Carlsbad Ocean Water Desalination Conveyance Pipeline. GHD is currently the owner's engineer for the Carlsbad Desalination Conveyance Pipeline that will deliver an average flow of 50 MGD of desalinated ocean water from the future Carlsbad Ocean Desalination Plant to the SDCWA's Twin Oaks Valley Water Treatment Plant. The transmission pipeline system is comprised of approximately 53,000 feet of 54" diameter steel pipeline with a shell thickness up to 0.900-inches to withstand a working pressure of 550 psi and surge pressures exceeding 1000 psi.

Project Engineer
P-1046B Recycled Water Conveyance Facilities | Camp Pendleton, CA

Project Engineer for the P-1046B Recycled Water Conveyance Facilities project that will expand the use of recycled water at the Marine Corp Base Camp Pendleton and improve the water aquifer by providing a seawater intrusion barrier. The project includes two pumping stations, over 50,000 linear feet of reclaimed water pipelines, four horizontal directional drill crossings, service connections, 350,000 gallon reservoir, sixteen injection wells for seawater intrusion barrier, and two 75,000 gallon balancing reservoirs. The design includes preparation of permit applications for injections wells, recycled water services, and approval of pipe separations for potable/ recycled/ wastewater lines.

Project Engineer | Newport Coast Sewer Lift Station Rehabilitation | Irvine Ranch Water District, CA

Project Engineer for the rehabilitation of the Newport Coast Sewer Lift Station consisting of a new CMU block electrical building, a new stairway to the dry well, CIPP lining of the existing 12-inch DIP sewer force main, rehabilitation of the wet well concrete and coating, and the redesign of the pump discharge piping to install flow and pressure monitoring devices. A comprehensive bypass pumping plan was also developed to allow the contractor to rehabilitate the wet well and reconfigure the discharge piping within the dry well. GHD's tasks for the rehabilitation included a condition assessment of the wet well and sewer force main, along with the preparation of bidding documents including plans, specifications, and a cost opinion.

Project Manager | Seawatch Recycled Water Main Rehabilitation | Irvine Ranch Water District, Newport Beach, CA

Project consisted of the rehabilitation of a 10-inch recycled water main in a fire access road between two communities in Newport Beach. The recycled water main had required several emergency repairs due to failures from improper construction methods. An alternatives analysis was completed examining various rehabilitation methods including CIPP, sliplining, pipe bursting and full replacement. The project recommended CIPP lining approximately 4,500 LF and a full replacement of the existing ductile iron main in place for approximately 140 LF at the connection to the PRV vault. Access pits were designed to facilitate the installation of the CIPP lining along with the reconnection details using internal mechanical seals.

Project Engineer
Wineville Pipeline Extension | Inland Empire Utilities Agency, Ontario and Fontana, CA

Assisted with the design and construction of 6 miles of pipelines including 5 miles of 36-inch and 1 mile of 24-inch welded steel pipelines to extend the Agencies recycled water system from the City of Ontario to the City of Fontana. This project included hydraulic modeling of the recycled water system to determine appropriate pipe diameters by running average daily demand, maximum daily demand, and ultimate deposition into the Agency's groundwater recharge basins. It also included the preliminary and final design of the pipeline, turnouts to IEUA customers including private properties and the Fontana Water Company, and turnouts discharging recycled water to groundwater recharge basins at the IEUA RP-3 site and the SBCFCD Declez Channel. This included the specification of a 28-inch and 16-inch plunger valves enabling the pressurized recycled water system to discharge to open atmosphere. Other design elements included mitigating several storm drains, flood control channel crossings, railroad crossings through pipe bridges and bore and jack construction methods.

Project Engineer
Mountain View Park New Well and Raw Water Transmission Pipeline | Chino, CA

Project Engineer for the preparation of a Preliminary Design Report and construction plans for a new water well at the Mountain View Park in the City of Chino and a raw water transmission pipeline along Mountain Avenue, Chino Avenue and Bon View Avenue. A hydraulic analysis was completed in H2ONet Analyzer to appropriately size the transmission pipeline based on the contribution of groundwater from three wells. The proposed improvements include the development of the well site with a building that will enclose the well, pump discharge line and electrical equipment and approximately 12,500 linear feet of 12-inch to 24-inch raw water pipeline.

Project Engineer
Philadelphia Force Main Improvements and Regional Force Main Improvements | Inland Empire Utilities Agency, Ontario, CA

Project consists of improvements to the Philadelphia, Montclair, and San Bernardino Lift Station force mains operated and maintained by IEUA. Improvements include construction of two new parallel 18-inch non-reclaimable waste force main pipelines for the Philadelphia Lift Station at 14,800 LF each, construction of clean out valves along the force mains at 500-ft intervals, condition assessment of the Montclair and San Bernardino Avenue Lift Station force mains, temporary sewer bypass plans, and site grading modifications at the Montclair Lift station. Specific project tasks included a comprehensive preliminary design report to analyze various alignment alternatives; design of trenchless alignments including a geotechincal baseline report; permitting with various cities, Caltrans, and Union Pacific Railroad; and development of construction plans, technical specifications, and cost opinion.

Project Engineer
Relocation of Feeder No. 2 | West Orange County Water Board

Project Engineer for the relocation of the West Orange County Water Board's Feeder No. 2 water transmission main due to impacts from the widening of the Interstate 405 freeway. The relocated 30-inch water transmission main is located in Mahogany Avenue and crosses the Interstate 405 freeway to Willow Lane. The portion beneath the Interstate 405 freeway is constructed via microtunneling within a 42-inch steel casing. Other specific tasks included permitting and coordination with Caltrans, City of Westminster, and Cal-OSHA; development of traffic control plans; geotechnical investigation; potholing; and development of construction plans, technical specifications and cost opinion.

Project Engineer | Rose Canyon Trunk Sewer Joint Repair Project | City of San Diego, CA

Project Engineer for the rehabilitation of a portion of the Rose Canyon Trunk Sewer (RCTS) consisting of 4.5 miles of 54- and 60-inch T-Lock PVC lined RCP piping. Numerous trenchless rehabilitation options were evaluated to repair the failed plastic liner weld strips and the potential environmental, encroachment and traffic impacts of the rehabilitation were considered. Internal mechanical pipe seals and new plastic liner strips were selected to repair the pipe joints installed via manned entry of the trunk sewer. Although labor intensive, these methods were the least invasive to the Rose Canyon habitat and also the most cost effective. To complete the necessary repairs, a 32 MGD bypass system was designed consisting of two temporary pump stations, 2,100 LF of 32-inch HDPE bypass piping, and the installation of fabricated aluminum stop logs and a temporary bulkhead upstream of the work.

Project Engineer | Pacific Avenue Trunk Sewer Rehabilitation Project | Long Beach Water Department, CA

Project engineer for a sewer rehabilitation program in Pacific Avenue between 36th Street and Wardlow Road consisting of 7 sewer segments. Three segments were identified for point repairs and the remaining four segments were identified as lining projects. The rehabilitation also included the reconstruction of three manholes. Specific tasks included identifying the pipes in need of rehabilitation; proposing appropriate rehabilitation methods for various pipe conditions; coordinating with other utilities; and preparing plans, specifications, and cost estimates for the implementation of the rehabilitation program.

Chris Richards, PE

Telemetry

Qualified: Bachelor of Science, Electrical Engineering, 2002, California Polytechnic State University, San Luis Obispo, CA; Electrical Engineer: CA #E17660; Construction Documents Technologist (CSI)

Connected: Member BICSI Telecommunications Association

PE Electrical CA (Issued June 24, 2005; Expiration Date: September 30, 2021)

Years with GHD: 17 | Home Office Location: Santa Rosa

Professional Summary: Mr. Richards has 17 years of experience in the design and implementation of electrical systems. His design experience includes medium and low-voltage design for industrial, educational, laboratory, commercial, and residential power, power generation, photovoltaic generation, cleanroom applications, data and server rooms, lighting, telecommunications, security, audio/visual, and fire alarm systems, power and lighting system analysis and modeling, arc flash and coordination studies, LEED® credit driven design and documentation, and CA Title 24 lighting efficiency & lighting control measures.

Staff Electrical Engineer
Dechlorination Facility | Novato Sanitation District | Novato, CA

Staff electrical engineer for the sodium hypochlorite injection facility used to remove chlorine from the outfall. This project involved power supply distribution, chlorine and hypochlorite measurement and analysis and radio telemetry back to the Marin wastewater treatment plant.

Staff Electrical Engineer
Power Quality Analysis | City of Rohnert Park | Rohnert Park, CA

Staff electrical engineer, performing a Power Quality Analysis (Harmonic Distortion Analysis) for three (3) 200 HP variable frequency drives at the waste water pump station. A time line was developed for phased replacement of the 6-pulse VFDs to meet City's budgetary constraints.

Staff Electrical Engineer
Napa Sanitation Ventilation Upgrades | Napa, CA

Staff electrical engineer designed a variety of systems to improve the ventilation of work areas which included alarm systems to detect hazardous gasses, SCADA interface with existing systems, power distribution to the fans and hazardous gas monitoring systems.

Staff Electrical Engineer
Napa Sanitation Lighting Upgrades | Napa, CA

Staff electrical engineer for this project. The purpose of this project was to improve the existing lighting of the wastewater treatment plant.

Staff Electrical Engineer
Stevenson Pump Station | Union Sanitary District | Novato, CA

Staff Engineer for this project which consisted of predesign and design of this 9.0 mgd wastewater pump station and 20-inch HDPE force main that will take the place of two existing pump stations. Provided the design of a wastewater pump station including service generator size, load calculations, and PG&E service applications.

Staff Electrical Engineer
Bel Marin Keys Pump Station No. 5 | Novato Sanitary District | Novato, CA.

Staff electrical engineer providing design for the design of a replacement sewage pump station conveying flows from the Bel Marin Keys neighborhood to the Ignacio Treatment Plant including service sizing generator size, and load calculations. Located on a small site, the new pump station will be constructed while the existing pump station continues to operate. The new 1800 gpm facility will be a submersible pump station.

Staff Electrical Engineer
Vallejo Grid Pump | Vallejo, CA

Staff electrical engineer for this project. Replaced three natural gas driven water pumps for the City with three pumps driven by variable frequency drives (VFD).

Electrical Engineer
Novato Sanitation District Wastewater Facilities Upgrade | Novato, CA

Electrical engineer for the project to combine and upgrade the Ignacio and Novato Treatment Plants into a single 55MGD wastewater treatment facility at the site of the existing Novato Treatment Plant. The project included upgrading to a 12,470-volt PG&E service with medium voltage transmission over the site to a district owned transformer and metal-clad switchgear, and low-voltage distribution to influent, treatment and effluent processes. The design included power distribution, lighting and implementation of a distributed SCADA system. The SCADA system generally consisted of local controllers with touch screen interfaces, local and remote I/O for monitoring and controlling process conditions, and recording and database operations at a central control station manned by District personnel.

Electrical Engineer
West College Utilities Facility Short Circuit, Arc Flash, and Coordination Study | Santa Rosa, CA

Electrical Engineer tasked to perform a Short Circuit, Coordination, and Arc Flash Study for the overall project site. The tasks included integrating the single line diagrams and as-built conditions for the various phases of construction, on-site verification of existing systems and settings, and creation of a SKM PowerTools model for the entire facility. Using the model, GHD determined recommended device settings to achieve selective system coordination, short circuit current levels, and produced Arc Flash labeling for the various electrical equipment on site to advise site personnel of the local incident energy levels.

Electrical Engineer
City of Santa Rosa Utilities Field Office | Santa Rosa, CA

GHD prepared plans and specifications for a Solar PV system having a combined total capacity of 150 kW with a potential future build-out to 500 kW. The PV system design utilized high efficiency, mono-crystalline silicon, all-back contact solar cells in order to maximize the power production in the limited roof top area. Both 10-degree tilted and standing seam integrated-rail mounting systems were used. Alternate design options were considered including the use of flexible photovoltaic laminates on the standing seam roof as well as a proposal for an interlocking, insulated & self-ballasted flat panel system. Compatibility of the PV system with the 600 kW backup emergency generator system was analyzed which resulted in a modified PG&E interconnection scheme.

Electrical Engineer
Maintenance Facility Expansion Lighting | Mendocino Transit Authority | Ukiah, CA

Mr. Richards was the Electrical Engineer for the development of a master plan for upgrading and "greening" the facilities. The concept design documented specific office, maintenance, parking, support and circulation space required for current and future operations. The detailed analysis provided recommendations on grading, site utilities, electrical power upgrades including power generation capacity, improved fencing, site lighting and security, covered parking, improvements to the wash bay. The recommended fleet maintenance building includes photovoltaic panels. The recommended administration and operations building includes showers, lockers, and a kitchen and break room. The project was completed on time and budget and the master plan is supporting MTA's grant-writing activities.

Electrical Engineer
Service Center Relocation at 2025 Aviation Blvd | Sonoma County Water Agency | Santa Rosa, CA

Electrical Engineer for the Water Agency's project at their ALW treatment plant to renovate portions of the existing 6,600 sf building and to add a new 5,000 sf Service Center building complete with space for offices, storage, Labs, and 2 large service bays for vehicle maintenance. The electrical engineering design scope included medium voltage distribution, and low voltage normal and standby power distribution for each building. Signal systems included data, voice, security, fire alarm, and CCTV, with associated racks and infrastructure. Interior and exterior lighting systems included "intelligent" daylighting, dimming, local area controls, and egress lighting. All lighting was designed to meet or exceed CA Title 24 requirements.

Electrical Engineer
204 Concourse Blvd Tenant Improvement | Sonoma County Water Agency | Santa Rosa, CA

Electrical Engineer for the Water Agency's tenant improvement at 204 Concourse Blvd. The building consisted of approximately 25,000 sf of mixed use space, including modifications to create private office space, open office workstations, conference rooms, shops, server and SCADA rooms, a small shop and parts inventory space, and miscellaneous service and support spaces.

The electrical engineering design scope included normal and standby power distribution for each area, including machine tool power and uninterruptable power for the control and data centers. Signal systems included data, voice, security, fire alarm, and SCADA, with associated racks and infrastructure. Interior and exterior lighting systems included "intelligent" daylighting, dimming, local area controls, and egress lighting. All lighting was designed to meet or exceed CA Title 24 requirements.

Staff Electrical Engineer
Mendo Lake Credit Union | Fort Bragg, CA

Electrical Engineer for the design of a 3,000 sf. LEED certified credit union building. Designed power systems including building distribution, supply to mechanical equipment, and a standby generator. Designed interior and exterior lighting systems including advanced user programmable lighting controls to meet LEED and CA Title 24 requirements. Completed LEED forms required for electrical portion of the certification.

James Taylor

Safety/HIS

Connected: American Water Works Association; Arizona Water Association.

Professional Summary: James joined GHD in 2012, bringing more than 25 years of experience in the operation, maintenance, and management of water and wastewater utilities. He has worked as an Operations Manager and Utility Manager for multiple water and wastewater providers throughout the southwest. James has worked as a Project Manager and Operations Manager for 10 years, specializing in water and wastewater operations maintenance and asset management programs.

Senior Project Manager
Environmental Health and Safety / Security Assessment | EPCOR Water USA | Phoenix AZ

Coordinated and led a team of professionals with combined experience of over 100 years. To deliver the client with a detailed 3rd party examination of environmental compliance policies and procedures, employee health and safety programs, facility security and operation and maintenance programs in order to provide recommendations designed to identify risk and continue the owners commitment to constant improvement.

Operations Manager
Global Water Resources | Phoenix AZ

Provided leadership, oversight and management of water treatment and distribution facilities for the Global Water Resources west valley district. This included the direct supervision of all west valley region operations and maintenance (O&M), customer service and compliance staff. James was directly responsible for the financial performance, operational compliance and vastly improved customer satisfaction.

Operations Supervisor
Arizona Water Company | Phoenix AZ

Provided leadership, oversight and management of water treatment and distribution facilities for the Sun City, Sun City West, Agua Fria and Surprise water districts. This included the direct supervision of all operations and maintenance, staff. James was directly responsible for the financial performance, operational compliance and vastly improved customer satisfaction. During this period of unprecedented growth, the team set new benchmarks in efficiencies and safety.

Operations Project Manager
Commissioning, Agua Fria Water Treatment and Pumping Facilities | Arizona Water Company | Phoenix, AZ

Supervised the operation, start-up, and commissioning of 9 water booster stations in series with capacities from 2 to 10 mgd. Services included developing reliable operations, documenting operating procedures, staff training, and optimizing chemical and energy use and staff utilization.

Operations Supervisor
Private Water Company Evaluation Citizens Utilities

Conducted an asset inventory, assessment, and valuation of a private water company to assist Citizens Utilities in determining the feasibility of acquisition. Compiled asset information on production facilities, including condition assessment, and projected remaining useful life. Determined operating conditions cost and capital improvement requirements.

Operations Project Manager
Lake Pleasant Water Treatment Plant | Arizona Water Company | Phoenix, AZ

As part of the design team the Lake Pleasant Water Treatment Plant was designed in 2003 and to meet the urgent needs to address future water supplies for one of the nation’s fastest growing metropolitan areas. Opened in 2007 the facility was constructed with an initial capacity of 80MGD and ability to expand to 320MGD keeping pace with future development in northern Phoenix. Incorporating the latest in modern water treatment technology the facility comprises of an intake structure, pumping station and 90-inch diameter pipeline to deliver raw surface water 2.3 miles from the Waddell Canal to the 225-acre treatment plant site. The facility utilizes a multi-barrier process that includes ballasted flocculation, ozonation, filtration and secondary filtration through granulated activated carbon contactors, ultraviolet disinfection, and solids processing. A 40-MG finished water storage reservoir and pump station serving multiple pressure zones. Serving a population of 400,000 the facility represented the largest DBO in North America.

Operations Project Manager
White Tanks Regional Water Treatment Facility | Arizona Water Company | Surprise, AZ

As part of the design team, and utilizing Central Arizona Project surface water the facility allowed West Valley water providers the ability to reduce reliance on groundwater sources and utilize renewable CAP water supplies. With a capacity of 13.5 MGD and serving a population of 30,000 residents this facility saves 3 billion gallons of groundwater per year, with the future capacity to provide 80MGD and serve 250,000 residents.

Key components of the facility include raw water intake screening, storage and pumping stations. Treatment processes including flocculation, dissolved air flotation clarification and granulated activated carbon as well as sand filtration. The finished water process includes UV light disinfection, chlorination, storage and distribution service pumps. Utilizing state of the art security systems and supervisory control and data acquisition SCADA systems the facility sets the standard for the industry.

Operations Manager
Global Water Resources | A.M.M.S. System | Phoenix AZ

Supervised the development and implementation of the Asset Management Maintenance System resulting in immediate operational expense reductions and improved asset effectiveness and improved life cycles. Supervising a team of specialized experts and staff at all levels, initially conducted an extensive audit of assets and condition. Developed program requirements and recommended improvements then prepared a detailed plan for implementing the recommended improvements including priorities and resource requirements. Developed asset data requirements, data management systems, and condition inspection requirements for wells, pump stations and other appurtenances for water distribution, and production. Conducted asset inventory and condition assessment of wells and distribution facility electrical equipment. Assisted in constructing on-line data system for compiling asset and inspection data, and production data from the existing SCADA components.

Operations Manager
Treatment Optimization | Global Water Resources | Phoenix, AZ

Developed and implemented programs intended to establish baseline information including standard operating procedures, conducted on-site inspections that included testing of treatment processes, and evaluating treatment system's efficiency's. Completed reports calculated to highlight potential savings and how chemical optimization improvements can be facilitated. Researched and provided recommendations for alternative treatment processed designed to reduce operational expenses.

Operations Supervisor
Emergency Response and Troubleshooting | Arizona Water Company | Phoenix, AZ

With over 20 years' experience in all aspects of water and wastewater treatment, distribution and collections James possesses the skills to quickly analyze emergency situations, provide recommendations and implement corrective actions intended to quickly and safely resolve critical system failures.

Senior Project Manager
Water and Wastewater System Condition Assessment, Operations and Maintenance Program Development | City of Carlsbad | Carlsbad, CA

Performed facility condition assessments (FCA) for the potable water distribution and pumping facilities as well as the recycled water pumping stations and pressure control stations. Developed standardized condition assessment protocol, and developed strategies to optimize the life or effectiveness of the assets. GHD conducted the FCA along with Carlsbad staff in order to provide training and gain institutional feedback during the condition assessment. The results of the FCA were incorporated into the asset register. Analyzed collected data to calculate the estimated replacement costs of assets. Completed a workshop with stakeholders to review and develop strategies for rehabilitation and develop budget strategies. Reviewed and recommend management strategy groups for incorporation in the asset register and presented the initial management strategies to Carlsbad staff in a workshop and worked together to refine the management strategies. The workshop will included a discussion of rehabilitation efforts, along with replacement costs. This project is ongoing.

Other related areas of interest

Recognized (Certifications/Trainings)

- ADEQ operator certification # OP11500
- Wastewater Treatment Operator Grade 2, AZ
- Wastewater Collection Operator Grade 2, AZ
- Water Treatment Operator Grade 3, AZ
- Water Distribution Operator Grade 4, AZ
- Class A AZ Contractor ROC # 264121
- HAZWOPER 40 hour, Supervisor Certified

Larry B. Tortuya, PE

Stormwater

Qualified: B.S., 2004, Civil Engineering, California State Polytechnic University, Pomona
A.S., 2000, Engineering, Long Beach City College CA# C67618

Connected: American Society of Civil Engineers, Society of American Military Engineers, American Public Works Association, Filipino American Society of Architects and Engineers

PE Civil CA (Issued July 27, 2007; Expiration Date: December 31, 2019)

Years with GHD: 3 | Home Office Location: Irvine

Professional Summary: Mr. Tortuya has experience in the design of flood control systems, ecosystem and wetlands restoration, erosion control, LID and HCOC design for storm water quality (MS4) compliance, hydrologic/hydraulic modeling, watershed management, flood plain management, and storm drain site design. He has experience in the design of backbone storm drain infrastructure, water quality NPDES Compliance, and large scale drainage projects including reservoirs, dams, levees, and flood attenuation basin design. He is an expert in AutoDesk Civil 3D software.

Project Manager
Standard Plan Updates | Orange County Public Works, CA

Project Manager responsible for overseeing the updates to Orange County Standard Plans. This task order included converting Microstation CAD files to Autodesk, and reviewing the standards for revisions in the design. Revisions were based on knowledge of current design criteria in Transportation, Drainage, and Land Development design. Also included in the revisions were approaches to sustainability in design, and an evaluation of the standards in comparison to other agency standards such as Caltrans.

Project Manager
Local Drainage Manual (LDM) Peer Review | Orange County Public Works, CA

Project Manager responsible for overseeing the peer review of the OC LDM. This task includes coordinating experienced hydraulic engineers and scientists to provide a third party peer review of the Local Drainage Manual Updates which were submitted in December 2017. GHD will provide a review with the County of resulting comments and make suggestions on how to incorporate/address the comments. This task order also included the coordination of a Peer Review by all 34 Cities in Orange County. GHD will compile all comments to be evaluated in a review with County staff in September, 2018. The revisions are scheduled to be implemented and a Final version of the LDM released to the public in December, 2018.

Project Manager
La Palma Avenue and Richfield Road Storm Drain Improvement Project | City of Anaheim, CA

Project Manager of a storm drain system extension project. The project included grant funding requirements, including schedule, budget, and project costs. The primary objective of the project was stormwater capture and groundwater recharge. As the designer of record, GHD is tasked to provide hydrology and hydraulic calculations to show annual capture of stormwater runoff. Also included in the scope is final design of the storm drain extension into the ground water recharge basin, and the design of a pre-treatment system that includes a full capture alternative. A secondary objective of the project was to alleviate flooding within the intersection of La Palma Avenue and Richfield Road. The project is scheduled to begin construction in the spring of 2019.

Assistant Project Manager
Los Cerritos Channel Sub-Basin 4 Regional BMP and Diversion | Signal Hill, CA

Responsible for the internal supervision of production for plans, specifications, and estimates for a Design/Build Regional BMP and Diversion Structure. This project includes a road relocation, excavation/grading plan for an underground storage system which will store up to 130 ac-ft of storm water run-off, improvements to a regional flood control facility, and a storm water diversion system, hydrology and hydraulic calculations for the system, and permitting. Responsibilities included the quality control of the design, responsible Engineer for the plans, and coordination with the various sub-consultants on the project. Responsibilities also include providing a project schedule and meetings with stake holders to present, and review the project. GHD analyzed multiple channel low-flow configurations and presented alternatives detailing construction costs and environmental impacts. Based on the recommended improvements, GHD will prepare the final design plans, which include grading plans, storm drain pipe plan and profile, structural, and channel modifications. The project is scheduled to break ground November, 2016.

Project Manager
Engineer's Opinion (second) of Probable Cost for Lane Channel Improvement Project | Orange County Public Works, CA

As part of the On-call Services contract we hold with Orange County Public Works, GHD was tasked with providing the County with a second opinion on Engineer's Estimate and Quantities for the Lane Channel Improvement Project. This project included evaluating the 100% plans sheets, and quantifying all materials outlined in the QTO. It also included researching cost data and establishing unit costs for the Bid Items.

Task Manger
Hydrology and Hydraulics Report/Plan Review On-Call, City of Buena Park, CA

Oversee reviews for the City of Buena Park of H&H plans, studies, and other exhibits submitted for entitlement application of new or re-development projects to conform to the Orange County Hydrology Manual and design standards.

Project Manager
Storm Water Quality Management Plan Review On-Call | City of Oceanside, CA

Currently acting as Project Manager of Storm Water Quality Management Plans (SWQMPs) Review On-Call with the City of Oceanside Engineering Division for projects subject to the current San Diego Region NPDES MS4 Permit. Also developed, in conjunction with the GHD team, the City's BMP Design Manual and Storm Water Quality Management Plan templates to comply with the current permit. Additional responsibilities include City staff permit compliance training, consultation with CIP staff for evaluation of current/future projects.

Project Manager
MS4 NPDES Permit Compliance Support Services On-Call | City of Anaheim, CA

The City of Anaheim is required to develop, implement, and refine programs identified in the Orange County's Drainage Area Management Plan (DAMP). Collectively these programs are referred to as Stormwater Permit Compliance Programs. As the permit evolves, the re-issuance often requires refinement to the permit requirements. This project includes providing the City of Anaheim with adequately trained and competent managers, administrative and data management staff to assist the City in interpreting the requirements and refinements in the NPDES Permit or permit compliance programs assist with data collection, and submittals to Orange County and the Regional Water Quality Control Board (RWQCB). Tasks also include assisting the City with grant applications, and design of innovative approaches to water quality compliance, such as regional BMP implementation.

District Engineer, Flood Control Engineer
Tres Rios - Phase 3 Environmental Restoration | Maricopa County, AZ

As part of the project, responsibilities included providing civil engineering support to the Los Angeles Division of the South Pacific Division as part of the Genterra Consultants, Inc. team. On the Tres Rios project, Consultant was responsible for the preparation of design and contract documents for construction of Phase 3 of the Tres Rios ecosystem restoration project. The project extends 5.2 miles along the Gila and Salt rivers and included the restoration of critical riparian and wetland habitats that have been lost in the area. The project will improve more than 500 acres of cottonwood-willow-riparian corridors and open water-wetland marshes along the river. The team completed a DDR for the final design features and produced civil and landscape plans and specifications using SpecsIntact and cost estimates in MII.

Task Manager
Irvine Community Development Company | Irvine, CA

Prepare Grading and Infrastructure Plans for Phase 1 responsible for overseeing the plan, specifications, and estimates production for the storm drain infrastructure of Planning Area 39. The project included the improvements of two reinforced concrete box systems, stream restoration and embankment protection for San Diego Creek, and a bicycle trail low flow water crossing. The Task Manager role included overseeing plan production and support during the construction of the project. Consultant contracted with the Irvine Company to prepare the grading and infrastructure plans for Phase 1 of the Irvine Apartment Community project, Planning Area 39. The project will provide approximately 1,750 apartment units, with parks and trails to serve the community.

Other related areas of interest

- Fluent in 2 languages. Tagalog and English
- IT savvy. Expert in Civil 3D, HEC-RAS, WSPGW, WMS, STORM, AES, FLOWMASTER, HY8, HDS5, XPSWMM, Arc GIS, Infraworks 360.
- Memberships. FASAE, ASCE

Certifications/Trainings

- CA Registered Professional Engineer (2007)
- Envision Certified Professional (ENV SP)
- Certified Floodplain Manager (CFM)

Recognized

- Excellence in Teamwork Awards 2009, Client Service Award 2008

Nathan Towlerton, PE, QSP/QSD, QISP

WQ Management Plan

Qualified: B.S. Chemical Engineering – Environmental Process, Oregon State University, 2006

Connected: American Society of Civil Engineers (ASCE); Environmental & Water Resources Institute (EWRI); American Public Works Association (APWA); Licensed Civil: CA (#C81643)

PE Civil CA (Issued May 29, 2013; Expiration Date: September 30, 2021)

QSP/QSD (Issued 2017)

Years with GHD: 4 | Home Office Location: Long Beach

Professional Summary: Mr. Towlerton is a licensed professional engineer who has worked on a multitude of stormwater projects throughout Southern California. His expertise includes MS4 & Industrial General Permit compliance, Stormwater Pollution Prevention Plan (SWPPP) development, hydraulic and hydrologic modeling, stormwater feasibility studies, BMP maintenance compliance, structural analysis, and construction oversight. Mr. Towlerton specializes in the design of structural stormwater BMPs including bioretention/biofiltration, detention/retention/rainwater harvesting systems, hydrodynamic separators, and media filtration systems.

Project Engineer
Stormwater Quality Management Plan Review | City of Oceanside, CA

Mr. Towlerton is currently acting as expert reviewer of Stormwater Quality Management Plans (SWQMPs) on behalf of the City of Oceanside Engineering Division for projects subject to the current San Diego Region NPDES MS4 Permit. He also developed, in conjunction with the GHD team, the City's BMP Design Manual and Storm Water Quality Management Plan templates to comply with the current permit. Additional responsibilities include City staff permit compliance training, and consultation with CIP staff for evaluation of current/future projects.

Project Engineer
Richfield Road | City of Anaheim, CA

Mr. Towlerton performed alternatives and feasibility analysis for City of Anaheim area storm drain infrastructure. Analysis included dynamic modeling of storm drain network to minimize stormwater infrastructure and mitigate peak flow rates. The feasibility study analyzed multiple options for storm drain infrastructure improvement with an emphasis on obtaining grant funding through specific improvement characteristics.

Project Engineer
State College Blvd. Regional BMP | City of Anaheim, CA

Mr. Towlerton performed the analysis and feasibility study for conversion of existing sanitary sewer to regional stormwater BMP. Analysis included delineation of contributing watersheds, evaluation of available storage volumes, and design/hydraulics of connections to existing storm drain system.

Project Engineer
Ball Road Storm Drain | City of Anaheim, CA

Mr. Towlerton conducted the review and alternatives analysis of the City of Anaheim storm drain master plan. Analysis included dynamic modeling of storm drain network to minimize stormwater infrastructure and mitigate peak flow rates.

Project Engineer
Lambert Road WQMP | Orange County Department of Public Works, CA

Mr. Towlerton developed a Water Quality Management Plan for the Orange County Public Works bikeway project. Development included site evaluation, hydrologic analysis, and specification and design of stormwater BMPs in accordance with Orange County Model WQMP and U.S. EPA's Green Streets Handbook.

Project Engineer
Live Oak and Trabuco Canyon WQMP | Orange County, CA

Mr. Towlerton developed a Water Quality Management Plan for Orange County Public Works safety improvement project along rural highway in unincorporated Orange County. Tasks included specification and design of Green Streets stormwater BMPs, development of long-term operation and maintenance specifications, and WQMP document and appendices.

Project Engineer
Anaheim Alley Sewer Improvements | Anaheim, CA

Mr. Towlerton designed greenway stormwater BMPs as part of sewer improvement project for the City of Anaheim Department of Public Works. The project utilized grant funding based on stormwater volume capture. He used Orange County stormwater methodology to design modified sand filters and permeable pavement to meet volume capture requirements.

Project Engineer
Stormwater Permitting Compliance | ConAgra Foods | Azusa, CA

Mr. Towlerton developed a Stormwater Pollution Prevention Plan (SWPPP) and provided guidance to client in transition from Notice of Non-Applicability to Notice of Intent in compliance with New Industrial Stormwater General Permit 2014-0057-DWQ.

Stormwater Design Engineer
Otay Ranch Village 2 | Chula Vista, CA

Mr. Towlerton provided specification and hydraulic design of Vortechs hydrodynamic separator as an end of pipe stormwater treatment solution in compliance with the San Diego County Municipal Stormwater Permit.

Stormwater Engineer
Stormwater Permitting Compliance | Kraft Foods | Fullerton, CA

Mr. Towlerton developed a SWPPP as part of compliance with the Industrial General Permit.

Project Engineer
Stormwater Improvements | Morton Salt | Newark, CA

Mr. Towlerton served as Engineer of Record for bioretention stormwater improvements at an existing industrial facility, utilized volume/flow-based design to conform to facility size constraints while still meeting provisions of the City's Municipal Regional Stormwater Permit.

Stormwater Engineer
Jefferson at Platinum Triangle | Anaheim, CA

Mr. Towlerton designed modular concrete underground infiltration sand filters for a 400-unit luxury multifamily residential site in Orange County. System requirements included design of sedimentation forebay and volume/flow-based analysis to provide both treatment and storage of the water quality volume. Underground design allowed maximization of site use while still meeting Orange County's stormwater quality and quantity regulations.

Stormwater Design Engineer
Del Rey Apartments | Marine Del Rey, CA

Mr. Towlerton designed multiple high-rate proprietary biofilters as treatment segment of multifamily development storm drain system. He performed hydraulic analyses for the proper design of inlet/outlet control features, biofilters media bed, and an underdrain system. Site constraints required excessive burial depth and unique sloped slab design to meet structural and grading requirements.

Stormwater Engineer
Broadway Neighborhood Greenway | City of Los Angeles, CA

Mr. Towlerton provided design assistance to City of Los Angeles and local consulting firms on a 55,540 cu ft concrete stormwater infiltration vault for a pilot project in South Los Angeles. Requirements included a hydraulic analysis for overall system volume and design of integrated water quality sedimentation pond to meet requirements of City's Municipal Stormwater Permit.

Stormwater Engineer
Civita Park | City of San Diego, CA

Mr. Towlerton provided engineering expertise to local consulting firm on design and construction of a 98,670 cu ft underground modular concrete stormwater hydromodification vault for City of San Diego. Design included hydraulic analysis and design of integrated high-capacity overflow system along with structural review.

Stormwater Design Engineer
Distribution Center | Amazon | San Bernardino, CA

Mr. Towlerton provided consulting assistance to local engineering firm with the design of three large-scale underground corrugated metal pipe stormwater detention systems for high-profile industrial development. Design requirements included hydraulic analysis, structural evaluation, and soils analysis.

Recognized (Certifications/Trainings)

- Qualified Industrial Stormwater Practitioner (QISP)
- Qualified SWPPP Practitioner (QSP) / Qualified SWPPP Developer (QSD)

Presentations

- City of Oceanside SWQMP Template Training for the 2013 San Diego Region MS4 Permit, Oceanside, CA, January 2017

Matthew Winkelman

Digital Integration

Qualified: B.S. Civil Engineering, University of Washington, 2000.

Connected: Member of Water Environment Federation. Member of California Water Environment Association (Redwood Empire Section Board Member). Member of American Society of Civil Engineers.

PE Civil CA (Issued: July 23, 2009; Expiration Date: December 31, 2019.)
PE Civil WA (Issued: December 15, 2004; Expiration Date: August 29, 2021)

Years with GHD: 11 | Home Office Location: Santa Rosa

Professional Summary: Matt Winkelman is a Project Manager with GHD and has over 19 years of experience designing and managing municipal water resources projects. Project experience covers a wide range of assignments in planning, design, and project management, including: feasibility and infiltration/inflow studies, sanitary sewer master and management planning, hydraulic modeling, utility and pump station design and rehabilitation, regulatory compliance, funding assistance, and construction management. Mr. Winkelman's project experience is described below.

Project Director | Stanly Ranch Wastewater Project | Napa, CA

Project Director for preparation of a Phased Wastewater Master Plan for Stanly Ranch and senior civil engineer for the design of a 2,800-LF HDD crossing under the Napa River bundling both a 6-inch sanitary sewer force main and 24-inch recycled water line and connecting to the Napa Sanitation District Soscol Water Recycling Facility.

Project Manager, Lead Project Engineer Eastside Trunk Sewer Phases 2 and 3 | City of Rohnert Park, CA

Project manager and lead civil engineer designer for the completion of the design documents for Phases 2 and 3: $17 million, 12,600-LF, 18- and 24-inch diameter AWWA C905 sewer main project. Aside from pipeline design, project work included review of design criteria, hydraulic modeling, survey, field reconnaissance, update of the hazardous materials corridor study, permit review, and road rehabilitation design. Project challenges included difficult geotechnical conditions and the review and design of project-specific trench design based on the soil and groundwater conditions.

Project Manager | Browns Valley Trunk Sewer | Napa Sanitation District, CA

Project manager for the planning and design for a new 3-mile, 18- to 54-inch diameter trunk sewer located in West Napa. The project began with an alignment study and hydraulic assessment that resulted in the selection of the preferred alignment. Specific tasks for the alignment study included: preparation of an extended period simulation model utilizing synthetic hydrographs to approximate the effect of peak wet weather flows on the sewer collection system; and evaluation of various alignments based on several selection criteria, including hydraulics, environment, stakeholders, permitting, constructability, schedule, and cost. Design includes trenchless crossing of Caltrans Highway 29 right-of-way, CEQA evaluation, Caltrans permitting, coordination with various stakeholders, and preparation of SRF funding documents.

Project Manager | Long Drive and Vicinity Sewer and Water Improvements Project | City of Santa Rosa, CA

Project manager for the replacement of sewer and water infrastructure in busy City roadways and Highway 12 (Caltrans). Sewer improvements include CIPP rehabilitation of sewer main and laterals within private property and trunk sewer improvements in busy City roadways.

Project Manager | Boyce Road Lift Station Project | Union Sanitary District, Fremont, CA

Project manager for project scoping and design to replace the District's existing Boyce Road Lift Station with a new 7.0-mgd lift station. The scoping effort included site layout alternatives, collaboration with the District, and recommendations for design features based on operational preferences and cost-efficiency. Project challenges included Bay Mud, high groundwater table, and the development of contract documents for construction within a small project site and adjacent to the existing lift station that needed to remain in operation until the new lift station was ready for operation.

Project Engineer | Sunnyside WWTF Project – Vernon Road Diversion | Lake Stevens Sewer District, WA

Following completion of the District's WWTF Feasibility Study, Matt worked as a project engineer for the development of contract documents for this $4.9 million 5,500-linear foot, 36-inch diameter, PVC and DI sewer gravity main. During preliminary design, coordination with the Washington State Department of Transportation determined that the alignment for the sewer main would not be permitted within the State's Highway 204 right-of-way. Working with the District, Matt identified an alternate alignment that included trenchless construction under Highway 204 and forested wetlands, through various County rights-of-way, and 11 private properties. Preparation of contract documents included: coordination with right-of-way and appraisal sub-consultants and various property owners for the acquisition of the private property easements and two right-of-way permits; coordination with environmental, geotechnical, and cultural resource sub-consultants to prepare permit and construction documents for various permitting agencies; jack and bore installation of 1,300-linear feet of 54-inch diameter casing under a wetland and State Highway; and the preparation and administration of project funding documents ($54 million construction loan funding).

Project Manager | 20th Street SE Sewer Improvements Project | Lake Stevens Sewer District, WA

The Lake Stevens Sewer District is located about an hour north of Seattle, Washington and serves a population of approximately 40,000 people. Project management and lead civil engineering services included comprehensive planning, design, and project needs presentations to the District Commission for this $2.5 million 4,000-linear foot, 15- and 24-inch diameter PVC and DI sanitary sewer main project. Project responsibilities also included: development and implementation of an Interlocal Agreement between the District and County; preparation of project scopes, budgets, and construction documentation; coordination with County engineering staff and geotechnical sub-consultant; and the acquisition of permits from the DOT and County.

Project Engineer | Coal Mines Trail Interceptor Project | City of Roslyn, WA

Design engineer services included design support and client coordination for this $1.0 million, 7,000-linear foot, 12-inch diameter HDPE and PVC sanitary sewer main located within a recreational trail corridor. Project responsibilities included the preparation of plans, specifications, and estimates, coordination with geotechnical sub-consultant, Coal Mines Trail Commission, Bonneville Power Administration, and the City of Cle Elum.

Project Engineer | SW 7th Street Storm Drainage Project | Renton, WA

Project engineer services included lead design and construction management assistance to the City for this $3.5 million, 5,500-linear foot, 36- and 60-inch HDPE and RCP diameter storm sewer main located in a heavily trafficked commercial corridor with multiple existing utilities and businesses. Project responsibilities included the preparation of contract documents, coordination with utility location and geotechnical sub-consultants and the City's Project Manager. The project area had multiple utility conflicts that required relocation or redesign of the project alignment. As the project engineer, Matt coordinated with the City, business owners, and utility providers, including project team site visits to verify the pipeline alignment prior to the detailed design phase.

Project Engineer | Sewer System Management Plans (SSMP), Statewide | California Department of Corrections and Rehabilitation (CDCR), CA

Project engineer for the preparation of SSMP documents for 38 CDCR Institutions located throughout the state. The purpose of the project was to provide CDCR with standardized documentation and procedures to meet the requirements of the State's SSO Program. SSMP documents include evaluation and modification to various CDCR and Institution-specific programs, including: legal authority, operation and maintenance (O&M), Sanitary Sewer Overflow Emergency Response Plan (OERP), and fats, oils, and grease (FOG). Project work was coordinated with CDCR Headquarters staff and various personnel at each Institution.

Project Engineer | Sewer System Management Plan (SSMP) | United States Coast Guard, TRACEN Petaluma Facility, CA

Project engineer for the preparation of the SSMP for the Coast Guard base's sanitary sewer collection system.

Project Engineer | North Old Redwood Highway Area Utility Infrastructure Study | Town of Windsor, CA

This project included a comprehensive review of sanitary sewer, potable water, storm drainage, recycled water, and overhead utilities within a portion of the Town's designated redevelopment area. Project work included site reconnaissance, records review and data collection, close coordination with Town staff, various meetings and workshops with Town planning, engineering, and O&M staff, coordination with Sonoma County Water Agency, hydraulic evaluation, and preparation of recommendations for capital projects and funding.

Project Manager | Sewer Collection System Planning | Napa Sanitation District, Napa, CA

Project manager for various technical evaluations of the District's sewer collection system, including hydraulic assessment of the 16-mgd West Napa Pump Station.

WILLIAM D. BELLAMY

William Bellamy is an adjunct Professor of Practice and Deputy Director of the Center of Excellence in Produce Water Management at the University of Wyoming. Prior to joining UW, he had 40 years experience with organizations such as CH2M Hill, Texaco Inc, US Army Environmental Hygiene Agency, US EPA, as a professional design, operations, construction engineer and planner. He specializes in the application of sustainable facility development and assessment principles for government, municipal, and industrial clients, focusing on water treatment and quality issues.

Education

Ph.D., Civil (Environmental) Engineering, 1984, Colorado State University
M.S., Civil (Environmental) Engineering, 1974, University of Wyoming
B.S., Electrical (Bio-medical) Engineering, 1972, University of Wyoming

Overview of Work Experience

2014 to Present, Adjunct Professor of Practice, University of Wyoming – Current research activities include systems to provide safe drinking water, resource recovery from wastewater and energy production waters, economics of beneficial use. Current teaching has included Sustainability in the Built Environment, Senior Environmental Design, Intro to Environmental Engineering, and freshman Introduction to Engineering, and lectures on professionalism and decision making.

1984 to 2014, CH2M HILL; Fellow and Senior Vice President - Fellow and Senior Vice President of Water Technologies at CH2M HILL, a $6 billion engineering planning, design, construction and operations company. He provided leadership and direction for the water business and application of technologies worldwide. He was instrumental in the development of innovative methods for assisting clients develop sustainable infrastructure projects which balance stakeholder input, economics, and environmental considerations. He provided engineering services including studies, designs, construction, and operations for clients, valued at over $4 billion.

1978 to 1980, ARAMCO Inc., Dhahran, Saudi Arabia; Senior Environmental Engineer – Senior planner and environmental engineer for oil refining, distribution and marine facilities as well as project manager for various water, wastewater, and reuse projects. Project responsibilities included the development of designs and operating plans for RO treatment, seawater filtration, non-potable reuse, and assisting with the development of a new 5,000-person community. Served as the emergency response engineer for environmental incidences such as well fires and pipeline brakes.

1974 to 1978, Texaco, Inc., Port Arthur, Texas; Senior Process Engineer – Process engineering duties included technical supervisor of the wastewater treatment facility, and hazardous waste treatment and reclamation facility. Design, construction, and operations duties included hazardous and non-hazardous waste reclamation and landfill disposal facilities. Certified as a wastewater treatment operator by the State of Texas.

1971 to 2001, Environmental Hygiene Agency, US Army, Captain – Duties included conducting reviews of water and wastewater treatment plants and water quality on US military instillations, as well as review of US Army positions on environmental subjects. Prior duties included 3 years as an infantry officer (1966 to 1969).

William Bellamy 303-807-2195 wbellamy@uwyo.edu

Research Grants and Projects

Participation in research grants and projects include grant procurement and management as principle investigator (PI) or in a significant participatory role.

- Senior advisor for the study of biological treatment for removal of nitrate including two types of heterotrophic reactors and one autotrophic reactor using hydrogen as the energy source, Water Research Foundation.
- Greenhouse Gas Emission Inventor Guidance, Specialty Protocol Development, and Management Strategies for Water Utilities, Senior Advisor and co-author, WRF.
- Treatability of Algal Toxins Using Oxidation, Adsorption, and Membrane Technologies, Co-Principle Investigator, AwwaRF and Saint John's Water Quality District, FL.
- Ultraviolet Light Disinfection of Surface Waters, Co-Principal Investigator, with AwwaRF and City of Winnipeg.
- Surrogate Indicators for Treatment Plant Evaluations, Co-Principal Investigator, AwwaRF.
- Full-Scale Ozone Contactor Evaluations, Principal Investigator, AwwaRF.
- Backwash Waste Recycle Impacts of Potable Water Treatment Efficiency, Co-Principal Investigator, AwwaRF.
- Implementation of the Integrated Disinfection Design Framework, Co-Principal Investigator, AwwaRF.
- Addressing Operational Impacts of Enhanced Coagulation/Enhanced Softening, Co-Principal Investigator, AWWA and AwwaRF.
- Integrated Disinfection Design Framework (IDDF), Principal Investigator, AwwaRF.
- Capital Planning Strategy Manual, Contributing Author, AwwaRF.
- *Giardia* Treatment Efficiency of Slow Sand Filtration, U.S. EPA project conducted at Colorado State University, Project Engineer.
- *Giardia* Treatment Efficiency of Diatomaceous Earth Filtration, U.S. EPA project conducted at Colorado State University, Project Engineer.
- Atmospheric Monitoring and Data Analysis of Hydrogen Sulfide, State of Wyoming project, University of Wyoming, Principal Investigator, State of Wyoming.

Applications Research for Utilities and Municipalities

Participated in over 40 municipal and industry research and study activities. Projects resulted in the development of several new treatment technologies and significant reduction in capital and operating costs. In each case, regulatory compliance was an important component.

Board Appointments

- Board member Iofina Inc., chemical company, 2014 to present
- CH2MHILL Foundation, Board Member, philanthropic foundation, 2012 to 2015
- Colorado Water and Energy Consortium 2010 to 2016

Professional Advisory Boards and Committees

- Advisory Board Member, Center for Advanced Energy Studies (CAES), Idaho Falls Idaho (consortium of Idaho State, Idaho, Boise State, Wyoming University and Idaho National Lab) 2015 to 2018
- Drinking Water Subcommittee, Board of Scientific Counselors (BOSC), to USEPA, 2010 to 2012
- Science Advisory Board, USEPA, Homeland Security Advisory Committee 2005 to 2010
- National Advisory Board, University of Wyoming, College of Engineering 2002 - 2010
- International Experts Committee, Sydney Water Corporation 1999 and 2003, Sydney, Australia
- National Drinking Water Advisory Council, USEPA, 1998 to 2000

- U.S. EPA appointment to National Drinking Water Advisory Committee, Co-chairman of Working Group on Research Prioritization, 2000
- Co-chairman of AwwaRF and EPA's experts workshop on Microbial and Disinfection Byproduct Research Needs, 1999
- Technical Committee member for EPA and AwwaRF Disinfection and Disinfection Byproducts Council, 1997 to 2002
- Chairman Blue Ribbon Expert Panel, Impacts of Recreation on Drinking Water Supplies, Metropolitan Water District Southern California, 1995
- Co-chairman for AwwaRF and EPA Research Prioritization, 1996

Representative Engineering Studies, Designs, and Construction Activities

The following is representative of involvement in over 150 water projects totally over $4 billion.

- Project lead consultant for the investigation of desalination, solar power enhancements, and conveyance of water for Riyad Master Planning which included potable water for 9 million, regional sustainable agriculture, 800 km conveyance, and reuse opportunities (2013).
- Senior consultant for Master Planning of the water treatment and distribution system, City of Longmont Colorado, 2012
- Senior consultant for the study of ozone application and implementation at the 120 mgd Crescent Hill Water Treatment Plant for the Louisville Water Company.
- Lead technologist and consultant for the expansion of the Dublin Road Water Treatment Plant for Columbus Ohio. 80 mgd with additions of ozone, granular activated carbon filters (BAC), ion exchange for nitrate and improvements to chemicals, flocculation, sedimentation, lime soda softening and recarbonation processes.
- Lead consulting engineer for the preliminary design, build, and operate, 100 mgd membrane water treatment plant for San Diego County Water Authority. Process train included, direct membrane filtration, ozone, BAC filtration. (2005 to present)
- Senior Project Advisor and Consultant for the Southern Nevada Water Authority disinfection byproducts study, including advise and direction on regulations, decision making techniques, and technologies.
- Member Experts Panel assessing current and future CIP development for Metropolitan Water District of Southern California
- Managing Engineer for the $2.2 billion (Public Works and Water) Iraqi reconstruction program.
- Project Director for design of 100 mgd water treatment plant, presedimentation, enhanced coagulation, ballasted clarification, ozone, GAC filtration, Albuquerque Bernalillo County Water Authority, NM.
- Senior consultant and lead process engineer for the design of 120 mgd UV disinfection system for the City of Winnipeg, Canada, as well as the conceptual design of the advanced water treatment plant consisting of enhanced coagulation, DAF, ozone, GAC filtration, UV.
- Senior technologist for the design of the 180 mgd ozone and UV disinfection facilities for Seattle Public Utilities (1999-2002)
- Senior consultant for the development of distribution system early warning system, City of Anaheim, CA (2002)
- Senior consultant for the study and design of water treatment facilities including UV for the City of Henderson, NV (1999-2002)
- Senior Technologist for 30 mgd arsenic water treatment plant, enhanced coagulation, clarification, filtration, El Paso, TX (2002-2004)
- Senior consultant for the upgrade and expansion of the 20 mgd water treatment plant; enhanced coagulation, ballasted clarification, ozone, biofilters, Melbourne, FL

Over 100 Presentations and Papers

Emily L. Owens-Bennett, P.E., BCEE

Trussell Pasadena Office

EDUCATION

• M.S. Environmental Engineering, Master's International Program, *Michigan Technological University, Houghton, Michigan*
• B.A. Environmental Studies-Geology, French minor *Whitman College, Walla Walla, Washington*

REGISTRATION

Civil Engineer, State of California - No. 78720
Issued: 6/10/11 Exp: 9/30/20

CERTIFICATION

Board Certified Environmental Engineer, American Academy of Environmental Engineers – No. 19-10007 Issued: 11/8/19 Exp: 12/31/20

SUMMARY

Emily Owens-Bennett is a Supervising Engineer with more than 10 years of water quality and treatment project experience with Trussell Technologies. Ms. Owens-Bennett has been involved in projects spanning a wide variety of applications, including assessment of source water quality for new drinking water projects, implementation of rigorous water quality monitoring programs aimed at demonstrating regulatory compliance for future full-scale facilities, characterization and laboratory investigation of solids in a brine wastewater matrix, seawater desalination through the use of UF/RO and the application of preformed chloramines, a study of the seawater quality impacts of red tides and stormwater inputs, pilot project field monitoring and water quality analyses, sampling and maintenance of soil columns replicating groundwater water quality and contaminant attenuation (synthetic organic compounds, microbes, nutrients, etc.), routine laboratory water quality analyses associated with a variety of water and wastewater treatment applications, investigation and pilot treatment of groundwater odor issues, bench-scale testing of advanced oxidation processes (solution ozone test and collimated beam testing), and the development of point-of-use (POU) water treatment technologies.

PROJECT EXPERIENCE

East Valley Water District

Plant 134 Disinfection Byproduct Investigation
Year: 2019

As part of a diverse water supply portfolio, East Valley Water District (East Valley) treats surface water from the State Water Project (SWP), as well as local surface water from the Santa Ana River at the Plant 134 Water Filtration Facility (Plant 134). The current treatment train for Plant 134 includes coagulation, membrane filtration, and chlorination. Seasonal water quality changes in the two surface water sources for Plant 134 have historically resulted in elevated concentrations of disinfection byproducts (DBPs), namely trihalomethanes (THMs), in certain areas of the East Valley distribution system. In response to an exceedance of the regulatory limit for total THMs, East Valley submitted a Corrective Action Plan (CAP) to the State Water Resources Control Board Division of Drinking Water (DDW) in June 2017. Trussell Tech was retained to investigate DBP formation and optimize treatment at Plant 134 for the removal of DBP precursors from the SWP source water, which historically has higher bromide concentrations. Trussell Tech conducted bench-scale tests comparing the effectiveness of three coagulants–ACH, aluminum sulfate, and ferric chloride–at three target pH conditions, for DBP precursor removal. Simulated distribution system (SDS) THM formation of the coagulated/filtered water was tested for quantitative comparison of DBP formation. The bench-testing results showed that pretreatment with ferric and sulfuric acid (to a pH of 6.5) yielded the lowest DBP levels and can be used to improve DBP levels within the EVWD distribution system.

Role: *Project Manager*

Mesa Water District

Free Chlorine Conversion Study
Year: 2018 to present

The Mesa Water District (Mesa Water) is considering converting its clear groundwater wells from chloramines to free chlorine disinfection and engaged Trussell Tech to complete a phased Free Chlorine Conversion Study. To avoid issues with disinfection byproduct (DBP) formation, two of Mesa Water's sources, amber-colored groundwater treated at the Mesa Water Reliability Facility (MWRF) and supplemental imported water provided by the Metropolitan Water District of Southern California (Met) would continue to be chloraminated. Owens-Bennett led a technical evaluation of the feasibility of the chloramine to free chlorine residual conversion for the clear groundwater wells through bench testing blended water scenarios of free chlorinated clear well groundwater with chloraminated

MWRF and Met waters. A feasibility assessment included hydraulic modeling by Carollo over a range of operating scenarios to confirm locations of potential problematic blends in the system. Owens-Bennett contacted a number of local drinking water utilities that currently operate with a blend of free chlorinated groundwater and chloraminated imported water from Met in a single distribution system pressure zone. A full-scale testing program has been developed and reviewed by the California State Water Resources Control Board Division of Drinking Water. This testing will pave the way for permanent system conversion.
Role: *Project Manager*

West Yost Associates – Stanislaus Regional Water Authority

Regional Surface Water Supply Project
Year: 2016 – Present

Driven by historic drought conditions, degradation of groundwater supplies, and declining groundwater levels, the Stanislaus Regional Water Authority is seeking to develop a reliable supplemental surface water supply. Trussell Technologies is part of the Program Management team, guiding and performing technical work to inform decisions regarding the proposed Surface Water Treatment Plant Project. Owens-Bennett has worked on the source water evaluation, including review of historical water quality data, development and oversight of the sampling program, and working with California's Division of Drinking Water to gain approval for source water monitoring, including Bin classification per LT2ESWTR regulations. Owens-Bennett completed a bench-scale testing program to evaluate treatment alternatives, including enhanced coagulation via jar tests, ozonation using solution ozone testing, DBP formation, as well as process performance, including manganese removal.
Role: *Project Engineer*

Goleta Water District

Bench-Scale Pretreatment Evaluation
Year: 2017

The Goleta Water District (District) treats surface water from Lake Cachuma, a reservoir fed by local runoff and dechloraminated State Project Water from the Sacramento-San Joaquin River Delta, at the Corona Del Mar Water Treatment Plant (CDMWTP). Lake Cachuma was influenced by runoff associated with above-average rainfall in early 2017, as well as a watershed impacted by fire, resulting in elevated total organic carbon (TOC) concentrations in the CDMWTP feed water. The District increased its prechlorination dose to prevent algae growth in the CDMWTP sedimentation basins, however elevated levels of total trihalomethane (TTHM) were measured in the CDMWTP effluent and within the distribution system. Trussell Technologies was retained to conduct bench testing to evaluate ozone and chlorine dioxide as alternative pretreatments to replace prechlorination at the CDMWTP. The bench test evaluation was completed in the Trussell Technologies Lab in Pasadena, CA and included: assessment of CDMWTP influent water oxidant demand for ozone, chlorine dioxide, and free chlorine; simulation of the CDMWTP treatment process; assessment of disinfection byproducts (DBPs) – TTHM, haloacetic acids (HAAs), bromate, chlorite, and chlorate – formed over a maximum distribution system residence time of 6 days.
Role: *Project Manager*

Mesa Water District

Title: Water Quality and Compliance Supervisor
Date: 2014-2015

Mesa Water District (Mesa Water) retained Owens-Bennett for five months as a full-time consultant working in the capacity of Water Quality and Compliance Supervisor within their Operations Department to provide support for the position on a temporary basis, while recruiting a permanent employee. Responsibilities of this position included oversight of water quality and cross-connections staff, including implementation of the District's monitoring plan, working with operators to enact operational changes in response to water quality measurements, regulatory compliance reporting, capacity building through cross-training on water quality and sampling, coordination with operators, maintenance staff, and the District's Engineering Group, as well as training the permanent hire on job-related tasks during a three-week transition period. Mesa Water predominantly uses local groundwater from five clear wells and two amber-colored wells that are treated at the Mesa Water Reliability Facility using a combination of nanofiltration, air stripping, and odor polishing. All water within the Mesa Water distribution system is chloraminated at the source wells, and supplemental disinfection boosting is implemented, as needed, at the reservoirs for improving chlorine-to-nitrogen ratios and controlling nitrification.
Role: *Project Manager*

Western Municipal Water District

Western Riverside County Regional Wastewater Authority Plant Expansion – Chlorine Contact Basin Tracer Study
Year: 2017

Demonstrated to the State Water Resources Control Board Division of Drinking Water the modal contact time of the chlorine contact basins for the WRCRWA plant

expansion project. Developed a test plan; obtained test plan approval from DDW; prepared for and conducted tracer tests with team; analyzed results; prepared final report; and obtained approval from DDW.
Role: *Project Manager*

James H Borchardt PE

Water Treatment Technical Director

Stantec

Jim has 40 years of experience in project management and engineering for water treatment, conveyance, and storage facilities. He is an award winning water treatment expert and a contributing author of the MWH Water Treatment Principles and Design Text Book (3rd Edition) that is used to teach water treatment in universities across the country. Jim has managed water quality studies, bench and pilot scale testing, facility planning and design, process evaluation, site development, hydraulic analysis, treatment plant design, construction management, and startup and operation on more than 125 treatment facilities. Jim has also served as technical advisor on more than 250 other treatment projects.

EDUCATION

Bachelor of Science, Civil Engineering, Colorado State University, Fort Collins, Colorado, 1976

Master of Science, Environmental Engineering, University of North Carolina, Chapel Hill, North Carolina, 1979

CERTIFICATIONS & TRAINING

Awards, 2006 Engineer of the Year in Santa Barbara County

REGISTRATIONS

Registered Professional Engineer #21603, State of Nevada

Registered Civil Engineer #17847, State of Colorado

Registered Civil Engineer #35819, State of California

MEMBERSHIPS

Member, WateReuse Association

Member, Water Environment Federation

Member, International Ozone Association

Member, American Water Works Association

Member, Chi Epsilon National Civil Engineering Honor Society

Member, American Membrane Technology Association

Member, American Society of Civil Engineers

OFFICE LOCATION

Pasadena, CA

PROJECT EXPERIENCE

Weymouth WTP Filter Rehabilitation Design and Construction, Los Angeles, California (Project Manager), 2007-2017
Client: Metropolitan Water District of Southern California (MWD)

The Weymouth WTP is a 520-mgd plant with 48 dual-media gravity filters. Initially, Jim oversaw the rehabilitation of four filters, each with an individually different filter design. The four filters were studied for two years to determine the best design for long-term performance. After the optimum design was determined, all 48 plant filters were rehabilitated in a $35M construction project. The design included media and underdrain replacement, and new surface wash and wash troughs, raising the concrete gullet walls, hatch and connection replacement, new handrails, and instrumentation.

Green River Filtration Facility, Tacoma, Washington (Principal-in-Charge), 2012-2016
Client: Tacoma Water

Jim was the principal-in-charge of this $180 million new treatment plant project. The facility is constructed on the site of the existing Green River Headworks, and treats water from both the Green River and from groundwater supplies delivered from the North Fork Wellfield. The initial maximum filtration capacity of the new facilities is 150 mgd with an ultimate filtration capacity of 168 mgd. The Green River Filtration Facility is a hybrid facility,

James H Borchardt PE

Water Treatment Technical Director

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with a capacity of 90 mgd operating in conventional treatment mode (with clarification preceding the filters), and full capacity operating in direct filtration mode. Turbidity in the Green River varies widely, ranging from less than 1 NTU in the summer to over 500 NTU during winter storms or reservoir flushing operations. The solids treatment facilities include mechanical dewatering to provide reliable, year-round ability to process solids in preparation for final disposal. Jim provided support for the pilot testing of alternate filter media combinations, which led to approval from the state to design the plant at a 10 gpm/sf filtration rate.

Advanced Water Treatment Demonstration Facility, Los Angeles, California (Project Manager), 2016-2019
Client: Metropolitan Water District of Southern California
Jim serves as project manager for the 0.5 mgd Advanced Water Treatment Demonstration Facility, proposed as a partnership between the Metropolitan Water District of Southern California and the Los Angeles County Sanitation Districts. The AWTDF will provide biological NdN treatment with MBR, followed by traditional RO-UV/AOP treatment on secondary effluent from the 400-MG Joint Water Pollution Control Plant, to investigate treatment needs for indirect potable reuse. The goal of the project is to obtain DDW approval for log removal credits for MBR. In related studies, full-scale facilities of up to 340-mgd have been modeled and cost estimates prepared to support the Regional Recycled Water Supply Project.

Jensen Solids Handling Facilities Project, Granada Hills, California (Technical Director), 2005-2017
Client: Metropolitan Water District of Southern California (MWD)
Jim served as technical director for the solids handling facilities project at the 750-mgd Jensen Water Treatment Plant. He was responsible for managing all technical aspects of the project, including concept development, discipline engineering, and presentation of results. Project facilities included new equalization, thickening, four pump stations, temporary and permanent lagoons, four 2-meter belt presses, and storage hoppers for processing up to 40 tons of dry weight solids per day.

Water Treatment Plant Expansion and Disinfection-By-Product Control Project, Antelope Valley, California (Project Manager), 2004-2010
Client: Antelope Valley East Kern Water Agency
Jim led the planning and pilot studies, through detailed design services, construction support, and start-up for the expansion and upgrade of four WTPs. These plants ranged in size from 4 to 90 mgd. The four treatment plants (Quartz Hill, Eastside, Acton, and Rosamond) were upgraded to include intermediate ozonation, deep-bed GAC filtration, and chloramines. The work required coordination of three main contractors and more than a dozen equipment suppliers. The project emphasis on schedule control was critical to allow coordinated conversion of the distribution system residual. Standby disinfection was also provided with the addition of chlorine contact basins. In addition, the largest treatment plant was expanded to 90 mgd by the addition of plate settler modules and new sludge removal mechanisms to the existing sedimentation basins. Jim also provided final start-up and commissioning services.

Design Manager, Corona Del Mar WTP Upgrades and Modifications, Goleta, California 2006-2009
Client: Goleta Water District
Jim managed the design under a design-build contract for the extensive upgrades and modifications to an existing 30-year-old, 36-mgd conventional surface WTP. The design team's work included hydraulic flocculation, pumped flash mixing, reconfiguration of the sedimentation

James H Borchardt PE

Water Treatment Technical Director

basins, filter-to-waste, new chemical storage and feed systems, and a new LEED® certified laboratory/administration/control building. Jim was nominated by the District and received the Engineer of the Year Award in Santa Barbara County for this work and the project received the Achievement Award for the Best Infrastructure Project under $50M.

Technical Lead, Recycled Water Seasonal Storage Facility Plan of Action and Basis of Design, 2014-2016
Client: Las Virgenes – Triunfo Joint Powers Authority
Jim led the JPA Board, project stakeholders, and Stantec team through a facilitated public workshop process to develop and evaluate six conceptual project alternatives. The JPA Board selected two scenarios for further investigation and established a Plan of Action for development of a project. The subsequent Basis of Design provided detailed evaluation of the two scenarios and continued the process of stakeholder engagement, four public workshops, and technical analysis. The conceptual scenarios were refined into two specific project alternatives, each with strong stakeholder support. On August 3, 2016, the JPA Board of Directors voted to explore Potable Reuse using surface water augmentation in the Las Virgenes Reservoir as the preferred option to address seasonal storage.

Sustainable Water Infrastructure Project (SWIP), Santa Monica, California (Project Manager), 2016-2019
Client: City of Santa Monica
Jim managed the planning and conceptual design of the SWIP project and is now leading Stantec's team as Owner's Engineer on this progressive design-build project. SWIP was created to help the City to achieve its long-term goal of water sustainability and drought resilience by using all of its local water resources, including stormwater runoff, recycled municipal wastewater, and brackish groundwater. The SWIP combines each of these sources to produce approximately 1,680 AFY of advanced treated water for City use in lieu of imported water supply. The SWIP will produce water of advanced treated quality that, when properly permitted, will be acceptable for potable reuse via replenishment of the City's natural groundwater aquifers. Until final permits are obtained, the SWIP water will be used to meet existing recycled water demands.

CS-879 Sunol Valley Water Treatment Plant Improvements Project, San Francisco, California (Technical Advisor)
Client: San Francisco Public Utilities Commission
Jim served as technical advisor on multiple phases of improvements to the 160-mgd Sunol Valley WTP. The initial $50M project lifted a regulatory compliance order and increased peak capacity to 160 mgd. Improvements included replacement of all filter valves, new filter-to-waste facilities, new chemical feed facilities, a new water quality laboratory, modification of the plant control building and maintenance shops, and seismic strengthening of all plant structures. A subsequent project will increase peak capacity to 200 mgd by adding a new 40-mgd flocculation/sedimentation basin, a new 3.5-MG chlorine contact tank, and a 17.5-MG circular storage tank; and upgrading the plant's existing filters with new filter media, new underdrains, and air/water backwash capability. Upgrading the plant's 12 existing filters and increasing filtration rates to 8 gpm/sf saved the SFPUC $18 million, compared to building 4 new filters operating at 6 gpm/sf. Stantec prepared the high rate test plan, conducted training of plant staff, analyzed performance data, and obtained operating permit approval.

Charles Cruz, P.E.
Vice President

Education:

B.S., Chemical Engineering, Stanford University, 1985
M.S., Civil Engineering, Stanford University, 1992

Registrations/Certifications:

Professional Engineer, Civil, California, C59845, issued 7/23/1999, expires 12/31/2021

Professional Affiliations:

Water Environment Federation

Employment History:

Separation Processes, Inc. - 2005- to Present
CDM, Inc. – 1995 to 2005, 1991 to 1993
Dow Chemical, U.S.A. – 1985-1990

Areas of Expertise:

MF/UF Treatment Design/Construction
MF and MBR Procurement
Advanced Water Treatment
Water Reuse
Membrane Bioreactor

Years of Experience: 34

Years with SPI: 17

Office Location:
Carlsbad, CA

Mr. Cruz is a registered Civil Engineer and a Vice President at SPI. He has experience in the design of water, wastewater and water reuse facilities. His assignments have included detailed design, pilot testing, equipment procurement, equipment selection, life-cycle evaluations, feasibility studies, and construction services. He has experience with advanced treatment technologies and equipment including membrane filtration, membrane bioreactors, ozone, reverse osmosis, granular activated carbon, and UV as well as conventional water treatment technologies.

EXPERIENCE

Water Treatment

KETTLEMAN CITY COMMUNITY SERVICES DISTRICT
Surface Water Treatment Plant Project, Kettleman City, CA (2009–Present)
Project Manager – Mr. Cruz is the project manager for the membrane filtration component of a 1.3 mgd surface water treatment plant. The plant will produce drinking water by treating California Aqueduct water. He oversaw the planning, construction, and operation of a 3 month pilot study for the project which included membrane system pilot testing, conventional water treatment plant evaluation, and a disinfection by-product mitigation evaluation. He prepared plans and technical specification for the membrane filtration system. During construction, Charles will provide contract administration for the selected Pall microfiltration system as well as installation, commissioning, start-up, training, and operations assistance services.

SWEETWATER AUTHORITY
Electronic O&M Manual Project, Chula Vista, CA (2011- 2018)
Project Manager – Charles was the project manager for a five year project involving design, content development, installation, and integration of an Electronic O&M Manual for all of Sweetwater Authority's facilities. Facilities included three water treatment plants, wellhead treatment facilities, and distribution system facilities including numerous pump stations and storage tanks. Activities included coordination of software development sub consultants, development of O&M content, deployment of O&M content, and training of Sweetwater Authority staff for content management and general use of the Electronic O&M Manual.

SWEETWATER AUTHORITY
Lockout/Tagout Procedures Project, Chula Vista, CA (2011–2018)
Project Manager – Charles served as the project manager for a five year project involving development of lockout/tagout procedures for all of Sweetwater Authority's facilities. Facilities included three water treatment plants, wellhead treatment facilities, and distribution system facilities including numerous pump stations and storage tanks. Activities included conducting field visits in conjunction with Sweetwater Authority safety and operations staff to collect information for development of lockout/tagout procedures, and production of electronic lockout/tagout procedures.

SOLANO IRRIGATION DISTRICT
Pleasant Hills Water Treatment Plant Project, Vacaville, CA (2009 – 2017)
Project Manager – Charles was the project manager for procurement and design of a 150 gpm packaged Pall microfiltration system. The treatment system employs direct filtration followed by chlorination to treat surface water for drinking water

use. Provisions for coagulant addition upstream of the membranes will be provided to assist with Total Organic Carbon removal.

METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA
Weymouth Water Treatment Plant Oxidation Retrofit Program, La Verne, CA (2014-2016)
Sr. Project Engineer – The Weymouth Water Treatment Plant is a 520 mgd surface water treatment plant. The Oxidation Retrofit Program included the addition of pre-ozonation ahead of the conventional water treatment process. Mr. Cruz prepared commissioning manuals for retrofit equipment including ozone system ancillary equipment, washwater pumps, chemical systems, life and safety systems and plant utilities.

TURLOCK IRRIGATION DISTRICT
Regional Surface Water Supply Project, Turlock, CA (2006–2007)
Project Manager – Charles served as the project manager for membrane filtration pre-design activities for a 40.5 mgd surface water treatment plant. He prepared a detailed process analysis that reviewed conventional flocculation/sedimentation, high rate clarification, membrane filtration, media filtration, ozone, GAC and UV processes. Charles also oversaw the membrane filtration component of a nine month pilot testing program for the project which included development of the membrane pilot system protocol. He developed the membrane filtration section of the preliminary design report for the project.

CITY OF SCOTTSDALE
CAP Water Plant Expansion, Scottsdale, AZ (2005–2006)
Project Manager – Charles developed preliminary design documents for the membrane filtration component of the 30 mgd CAP Water Treatment Plant Expansion as well as the detailed procurement documents for the membrane system.

GLOBAL WATER
Maricopa Groves and Terrazo Water Treatment Plant Feasibility Study, Maricopa, AZ (2005–2006)
Project Engineer – Charles prepared a detailed process analysis of two 5 mgd water treatment plants treating CAP water for potable use. The process analysis reviewed conventional flocculation/sedimentation, high rate clarification, membrane filtration, media filtration, ozone, GAC and UV processes. The evaluation determined the standard processes to be used in both facilities.

CITY OF SANTA MONICA
Sustainable Water Infrastructure Project (SWIP) Advanced Water Treatment Facility (AWTF), Santa Monica, CA (2018-Present)
Project Manager – Charles is leading membrane procurement support efforts for the MBR and reverse osmosis components of a 1 mgd indirect potable reuse facility. The facility will be located in a subterranean structure and will operate as a scalping plant to treat a blend of municipal wastewater and stormwater runoff for indirect potable and non-potable reuse. Activities include assistance to the progressive design-build team for design criteria development, procurement specification review, and bid evaluation.

CITY OF POST FALLS
Post Falls Water Reclamation Facility Tertiary Treatment Improvements, Post Falls, ID (2016-Present)
Project Manager – Charles is the project manager for membrane filtration pre-design and procurement activities for a tertiary wastewater treatment system. The existing 5.2 mgd average/8.8 mgd peak water reclamation facility will add tertiary treatment to achieve ultra-low phosphorus removal for regulatory compliance and recycled water use. He led the supplier prequalification and membrane filtration equipment procurement efforts. The membrane filtration system will be designed to accommodate membranes from at least two different membrane modules suppliers. Charles also oversaw the membrane filtration component of a six month pilot testing study to evaluate high rate clarification and membrane filtration. He led the membrane pilot design, construction, operation, data evaluation, and pilot study report efforts.

Kirill Dolinskiy, PMP

Project Manager/ Scheduling/ Document Management

SUMMARY

Mr. Dolinskiy has more than twenty years of program and project management, risk and change management, governance, compliance audit, and engineering experience (USA and International).

Below are the key elements of Mr. Dolinskiy's expertise:

- Program Management
- Project Management
- Governance and Compliance Audit
- Project Controls
- Program/ Project Delivery Models
- Risk Management
- Change Management
- QA/QC Management
- Contract Management
- Document Management
- Design Management
- Engineering Services during Construction
- EPC Management
- Construction Management
- Conflict Resolution

EDUCATION/ CERTIFICATIONS:

M.S. in Civil and Environmental Engineering, University of Pittsburgh, Pittsburgh, PA

B.S in Civil Engineering, Chelyabinsk State Technical University, Chelyabinsk, Russia

Project Management Professional (PMP Number: 1584705); Expiration Date – 3/13, 2022

HOME OFFICE

630 South Indian Hill Boulevard, Suite 1, Claremont, California 9171

YEARS WITH THE COMPANY – 6 years

2019- Current
Inland Empire Utilities Agency (IEUA)
CIP Program Project Control Services
Principal-In-Charge/ Project Manager

Mr. Dolinskiy served as a Principal-In-Charge and Project Manager for the Engineering Department-wide CIP program. The services include developing the Department-wide project control (scheduling and cost estimating) policies and procedures, project management SOPs, claim management and reporting protocol.

2019 - Current
City of Beverly Hills, CA
Reverse Osmosis (RO) Water Treatment Plant
QA/QC Reviewer
Mr. Dolinskiy is responsible for technical and constructability review of the design of the City's Reverse Osmosis Water Treatment Plant improvements. The improvements were triggered by a decrease in source well capacities and challenging source well water quality. The improvements consisted of addition of sand separator system, an oxidation media filter (OMF) process, upgrade of RO system and membranes to increase facility reliability, operability, and to operate at maximum flow capacity, upgrade of the existing facilities to include new chemicals required for the oxidant media filtration process and improve existing chemical systems, modification of the control system to incorporate new pre-treatment processes and provide automated monitoring of RO performance, as well as changing wellhead facility control from flow control to pressure control to limit plant unexpected shutdown

2017 - 2019
Inland Empire Utilities Agency (IEUA)
CIP Program Management Assistance
Principal-In-Charge/ Project Manager

Mr. Dolinskiy served as a Principal-In-Charge and Project Manager in assisting Agency to execute 10-year $750MM CIP engineering infrastructure (pipeline and pumps stations) and treatment plants expansions projects to assure executing efficiency, schedule and cost compliance. Mr. Dolinskiy assists Agency's Engineering Department with the development of the department's organizational structure, development of the department-wide project management procedures, risk and change management protocol, reporting and document management requirements, as well as standards and procedures for project controls consisting of scheduling, cost estimating, and claim management.

2017 - 2019
Coachella Valley Water District (CVWD) Program Management Support
Program Manager

Mr. Dolinskiy served as a Program Manager assisting District in execution its $110M engineering CIP consisting of various pipeline, pump stations, state loans and grants and consolidating projects. In addition, Mr.Dolinskiy provided support to CVWD Engineering Department in development of project control scheduling methodology, as well as developing program and project management operating procedures.

2016
City of San Diego Pure Water Program
Risk/ Change/ Quality Control and Quality Assurance Manager

Mr. Dolinskiy served as Risk, Change and Quality Manager at the City of San Diego $3.6B Pure Water Program, which is a phased, multi-year program that will provide 1/3 of San Diego's water supply locally by 2035. Mr. Dolinskiy was responsible for establishing the overall methodology, policies, business processes and procedures that will be put in place to manage program and project-specific risks, changes and quality; training all program and project team members on the requirements established in the program's Risk, Change and Quality Management Plans; running analyses on the program and project-specific risks to identify highest risks and determine whether adequate contingencies are available to address those risks; and performing program and project-specific audits to monitor compliance with all program policies, directives, business process procedures and standards.

2012 –2015
Altalink, Calgary, Canada
PMO Governance. Stage Gate and Risk Manager, Audit Compliance Manager

Mr. Dolinskiy served as Governance/ Stage Gate and Risk Manager at Altalink, L.P. – a power transmission Calgary-based company. As a part of a $7B Altalink's infrastructure upgrade, Mr. Dolinskiy was responsible for development, implementation and improvements of a project governance framework, Projects Delivery Model (PDM), KPIs, and change and risk procedures to ensure program's compliance with industry best practices and PMI standards. In addition, Mr. Dolinskiy developed and ran the stage gate framework process to assure that each project meets pre-determined criteria to advance to the following execution stage. Mr. Dolinskiy successfully guided projects with a total value of over $5B for governance, corporate and industry standards compliance and served as a liaison between the project's teams and Altalinks's senior executive management team. Mr. Dolinskiy was responsible for coordination of overall portfolio, program and project risk assessments across Altalink's major, regional and customer capital projects.

In addition, Mr. Dolinskiy served as an Audit Compliance Manager to ensure Altalink's compliance with ISO (International Organization for Standardization) and AESO (Alberta Electric System Operator) rules and regulations. Mr. Dolinskiy developed the workflow process and Audit Delivery Model, and ensured project teams' conformity to the audit requirements.

Mr. Dolinskiy developed and implemented a methodology of document management system to be utilized across Altalink's portfolio.

2007-2012
Temporary Ocean Water Desalination Demonstration Facility,
West Basin Municipal Water District
Project Manager

Mr. Dolinskiy served as a Project Manager for the development, design and construction of Temporary Ocean Water Desalination Facility in Redondo Beach, CA. Mr. Dolinskiy provided project management, coordination among project team, over 20 subconsultants, and more than 10 local, state and federal regulatory agencies to provide West Basin Municipal Water District (WBMWD) with professional engineering, environmental, construction management, and operational services, necessary to complete the project.

Hashmi Quazi, PhD, PE, GE

Principal in Charge/Project Manager

Dr. Quazi works out of our Redlands office and has over 32 years of experience and 31 years with Converse Consultants providing geotechnical engineering services and has earned a reputation for providing quality work in an honest and ethical manner, on time and within budget. Dr. Quazi provides quality control, budget oversight, and technical assistance on water treatment plants, water storage, basins, pump stations and other related studies.

Education

- Ph.D., Civil Engineering, University of Arizona, 1987
- M.S., Civil Engineering, Arizona State University, 1982
- B.S., Bangladesh Engineering University, 1978

Registrations/Certifications

- California, Civil Engineer, #46651, issued 2/1/1991, expires 6/30/2021
- California, Geotechnical Engineer, #2517, issued 2/8/2001, expires 6/30/2021

Office Location

Redlands, California

Relevant Experience

EVWMD Expansion & Upgrade, *Lake Elsinore, CA*. Principal in Charge. Provided resource and budget oversight, technical review and contract management for the geotechnical investigation. The Elsinore Valley Municipal Water District constructed a 4.0 MGD MBR Plant to expand the existing plant. Work included upgrades to the existing 8.0 MGD Extended Aeration Plant, plant-wide comprehensive condition assessment, Distributed Control System conversion to SCADA and other limited upgrades. The improvements included clarifier 6 and well point system, secondary equalization and stormwater ponds, diversion structure, stormwater drainage ditch retaining walls, stormwater return pump station, operations building expansion and maintenance workshop.

IEUA Regional Plant 1, *Ontario, CA.* Principal in Charge. Provided resource and budget oversight, technical review and contract management for the geotechnical investigation. The proposed improvements were located south of the existing tertiary filter banks and east of the waste wash water holding basin. The vault was located near the north of two tanks. The disinfections improvements project consisted of 4 circular steel tanks contained within hexagonal concrete structures and a valve vault. The tanks were installed on a 93 foot long by 33 foot wide concrete slab.

San Bernardino Municipal Water District Clean Water Factory, *San Bernardino, CA*. Principal in Charge. Provided budget and technical oversight for design phase. The project consisted of the construction of a Clean Water Factory (CWF) which will treat effluent from the San Bernardino Water Reclamation Plant (SBWRP) and convey the treated effluent to the Waterman Basins and the East Twin Creek Spreading Grounds. Recycled water spread at these facilities will artificially recharge the Bunker Hill Groundwater Basin.

HDWD Water Reclamation Facility, *Yucca Valley, CA*. Principal in Charge. Provided budget and technical oversight for design phase.The Hi-Desert Water District (HDWD) Wastewater Reclamation Facility was located on a 16.4 acre site northeast of Sunnyslope Drive and Indio Avenue in Yucca Valley, California. The project included ponds, basins, pump stations, aeration tank, maintenance/operations building, electrical building, above-ground and underground utilities, asphalt and concrete pavement, and open spaces. The facility has the capacity of processing 1.0 million gallons per day.

Montclair Valley Water District Plant 30 Wellhead Treatment Plant, *Montclair & Ontario, CA*. Principal in Charge. Provided budget and technical oversight for the proposed project. The project consisted of improvements of a Wellhead Treatment Plant within the existing Well 30 to treat water from Montclair Valley Water District (MVWD) Wells 30 and 32, and from Well 33. The project will provide treatment for 1,2,3-TCP, perchlorate, and nitrate at Wells 30, 32, and 33. Well 33 is the only one of the 3 wells with current treatment consisting of more than disinfection. MVWD intends to bring the treated Well 33 water and untreated Well 32 water to the Well 30 site for granular activated carbon (GAC) and partial ion exchange (IX) treatment.

Samir Hijazi, Asso. AIA

Architect

Bachelor of Science in Architecture, 1988
College of Architecture
University of Houston
Houston, TX
Land Use and Environmental Planning, 1991–1992
University of California at Irvine (UCI)
Irvine, CA
Project Management Certificate, 2008
California State University - Fullerton
Fullerton, CA

Connected:
Construction Specification Institute, CSI
American Institute of Architects, AIA
International Code Council, ICC
Measurement Science Conference, MSC

Professional Summary:

- Recognized for completing multi-million dollar projects on time and on budget for private and public clients
- Combines excellent managerial and team-building skills with effective project controls.
- A mastery of the financial aspects of construction assembly replacement costs and useful life analysis.
- Extensive Job Order Contract (JOC) experience for municipal and governmental projects.
- Successfully managed design and construction projects for private and public clients with varying budgets and construction types.
- Represented projects at public hearings and public forums for design reviews, conditional use permitting, variances, and entitlements.
- Conducted due diligence efforts for projects through governmental discretionary processing and research.
- Demonstrated strong analytical and problem solving skills.
- Effective negotiator with strong contract administration skills.
- Managed staff and coordinated interdisciplinary consulting design and engineers for varying project types and orders of magnitude.
- Comprehensive knowledge of the construction and design industries processes and phases from both angles: design and construction.

Arch. Project Manager
Anaheim Water Treatment Plant| City of Anaheim Utilities| Anaheim, CA

Samir conducted client meetings for scope development for Reservoir Outlet Structure. Worked on the conceptual design, design development and construction document phases of the project. Coordinated the interdisciplinary engineering for the project. Managed and coordinated the permitting effort from the submittal and application phase through permit issuance from building, civil, electrical, mechanical, and fire. Departments.

Arch. Project Manager
Lenain Water Treatment Plant| City Of Anaheim | Anaheim, CA

Samir conducted client meetings for scope development for the Operations Building Remodel; led the design and space planning effort; oversaw the design development and construction document phases. Coordinated the interdisciplinary engineering for the project. Managed the permitting effort through permit issuance from building, civil, electrical, mechanical, and fire department requirements.

Arch. Submittals and Materials Reviewer
WRD -GRIP | Water Replenishment District | Lakewood, CA/

Samir's primary responsibility includes the review of submittals by the contractor for architectural material submittals to ascertain conformance with plans and specifications and quality of architectural materials and systems being installed for the project. Other responsibilities include review of conditions that may have impact on codes such as exiting, fire rating and ADA..

John D. Kenny, P.E.

Trussell Oakland Office

EDUCATION

- M.S., Civil & Environmental Engineering, *University of California at Berkeley*
- B.S., Civil, Environmental, & Architectural Engineering, *University of Kansas*

REGISTRATION

Civil Engineer, State of California, No. 82975
Issued: 5/24/14 Exp: 9/3/20

SUMMARY

John Kenny is a process and water quality expert with Trussell Technologies, Inc. He is the lead process engineer for the Santa Margarita River Conjunctive Use Project, an 8-mgd groundwater treatment project including brackish water desalination, as well as the lead process engineer for the Pure Water Monterey project, a 5-mgd groundwater replenishment reuse project utilizing ozonation upstream of membrane filtration and reverse osmosis. Mr. Kenny leverages both science and experience to solve emerging water quality issues and enjoys finding elegant solutions to complex problems.

PROJECT EXPERIENCE *(Select Projects)*

Alameda County Water District

Joint ACWD, SFPUC, and USD Purified Water Feasibility Evaluation

2019 – Present

As part of the consulting services to Alameda County Water District for their Purified Water Feasibility Evaluation, Trussell Tech will conduct a relability assessment of the Newark Desalination Facility, which includes the use of reverse osmosis to reduce the total dissolved solids concentration of brackish groundwater.

Role: *Desalter Task Lead*

Fallbrook Public Utilities District

Santa Margarita River Conjunctive Use Project Facilities Design

2014 – Present

The Fallbrook Public Utility District is integrating a new potable water supply into their portfolio through the Santa Margarita River Conjunctive Use Project, where FPUD will receive infiltrated Santa Margarita River water from Marine Corps Base Camp Pendleton. Trussell Technologies was hired to assist with designing the SMRCUP facilities, which include iron and manganese treatment, reverse osmosis, stabilization and disinfection. The effort has included developing a raw water quality characterization of the source water, defining treatment goals, and developing alternative treatment options, developing the design through the 30-% to 100%-level for use in a bid package, bid-phase support services, engineering services during construction, and working with regulators to ensure compliance. Most recently, Mr. Kenny is helping FPUD evaluating the use of Granular Activated Carbon to treat the RO bypass.

Role: *Process and Water Quality Lead*

Monterey One Water

Pure Water Monterey Project

2013 – Present

To meet water supply needs in the region, Monterey One Water consulted Trussell Tech in developing the Pure Water Monterey project, a Groundwater Replenishment Reuse Project. Trussell Tech has been provided technical guidance from the conception phase through construction. Trussell Tech conducted preliminary bench-scale tests of new source waters, pilot-tested the treatment train, evaluated regulatory compliance, assisted with obtaining permits, assisted with public outreach, designed and helps operate their Demonstration Facility, designed the facilities, provided bid-phase support, is providing engineering services during construction, developed the Engineering Report, and developed the Operations Plan, including the Membrane Filtration Integrity Verification Protocol. Trussell Technologies helps operate the Demonstration Facility membrane filtration unit, including optimization of the backwash and chemical cleaning strategies, and used the Demonstration Facility to evaluate threshold inhibitors and optimize the RO feed pH. Mr. Kenny continues to provide technical and regulatory guidance as the project considers expansion.

Role: *Process and Water Quality Lead*

City of Santa Cruz

Graham Hill Water Treatment Plant Filter Rehabilitation, As-needed Production Support, and Source Water Quality Monitoring

2014 - 2017

Trussell Tech used their filter model and Santa Cruz's historical data to develop a filter media design for the Graham Hill Water Treatment Plant Filter Rehabilitation. Trussell Tech piloted tested the selected filter media design, along with alternatives, and a control, to validate the filter design media design prior to installation. The alternatives included dual media Granular Activated Carbon with sand and various anthracite with sand designs. Trussell Tech supported the City through the rehabiliation process, and developed alternative methods for reducing trihalomethanes in their treated water and distribution system. Trussell Tech developed jar testing procedures to evaluate disinfection alternatives. In order to support the City with increasing their San Lorenzo River water use, Trussell Tech also developed a source water monitoring program, including test plan, regular calls and final recommendations with respect to turbidity and disinfection by-products.
Role: *Project Engineer*

California American Water
Monterey Peninsula Water Supply Project Watershed Sanitary Survey
Date: 2015-2018
Trussell Tech was retained to support California American Water in pursuit of a new Domestic Water Supply Permit for the operation of the proposed Monterey Peninsula Water Supply Project (MPWSP). This effort includes watershed delineation, assessment of the quality of the source water, as well as identification of potential activities that could influence its quality. Trussell Tech prepared a report that will serve as the initial Watershed Sanitary Survey (WSS) and Source Water Assessment for the MPWSP source water – ground-filtered ocean water that is designated as groundwater under the direct influence of surface water (GWUDI). This report fulfills the requirements promulgated by EPA's Surface Water Treatment Regulations and through DDW's Drinking Water Assessment and Protection Program. Mr. Kenny provided support for with slant well sampling and analysis, assessment of brine discharge, and CO_2 emissions. The final WSS report was reviewed and approved by DDW.
Role: *Project Engineer and Technical Advisor*

City of San Diego/ Kleinfelder
Title: North City Water Reclamation Plant Tertiary Filter Capacity Evaluation and Pathogen Study
Year: 2015 – Present
The City of San Diego is in the process of expanding the North City Water Reclamation Plant (NCWRP) in order to supply feed water to a new Advanced Water Purification Facility (AWPF) which will be used to augment the region's water supply portfolio. Trussell Technologies was consulted evaluate the capacity of the filters and to determine the removal of pathogens across the NCWRP treatment process.

California's Water Recycling Criteria limit tertiary filtration rates to 5 gallons per square foot per minute (gpm/sf); however, Trussell Technologies has previously shown that equivalent water qualities can be produced at a higher filtration rate of 7.5 gpm/sf. Trussell Technologies demonstrated to the State Water Resources Control Board Division of Drinking Water that the City of San Diego North City Water Reclamation Plant's tertiary filters have equivalent effluent water quality at a filtration rate of 8.7 gpm/sf as 5 gpm/sf, resulting in approval to operate the filters at 8.7 gpm/sf. This project involved development of the test plan, an update of the Engineering Report, development of the interim operations plan, communication with DDW, support of operations and project team to conduct testing, assessment of results.
Role: *Project Engineer*

City of Calistoga
Disinfection By-Product Control for the Wastewater Treatment Plant and Drinking Water System
2018-2019
Trussell Technologies assisted the City of Calistoga with complying with a Cease and Desist order on the discharge of trihalomethanes to the Napa River; assisted the City with considering optimization disinfection by-product precursor removal at their Kimball Water Treatment Plant; evaluate the use of on-site hypochlorite generation for their Feige Canyon water storage tank; and evaluate alternatives to remove trihalomethanes and haloacetic acids from their North Bay Aqueduct Napa water supply.
Role: *Project Lead*

Ed Macias Jr.

Electrical Inspector/Instrumentation and Controls

Firm
- MNS Engineers, Inc.

Areas of Expertise
- Electrical construction inspection
- Electrical project management
- SCADA
- Instrumentation and controls specialist
- Water and wastewater treatment plant experience
- Public works experience

Years of Experience
- Total: 26
- With MNS: 4

Education
- AS, Electronics Technology, Don Bosco Technical Institute, CA
- AA, Allan Hancock College, CA

Professional Development
- Water Distribution Operators Certification Course for Operators I and II

Office Location
- Ontario, CA

Mr. Macias specializes in electrical construction inspection services for water and wastewater treatment facilities projects. Ed has provided electrical inspection services for various clients such as the Los Angeles County Sanitation Districts (LACSD). He has extensive experience with electrical construction project management and design; electrical engineering startup and modifications of instrumentation and controls; control cabinet design and fabrication; third-party electrical point to point and functional system testing; various volt-free contacts (VFCs) installation; instrumentation and related accessory application, calibration, installation, and internal operation; conduit installation (underground and exposed); and service and repair of wastewater flowmeters and instrumentation. Ed is also experienced with AutoCAD and HMI/SCADA software. His experience includes:

Owner's Agent/Owner's Engineer (OA/OE) Services for the Groundwater Reliability Improvement Program (GRIP), Water Replenishment District of Southern California (WRD), CA. *Construction Inspector.* WRD established the GRIP to find alternative sources of water to offset the imported water used for replenishment in the Montebello Forebay. As part of the GRIP, an advanced water treatment facility (AWTF) is being designed and constructed to treat 10,000 acre feet per year of tertiary recycled water. The GRIP AWTF is located in a 5.2-acre lot, adjacent to the San Gabriel River in the City of Pico Rivera. Treatment processes include automatic strainer to protect downstream membrane treatments systems from large particles; microfiltration (MF) or ultrafiltration (UF) to reduce turbidity and silt density index (SDI) of reverse osmosis (RO) feed water; cartridge filtration to project downstream of the RO process; RO to remove salts, minerals, metal ions, organic compounds, and microorganisms; advanced oxidation with ultraviolet light (UV) treatment using hydrogen peroxide in concert with UV to reduce N-Nitroso-Dimethylamine (NDMA) concentrations and provide additional disinfection, decarbonation to release excess carbon dioxide and stabilize the product water; and pH adjustment/corrosivity stabilization.

Vista Canyon Water Factory, City of Santa Clarita, CA. *Construction Inspector.* This $10M project constructed the Vista Canyon Water Factory—a tertiary wastewater treatment and recycling plant to treat wastewater generated from Vista Canyon Project in accordance with the requirements of California Code of

Regulation, Title 22. During rainy weather, effluent will be conveyed to downstream facilities of the Santa Clarita Valley Sanitation District (SCVSD) facilities. The Water Factory has a design capacity of 392,000 gallons per day (GPD), which generates 371,000 GPD of effluent to be recycled. The wastewater treatment process consists of influent pumping, screening, flow equalization, extended aeration activated sludge, disc filtration, and ultraviolet (UV) disinfection. The facility building's footprint is less than an acre and consists of two separate levels of subterranean construction with the finish floor elevation extending approximately 10 to 19 feet below the surrounding finish grades. The design of the building matches the character of the community while providing protection for the treatment elements. Noise is minimized by the building enclosures and careful selection of equipment. MNS provided comprehensive inspection services for the Water Factory through the construction phase.

New Turn-Out Structures at the San Gabriel River Coastal Basin Spreading Ground, Water Replenishment District of Southern California, CA. *Construction Inspector.* This project constructs two new turn-out structures and associated discharge structures at the San Gabriel River Coastal Basin Spreading Grounds, which will provide needed operational flexibility for the spreading of an additional 11,000 acre-feet per year (AFY) of tertiary recycled water and 10,000 AFY of advanced treated recycled water. Additional work includes shotcrete lining of an existing approximately 6,400-linear-foot distribution channel and the installation of new 66-inch pipelines approximately 500 linear feet along with electrical and instrumentation and control systems.

EM Enterprises, Baldwin Park, CA. *Owner/Operator.* For the past 18 years, Edmudo owned EM Enterprises where he specializes in electrical project management and inspection services for various clients in Los Angeles County. He maintained long-term contracts with LACSD providing electrical project management and inspection. Sample projects include:

- Electrical project management and design at LACSD Carson Joint Water Pollution Control Plant (JWPCP) 85,000 cfm odor control with high Hp Siemens VFCs 3-500 Hp and 2-1000 Hp VFCs.
- Engineering and management for the termination team at OC-88 (7-1,500 Hp pumps with Toshiba 12kV VFCs), Hyperion Primary Sedimentation Battery-A, and 180,000 cfm odor control scrubber system. Interfaced control panels to a US filters skid system with Allen Bradley Control Logix PLCs and 500 Hp Schneider-Electric AltiVar VFCs.
- Complete startup of controls and systems, third-party electrical testing including wire checking, Megger testing, and functional commissioning. Honeywell HVAC commissioning (LACSD Lab/Ops Building in Palmdale).
- Panel and control cabinet design, fabrication, and installation for MAS to UL-508 standards (specification grade). PLCs included Control Logix, Flex I/O, GE Fanuc, Siemens/TI, Modicon, and Honeywell DCS systems with RTU fabrication.
- Panel QC and fabrication for MAS prior to shipping and FAT, wire checks, Megger testing, labeling, checkout for UL-508 conformity. In shop FAT for MWD for a 7-1500 Hp Pump Station (OC-88).
- Design, fabrication, and installation of alarm annunciation panels at LACSD Carson odor control.
- Verified contractor compliance to contract specifications and drawings, NEC Codes, and NFPA-70E.
- Calibration, installation, and operation of relay logic, 4-20mA circuits and instrumentation.
- Field and factory service, warranty repairs, and calibration of ISCO water and wastewater products, water quality monitors, samplers and superior electrical voltage and power monitors/meters.

Manufacturing Automation Solutions. *Project Manager/Project and Field Engineer.* Ed managed a long-term contract for Manufacturing Automation Solutions (MAS) for projects up to $4.5M. Responsibilities included:

- Panel design, integration, layout, fabrication, quality control, FAT, installation and commissioning, and in-house cabinet inspection for UL-508 requirements.
- Design of instrumentation and controls for various MAS projects.
- Ran all MAS field employees and electrical subcontractors at the LACSD Carson odor control project.
- Calibration and startup of control cabinets, SCADA MCCs, VFCs, relay logic, 4-20mA circuits, equipment, and instrumentation.
- Third-party quality assurance for electrical contractors (Clark County Wastewater Reclamation Plant rehabilitation of existing cabinets in the field and shop and Elkhorn Reservoir in Las Vegas, NV).

FLW Inc./RC Hoffman Company, Inc., Costa Mesa, CA. *ISCO Service/Calibration Technician.* Responsibilities included field and factory service, warranty repairs, and calibration of flow-monitoring products, voltage and power monitors, all brands of pH meters, chart recorders, water quality monitors, and liquid samplers.

Jason Mate, CMAA, CPII

Construction Manager

Firm
- MNS Engineers, Inc.

Areas of Expertise
- Water/wastewater projects
- Roadways
- Project management

Years of Experience
- Total: 12
- With MNS: 4

Certifications
- Certified Construction Manager, CMAA (awaiting certificate)
- Certified Public Infrastructure Inspector, APWA (issued 5/5/2017; expires 5/4/2022)
- Concrete Field Testing Technician, ACI Grade 1 (issued 4/20/2017; expires 4/29/2022)
- 10-hour Construction Safety, Cal/OSHA (issued 12/31/2015; no expiration date)

Education
- BEng, Environmental Engineering, minor in Civil Engineering (Honors), Griffith University, Queensland, Australia

Professional Development

Stormwater Pollution Prevention Plan (SWPPP) training

Office Location
- Ontario, CA

Mr. Mate has over 12 years of experience in environmental and civil engineering. Jason's roles have ranged from project engineer, resident engineer, to project manager for several large-scale $500M+ projects involving water/wastewater resources, transportation, and solar energy. His experience includes:

Owner's Agent/Owner's Engineer (OA/OE) Services for the Groundwater Reliability Improvement Program (GRIP), Water Replenishment District of Southern California (WRD), CA. *Construction Manager.* WRD established the GRIP to find alternative sources of water to offset the imported water used for replenishment in the Montebello Forebay. As part of the GRIP, an advanced water treatment facility (AWTF) was designed and constructed to treat 10,000 acre feet per year of tertiary recycled water. The GRIP AWTF is located in a 5.2-acre lot, adjacent to the San Gabriel River in the City of Pico Rivera. Treatment processes included automatic strainer to protect downstream membrane treatments systems from large particles; microfiltration (MF) or ultrafiltration (UF) to reduce turbidity and silt density index (SDI) of reverse osmosis (RO) feed water; cartridge filtration to project downstream of the RO process; RO to remove salts, minerals, metal ions, organic compounds, and microorganisms; advanced oxidation with utraviolet light (UV) treatment using hydrogen peroxide in concert with UV to reduce N-Nitroso-Dimethylamine (NDMA) concentrations and provide additional disinfection, decarbonation to release excess carbon dioxide and stabilize the product water; and pH adjustment/corrosivity stabilization. The 11,700-square-foot treatment facility is LEED certified with approximately 40,000 square feet of additional surface landscape and bioretention, 4,000 square feet of vegetated roof garden, with 79,000 square feet of surface parking and pedestrian hardscape.

El Estero Wastewater Treatment Plant Tertiary Filter Replacement, City of Santa Barbara, CA. *Assistant Resident Engineer.* This $8.4M project replaced the treatment plant's existing filtration system with a microfiltration (MF)/ultrafiltration (UF) facility. Work included demolition of an existing gravity filter, installation of driven concrete piles, construction of a new MF/UF facility, new filter feed pumps, replacement of chemical feed pumps, modifications to the chlorine contact basin, modifications to the reclaimed water storage reservoir, new reclaimed water transfer pumps, yard piping modifications, associated electrical and instrumentation modifications, and other appurtenant work.

New Turn-Out Structures at the San Gabriel River Coastal Basin Spreading Ground, Water Replenishment District of Southern California, CA. *Construction Manager.* This project constructed two new turn-out structures and associated discharge structures at the San Gabriel River Coastal Basin Spreading Grounds, which will provide needed operational flexibility for the spreading of an additional 11,000 acre-feet per year (AFY) of tertiary recycled water and 10,000 AFY of advanced treated recycled water. Additional work included shotcrete lining of an existing approximately 6,400-linear-foot distribution channel and the installation of new 66-inch pipelines approximately 500 linear feet along with electrical and instrumentation and control systems.

Government Wastewater Treatment Plant (WWTP) Upgrade (ICI), Ontario, Canada. *Project Superintendent/Engineer*. This $15M project constructed a new state-of-the-art polymer distribution system for sludge discharge, a new oil handling facility, civil cut/fill operation for new roads and access paths, retrofit of entire WWTP facility including a four-story demolition and reinstallation of concrete slabs and office layout. Project management responsibilities included conformance to stringent government specifications, requests for information (RFIs), monthly draws, cost estimating, close-out reports, document control, weekly contract negotiations and bid approval, quality assurance/quality control (QA/QC) inspections, project scheduling and update (250-line CPM schedule), four-week-look-ahead schedule, operations and maintenance (O&M) manuals, as-built markups, cost and budget management, and weekly client meetings. Project completed successfully on time and within budget; 10% extra work was granted with full use of contingency. The project resulted in a $500K/year savings for client and plant capacity increased from 17M to 22M liters per day.

Utility Scale Solar Farm (30 megawatts) for FIT program with LEED Certification, Ontario, Canada. *Assistant Project Manager/Project Engineer*. This $135M project required CAD layout and pre-side inspection of three utility scale solar farms with road access, module layout, structural footings, cultural excursion zones, racking supports, inverter, structural pads, substation, and interconnection point. Responsibilities included managing the principal contractor (PCL Constructors and RES USA), contract compliance, scheduling milestone and phase construction, problem solving design discrepancies onsite, extra work approvals, and quality assurance/quality control (QA/QC) inspections with 200 manpower onsite daily. Project management tasks included weekly and monthly reporting; monthly draws and cost; requests for information (RFIs); NCR; letters and notices; engineer reporting; chairman meetings; operations and maintenance (O&M) manuals; four-look-ahead forecast schedule; submittal of future project plans, testing plans, permits; contract negotiation; native exclusion zoning; and complete site due diligence for three future solar farm locations.

Two Main Roads Government Projects, Brisbane, Canada. *Site Engineer*. This $700M major roadway infrastructure improvements project involved multiple subprojects: construction of large cut/fill operations, landscaping, and embankments ($7M); installation of 110,000 tons of four-lane highway asphalt ($10M); inner city installation of stormwater drainage and manholes ($1.5M); construction of a new road including diversions and traffic switches, which required 10 to 15 closures per week $1.25M; and installation of heavy-duty structural walls for a new road subgrade and paving ($5M). Detailed and site specific paperwork were created for each project including safe work method statements, process control plans, specification conformance, scheduling, bid analysis, contractor meetings, engineer meetings, permitting (road closure), NCR, requests for information (RFIs), and budgeting. Responsibilities included managing a total of $20-25M as a client engineering representative of AECOM and SKM, contract management, and site engineering.

John Robinson

Principal

John Robinson Consulting, Inc.

Education/Training

BS, Civil Engineering, California State University, Long Beach, 1993

Licenses/Registrations

Engineer in Training – CA

Office Location

Pasadena – CA

Key Experience

- ✓ Facilitator and Technical Advisor for multiple Infrastructure Projects
- ✓ Assisted clients with 50 environmental documents (CEQA, NEPA, EIS and EIR) documents.
- ✓ Provided technical and management support for preliminary design through construction for projects.

Summary

Mr. Robinson's over 25 years of environmental engineering experience has focused exclusively on water reclamation, wastewater engineering, and wastewater master plan projects for municipalities in California and Arizona. He has been the Principal-in-Charge or Project Manager for infrastructure projects that include feasibility/master studies and planning, preliminary and final design, bidding, construction management and commissioning. His project experience includes 15 new water reclamation and wastewater facilities, 4 groundwater treatment projects, 300 miles of sewer, potable water and recycled water pipeline designs, 15 pump stations, 12 groundwater wells and 10 reservoirs and 45 master plans for water, sewer and recycled water.

Mr. Robinson has served as both a principal in charge as well as program manager for approximately fifty (50) environmental documentation projects. As a principal in charge, he has on numerous occasions successfully led my project teams to complete the work within the project budgets and time schedules and with a high degree of responsiveness to the clients. His project experience includes California Environmental Quality Act (CEQA), Environmental Impact Reports (EIRs), Initial Studies (IS) and NEPA for developments, water resource and federal projects.

Relevant Project Experience – Agency Coordinator

Principal-in-Charge, Rosemead Extension, City of Rosemead, CA - Mr. Robinson managed the preliminary and final design and construction services for 6000-LF of 18-inch CML&C Steel and Ductile Iron Pipe alternate recycled water pipeline within the City of Rosemead. The project serves approximately 510 AFY to three adjacent irrigation customers.

Centralized Groundwater Treatment System, City of Monterey Park – Owner's representative for the permitting of the Centralized Groundwater Treatment System (CGTS) project that involves the permitting and approval from SWRCB DDW and USEPA for the treatment of groundwater pumped from the South El Monte Operable Unit. Permitting agency efforts includes the development of a 97-005 report as well as a Title 22 report both for DDW review and approval. Mr. Robinson is coordinating with the City for the Department of Water Resources Proposition 84, Round 3 funding of approximately $4.0M as well as assisting staff in the daily inspection of the facility that is being constructed as a part of a design/build.

Project Manager, Whittier Narrows Water Recycling Project Phase IIA-Pipeline and Pump Station Expansion, Upper San Gabriel Valley Municipal Water District, CA - The facilities for the project include a pump station and reservoir at the County Sanitation Districts of Los Angeles County Whittier Narrows Water Reclamation Plant and approximately 18,000 linear feet of pipeline.

Project Manager, Hollydale Pump Station and Pipeline, Central Basin Municipal Water District and City of Vernon, South Gate, CA - Mr. Robinson's responsibilities included the preliminary design, design, and construction management of the Hollydale Pump Station located in the City of South Gate and approximately 8,000 linear feet of 12-and 18-inch recycled water pipeline to supply Marburg Generation Station. Part of the planning of the system included the ENVISION rating system. The facilities were in partnership between Central Basin Municipal Water District and City of Vernon.

Principal In Charge, 2015 Urban Water Management Plan, Foothill Municipal Water District, La Canada Flintridge, CA - Mr. Robinson's responsibilities included three (3) workshops involving staff members from FMWD, their 8 member agencies, City of Pasadena, City of Glendale and Metropolitan Water District. The first two meetings were to discuss short term emergency storage and supply issues and the 2nd workshop as to discuss long term emergency storage and supply issues. The 3rd workshop included the general manager of the agencies and reviewed the conclusions from the previous workshops and further developed next steps to secure the service area during short and long term emergencies.

QA/QC, Highland Pump Station, Yorba Linda Water District, CA - Mr. Robinson provided a QA/QC review for the new pump station that will include a combination of natural gas pumps and electric pumps to provide redundancy for this critical facility. Part of the planning of the system included the ENVISION rating system. The pump station will be in a new building with a separate electrical room. Backup power to the electric motors will be provided from the existing natural gas generator that was constructed in 2004. The pump station will be located adjacent to the existing Highland Reservoir and very close to an existing residence.

Relevant Project Experience – Environmental Assistance

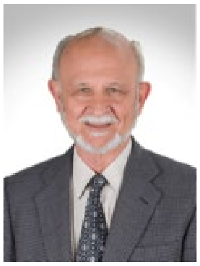
Program EIR and Permitting, Recycled Water Distribution System, Central Basin Municipal Water District, Commerce, CA. – Mr. Robinson prepared environmental compliance and permitting for the construction of 25 miles of recycled water distribution pipelines in existing city streets for the cities of East Los Angeles, Commerce, Montebello, Pico Rivera, West Whittier- Los Nietos and Whittier. Part of the planning of the system included the ENVISION rating system. The analysis complied with the EIR environmental requirements of the State Water Resources Control Board since the project sought State Revolving Fund (SRF) loans and grants.

Program EIR and Permitting, Recycled Water Distribution System, San Gabriel Valley Municipal Water District, Azusa, CA. – Mr. Robinson prepared environmental compliance and permitting for the construction of 15 miles of recycled water distribution pipelines in existing city streets for the cities of Alhambra and Montebello. Part of the planning of the system included the ENVISION rating system. The analysis complied with the EIR environmental requirements of the State Water Resources Control Board since the project sought State Revolving Fund (SRF) loans and grants.

CEQA Compliance and Permitting, Recycled Water Distribution System Phase IIB, Upper San Gabriel Valley Municipal Water District, West Covina, CA. – Mr. Robinson prepared environmental compliance and permitting for the construction of 12 miles of recycled water distribution pipelines in existing city streets and three aboveground steel tank reservoirs to be sited in the existing residential neighborhoods of the cities of West Covina and Walnut. Part of the planning of the system included the ENVISION rating system. The analysis complied with the CEQA-Plus environmental requirements of the State Water Resources Control Board since the project sought State Revolving Fund (SRF) loans and grants.

Environmental and Permit Tasks Leader, Mid-Valley Pipeline CEQA and Permitting, CVWD, Coachella, CA. – Mr. Robinson completed CEQA compliance (Subsequent EIR) and obtained permits for the pumping station and 7-mile-long pipeline project to serve Coachella Canal water to up to 50 golf courses. Permits included USACE Clean Water Act (CWA) section 404 Nationwide Permit, Regional Board CWA section 401 Water Quality Certification, California Department of Fish and Game Streambed Alteration Agreement, and a modification of CVWD Water Reclamation Plant No. 10 operation permit. Mr. Robinson oversaw a wetland jurisdiction delineation and delineations of waters of the State and waters of the US for the channel and negotiated onsite and offsite mitigation measures.

Project Scientist, Federal Environmental Impact Analyses, US Army Corps of Engineers, Bureau of Reclamation, Fort Irwin, CA. – Mr. Robinson has prepared environmental impact analyses under NEPA for the USACE, the US Navy, the Engineering Staff at Fort Irwin, California, and the US Bureau of Reclamation (Boulder City, Yuma, and Sacramento offices). He has also prepared environmental documents under NEPA regulations of the United States Agency for International Development (USAID). Mr. Robinson prepared an Environmental Assessment (EA) for USACE on wastewater conveyance and disposal facilities in Prado Basin, a wetland habitat containing several endangered bird species, and developed construction mitigation measures with the US Fish and Wildlife Service.



R. Rhodes Trussell, Ph.D., P.E., BCEE

Trussell Pasadena Office

EDUCATION

- Ph.D., Sanitary Engineering, *University of California, Berkeley*
- M.S., Sanitary Engineering, *University of California, Berkeley*
- B.S., Civil Engineering, *University of California, Berkeley*
- Graduate, *Stanford Executive Program*

REGISTRATION

Civil Engineer, State of California – No. 25107 Issued: 2/12/75 Exp: 12/31/21
Corrosion Engineer, State of California – No. 745 Issued: 3/9/77 Exp: 9/30/21

CERTIFICATION

Board Certified Environmental Engineer, American Academy of Environmental Engineers – No. 89-30012 Issued: 1/1/90 Exp: 12/31/20

HONORS

1995 National Academy of Engineering
2001 AAMWA Boyd Award
2005 AEESP/AAEE Pohland Medal
2010 AWWA Black Award
2012 IWA's Global Water Award
2013 NWRI Clarke Prize

ORGANIZATIONS:

- American Association of Environmental Engineering Professors (Associate)
- American Chemical Society
- American Society of Civil Engineers
- American Institute of Chemical Engineers
- American Water Works Association (Life Member)
- California Water Pollution Control Association
- International Water Association
- National Association of Corrosion Engineers
- Sigma Xi - The Scientific Research Society of North America
- Water Environment Federation

SUMMARY

Dr. Trussell is recognized worldwide as an authority in the field of water treatment. His career has been characterized by the use of fundamental scientific principles and research to effectively design water treatment plants and improve treatment technologies. He is often called upon to help utilities effectively manage critical projects involving regulatory authorities and public health. Dr. Trussell has also for more than 40 years maintained an active practice in the corrosion of materials in water systems, having conducted more than a dozen pipe-loop tests. Dr. Trussell was awarded the 2013 Clarke Prize from the National Water Research Institute, for his extraordinary accomplishments. Dr. Trussell has authored more than 200 publications. He has worked on the process designs for dozens of treatment plants, ranging from 1 to more than 900 mgd in capacity, and has experience with numerous physiochemical and biological processes. Dr. Trussell is available to review and advise on any complex water quality problem.

PROJECT EXPERIENCE *(Select Projects)*

Stanislaus Regional Water Authority/ West Yost Associates

Title: Regional Surface Water Supply Project
Year: 2016 - Present

Driven by historic drought conditions, degradation of groundwater supplies, and declining groundwater levels, the Stanislaus Regional Water Authority is seeking to develop a reliable supplemental surface water supply. Trussell Tech led the evaluation of the proposed source water, reviewed historical water quality data, and developed a sampling plan to address any data gaps. The sampling plan defined parameters to be analyzed, analytical methods, and sampling

frequency. Trussell Tech worked with DDW to gain approval of the proposed source water monitoring, and reviewed the collected data and prepared a technical report summarizing the results. In addition, Trussell Tech evaluated treatment alternatives for the new source water. This included the development of treatment goals, evaluation of source water impacts, and recommendation of treatment processes. Trussell Tech executed a bench-scale testing plan to evaluate the impacts of enhanced coagulation using jar tests and ozonation using solution ozone testing. The test plan included an evaluation of DBP formation, as well as process performance of coagulation, sedimentation, and ozonation. Trussell Tech performed all necessary data analysis and prepared a report summarizing the results. Currently, Trussell Tech is providing technical guidance on treatment process selection and RFP documents for the selection of a Design-Build firm to construct the new 15 MGD surface water treatment plant, with projected expansion to 45 MGD.
Role: *Technical Advisor*

Hazen and Sawyer/New York Department of Environmental Protection (NYDEP)
Title: Catskill/Delaware Water Supply Blue Ribbon Expert Panel
Date: 2018 – Present
Dr. Rhodes Trussell is on the second year of a seven year assignment to serve on the Blue Ribbon Expert Panel appointed to advise Hazen and Sawyer and the New York Department of Environmental Protection (NYDEP) in completing bench testing, pilot testing, process selection, and conceptual design for a future filtration plant for the Catskill/Delaware water supplies. The Catskill/Delaware sources have met the criteria for waiving the United States Environmental Protection Agency requirements per the Surface Water Treatment Rule (SWTR) since EPA's SWTR came into effect in 1993, but the waiver requires that the NYDEP complete a preliminary design and cost estimate so that filtration can be quickly implemented should the supply fail to meet the requirements of the waiver in the future.

Davis-Woodland JPA/ West Yost Associates
Title: Davis-Woodland Water Supply Project
Year: 2009 – 2016
The Cities of Davis (Davis) and Woodland (Woodland) and the University of California at Davis (UC Davis) are working in partnership to develop a regional water supply for this "new" water supply integration project. The Davis-Woodland Water Supply Project (DWWSP) is intended to divert and treat Sacramento River water and convey the resulting potable water to the project partners. Trussell Technologies, Inc. was hired by West Yost to assist with treatment process selection, procurement document preparation and permitting for the Davis-Woodland Water Supply Project (DWWSP). As part of this project, Trussell Technologies has conducted a detailed analysis of historical and current water quality of the Sacramento River; prepared a report of the occurrence and treatment of synthetic organic chemicals, including pharmaceuticals and personal care products (PPCPs) and endocrine disrupting chemicals (EDCs), in the Sacramento River; conducted bench-scale tests assessing enhanced coagulation, disinfection by-product formation and ozone demand of this water; prepared permitting documents for submittal to CDPH, participated in process train selection and conceptual-level facility design for a new 40 mgd treatment facility; and assisted in preparation of procurement documents for selection of a Design-Build-Operate team to construct and operate this new 40 mgd surface water treatment facility.
Role: *Technical Director*

City of Woodland
Title: Surface Water Project
Year: 2016
Trussell Tech worked with the City of Woodland to address issues related to colored water in its distribution system after integration of a new surface water supply into it's historically groundwater distribution system. Trussell Tech assembled a panel of corrosion experts to review water quality and distribution system data to understand the cause of the colored water and plan for implementation of additional monitoring, and recommended solutions.
Role: *Technical Advisor/ Expert Panel Leader*

California American Water

Title: Owner's Representative for Monterey Peninsula Water Supply Project

Year: 2014 – Present

California American Water (CAW) is pursuing the Monterey Peninsula Water Supply Project (MPWSP) to develop a new water supply to replace the region's existing reliance on the Carmel River and Seaside Aquifer. This project includes a new desalination facility to produce drinking water from seawater pulled from the Pacific Ocean via beach wells, the potential for expansion of CAW's current Aquifer Storage and Recovery activities, and related facilities (pipelines and desalination brine disposal). Trussell Tech, with expertise in desalination, post treatment, corrosion control, and DDW permitting, is serving as the owner's representative for the MPSWP with regards to these topics. Trussell Tech is assisting CAW with development of the seawater desalination facility conceptual design, consisting of pretreatment, reverse osmosis, post-treatment, and disinfection; technical guidance during the Design Build procurement process, including RFP document preparation; and application to Proposition 50 grant funding. Trussell Tech is also working with CAW to ensure a smooth permitting process with DDW on this new water supply and treatment plant, by facilitating meetings and providing technical and scientific guidance on the necessary monitoring and treatment processes to meet current and future regulations. In addition, because bringing a new water supply into an existing distribution system has the potential to create corrosion issues and consumer complaints, Trussell Tech is working with CAW to pre-emptively understand the situation and develop strategies to minimize future distribution system issues.

Role: *Technical Advisor*

EBMUD/ MWH

Mokelumne Aqueduct Corrosion Optimization Study

Year: 2014 – 2016

Trussell Tech performed an evaluation of corrosion control strategies for the East Bay Municipal Utilities District (EBMUD). The cement mortar lining (CML) in two of EBMUD's aqueducts had shown signs of deterioration and EBMUD hired the Trussell Tech/MWH team to evaluate different aqueduct lining alternatives and various water quality strategies to manage corrosion. Dr. Trussell served as a Technical Advisor to the team, who began by reviewing the historical and existing corrosion control strategies and the condition of the existing linings. The team developed a framework for defining the potential aqueduct lining materials and water quality options. The team worked with EBMUD to refine the water quality goals and establish design criteria for improvements to the stabilization treatment technologies, including the addition of lime, CO_2, and caustic to maximize treatment efficiency and protect pipes in the distribution system.

Role: *Technical Advisor*

MWH/San Francisco Public Utilities Commission

Title: Comprehensive Report on Lead and Copper Rule Compliance

Date: 2005 - 2006

Working with MWH, Trussell Tech was retained to prepare a comprehensive report on the implementation of the lead and copper rule in the San Francisco Water System, and in the Regional Water Systems also served by SFPUC. The study addressed past and current practice, compared it to the practices of several other U.S. cities treating similar water supplies and recommended pH adjustment as corrosion control treatment. The study also included an extensive assessment of the impact of this strategy on the protection of cement-based assets in the system and made recommendations to maximize their protection. Finally, the study examined the rationale for water quality parameters in the system to address lead and copper rule requirements. In the end all the recommendations of the study were approved by CDHS.

Role: *Project Manager*

James Vickers, P.E.
President

Education:

B.S., Chemical Engineering - Youngstown State University 1982
MS Engineering Management – George Washington University 1991

Registrations/Certifications:

Registered Professional Engineer in California CH 5979, issued 6/1/2000, expires 9/30/2020

Professional Affiliations:

AWWA, AMTA

Employment History:

Separation Processes, Inc. 2000 - Present
Malcolm Pirnie, Inc. 1993 – 2000
Memtec America Corporation 1988 – 1993
Filterite (Brunswick-Memtec America Corp) 1984 - 1988

Area of Expertise:

Microfiltration
Ultrafiltration
Nanofiltration
Reverse Osmosis
Drinking Water Treatment
Coagulation & Process
PLC/SCADA

Years of Experience:

36

Years with SPI:

20

Office Location:
Carlsbad, CA

Mr. Vickers is President of SPI and a nationally recognized authority in membrane treatment processes used for recycled water and drinking water treatment. His expertise covers over 36 years with MF/UF/NF/RO membrane technology including membrane procurement, piloting, design, commissioning and operational support. Mr. Vickers is a primary reviewer of the AWWA MF and UF Manual of Practice (MOP) and author of the chapters on membrane system design and cost. He is also one of the primary authors of the USEPA Membrane Filtration Guidance Manual. Mr. Vickers is the former chair of the AWWA Membrane Process Committee.

Mr. Vickers has a detailed understanding of membrane integrity and regulatory compliance issues. He has recently developed a concept for automated conductivity profiling for characterizing RO membrane LRVs. This concept has won awards from the USBR crowd sourcing prize as part of its Pathogen Challenge program. He has also obtained a provisional patent to allow for further development. He recently received the 'best paper award' for his conductivity profiling paper presented at the AMTA/AWWA Membrane Technology conference in 2019.

EXPERIENCE

YUCAIPA VALLEY WATER DISTRICT
Yucaipa Valley Regional Water Filtration Facility, Yucaipa, CA (2002–Present)
Project Manager – Jim is the Project Manager for the membrane system design of a 12 mgd MF and 6 mgd NF membrane treatment facility. SPI has assisted the District with various phases of the project including, MF procurement, MF and NF pilot testing, NF membrane procurement, membrane system engineering design, construction services, O&M Manual preparation and provided commissioning and start-up services. The facility was recognized as the 2010 AMTA Plant of the Year.

YUCAIPA VALLEY WATER DISTRICT
NF SCRAM Project, Yucaipa, CA (2009-Present)
Project Manager – Jim is the Project Manager for the membrane system design of a 3 mgd NF membrane treatment system expansion to the facility. SPI developed the basis of design, contract drawings and specification for a 95 percent recovery NF system that will increase the overall NF system recovery to 98 percent.

SAN PATRICIO MUNICIPAL WATER DISTRICT
20 mgd Facility Expansion Study, Ingleside, TX (2012–Present)
Project Manager – Jim is the Project Manager for the development of a facility plan to increase facility capacity by 20 mgd. The facility planning study assessed the conditions of the existing facilities, evaluated hydraulic limitations, and determined which structures would be retained, abandoned or modified. The study also included the development of a 12 mgd expansion alternative using a non-proprietary (universal) membrane system design. The output of the project will be used to develop a sequence of improvements necessary to expand the facilities.

SAN PATRICIO MUNICIPAL WATER DISTRICT
2013 TPCO Expansion Project, Ingleside, TX (2012–Present)
Project Manager – The project is for the expansion of the 16.55 mgd Plant C Facility to 19.4 mgd using Pall microfiltration. Jim is the Project Manager and membrane process design engineer for this facility which commenced operation in 2000. The Project includes new sedimentation basins, chemical feed equipment and storage facilities as well as additional Pall Membrane Filtration Equipment.

SAN PATRICIO MUNICIPAL WATER DISTRICT
Ingleside Facility Planning Study (2012-2014)
Project Manager – Jim was the project manager to identify the site constraints of the District facilities located in Ingleside Texas. Expansion requirements and phasing alternatives were developed to increase the capacity of the Plant C facility from 19.4 mgd to 32 mgd using a Universal Membrane Filtration System for the expansion. SPI developed facility and equipment requirements and developed a layout for a Universal Membrane System

MONTEREY REGIONAL WATER POLLUTION CONTROL AUTHORITY
Advanced Water Treatment Facility (2016 – present)
Technical Specialist – Developed plans and specifications for the procurement of a 6 mgd Universal Membrane Filtration system designed to accommodate membranes from 4 different suppliers (Pall, Toray, Dow, Scinor). Prepared the technical specification, developed programming and control requirements and selected equipment to satisfy the individual requirements

WEST BASIN MUNICIPAL WATER DISTRICT
Universal Membrane Filtration System, Los Angeles, CA (2013-Present)
Project Manager – As Project Manager and design engineer for a universal "non-proprietary" microfiltration/ ultrafiltration system that can test up to 3 membrane modules using the same or different operating conditions, Jim developed P&ID's, and equipment layout and requirements, as well as specification for the major component equipment.

WEST BASIN MUNICIPAL WATER DISTRICT
Portable Membrane Filtration System, Los Angeles, CA (2013-Present)
Quality Control Engineer – Jim was the engineer for a 1.0 mgd "non-proprietary" microfiltration/ultrafiltration system that will be used by the District to augment its existing membrane treatment capacity at various sites. He reviewed the project specifications and proposal offerings of various equipment suppliers for conformance to the project requirements.

YUCAIPA VALLEY WATER DISTRICT
Wochholz WISE Project, Yucaipa, CA (2010-2013)
Project Manager – Jim was the Project Manager for the design of a new 2.5mgd RO system in order to reduce salinity in Title 22 reclaimed water in order to achieve groundwater basin objective. SPI was the prime consultant for the various phases of the project including, Conceptual Design, Detailed Design, and Construction Management and start up.

GROUNDWATER REPLENISHMENT SYSTEM, ORANGE COUNTY, CA (2013-2016)
Construction Manager (Subcontractor) – Jim is assisting with the construction and start-up of the 30 mgd expansion (100 mgd total) Microfiltration and Reverse Osmosis system to treat secondary effluent for injection into the seawater intrusion barrier and for aquifer recharge. His responsibilities included oversight of the start up for microfiltration reverse osmosis and chemical feed systems.

ORANGE COUNTY WATER DISTRICT
Groundwater Replenishment System, Orange County, CA (2016-present)
Project Advisor/Extension of District Staff– Jim is currently assisting the District as a Project Advisor/Extension of the District Staff for the design of the 30mgd Final Expansion (130mgd total). His responsibilities include preparation of procurement documents, review of Technical Memorandums and other deliverables developed by the design engineer.

GROUNDWATER REPLENISHMENT SYSTEM, ORANGE COUNTY, CA (2013-PRESENT)
SARI Feasibility Study Water Quality Specialist (Subcontractor) – Jim is assisting with analysis of alternatives necessary to expand the GWRS system from 100 mgd to 130 mgd. Microfiltration and Reverse Osmosis and Advanced oxidation will be used to system to treat secondary effluent for injection into the seawater intrusion barrier and for aquifer recharge. His responsibilities included analysis and commentary regarding the water quality available from OCSD's Plant 1 and Plant 2 to determine the impact on MF and RO processes as a function of water quality.

APPENDICES

APPENDIX 1. RESUMES

APPENDIX 2. ACCEPTANCE LETTER

ACCEPTANCE LETTER

Company Name: GHD Inc.

Address: 175 Technology Drive, Suite 200, Irvine, CA 92618

Telephone: P 949 585 5200

Subject: Solicitation for Professional Engineering Design Services for the 16 MGD Oliver P. Roemer Water Filtration Facility Expansion Project

By my signature below, I, on behalf of the Company named above, acknowledge that I have read and understand the subject solicitation and all its attachments. I further acknowledge that, by submission of a submittal, proposal, quotation, or bid in response to the subject solicitation, the Company named above accepts all the terms and conditions, and meets the minimum requirements set forth in the subject solicitation and its attachments, including, but not limited to, the Sample Agreement for Professional Services Standard Terms and Conditions.

ACCEPTED:

Signature

Paul Hermann, CPEng
Name (please print)

Principal / Vice President
Title

1.15.2020
Date

about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

Jamal Awad, PhD, PE
Jamal.Awad@ghd.com
949.585.5235

www.ghd.com

EXHIBIT D

West Valley Water District

AGREEMENT FOR PROFESSIONAL SERVICES

with

GHD Inc.

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AGREEMENT FOR PROFESSIONAL SERVICES

This AGREEMENT FOR PROFESSIONAL SERVICES ("Agreement") effective as of this ___th day of _________, 2020 ("Effective Date") is by and between West Valley Water District ("District") and GHD Inc. ("Consultant"). The District and Consultant may be collectively referred to as the "Parties" and individually as a "Party."

RECITALS

A. The Parties desire to enter into this Agreement for the purpose of setting forth the terms and conditions upon which Consultant shall provide certain services to District.

NOW, THEREFORE, THE PARTIES HEREBY AGREE AS FOLLOWS:

Section 1. <u>Term of Agreement</u>.

(a) Subject to subsection (b) below, the term of this Agreement will be for a period of one (1) year commencing on the Effective Date and terminating one (1) year after the Effective Date.

(b) This Agreement shall renew automatically for continuous one (1) year periods for no more than two (2) additional years, unless either Party, prior to the end of the existing one (1) year period, delivers written notice to the other Party, that the Agreement shall not be extended.

Section 2. <u>Scope and Performance of Services</u>.

2.1 (a) District may, from time to time, by written instructions from the general manager or assistant general manager of the District ("Authorized Representative") issue task orders ("Task Orders") to the Consultant. The Task Order shall be in such form and content as shall be set forth on Exhibit "A" attached hereto and by this reference incorporated herein. The Task Order shall set forth: (i) the scope of services to be performed by Consultant; (ii) the compensation to be paid to Consultant; and (iii) the time to complete the Task Order. The provisions of this Agreement shall apply to all such Task Orders.

(b) For each Task Order, Consultant shall confer, as requested, with District representatives to review progress of work elements, adherence to work schedule, coordination of work, scheduling of review and resolution of problems which may develop.

2.2 Consultant will furnish all of the labor, technical, administrative, professional and other personnel, all supplies and materials, equipment, printing, vehicles, transportation, office space and facilities, and all tests, testing and analyses, calculation, and all other means whatsoever, except as otherwise expressly specified in this Agreement, necessary or proper to perform and complete the services required of Consultant under this Agreement.

2.3 Consultant's designated representative(s) who are authorized to act on its behalf and to make all decisions in connection with the performance of services under this Agreement are listed in Exhibit "B" attached hereto and by this reference incorporated herein ("Key Personnel").

2.4 Consultant represents and warrants that it has the qualifications, experience and facilities necessary to properly perform the services required under this Agreement in a thorough, competent and professional manner. Notwithstanding Section 3 below, in the event Consultant utilizes the services of subcontractors or sub-consultants, Consultant assumes sole and complete responsibility for the performance of the subcontractor or sub-consultant to the specifications provided hereunder for Consultant's work, and no adjustment will be made to Consultant's requirements under this Agreement for timely completion of services, complete performance of services, or delivery of products or deliverables in a timely fashion, and no adjustment will be made to performance deadlines, or compensation due to Consultant, due to or arising from issues Consultant may have with any subcontractor or sub-consultant. Consultant will at all times faithfully, competently and to the best of its ability, experience and talent, perform all services described in this Agreement. In meeting its obligations under this Agreement, Consultant shall employ, at a minimum, generally accepted standards and practices utilized by persons engaged in providing services similar to those required of Consultant under this Agreement.

Consultant warrants it will perform its engineering and design under the Task Order, as more particularly described in Exhibit "A" ("Task Order") in accordance with the current standards of care and diligence normally practiced by recognized engineering and design firms in performing services of a similar nature. Further, Consultant warrants that the engineering and design performed has been performed in accordance with the then current standards of care and diligence normally practiced by recognized engineering and design firms in performing services of a similar nature. If within one (1) year after substantial completion of the engineering and design work it is shown that there is an error in that work as a result of the Consultant's failure to meet those standards and the District has notified the Consultant in writing of any such error within that period, Consultant shall re-perform such engineering and design work within the original scope of such services, as may be necessary to remedy such error. All costs incurred by Consultant in performing such corrective services shall be the sole responsibility of the Consultant and such costs shall not be reimbursable in any way.

Section 3. Additional Services and Changes in Services

3.1 Consultant will not be compensated for any services rendered in connection with its performance of this Agreement that are in addition to or outside of those set forth in the Task Orders, unless such additional services are authorized in advance and in writing by District.

3.2 If Consultant believes that additional services are needed to complete a Task Order, Consultant will provide the Authorized Representative with written notification describing the proposed additional services, the reasons for such services, and a detailed proposal regarding cost.

3.3 District may order changes to a Task Order, consisting of additions, deletions, or other revisions, and the compensation to be paid Consultant will be adjusted accordingly. All such changes must be authorized in writing, and executed by Consultant and District. The cost or credit to District resulting from changes in a Task Order will be determined by the written agreement between the Parties.

Section 4. Familiarity with Services and Site.

4.1 By executing this Agreement, Consultant warrants that Consultant shall, prior to undertaking a Task Order:

(a) investigate and consider the services to be performed;

(b) carefully consider how and within what time frame the services should be performed;

(c) understand the facilities, difficulties, and restrictions attending performance of the services under a Task Order; and

(d) possesses all licenses required under local, state or federal law to perform the services contemplated by a Task Order, and maintain all required licenses during the performance of such Task Order.

4.2 If services involve work upon any site, Consultant warrants that Consultant has or will investigate the site and will be fully acquainted with the conditions there existing, before commencing its services under a Task Order. Should Consultant discover any latent or unknown conditions that may materially affect the performance of services, Consultant will immediately inform District of such fact and will not proceed except at Consultant's own risk until written instructions are received from the District.

Section 5. Compensation and Payment.

5.1 Subject to any limitations set forth in this Agreement, District agrees to pay Consultant the amounts shown in a Task Order.

5.2 Each month during the existence of a Task Order, Consultant shall furnish District with an original invoice for all services performed and expenses incurred during the preceding month in accordance with the fee schedule set forth in the Task Order. The invoice must detail charges by the following categories: labor (by subcategory), reimbursable costs, subcontractor contracts and miscellaneous expenses. The invoice must list, as applicable, the hours worked and hourly rates for each personnel category, the tasks performed, the percentage of the task completed during the billing period, the cumulative percentage completed for each task, and the total cost of the services.

5.3 District will independently review each invoice submitted by Consultant to determine whether the work performed and expenses incurred are in compliance with this Agreement. In the event that no charges or expenses are disputed, the invoice will be approved and paid. In the event any charges or expenses are disputed by District, the original invoice will be returned by District to Consultant for correction and resubmission.

5.4 Except as to any charges for work performed or expenses incurred by Consultant that are disputed by District, District will use its best efforts to cause Consultant to be paid within thirty (30) days of receipt of Consultant's invoice.

5.5 No payment or partial payment to Consultant shall constitute acceptance of any work completed by Consultant or waive any claims by the District for any reason whatsoever.

Section 6. **<u>Required Documentation Prior to Performance</u>**.

6.1 Consultant will not perform any services under this Agreement until:

(a) Consultant furnishes proof of insurance ("Insurance") as required under Exhibit "C" attached hereto and by this reference incorporated herein; and

(b) Consultant provides District with a Taxpayer Identification Number.

6.2 The District will have no obligation to pay for any services rendered by Consultant in advance of receiving written authorization to proceed for each Task Order, and Consultant acknowledges that any such services are at Consultant's own risk.

Section 7. **<u>Project Documents</u>**.

7.1 All original maps, models, designs, drawings, photographs, studies, surveys, reports, data, notes, computer programs, files and other documents (collectively, "Project Documents") prepared, developed or discovered by Consultant in the course of providing services under this

Agreement will become the sole property of District and may be used, reused or otherwise disposed of by District without the permission of Consultant. Consultant will take such steps as are necessary to perfect or protect the ownership interest of District in such Project Documents. Upon completion, expiration or termination of this Agreement, Consultant shall turn over to District all such original Project Documents in its possession; provided, however, that Consultant may retain copies of Project Documents.

7.2 Except as necessary for the performance of services under this Agreement, no Project Documents prepared under this Agreement, will be released by Consultant to any other person or entity without District's prior written approval. All press releases, including graphic display information to be published, must be approved and distributed solely by District, unless otherwise agreed to in writing by District.

Section 8. **<u>Consultant's Books and Records</u>**.

8.1 Consultant shall maintain any and all documents and records demonstrating or relating to Consultant's performance of services under this Agreement. Consultant shall maintain any and all ledgers, books of account, invoices, vouchers, canceled checks, or other documents or records evidencing or relating to work, services, expenditures and disbursements charged to District under this Agreement. Any and all such documents or records must be maintained in accordance with generally accepted accounting principles and must be sufficiently complete and detailed so as to permit an accurate evaluation of the services provided by Consultant under this Agreement. Any and all such documents or records must be maintained for three (3) years following the final payment for each Task Order.

8.2 Any and all records or documents required to be maintained by this section must be made available for inspection, audit and copying, at any time during regular business hours, upon written request by District or its designated representatives. Copies of such documents or records must be provided directly to District for inspection, audit and copying when it is practical to do so; otherwise, unless an alternative is mutually agreed upon, such documents and records must be made available at Consultant's address indicated for receipt of notices in this Agreement.

8.3 Where District has reason to believe that any of the documents or records required to be maintained by this section may be lost or discarded due to dissolution or termination of Consultant's business, District may, by written request, require that custody of such documents or records be given to a person or entity mutually agreed upon and that such documents and records thereafter be maintained by such person or entity at Consultant's expense. Access to such documents and records shall be granted to

District, as well as to its successors-in-interest and authorized representatives.

Section 9. <u>Status of Consultant</u>.

9.1 Consultant is and will at all times remain a wholly independent contractor and not an officer or employee of District. Consultant has no authority to bind District in any manner, or to incur any obligation, debt or liability of any kind on behalf of or against District, whether by contract or otherwise, unless such authority is expressly conferred under this Agreement or is otherwise expressly conferred in writing by District.

9.2 The personnel performing the services under this Agreement on behalf of Consultant will at all times be under Consultant's exclusive direction and control. Neither District, nor any elected or appointed boards, officers, officials, employees or agents of District, will have control over the conduct of Consultant or any of Consultant's officers, subcontractors or sub-consultants, employees or agents, except as provided in this Agreement. Consultant warrants that it will not at any time or in any manner represent that Consultant or any of Consultant's officers, employees or agents are in any manner officials, officers, employees or agents of District.

9.3 Neither Consultant, nor any of Consultant's officers, employees or agents, will obtain any rights to retirement, health care or any other benefits which may otherwise accrue to District's employees. Consultant expressly waives any claim to any such rights or benefits.

Section 10. <u>Compliance with Applicable Laws</u>.

Consultant shall keep itself informed of and comply with all applicable federal, state and local laws, statutes, codes, ordinances, regulations and rules in effect during the term of this Agreement.

Section 11. <u>Conflicts of Interest</u>.

Consultant covenants that neither Consultant, nor any officer, principal nor employee of its firm, has or will acquire any interest, directly or indirectly, that would conflict in any manner with the interests of District or that would in any way hinder Consultant's performance of services under this Agreement. Consultant further covenants that neither Consultant, nor any officer, principal or employee of its firm will make, participate in the making, or in any way attempt to use the position of Consultant to influence any decision of the District in which Consultant knows or has reason to know that Consultant, or any officer, principal or employee of Consultant has a financial interest as defined in Government Code section 87103.

Section 12. Confidential Information; Release of Information.

12.1 All information gained or work product produced by Consultant in performance of this Agreement will be considered confidential to the full extent permitted by law, unless such information is in the public domain or already known to Consultant. Consultant shall not release or disclose any such information or work product to persons or entities other than District without prior written authorization from an Authorized Representative, except as may be required by law.

12.2 Consultant, its officers, employees, or agents, shall not, without prior written authorization from an Authorized Representative or unless requested by the District counsel, voluntarily provide declarations, letters of support, testimony at depositions, response to interrogatories or other information concerning the work performed under this Agreement. Response to a subpoena or court order will not be considered "voluntary" provided Consultant gives District notice of such court order or subpoena.

12.3 If Consultant, or any officer, employee, or agent of Consultant, provides any information or work product (including Project Documents) in violation of this Agreement, then District shall have the right to reimbursement and indemnity from Consultant for any damages, costs and fees, including attorneys' fees, caused by or incurred as a result of Consultant's conduct.

12.4 Consultant shall promptly notify District should Consultant, its officers, employees, or agents be served with any summons, complaint, subpoena, notice of deposition, request for documents, interrogatories, request for admissions or other discovery request, court order or subpoena from any party regarding this Agreement and the services performed under this Agreement. District retains the right, but has no obligation, to represent Consultant or be present at any deposition, hearing or similar proceeding. Consultant agrees to cooperate fully with District and to provide District with the opportunity to review any response to discovery requests provided by Consultant. However, this right to review any such response does not imply or mean the right by District to control, direct, or rewrite such response.

Section 13. Indemnification.

Consultant covenants and agrees that, during the term of this Agreement, any injury suffered as a result of Consultant's services shall be the sole responsibility of Consultant and its successors and assigns and District shall not be liable to Consultant, or any other person or persons whatsoever for any such injury, loss or damage to persons or property unless caused by the negligence or intentional acts of District or its Representatives (as defined below). Consultant shall defend, indemnify and hold District, its officers, directors and Representatives ("District Indemnitees") harmless from and against any and all claims, costs, liabilities, debts, demands, suits, actions, causes of action, obligations, proceedings, damages, judgments, liens and expenses of whatever nature, including attorneys' fees and disbursements (collectively, "Claims") which may be made against the District Indemnitees arising out of or in connection with (a) the retention by District of Consultant's services; (b) the performance of or failure to perform, the work covered by this Agreement which is caused or occasioned by any act, action, neglect on the part of Consultant, or its Representatives, in the performance of this Agreement and the work to be done under this Agreement; (c) the death and/or injury to any person or damage to any property (real or personal) and/or economic loss which may be caused or is claimed to have been caused, by the negligence, act or omission of Consultant or its Representatives or its or their property; (d) any violation or alleged violation by Consultant of any law or regulation now or hereafter enacted; and (e) any breach by Consultant of its obligations under this Agreement. The foregoing indemnity shall not apply to the extent any such Claims are ultimately established by a court of competent jurisdiction to have been caused by the negligence or willful misconduct of the District Indemnitees or any of them. District shall make all decisions with respect to its representation in any legal proceeding concerning this section. If Consultant fails to do so, District shall have the right, but not the obligation, to defend the same and charge all of the direct or incidental Claims of such defense, including attorneys' fees and costs, to Consultant and to recover the same from Consultant. The term "Representatives" shall mean employees, representatives, agents, contractors, subcontractors or any other persons directly or indirectly employed by any one of the foregoing or reasonably under the control of any of the foregoing or for whose acts any of the foregoing may be liable.

Section 14. Insurance.

Consultant agrees to obtain and maintain in full force and effect during the term of this Agreement the Insurance coverages listed in Exhibit "C." All Insurance policies shall be subject to approval by District as to form and content. These requirements are subject to amendment or waiver if so approved in writing by an Authorized Representative.

Section 15. Assignment.

15.1 The expertise and experience of Consultant are material considerations for this Agreement. District has an interest in the qualifications of and capability of the persons and entities that will fulfill the duties and obligations imposed upon Consultant under this Agreement. Consultant may not assign or transfer this Agreement or any portion of this Agreement or the performance of any of Consultant's duties or obligations under this Agreement without the prior written consent of District. The District can withhold its approval/consent in its sole and absolute discretion. Any attempted assignment will be null and void, and will constitute a material breach of this

Agreement entitling District to any and all remedies at law or in equity, including summary termination of this Agreement.

15.2 Consultant must obtain District's prior written approval before utilizing any subcontractors to perform any services under this Agreement, which approval may be withheld in District's sole and absolute discretion. This written approval must include the identity of the subcontractor and the terms of compensation. Approval by District does not imply any agreement to or endorsement by the District as to the competency or capability of any proposed subcontractor or sub-consultant, and District reserves any and all rights against both Consultant and such subcontractor or sub-consultant , for any failure to perform or other breach of any of the provisions of this Agreement, or the standards of performance defined herein, and no waiver is intended or to be implied by District's approval of any subcontractor or sub-consultant.

Section 16. Termination of Agreement.

16.1 District may terminate this Agreement, with or without cause, at any time by written notice of termination to Consultant. In the event such notice is given, Consultant shall cease immediately all work in progress.

16.2 Upon termination of this Agreement, all property belonging exclusively to District which is in Consultant's possession must be returned to District. Consultant shall promptly deliver to District a final invoice for all outstanding services performed and expenses incurred by Consultant as of the date of termination. Compensation for work in progress not based on an hourly rate will be prorated based on the percentage of work completed as of the date of termination.

16.3 Consultant acknowledges District's right to terminate this Agreement as provided in this section, and hereby waives any and all claims for damages that might otherwise arise from District's termination of this Agreement.

Section 17. Notices.

17.1 All written notices required or permitted to be given under this Agreement will be deemed made when received by the other Party at its respective address as follows:

To District: West Valley Water District
855 West Base Line Road
P. O. Box 920
Rialto, CA 92377
Attention: General Manager
(Tel.) 909-875-1804

To Consultant: GHD Inc.

____

____

____

17.2 Notice will be deemed effective on the date personally delivered or transmitted by facsimile. If the notice is mailed, notice will be deemed given three (3) days after deposit of the same in the custody of the United States Postal Service, postage prepaid, for first class delivery, or upon delivery if using a major courier service with tracking capabilities.

17.3 Any Party may change its notice information by giving notice to the other Party in compliance with this section.

Section 18. General Provisions.

18.1 **Authority to Execute.** Each Party represents and warrants that all necessary action has been taken by such Party to authorize the undersigned to execute this Agreement and to bind it to the performance of its obligations hereunder.

18.2 **Binding Effect.** Subject to Section 15, this Agreement is binding upon the heirs, executors, administrators, successors and assigns of the Parties, including any subcontractors or sub-consultants of Consultant. .

18.3 **Entire Agreement.** This Agreement, including the attached Exhibits “A” through “C,” is the entire, complete, final and exclusive expression of the Parties with respect to the matters addressed in this Agreement and supersedes all other agreements or understandings, whether oral or written, between Consultant and District prior to the execution of this Agreement.

18.4 **Modification of Agreement.** No amendment to or modification of this Agreement will be valid unless made in writing and approved by Consultant and by the Board of Directors of the District, or General Manager, if such power has been delegated to General Manager. The Parties agree that this requirement for written modifications cannot be waived and that any attempted waiver will be void.

18.5 **Facsimile Signatures.** Amendments to this Agreement will be considered executed when the signature of a Party is delivered by facsimile transmission. Such facsimile signature will have the same effect as an original signature.

18.6 Waiver. Waiver by any Party to this Agreement of any term, condition, or covenant of this Agreement will not constitute a waiver of any other term, condition, or covenant. Waiver by any Party of any breach of the provisions of this Agreement will not constitute a waiver of any other provision, or a waiver of any subsequent breach or violation of any provision of this Agreement. Acceptance by District of any services by Consultant will not constitute a waiver of any of the provisions of this Agreement.

18.7 Interpretation. This Agreement will be interpreted, construed and governed according to the laws of the State of California. Each Party has had the opportunity to review this Agreement with legal counsel. The Agreement will be construed simply, as a whole, and in accordance with its fair meaning, and without resort to rules regarding draftsmanship. It will not be interpreted strictly for or against either Party.

18.8 Severability. If any provision of this Agreement shall be ruled invalid, illegal or unenforceable, the Parties shall: (a) promptly negotiate a substitute for the provisions which shall to the greatest extent legally permissible, effect the intent of the Parties in the invalid, illegal or unenforceable provision, and (b) negotiate such changes in, substitutions for or additions to the remaining provisions of this Agreement as may be necessary in addition to and in conjunction with subsection (a) above to give effect to the intent of the Parties without the invalid, illegal or unenforceable provision. To the extent the Parties are unable to negotiate such changes, substitutions or additions as set forth in the preceding sentence, and the intent of the Parties with respect to the essential terms of the Agreement may be carried out without the invalid, illegal or unenforceable provisions, the balance of this Agreement shall not be affected, and this Agreement shall be construed and enforced as if the invalid, illegal or unenforceable provisions did not exist.

18.9 Venue. The Parties agree any action or proceeding to enforce or relating to this Agreement shall be brought exclusively in the federal court located in Riverside County, California or state court located in San Bernardino County, California and the Parties hereto consent to the exercise of personal jurisdiction over them by such courts for purposes of any such action or proceeding.

18.10 Disputes. If any disputes should arise between the Parties concerning the work to be done under this Agreement, the payments to be made, or the manner of accomplishment of the work, Consultant shall nevertheless proceed to perform the work as directed by District pending settlement of the dispute.

18.11 Cooperation. Consultant shall cooperate in the performance of work with District and all other agents.

18.12 Time of Essence. Time shall be of the essence as to all dates and times of performance contained in this Agreement.

18.13 Counterparts. This Agreement may be signed and delivered in any number of counter parts, each of which, when signed and delivered, shall be an original, but all of which shall together constitute one and the same Agreement.

IN WITNESS WHEREOF, the Parties have caused this Agreement to be executed effective as of the day and year first above written.

DISTRICT:

WEST VALLEY WATER DISTRICT,
a public agency of the State of California

By ____
Clarence C. Mansell, Jr., General Manager

By____
Board Secretary

APPROVED AS TO FORM:

TAFOYA & GARCIA LLP

By ____
Robert Tafoya

CONSULTANT:

GHD Inc.

By________________________________

Name_____________________________

Its________________________________

EXHIBIT A

TASK ORDER

TASK ORDER NO. ____

This Task Order ("Task Order") is executed this ___ day of _____, 2020 by and between West Valley Water District, a public agency of the State of California ("District") and ________________________________ ("Consultant").

RECITALS

A. On or about ___________, 2020 District and Consultant executed that certain Agreement for Professional Services ("Agreement").

B. The Agreement provides that the District will issue Task Orders from time to time, for the provision of certain services by Consultant.

C. Pursuant to the Agreement, District and Consultant desire to enter into this Task Order for the purpose of setting forth the terms and conditions upon which Consultant shall render certain services to the District.

NOW, THEREFORE, THE PARTIES HERETO HEREBY AGREE AS FOLLOWS:

1. Consultant agrees to perform the services set forth on Exhibit "1" attached hereto and by this reference incorporated herein.

2. Subject to any limitations in the Agreement, District shall pay to Consultant the amounts specified in Exhibit "2" attached hereto and by this reference incorporated herein. The total compensation, including reimbursement for actual expenses, may not exceed the amount set forth in Exhibit "2," unless additional compensation is approved in writing by the District.

3. Consultant shall perform the services described in Exhibit "1" in accordance with the schedule set forth in Exhibit "3" attached hereto and by this reference incorporated herein. Consultant shall commence work immediately upon receipt of a notice to proceed from the District. District will have no obligation to pay for any services rendered by Consultant in advance of receipt of the notice to proceed, and Consultant acknowledges that any such services are at Consultant's own risk.

4. The provisions of the Agreement shall apply to this Task Order. As such, the terms and conditions of the Agreement are hereby incorporated herein by this reference.

[***SIGNATURES APPEAR ON FOLLOWING PAGE***]

IN WITNESS WHEREOF, the parties have caused this Task Order to be executed effective as of the day and year first above written.

DISTRICT:

WEST VALLEY WATER DISTRICT,
a public agency of the State of California

____
Clarence C. Mansell, Jr., General Manager

____
Board Secretary

CONSULTANT:

____

By______________________________________

Name____________________________________

Its______________________________________

By______________________________________

Name____________________________________

Its______________________________________

EXHIBIT “1”

TO

TASK ORDER NO. ____

SCOPE OF SERVICES

EXHIBIT "2"

TO

TASK ORDER NO. ____

COMPENSATION

EXHIBIT "3"

TO

TASK ORDER NO. ____

SCHEDULE

EXHIBIT B

KEY PERSONNEL

KEY PERSONNEL

1. Consultant's designated representative(s) who are authorized to act on its behalf and to make all decisions in connection with the performance of services under this Agreement are:

   Paul Hermann, CPEng, Principle/Vice President
   Jamal Awad, PhD, PE, Project Manager

2. Consultant shall exercise reasonable efforts to keep such key personnel employed in connection with the project as long as reasonably necessary to fulfill obligations under this Agreement. Consultant shall provide appropriate notice to the District prior to key personnel removal or replacement. Consultant shall submit the resume of the personnel nominated to fill the positions listed in the Request for Qualifications ("RFQ") to the District for review. Key personnel, included in the RFQ, are the following:

   Jamal Awad, PhD, PE, Project Manager
   Hector Ruiz, PE, Project Advisor
   Chris Hertle, CPEng, BE, Mphil, Blue Ribbon Panel
   Mark Donovan, PE, Treatment Evaluation & 30% Design Doc. & Process Lead
   Paul Hermann, CPEng, Design-Build Services Lead
   Sridhar Sadasivan, PE, SE, Design-Build Services – Contract Documents
   Kevin Tirado, PE, Design-Build Constructability Review
   Francisco Andrade, SE, PE, Structural Engineer
   Samir Hijaza, Technical Services – Architectural
   Bill Bellamy, Blue Ribbon Panel
   Hashmi Quazi, PhD, GE, Geotechnical
   John Robinson, Permitting & Regulatory Compliance Lead
   Kirill Dolinskiy, PMP, Design-Build Services – Document/Schedule Control
   Jim Vickers, PE, Treatment Evaluations & 30% Design Documentation
   Charles Cruz, PE, Treatment Evaluations & 30% Design Documentation
   James Borchardt, Blue Ribbon Panel
   Rhodes Trussell, Blue Ribbon Panel
   Devin Brady, CAD/BIMM
   Mike Chapman, Blue Ribbon Panel/Conventional Treatment
   Ulysses Fandino, PE, Plant Piping
   Michael Freid, Cost Estimating
   Ryan Kristensen, PE, Resident Engineer – Mechanical
   Mehdi Mardi, PE, Senior Electrical and I&C Lead
   Leila Munla, PhD, Membranes/Pilot Testing

EXHIBIT C

INSURANCE

INSURANCE

A. **General Requirements**. Before commencing the performance of services under this Agreement, and at all other times this Agreement is effective, Consultant must procure and maintain the following types of insurance with coverage limits complying, at a minimum, with the limits set forth below**:**

Type of Insurance	Limits (combined single)
Commercial General Liability:	$1,000,000
Business Automobile Liability	$1,000,000
Professional Liability	$1,000,000
Workers Compensation	Statutory Requirement.

B. **Commercial General Liability Insurance**. The amount of insurance set forth above must be a combined single limit per occurrence for bodily injury, personal injury, and property damage for the policy coverage. The insurance must be on an "occurrence" not a "claims made" basis.

C. **Business Automobile Insurance**. Automobile coverage must be written on forms subject to the written approval of District.

D. **Professional Liability Insurance**. This coverage must be on an "occurrence" basis, including coverage for contractual liability. The Professional Liability Insurance required by this Agreement must be endorsed to be applicable to claims based upon, arising out of or related to services performed under this Agreement.

E. **Workers Compensation**. Consultant must have a State of California approved policy form providing the statutory benefits required by law with employer's liability limits of no less than $1,000,000 per accident for all covered losses, or Consultant must provide evidence of an approved self-insurance program.

F. **Additional Insureds**. Each Commercial General Liability Insurance policy and Business Auto Insurance policy must provide that the <u>District, its officials, officers, employees, agents and volunteers</u> are "additional insureds" under the terms of the policy, and must provide that an act or omission of one the insureds will not reduce or avoid coverage to the other insureds.

G. **Deductibles and Self-Insured Retention**. Any deductibles or self-insured retentions applicable to the insurance policies required under this Agreement must be declared to and approved by District. In no event may any required insurance policy have a deductible, self-insured retention or other similar policy provision in excess of $50,000 without prior written approval by District in its sole discretion. At the option of District, either the insurer will reduce or eliminate such deductibles or self-insured retentions with respect to the District's additional insureds or Consultant will procure a bond guaranteeing payment of any losses, damages, expenses, costs or settlements up to the amount of such deductibles or self-insured retentions.

H. **Primary Insurance**. Each of the insurance policies maintained by Consultant under this Agreement must state that such insurance will be deemed "primary" so that any insurance that may be carried by District will be deemed excess to that of Consultant. This endorsement must be reflected on forms as determined by District.

I. **Certificates of Insurance and Endorsements**. Prior to commencing any services under this Agreement, Consultant must file with the District certificates of insurance and endorsements evidencing the existence of all insurance required by this Agreement, along with such other evidence of insurance or copies of policies as may reasonably be required by District. These certificates of insurance and endorsements must be in a form approved by the Legal Counsel. Consultant must maintain current certificates and endorsements on file with District during the term of this Agreement reflecting the existence of all required insurance. Each of the certificates must expressly provide that no material change in the policy, or termination thereof, will be effective except upon 30 days prior written notice to District by certified mail, return receipt requested. The delivery to District of any certificates of insurance or endorsements that do not comply with the requirements of this Agreement will not waive the District's right to require compliance.

J. **Insurance Rating**. All insurance required to be maintained by Consultant under this Agreement must be issued by companies licensed by or admitted to conduct insurance business in the State of California by the California Department of Insurance and must have a rating of A or better and Class VII or better by the latest edition of A.M. Best's Key Rating Guide.

K. **Aggregate Limits**. The aggregate limits for each insurance policy required under this Agreement must apply separately and solely to the services performed under this Agreement. If the required policies do not have an endorsement providing that the aggregate limit applies separately to the services being performed, or if defense costs are included in the aggregate limit, then the required aggregate limits must be increased to an amount satisfactory to District.

L. **Waiver of Subrogation Rights**. Consultant and each insurer providing any insurance required by this Agreement must waive all rights of subrogation against District, its officials, officers, employees, agents and volunteers, and each insurer must issue a certificate to the District evidencing this waiver of subrogation rights.

M. **Failure to Maintain Required Insurance**. If Consultant, for any reason, fails to obtain and maintain the insurance required by this Agreement, District may obtain such coverage at Consultant's expense and deduct the cost of such insurance from payments due to Consultant under this Agreement or may terminate the Agreement.

N. **Effect of Coverage**. The existence of the required insurance coverage under this Agreement shall not be deemed to satisfy or limit Consultant's indemnity obligations under this Agreement. Consultant acknowledges that the insurance coverage and policy limits set forth in this Agreement constitute the minimum coverage and policy limits required. Any insurance proceeds available to District in excess of the limits and coverage required by this Agreement, and which is applicable to a given loss, must be made available to District to compensate it for such losses.

BOARD OF DIRECTORS
FINANCE COMMITTEE
STAFF REPORT

DATE: May 13, 2020

TO: Finance Committee

FROM: Clarence Mansell Jr., General Manager

SUBJECT: CONSIDER A REIMBURSEMENT AGREEMENT WITH THE LYTLE DEVELOPMENT COMPANY FOR CONSTRUCTION OF A 30-INCH TRANSMISSION PIPELINE

BACKGROUND:

In the early 2000's, West Valley Water District ("District") embarked on a multi-year project to transport up to 20 million gallons per day of Bunker Hill Groundwater to the District's northern service area. The multi-year project began with the preparation of CEQA documents to construct transmission pipelines across the Lytle Creek Wash from the District's East End Complex to Terrace Avenue. The District then obtained approval from the railway to allow boring under their facilities. Finally, in 2007 over 4,400 linear feet of transmission pipeline was constructed across the Lytle Creek Wash. Subsequent sections were constructed in 2010, 2011, 2013, 2017 and 2019. Section 5 involved the lengthy coordination process with Caltrans to construct the pipeline under the 210-Freeway and Section 6 was plagued with difficult excavation due to several feet of concrete tile roofing material encountered underground. Section 6 of the 30-inch transmission pipeline was completed in 2019 and ended at the intersection of Oakdale Avenue and Highland Avenue in the City of Rialto.

The alignment of future Section 7 was anticipated to travel up Riverside Avenue to the District's Reservoir 4-3 site where 14 million gallons of storage will eventually be located. Riverside Avenue is a busy street that contains numerous underground utilities and has limited space to construct a 30-inch transmission pipeline. Not only would this alignment be very difficult to construct within, but the cost to repave the street would add a significant cost to the project. Other alignments for the 30-inch transmission pipeline were evaluated, each with their own challenges.

One of the alignments evaluated was through the future Lytle Creek Ranch master-planned development. This alignment would allow construction in a brand new roadway concurrently with the development's utility infrastructure (sewer, storm drain, electrical, etc…). This would eliminate any unforeseen underground obstacles during construction and remove the pavement replacement expense. The disadvantage to this alignment was the timing of the two projects.

DISCUSSION:

The Lytle Development Company ("Developer") is the owner of land located north-east of Riverside Ave. in the City of Rialto, formerly known as the El Rancho Verde Golf Course. This area is part of the Lytle Creek Ranch master-planned community. The Developer plans to construct their most southerly housing tract and the main transportation corridor this summer. This new roadway will contain the developments utilities such as storm drain, sewer, water, gas and dry utilities. The main entrance to the Lytle Creek Ranch master-planned community will be from Oakdale Avenue off Highland Avenue.

As these two projects are progressing at the same time, and at the same location, the District is requesting that the Developer construct 7,700 linear feet of 30-inch transmission pipeline when the Developer is installing utilities to serve the future development. This would save the District the costly expense of replacing pavement, avoid the numerous conflicts that would be encountered in an existing roadway installation and reduce the impact of a major construction project on our current customers. Attached as Exhibit A, is the current and proposed alignment of the 30-inch transmission pipeline through the development (Section 7).

Attached as Exhibit B is a Reimbursement Agreement, whereby the District will reimburse the Developer for the actual cost of constructing the 30-inch transmission pipeline as well as third-party out of pocket costs incurred in connection with the design, permitting, construction and conveyance of the pipeline.

The Developer will obtain a minimum of three (3) bids from the District's pre-approved list of contractors. The lowest responsible bid will be reviewed and approved by the District prior to construction. All materials used will be approved by the District and the District will oversee the inspection of the facilities installed.

FISCAL IMPACT:

The estimated cost to construct the 30-inch transmission pipeline is $2,100,000 but the actual cost of the reimbursement will be based on the bid received from the successful bidder. The reimbursement costs would be paid upon acceptance of the facilities by the District. This item is not included in the fiscal year 2019/2020 budget. The cost of the reimbursement will be included in the fiscal year 2020/2021 budget if approved by the Board of Directors.

STAFF RECOMMENDATION:

It is recommended, that the Finance Committee approve the Reimbursement Agreement with the Lytle Development Company for the construction of the 30-inch transmission pipeline, and have this item considered by the full Board of Directors at a future meeting.

Respectfully Submitted,

Clarence C. Mansell Jr.

Clarence Mansell Jr, General Manager

LJ:mm

ATTACHMENT(S):

1. Exhibit A - Pipeline Alignment
2. Exhibit B - Reimbursement Agreement 30-inch Transmission Pipeline

EXHIBIT A

eservoirs
Proposed
Existing

Pump Station
Proposed
Existing

Pipeline
Existing
In Design

Exhibit A
Transmission Pipeline

West Valley Water District

Date: 2/25/20

EXHIBIT B

REIMBURSEMENT AGREEMENT

THIS REIMBURSEMENT AGREEMENT(“Agreement”) is made and entered into this _____ day of _______________, 2020, by and between the WEST VALLEY WATER DISTRICT, a public agency of the State of California (“District”), and LYTLE DEVELOPMENT COMPANY, a California corporation (“Applicant”). District and Applicant are sometimes referred to herein singularly as “Party” and collectively as the “Parties.”

RECITALS

WHEREAS, the Applicant is the owner of certain real property located in the City of Rialto, State of California, legally described as Tract Map 20092 in Exhibit “A” attached hereto and by this reference incorporated herein (“El Rancho Verde Development”).

WHEREAS, Applicant is developing a residential project (“Project”) on the El Rancho Verde Development.

WHEREAS, by approval of the Board of Directors of the District, District authorized certain reimbursement to Applicant arising out of the construction of the Facility by or on behalf of Applicant.

WHEREAS, District desires the Applicant construct the water facility described and depicted on Exhibit “B”, attached hereto and by this reference incorporated herein (the “Facility”) when the Applicant is constructing other facilities needed to support the El Rancho Verde Development.

NOW, THEREFORE, THE PARTIES HEREBY AGREE AS FOLLOWS:

1. Applicant shall, at Applicant’s sole cost and expense, be responsible for compliance with the California Environmental Quality Act (“CEQA”) and all other applicable state and federal environmental laws and all requirements of the Federal Endangered Species Act and the California Endangered Species Act arising out of or in connection with the design and construction of the Facility and for compliance with all conditions and mitigation measures which must be satisfied in connection with the same. As part of its obligation to fund the CEQA process, Applicant shall prepare or cause to be prepared all instruments, documents, reports and other like or kind writings required to be prepared and/or filed by CEQA. District has received a copy of the Notice of Determination for the Project approved by the City of Rialto on September 10, 2019 as referenced in Exhibit “C” attached hereto.

2. District has or will approve West Valley Water District Waterline Improvement Plans, WATER IMPROVEMENT PLANS ZONE 4 – 30” TRANSMISSION LINE IMPROVEMENTS (“Plans”). Notwithstanding the approval, District shall have no responsibility for the Plans and Applicant hereby releases the District from and waives on its behalf and on behalf of its successors and assigns, all Costs (as that term is defined herein)

for any matter arising out of or in connection with the Plans, including review thereof, except as otherwise expressly provided herein. Applicant represents and warrants to District, to Applicant's knowledge, that the Plans conform to all applicable federal, state and local laws, rules, ordinances and regulations. To Applicant's knowledge, the Plans are complete, accurate, workable and are in compliance with all governmental requirements and in accordance with District approved design standards and specifications with respect thereto.

3. The Facility shall be constructed in the location identified in Exhibit "B" attached hereto and by this reference incorporated herein ("Route"). Applicant shall not change the Route without the prior written consent of District, which consent may be withheld in District's sole and absolute discretion. The majority of the Route will be located within property that will be dedicated right-of-way as set forth in Tract Map No. 20092. Prior to construction and acceptance of the Facility, Applicant shall cause such map to be recorded and shall furnish to District an easement satisfactory to District (in its sole and absolute discretion) as to content, form and width which assures District's unequivocal right to own, operate, maintain, replace, repair, enlarge, reconstruct, remove and improve the Facility to the extent the same is located on land owned by the Applicant (which shall be by easement and in content, form and width as is customarily required by the District). Applicant shall ensure that all deeds of trust, mortgages and private party monetary liens on the easement portion located on land owned by the Applicant are subordinated to the easement to be granted to the District referred to herein.

4. The provisions of Resolution No. 2018-25 designated as the Rules, Rates and Regulations for Water Service by the West Valley Water District and any amendments thereto, are hereby incorporated by reference in this Agreement. Notwithstanding the foregoing, Applicant shall construct the Facility in accordance with the following requirements:

a. Prior to commencing work on the Facility, Applicant shall arrange a pre-construction meeting. At such meeting there shall be at least one (1) representative of Applicant, Applicant's contractor and District.

b. The Applicant shall utilize one of the District's pre-approved contractors. The applicant shall obtain a minimum of three (3) bids and submit a copy of the contract between the Applicant and the selected contractor to the District for review and approval (and the District shall either approve of such contract or provide written notice of the reasons for disapproval within ten (10) days of submittal).

c. The Applicant shall provide material list submittal to District for approval (and the District shall either approve of such list or provide written notice of the reasons for disapproval within ten (10) days of submittal).

d. Prior to commencing work on the Facility, Applicant shall, at its sole cost, expense, and liability (except as otherwise expressly provided herein), obtain all necessary permits and licenses and give all necessary and incidental notices required for the lawful construction of the Facility and performance of Applicant's obligations under this Agreement.

e. The Facility shall be completed in substantial accordance with the Plans and specifications, and all other applicable maps, plans, specifications, standard drawings and special amendments thereto approved and on file with District. Any substantial deviations from the approved Plans must be approved by District, in writing, prior to being made (and the District shall either approve of such requested deviations or provide written notice of the reasons for disapproval within ten (10) days of submittal of a request for approval). The Facility shall be completed in conformance with all applicable federal, state, and local laws, ordinances, regulations codes, standards, and other requirements.

f. Applicant and its contractors shall construct the Facility in a skillful and workmanlike manner, and consistent with the standards generally recognized as being employed by professionals in the same discipline in the State of California. Applicant represents and maintains that its employees and its contractors shall be skilled in the professional calling necessary to perform the work. Applicant warrants that all of its employees and contractors shall have sufficient skill and experience to perform the work assigned to them, and that they shall have all licenses, permits, qualifications and approvals of whatever nature that are legally required to perform the work, and that such license, permits, qualifications and approvals shall be maintained throughout the term of this Agreement.

g. Once construction and/or installation of the Facility has commenced, Applicant shall diligently prosecute the same to completion at no cost or expense to District, except for the reimbursement set forth in Section 6.

h. District shall be under no obligation to protect the Facility or any material, tool and equipment until written acceptance thereof by District. Prior to the acceptance of the Facility, Applicant shall bear all risk of loss or damage thereto by whatever cause inflicted. Applicant shall rebuild, repair, restore and replace or cause to be rebuilt, repaired, restored or replaced, and make good all injuries or damages to any portion of the Facility before completion and acceptance by District and Applicant shall bear the expense thereof.

i. Applicant shall directly pay all costs associated with the construction and installation of the Facility, including, but not limited to, furnishing of materials, and Applicant shall keep District free and harmless from such costs, except for the reimbursement set forth in Section 6.

j. Applicant is subject to all of the same requirements as would be applicable to District had District undertaken construction of the Facility, including, without limitation, the payment of prevailing wages, and other public works requirements pursuant to the California Labor Code, the California Government Code and the California Public Contracts Code. Applicant shall indemnify, defend and hold harmless the District Indemnitees (as defined below) from all Costs (as defined below) to which they may be subjected or put, by reason of or resulting from failure to comply with public works requirements, including, but not limited to, the failure to pay prevailing wages or such other requirements as would be applicable to District had it undertaken such construction.

k. Applicant hereby irrevocably appoints District to inspect the construction and installation of the Facility. Applicant shall provide District representatives with reasonable access for inspection purposes. It is understood and agreed that District's inspection personnel shall have the authority to enforce the Plans, which authority shall include requiring that all unacceptable materials, workmanship and/or installation be replaced, repaired or corrected by Applicant's contractor. Nothing herein shall be construed to grant District direct control over Applicant's contractor. District's inspection does not include inspection for compliance with safety requirements by Applicant's contractor. Any inspection completed by District shall be for the sole use and benefit of District, and neither Applicant nor any third party shall be entitled to rely thereon for any purpose. Except for District's duties and obligations set forth in this Agreement, District does not undertake or assume any responsibility for or owe a duty to select, review or supervise the creation of the Facility.

l. Applicant shall, at Applicant's own expense, be responsible for obtaining and adhering to a National Pollution Discharge Elimination System (NPDES) permit from the Regional Water Quality Control Board as required for construction or pipeline flushing and disinfection.

In the event of an inconsistency or ambiguity between the terms of this Section and Resolution No. 2018-25, the terms of this Section shall control.

5. a. (i) Upon completion of the Facility, Applicant shall give District notice of the same. District shall make a final inspection within ten (10) days of receipt of such notice and shall provide written notice to Applicant within five (5) days thereafter either (A) confirming that the Facility has been completed in accordance with the requirements of this Agreement or (B) setting forth a punch list of items that need to be completed or corrected. If District provides such a punch list, the above-referenced notice and inspection procedure shall be repeated upon completion of the punch list items. Upon the District giving the Applicant written notice that the District has determined that the Facility has been completed in accordance with the requirements of this Agreement as contemplated above, the District shall be deemed to have accepted the Facility (with such written notice being proof thereof). Nothing herein shall be considered a waiver of any warranty, guarantee or other right in favor of the District.

(ii) Upon completion and acceptance of the Facility, Applicant shall prepare and District shall, within ten (10) days of request, execute a Certificate of Completion as to the Facility in such form and content as set forth in California Civil Code Section 8182 and record said notice with the Office of Recorder of the County of San Bernardino, State of California. In addition, thereto, District shall record a document within five (5) days thereafter releasing the lien of this Agreement with respect to the El Rancho Verde Development. The release of the lien of this Agreement shall not affect any term of condition set forth herein.

(iii) Upon receipt of the Certificate of Completion, the Applicant shall provide a Bill of Sale to District in the form of Exhibit "D" attached hereto which shall convey title to the Facility to District at no cost and expense to the District except for the reimbursement set forth in Section 6 and, within ten (10) days thereafter, the District shall execute the Bill of Sale and return a fully executed copy to the Applicant. The Facility shall be transferred to District free of all liens and encumbrances. Upon execution of the bill of sale, District shall own and operate the Facility subject to any express warranties set forth herein.

b. Upon completion of the Facility, Applicant shall cause all contractors, subcontractors and materialmen to provide unconditional lien and material releases and provide copies of the same to District prior to District's acceptance of the Facility.

c. Applicant shall provide District with a declaration by all contractors that the contractors and all persons and entities who furnished material in the construction of the Facility have been paid in full.

d. All permits, plans and operating manuals related thereto, shall be delivered to and become the sole property of the District, subject to Applicant's warranty work and other obligations required hereunder. On the acceptance of the Facility, Applicant shall deliver to District all surveys and as-built drawings associated with the construction of the Facility.

6. a. The Applicant estimates that the cost to construct the Facility is as follows:

(i) (Two million and one hundred thousand and no/100 dollars ($2,100,000) representing the construction of the Zone 4 – 30" Transmission Line Improvements.

Notwithstanding the foregoing, the amount of the fee reimbursement to be paid to Applicant by District shall be the amount determined herein. Applicant shall obtain a minimum of three (3) bids from the District's approved list of contractors. Applicant shall furnish to the District true and accurate copies of bids received. Applicant shall award the contract to the lowest bidder for the Facility. In addition to the foregoing, Applicant shall be required to post payment and performance bonds as required by the District for the Facility. A performance bond, from a surety institution licensed by the State of California and authorized to do and doing business in said state, valid and renewable until such improvements are accepted by the District. The performance bond shall be in the amount equal to 100 percent of the approved estimate. District shall have the right to review and approve the bids and the successful bidder (which shall be the lowest bidder). Notwithstanding anything to the contrary contained in this Agreement, the District shall reimburse the Applicant for all third-party out of pocket costs incurred in connection with the design, permitting, construction and conveyance of the Facility, including, without limitation, (i) all design costs, permitting costs, insurance costs and bonding costs incurred, (ii) all engineering costs incurred, (iii) all plan check and survey costs incurred and (iv) the costs of any as-built plans.

b. Applicant will not issue a change order with respect to the Facility without the prior written consent of District, which consent shall not be unreasonably withheld. Subject to the foregoing, District shall have no obligation to pay any cost increases for changes to the work for the Facility unless District has approved the same in writing, but once approved in writing, any increases in costs due to such changes shall be reimbursed by District to Applicant.

c. Upon the completion of the Facility and the acceptance thereof pursuant to Section 5 of this Agreement, and upon the compliance by Applicant with Section 5.b and 5.c, Applicant shall submit an invoice to District for the Facility. The invoice shall include an itemized accounting. The invoice shall be subject to the review and approval by District, which approval shall not be unreasonably withheld. District shall pay the undisputed portion of the invoice within thirty (30) days of receipt thereof. Payment of the disputed amount, if any, shall be paid within ten (10) business days following resolution of the payment dispute. Any amounts not paid when due shall also bear interest at ten percent (10%) per annum from the due date until paid.

7. Applicant shall be required to repair the Facility if it is damaged by any party (other than by District or its Representatives) prior to District's acceptance of the Facility. Applicant shall provide to District a two (2) year guarantee bond (following the date of final acceptance of the Facility) acceptable in form and substance to District (in its reasonable discretion), for defects in materials and workmanship which appear within said two (2) year period (the “Warranty Period”). In addition, thereto, Applicant specifically agrees, within the Warranty Period, to make or require Applicant’s contractor to repair, at its or their expense, all failures of the Facility (or any portion thereof) which was furnished, installed and/or constructed due to faulty materials or installation. In the event surety, Applicant or Applicant’s contractor fail to cause satisfactory repair, as reasonably determined by District,

within forty-eight (48) hours after written notice or such longer period of time as District may reasonably determine (the "Repair Period"), District may cause such repairs to be completed at Applicant's cost and expense. Notwithstanding the Repair Period, District shall have the unqualified right to immediately make any emergency repairs reasonably necessary due to faulty materials or installation to eliminate any imminent and material threat to the public's health, safety or welfare, at Applicant's cost and expense. Nothing in this Section shall limit or abrogate any other claims, demands or actions District may have against Applicant or Applicant's contractor on account of damages sustained by reason of such defects, nor shall the provisions of this Section limit, abrogate or affect any warranties in favor of District which are expressed or implied by law or set forth in any construction agreement.

8. The Applicant shall assume the defense of, indemnify and hold harmless District and its officers, directors, administrators, representatives, consultants, engineers, employees and agents, and their respective successors and assigns (collectively, "District Indemnitees") and each and every one of them, from and against all actions, causes of action, damages, demands, liabilities, costs (including, but not limited to reasonable attorneys' fees), claims, losses and expenses of every type and description (collectively, "Costs") to which they may be subjected or put, to the extent arising during the Warranty Period, but only to the extent resulting from: (A) the defective design, engineering and/or construction of the Facility; (B) the performance of or failure to perform, the work covered by this Agreement which is caused or occasioned by any neglect on the part of Applicant or its Representatives (as defined below); (C) any death, injury, property damage, accident or casualty caused by the negligence or willful misconduct of Applicant or its Representatives or including Applicant or its Representatives or its or their property; and (D) any breach by Applicant of its obligations under this Agreement. The foregoing indemnity shall not apply to the extent any such Costs are ultimately established by a court of competent jurisdiction to have been caused by any act or omission on the part of District Indemnitees or any of them. Nothing herein shall be construed to increase the Warranty Period set forth in Section 7. District shall make all decisions with respect to its representation in any legal proceeding concerning this Section. If Applicant fails to do so, District shall have the right, but not the obligation, to defend the same and charge all of the reasonable direct or incidental costs of such defense, including reasonable fees and costs, to Applicant and to recover the same from Applicant. The term "Representatives" shall mean employees, representatives, agents, contractors, subcontractors or any other persons directly or indirectly employed by any of the foregoing or reasonably under the control of any of the foregoing or for whose acts any of the foregoing may be liable. Except as expressly provided herein, no provision of this Agreement shall in any way limit the extent of the responsibility of Applicant for payment of damages resulting from its operations or the operations of any of its Representatives.

9. a. Unless otherwise approved by District in writing, Applicant shall carry and maintain, or shall cause its' contractor or subcontractor to carry and maintain, at Applicant's sole cost and expense (subject to reimbursement pursuant to this Agreement), until the Facility has been installed or completed, not less than the following coverage and limits of insurance which shall be maintained with insurers and under forms of policies satisfactory to District:

(i) Worker's Compensation and Employer's Liability:

(A) State Workers Compensation – coverage as required by law.

(B) Employer's Liability with limits of at least $1,000,000 per occurrence.

(ii) Automobile Liability for Bodily Injury, Death and Property Damage - $2,000,000 per person, $2,000,000 per occurrence.

(iii) Commercial General Liability for Bodily Injury, Death and Property Damage - $2,000,000 per person, $2,000,000 per occurrence.

(iv) Builder's Risk Insurance covering no less than the total construction costs of the Facility to be constructed by Applicant hereunder. Coverage shall be on an "all risks basis." The coverage shall include vandalism coverage which remains in force until acceptance of the Facility by the District, automatic inclusion of underground exposure, coverage to be on a replacement basis, and waiver of co-insurance penalties.

The foregoing policies shall include, without limitation, owned, non-owned and hired automobile (vehicle) liability, contractual liability, personal injury, blanket commercial, broad form property damage and product/completed operation liability coverage. These policies may contain an aggregate limit not less than the occurrence limit. The required limits may be satisfied by a combination of a primary policy and an excess or umbrella policy.

b. (i) All insurance required pursuant to the express provisions of this Agreement shall:

(A) Provide that coverage shall not be revised, cancelled or reduced until at least thirty (30) days written notice of such cancellation shall have been given to District. In the event any policies of insurance are revised, cancelled or reduced, Applicant shall, prior to the revision, cancellation or reduction date, submit evidence of new insurance to the District complying with this Section.

(B) Be issued by insurance companies which are qualified to do business in the State of California and which have a rating satisfactory to District and by such rating service as shall be reasonably acceptable to District.

(C) Be reasonably satisfactory to District in all other reasonable respects.

(ii) The policies required pursuant to this Agreement or a certificate of the policies, together with evidence of payment of premiums, shall be provided to District prior to the commencement of construction of the Facility.

(iii) The general liability insurance to be maintained by Applicant or its' contractor pursuant to this Section shall:

(A) Name District, their board members, its officers, agents, employees, consultants, and engineers as additional insureds;

(B) Apply severally to Applicant and District, its officers and employees.

(C) Cover Applicant and District as insureds in the same manner as if separate policies had been issued to each of them;

(D) Contain no provisions affecting the rights which either of them would have as claimants if not so named as insured.

(E) Be primary insurance with any other valid and collectible insurance available to the aforesaid additional insureds constituting excess insurance and each policy shall be endorsed substantially as follows:

"The insurance afforded by this policy to District shall be primary insurance and other valid and collectible insurance available to District shall be excess insurance and, under no circumstances, shall be considered contributory."

(F) Have a deductible or deductibles, if any, which are no greater than those normally maintained from similar projects in the State of California and shall contain a waiver of subrogation and endorsement in favor of the District.

10. All notices, demands, invoices, and written communication shall be in writing and delivered to the following addresses or such other addresses as the Parties may designate by written notice:

To District: West Valley Water District
Attn: General Manager
P.O. Box 920
855 West Baseline Road
Rialto, CA 92377

To Applicant: Lytle Development Company
Attn: Ron Pharris
2050 Main St. Suite 250
Irvine, CA 92614
(949) 313-5808

Depending upon the method of transmittal, notice shall be deemed received as follows: by electronic mail, as of the date and time sent; by messenger or overnight mail, as of the date delivered; and by U.S. Mail first class postage prepaid, as of 72 hours after deposit in the U.S. Mail.

11. a. The Parties shall fully cooperate with one another, and shall take any additional acts or sign any additional documents as may be necessary, appropriate, or convenient to attain the purposes of this Agreement.

. b. No supplement, modification or amendment of this Agreement shall be binding unless executed in writing and signed by both Parties.

c. This Agreement contains the entire agreement between District and Applicant and supersedes any prior oral or written statements or agreements between District and Applicant.

d. In the event of any litigation between District and Applicant concerning this Agreement, the prevailing Party as determined by the court shall be awarded its reasonable attorney's fees.

e. This Agreement shall be binding on the successors and assigns of the Parties.

f. This Agreement will be executed in multiple counterparts which shall together constitute the complete Agreement.

g. If any provision of this Agreement shall be ruled invalid, illegal or unenforceable, the Parties shall: (i) promptly negotiate a substitute for the provision which shall, to the greatest extent legally permissible, effect the intent of the Parties in the invalid, illegal or unenforceable provision, and (ii) negotiate such changes in, substitutions for or additions to the remaining provisions of this Agreement as may be necessary in addition to and in conjunction with subsection (i) above to give effect to the intent of the Parties without the invalid, illegal or unenforceable provision. To the extent the Parties are unable to negotiate such changes, substitutions or additions as set forth in the preceding sentence, and the intent of the Parties with respect to the essential terms of the Agreement may be carried out without the invalid, illegal or unenforceable provision, the balance of this Agreement shall not be affected, and this Agreement shall be construed and enforced as if the invalid, illegal or unenforceable provision did not exist.

h. This Agreement is entered into within the State of California, and all questions concerning the validity, interpretation and performance of any of its terms or provisions or any of the rights or obligations of the Parties hereto shall be governed by and resolved in accordance with the laws of the State of California.

i. Applicant may assign all or any portion of its' rights, responsibilities and liabilities under this Agreement to any person or entity acquiring all or a portion of the El Rancho Verde Development. No such assignment shall relieve Applicant of any responsibility or liability under this Agreement except to the extent the assignee expressly assumes Applicant's rights and obligations hereunder by written assignment and assumption agreement in a form approved by the District, which approval shall not be unreasonably withheld, delayed or conditioned.

k. The provisions of the Agreement shall be construed as to their fair meaning, and not for or against any Party based upon any attribution to such Party as the source of language in question.

l. Time is of the essence of this Agreement and each and every term and provision thereof.

m. This Agreement shall be construed as if prepared by all of the Parties. Accordingly, any rule of law (including California Civil Code Section 1654) or legal decision that would require interpretation of any ambiguities in this Agreement against the Party that has drafted it is not applicable and is waived.

n. No delay on the part of any Party hereto in exercising any right, power or privilege hereunder shall operate as a waiver thereof, nor shall any waiver on the part of any Party hereto of any right, power or privilege hereunder operate as a waiver of any other right, power or privilege hereunder, nor shall any single or partial exercise of any right, power or privilege hereunder, preclude any other or further exercise of any other right, power or privilege hereunder.

o. Each entity executing this Agreement hereby represents and warrants that the individual signing on such entity's behalf has the full power and authority to execute this Agreement on behalf of the named Parties.

p. Applicant shall maintain and make available for inspection by District during regular office hours and until the acceptance of the Facility, accurate records pertaining to the design, construction and installation of the Facility.

q. The Parties agree that any action or proceeding to enforce or relating to this Agreement shall be brought exclusively in the State courts located in San Bernardino County, California, or the Federal court located in Riverside County, California and the Parties hereto consent to the exercise of personal jurisdiction over them by any such courts for purposes of any such action or proceeding.

IN WITNESS WHEREOF, the Parties have executed this Agreement on the date and year hereinabove written.

WEST VALLEY WATER DISTRICT

By: ____________________________
Name: Clarence C. Mansell, Jr.
Its: General Manager

Lytle Development Company, a California Corporation.

By: ______________________
Name: Ron Pharris
Its: Chairman

EXHIBIT LIST

EXHIBIT “A”	LEGAL DESCRIPTION OF TRACT 20092
EXHIBIT “B”	DESCRIPTION AND LOCATION OF FACILITY
EXHIBIT “C”	NOTICE OF DETERMINATION
EXHIBIT “D”	DEPICTION OF BILL OF SALE FORM

EXHIBIT "A"

LEGAL DESCRIPTION

REAL PROPERTY IN THE CITY OF RIALTO, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

PARCEL No. 1 (APNs: 0264-421-12 & 0264-421-35)
THAT PORTION OF LOT 1, BLOCK 1, TRACT No. 5135, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AS PER PLAT RECORDED IN BOOK 64 OF MAPS, PAGES 99 AND 100, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY, MORE PARTICULARLY DESCRIBED AS PARCEL 1 IN LEGAL DESCRIPTION PREPARED BY FIRST AMERICAN TITLE COMPANY'S PRELIMINARY REPORT FOR COMMITMENT No. NHSC-5396737 (29).

PARCEL 1A (APN: 0264-421-30)
DESCRIBED AS PARCEL 1A IN LEGAL DESCRIPTION PREPARED BY FIRST AMERICAN TITLE COMPANY'S PRELIMINARY REPORT FOR COMMITMENT No. NHSC-5396737 (29).

PARCEL No. 2 (APN: 0264-421-31)
THAT PORTION OF LOT 1, BLOCK 1, TRACT No. 5135, BEING A REVERSION TO ACREAGE MAP, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AS PER PLAT RECORDED IN BOOK 64 OF MAPS, PAGES 99 AND 100, RECORDS OF SAID COUNTY, MORE PARTICULARLY DESCRIBED AS PARCEL 2 IN LEGAL DESCRIPTION PREPARED BY FIRST AMERICAN TITLE COMPANY'S PRELIMINARY REPORT FOR COMMITMENT No. NHSC-5396737 (29).

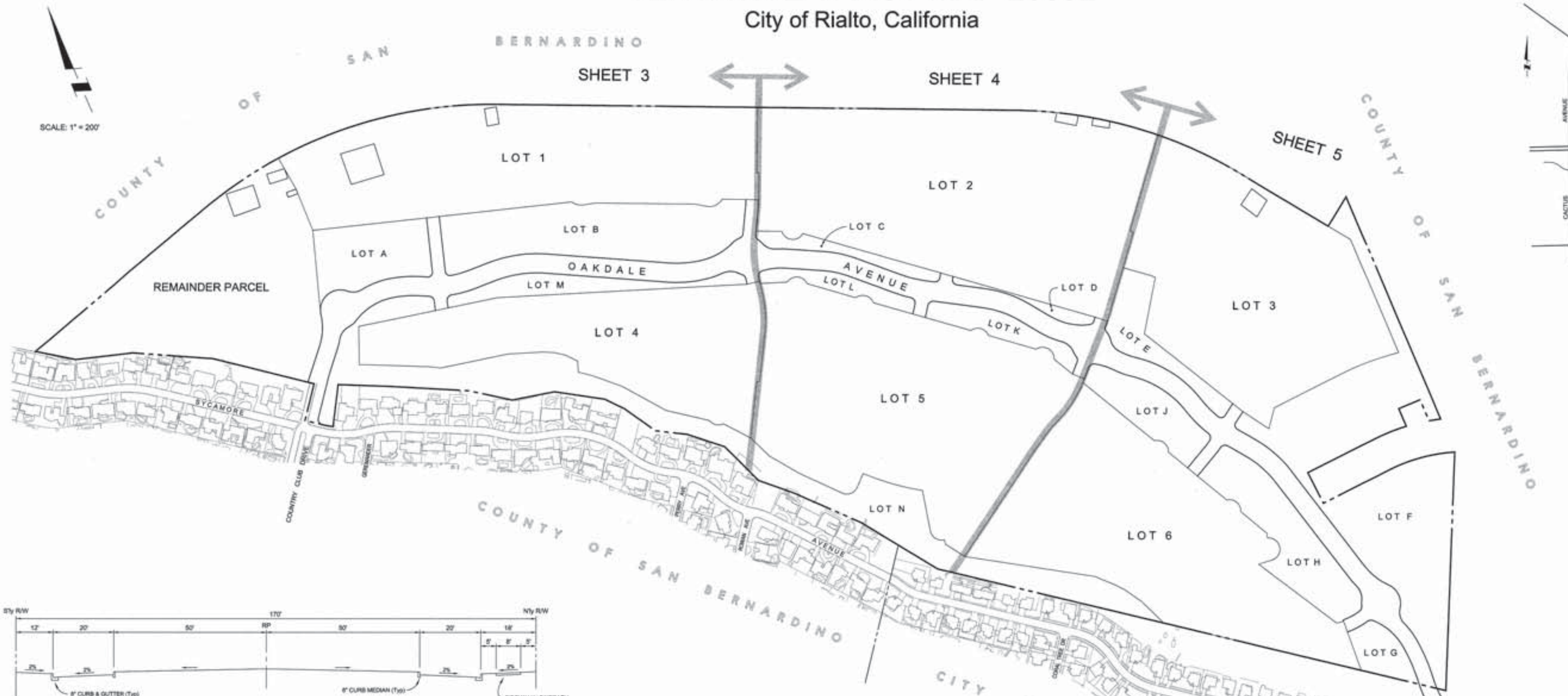
PARCEL No. 3 (APNs: 0264-482-12 & 0264-482-13)
LOT 1, TRACT No. 5638, IN THE COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AS PER PLAT RECORDED IN BOOK 75 OF MAPS, PAGE 38, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY.

PARCEL No. 4 (APN: PORTION 264-421-18)
THAT PORTION OF LOT 1, BLOCK 1, TRACT No. 5135, IN THE CITY OF RIALTO, COUNTY OF SAN BERN, STATE OF CALIFORNIA, AS PER MAP RECORDED IN BOOK 64, PAGES 99 AND 100 OF MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY, MORE PARTICULARLY DESCRIBED AS PARCEL 8 IN LEGAL DESCRIPTION PREPARED BY FIRST AMERICAN TITLE COMPANY'S PRELIMINARY REPORT FOR COMMITMENT No. NHSC-5396737 (29).

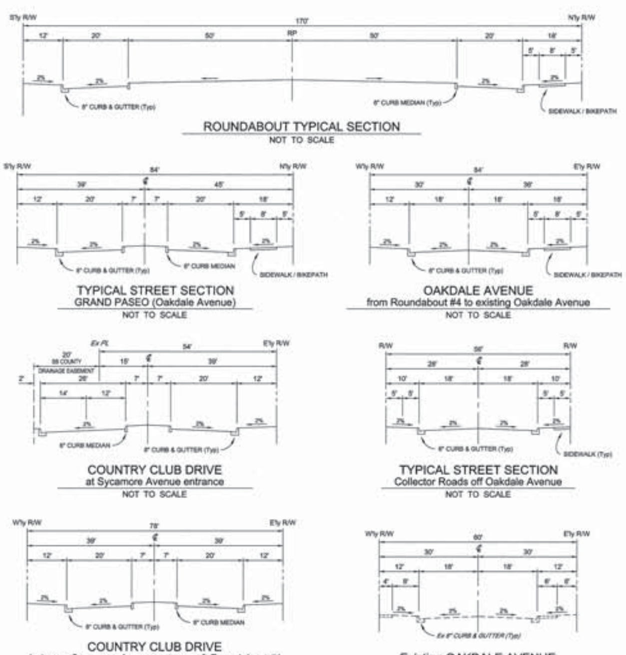
PARCEL No. 5 (APN: 264-421-17)
THAT PORTION OF LOT 1, BLOCK 1, TRACT No. 5135, IN THE CITY OF RIALTO, COUNTY OF SAN BERNARDINO, STATE OF CALIFORNIA, AS PER MAP RECORDED IN BOOK 64, PAGES 99 AND 100 OF MAPS, IN THE OFFICE OF THE COUNTY RECORDER OF SAID COUNTY, MORE PARTICULARLY DESCRIBED AS PARCEL 9 IN LEGAL DESCRIPTION PREPARED BY FIRST AMERICAN TITLE COMPANY'S PRELIMINARY REPORT FOR COMMITMENT No. NHSC-5396737 (29).

TENTATIVE TRACT MAP 20092

City of Rialto, California



VICINITY MAP
NOT TO SCALE



ROUNDABOUT TYPICAL SECTION
NOT TO SCALE

TYPICAL STREET SECTION
GRAND PASEO (Oakdale Avenue)
NOT TO SCALE

OAKDALE AVENUE
from Roundabout #4 to existing Oakdale Avenue
NOT TO SCALE

COUNTRY CLUB DRIVE
at Sycamore Avenue entrance
NOT TO SCALE

TYPICAL STREET SECTION
Collector Roads off Oakdale Avenue
NOT TO SCALE

COUNTRY CLUB DRIVE
between Sycamore Avenue entrance & Roundabout #1
NOT TO SCALE

Existing OAKDALE AVENUE
NOT TO SCALE

OWNER / APPLICANT

LYTLE DEVELOPMENT COMPANY
285 W. RIALTO AVENUE, SUITE B
RIALTO, CALIFORNIA 92376
CONTACT: Mr. KEVIN LYNCH
(909) 937-4058

LEGAL DESCRIPTION

REAL PROPERTY IN THE CITY OF RIALTO, STATE OF CALIFORNIA, DESCRIBED AS FOLLOWS:

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LAND USE

EXISTING ZONING........................LYTLE CREEK RANCH SPECIFIC PLAN
PROPOSED ZONING........................LYTLE CREEK RANCH SPECIFIC PLAN (AMENDED)
ADJACENT LAND USE
NORTH: VACANT/FLOOD CONTROL (COUNTY OF SAN BERNARDINO)
EAST: COMMERCIAL/INDUSTRIAL (COUNTY OF SAN BERNARDINO)
SOUTH: SINGLE FAMILY RESIDENTIAL (CITY OF RIALTO)
WEST: SINGLE FAMILY RESIDENTIAL (COUNTY OF SAN BERNARDINO)

GENERAL NOTES

1. APN(s): 0264-421-12, -17, -18, -30, -31, -35, 0264-482-12, & 0264-482-13
2. TOTAL GROSS AREA = 188.4 Ac
3. TOTAL OF NUMBERED LOTS = 6
4. TOTAL OF LETTERED LOTS = 13
5. "A" STREET, "B" STREET, "C" STREET, "D" STREET, "E" STREET, "F" STREET, "G" STREET, COUNTRY CLUB DRIVE and OAKDALE AVENUE FOR PUBLIC ROAD DEDICATION
6. LOTS 1 & 6 RESERVED FOR Min 47' × 80' RESIDENTIAL LOTS
   LOTS 2 & 4 RESERVED FOR Min 50' × 100' RESIDENTIAL LOTS
   LOTS 3 & 5 RESERVED FOR Min 60' × 100' RESIDENTIAL LOTS
7. LOTS A, B, C, D, E, H, J, K, L, M, & N INTENDED FOR PUBLIC OPEN SPACE
   LOT F INTENDED FOR WATER QUALITY/FLOOD CONTROL PURPOSES
   LOT G INTENDED FOR SEWER/PUBLIC UTILITY PURPOSES
8. CONTOUR INTERVAL = 1 FOOT
9. ALL SLOPES SHALL BE 2:1 OR FLATTER
10. LOT DIMENSIONS SHOWN HEREON ARE APPROXIMATE
11. BOUNDARY SURVEY PROVIDED BY DAWSON SURVEYING
12. TOPOGRAPHY PROVIDED BY ANALYTICAL PHOTOGRAMMETRIC SURVEYS
13. NO REGULATED TREES EXIST ON-SITE
14. THE LOCATION OF EXISTING UTILITIES SHOWN ON THIS MAP ARE APPROXIMATE AND WERE OBTAINED FROM APPROVED PLANS & UTILITY COMPANY MAPS
15. ADDITIONAL ACQUISITION AND DEDICATION SHALL BE REQUIRED TO CONNECT TO EXISTING OAKDALE AVENUE INFRASTRUCTURE

UTILITY PURVEYORS

WATER	WEST VALLEY WATER DISTRICT 855 W. BASELINE RIALTO, CALIFORNIA 92377 (909) 875-1804
SEWER	CITY OF RIALTO 335 W. RIALTO AVENUE RIALTO, CALIFORNIA 92376 (909) 421-7229
ELECTRIC	SOUTHERN CALIFORNIA EDISON 300 N. PEPPER AVENUE RIALTO, CALIFORNIA 92376 (909) 820-5617
GAS	THE GAS COMPANY 251 EAST FIRST STREET, SC8080 BEAUMONT, CALIFORNIA 92223 (909) 845-0709
TELEPHONE	AT&T 100 S. ANAHEIM BOULEVARD, SUITE 320 ANAHEIM, CALIFORNIA 92805 (714) 284-3498
CABLE	ADELPHIA CABLE 1971 W. REDLANDS BOULEVARD, "B" REDLANDS, CALIFORNIA 92373 (888) 683-1000
SCHOOLS	RIALTO UNIFIED SCHOOL DISTRICT 625 W. RIALTO AVENUE RIALTO, CALIFORNIA 92376 (909) 421-7555

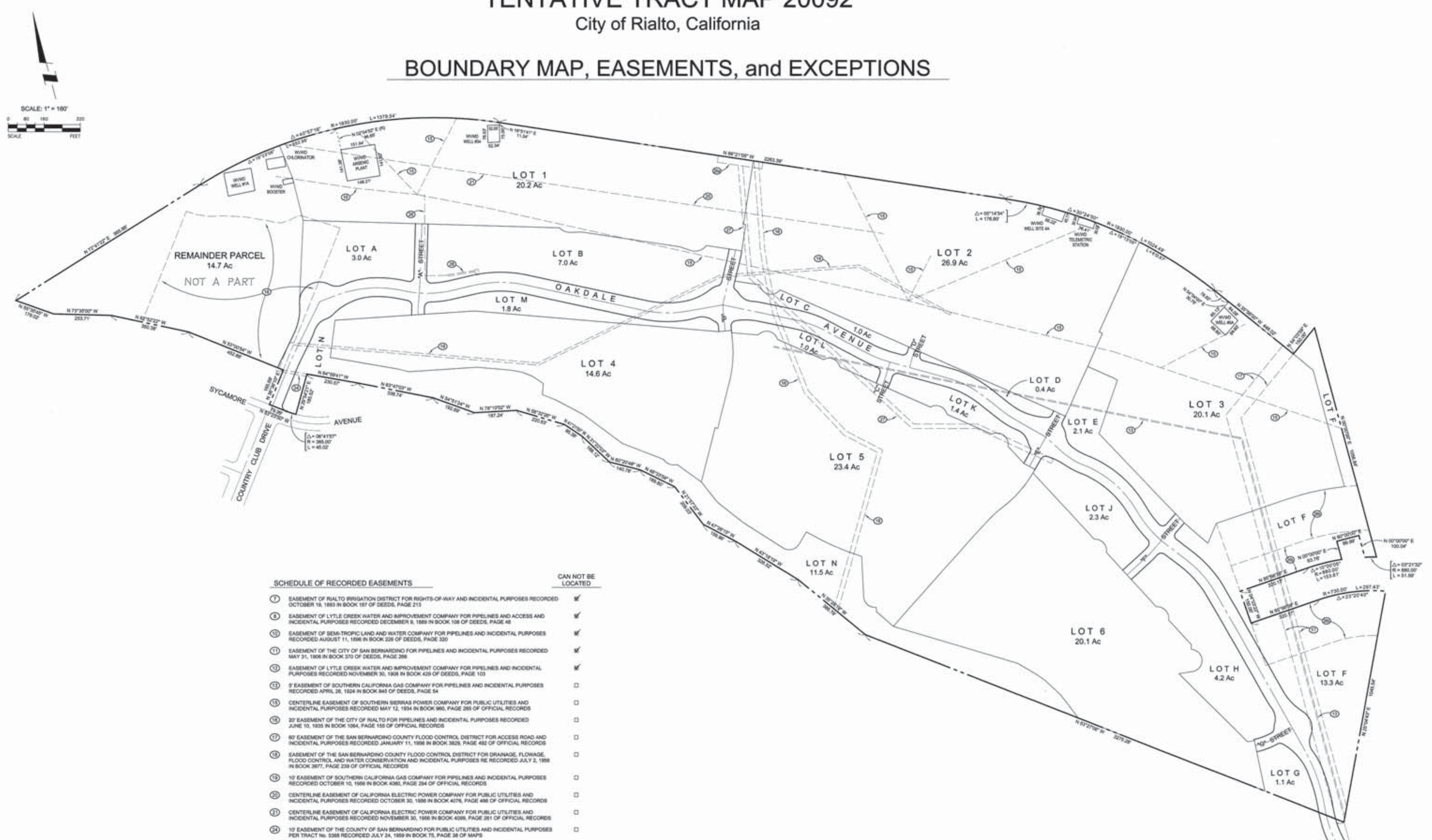
OTTE-BERKELEY GROUPE ENGINEERS

6.3.b

TENTATIVE TRACT MAP 20092

City of Rialto, California

BOUNDARY MAP, EASEMENTS, and EXCEPTIONS



SCHEDULE OF RECORDED EASEMENTS		CAN NOT BE LOCATED
7	EASEMENT OF RIALTO IRRIGATION DISTRICT FOR RIGHTS-OF-WAY AND INCIDENTAL PURPOSES RECORDED OCTOBER 19, 1893 IN BOOK 187 OF DEEDS, PAGE 213	☑
8	EASEMENT OF LYTLE CREEK WATER AND IMPROVEMENT COMPANY FOR PIPELINES AND ACCESS AND INCIDENTAL PURPOSES RECORDED DECEMBER 9, 1889 IN BOOK 108 OF DEEDS, PAGE 48	☑
10	EASEMENT OF SEMI-TROPIC LAND AND WATER COMPANY FOR PIPELINES AND INCIDENTAL PURPOSES RECORDED AUGUST 11, 1896 IN BOOK 226 OF DEEDS, PAGE 320	☑
11	EASEMENT OF THE CITY OF SAN BERNARDINO FOR PIPELINES AND INCIDENTAL PURPOSES RECORDED MAY 31, 1906 IN BOOK 370 OF DEEDS, PAGE 268	☑
12	EASEMENT OF LYTLE CREEK WATER AND IMPROVEMENT COMPANY FOR PIPELINES AND INCIDENTAL PURPOSES RECORDED NOVEMBER 30, 1908 IN BOOK 429 OF DEEDS, PAGE 103	☑
13	5' EASEMENT OF SOUTHERN CALIFORNIA GAS COMPANY FOR PIPELINES AND INCIDENTAL PURPOSES RECORDED APRIL 26, 1924 IN BOOK 845 OF DEEDS, PAGE 54	☐
15	CENTERLINE EASEMENT OF SOUTHERN SIERRAS POWER COMPANY FOR PUBLIC UTILITIES AND INCIDENTAL PURPOSES RECORDED MAY 12, 1934 IN BOOK 980, PAGE 285 OF OFFICIAL RECORDS	☐
16	20' EASEMENT OF THE CITY OF RIALTO FOR PIPELINES AND INCIDENTAL PURPOSES RECORDED JUNE 10, 1935 IN BOOK 1064, PAGE 155 OF OFFICIAL RECORDS	☐
17	60' EASEMENT OF THE SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT FOR ACCESS ROAD AND INCIDENTAL PURPOSES RECORDED JANUARY 11, 1956 IN BOOK 3829, PAGE 492 OF OFFICIAL RECORDS	☐
18	EASEMENT OF THE SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT FOR DRAINAGE, FLOWAGE, FLOOD CONTROL AND WATER CONSERVATION AND INCIDENTAL PURPOSES RE RECORDED JULY 2, 1956 IN BOOK 3977, PAGE 239 OF OFFICIAL RECORDS	☐
19	10' EASEMENT OF SOUTHERN CALIFORNIA GAS COMPANY FOR PIPELINES AND INCIDENTAL PURPOSES RECORDED OCTOBER 10, 1956 IN BOOK 4080, PAGE 294 OF OFFICIAL RECORDS	☐
20	CENTERLINE EASEMENT OF CALIFORNIA ELECTRIC POWER COMPANY FOR PUBLIC UTILITIES AND INCIDENTAL PURPOSES RECORDED OCTOBER 30, 1956 IN BOOK 4076, PAGE 486 OF OFFICIAL RECORDS	☐
21	CENTERLINE EASEMENT OF CALIFORNIA ELECTRIC POWER COMPANY FOR PUBLIC UTILITIES AND INCIDENTAL PURPOSES RECORDED NOVEMBER 30, 1956 IN BOOK 4099, PAGE 261 OF OFFICIAL RECORDS	☐
24	10' EASEMENT OF THE COUNTY OF SAN BERNARDINO FOR PUBLIC UTILITIES AND INCIDENTAL PURPOSES PER TRACT No. 5368 RECORDED JULY 24, 1959 IN BOOK 75, PAGE 38 OF MAPS	☐
25	EASEMENT OF CALIFORNIA ELECTRIC POWER COMPANY FOR UTILITIES AND INCIDENTAL PURPOSES RECORDED JULY 29, 1960 IN BOOK 5199, PAGE 217 OF OFFICIAL RECORDS	☐
25a	30' EASEMENT OF THE SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT FOR RIGHT OF TRAVEL AND INCIDENTAL PURPOSES RECORDED FEBRUARY 21, 1961 IN BOOK 5358, PAGE 129 OF OFFICIAL RECORDS	☐
26	EASEMENTS OF THE UNITED STATES OF AMERICA RECORDED APRIL 10, 1969 IN BOOK 7212, PAGE 192 OF OFFICIAL RECORDS	☐
27	20' EASEMENT OF THE CITY OF RIALTO FOR WATER PIPELINES AND INCIDENTAL PURPOSES RECORDED SEPTEMBER 20, 1972 IN BOOK 8024, PAGE 801 OF OFFICIAL RECORDS	☐
37	EASEMENTS OF WEST VALLEY WATER DISTRICT FOR ROADWAYS AND WATER PIPELINES RECORDED NOVEMBER 24, 2015 AS INSTRUMENT No. 2015-0514444 OF OFFICIAL RECORDS	☑

OTTE - BERKELEY GROUPE
ENGINEERS

6.3.b

TENTATIVE TRACT MAP 20092

City of Rialto, California

CURVE / LINE TABLE

⬡	Δ / Bearing	Radius	Length
A	04° 01' 40"	500.00'	35.15'
B	16° 19' 04"	473.00'	134.71'
C	07° 06' 07"	300.00'	37.19'
D	N 19° 14' 58" E		111.14'
E	02° 39' 48"	300.00'	13.95'
F	04° 41' 51"	300.00'	24.60'
G	N 23° 38' 55" E		10.11'

6.3.b

TENTATIVE TRACT MAP 20092

City of Rialto, California

SCALE: 1" = 80'

SEE SHEET 3

SEE SHEET 5

CURVE / LINE TABLE

◯	Δ / Bearing	Radius	Length
B	16° 19' 04"	473.00'	134.71'
F	04° 41' 51"	300.00'	24.60'
G	N 23° 38' 55" E		10.11'
H	12° 30' 41"	527.00'	115.08'
J	08° 25' 52"	527.00'	77.58'
K	20° 45' 35"	300.00'	108.70'
L	N 30° 47' 23" E		59.61'
M	06° 49' 02"	300.00'	35.69'
N	N 37° 36' 25" E		15.36'
P	N 30° 39' 02" E		62.00'
Q	04° 06' 50"	300.00'	21.54'

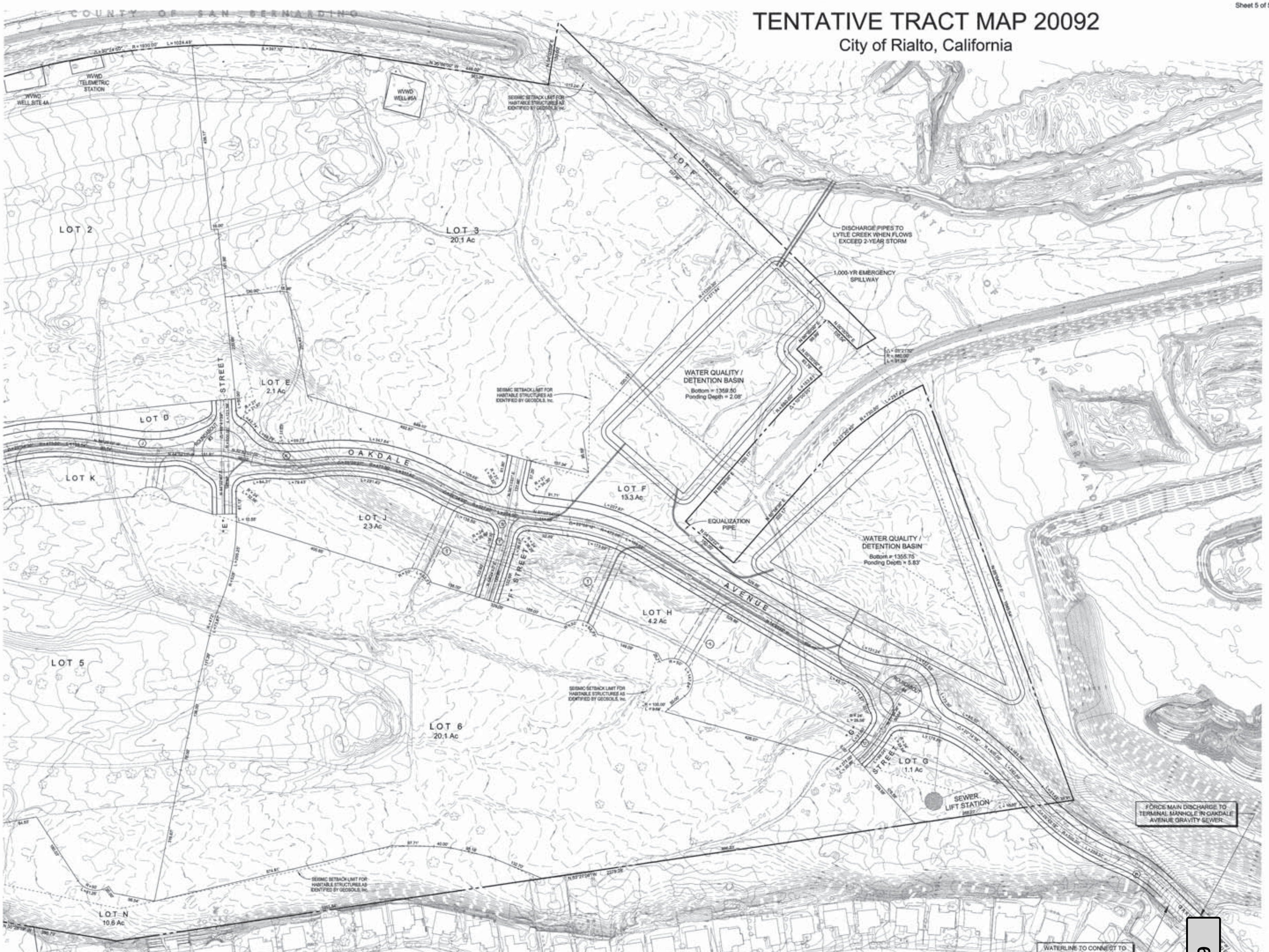
(1) DEPICTS PROPOSED 40' SEWER & DRAINAGE EASEMENT TO THE CITY OF RIALTO

OTTE-BERKELEY GROUPE ENGINEERS

6.3.b

TENTATIVE TRACT MAP 20092

City of Rialto, California



SCALE: 1" = 80'

CURVE / LINE TABLE

⬡	Δ / Bearing	Radius	Length
J	08° 25' 52"	527.00'	77.56'
K	20° 45' 35"	300.00'	108.70'
R	23° 42' 27"	300.00'	124.13'
S	N 55° 46' 03" E		59.61'
T	06° 38' 09"	300.00'	34.75'
U	17° 35' 12"	300.00'	92.08'

(1) DEPICTS PROPOSED 40' SEWER & DRAINAGE EASEMENT TO THE CITY OF RIALTO

OTTE-BERKELEY GROUPE
CIVIL ENGINEERS

6.3.b

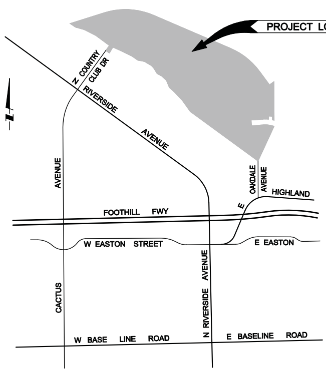
EXHIBIT "B"

DESCRIPTION AND LOCATION OF FACILITY

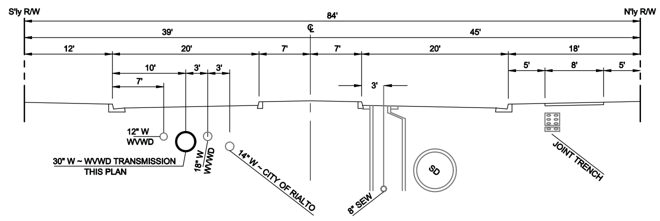
IN THE CITY OF RIALTO

WATER IMPROVEMENT PLANS

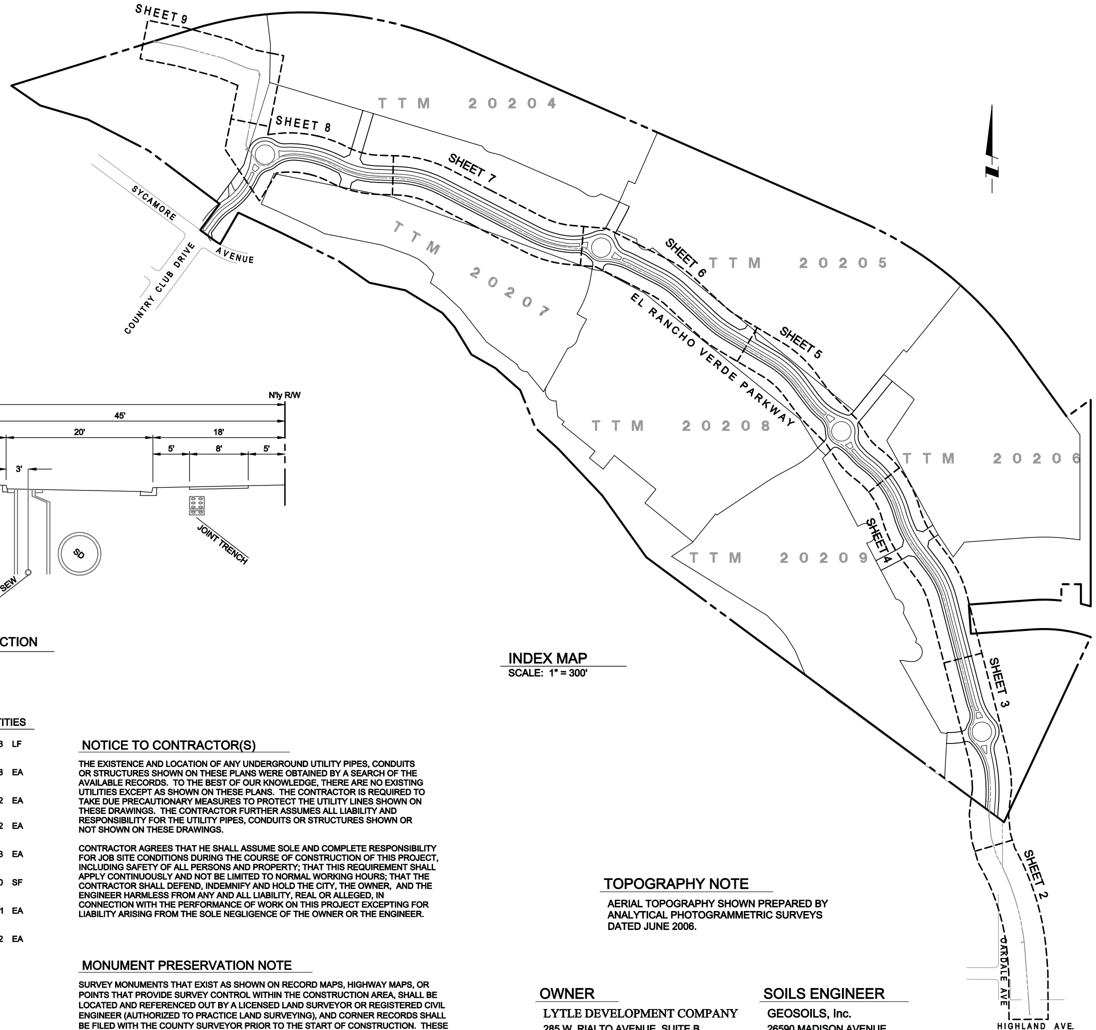
ZONE 4 ~ 30" TRANSMISSION LINE IMPROVEMENTS



VICINITY MAP
NOT TO SCALE



TYPICAL STREET SECTION
NOT TO SCALE



INDEX MAP
SCALE: 1" = 300'

GENERAL NOTES

1. PIPE 10" AND SMALLER SHALL BE CLASS 350, 10 GA CEMENT MORTAR LINED AND COATED STEEL. PIPE GREATER THAN 12" SHALL BE CLASS 50 DUCTILE IRON PIPE, OR CLASS 150, 10 GA CEMENT MORTAR LINED AND COATED STEEL PIPE OR AS SPECIFIED.
2. WATER SERVICE LATERALS SHALL BE TYPE K COPPER LINE, MINIMUM 1" DIAMETER, WITH 1" × 1" ANGLE VALVES. THERE SHALL BE A SEPARATE SERVICE FOR EACH LOT BEING SERVED. ONE SERVICE PER PIPE TRENCH.
3. ALL WATER SERVICE LATERALS TO BE INSTALLED AT SAME TIME AS MAIN LINE. NO SPLICE SHALL BE ALLOWED ON COPPER SERVICE LATERAL LINE.
4. WATER SERVICE LATERALS TO BE TERMINATED 12" BEHIND REAR OF CURB OR FUTURE CURB. IN CITY LIMITS, TERMINATE 12" BEHIND FUTURE SIDEWALK.
5. FIRE HYDRANTS SHALL BE 6" × 4" × 2 ½" - CLOW F-850, OR EQUAL, PAINTED WITH ONE COAT PRIMER AND ONE COAT YELLOW. THE 4" STEAMER OUTLET SHALL BE PERPENDICULAR TO THE CURB OR FUTURE CURB.
6. DEPTH OF COVER FOR WATER SERVICE LATERALS SHALL BE MINIMUM 30"; FOR WATER MAINS 10" AND SMALLER SHALL BE MINIMUM 36"; FOR 12" AND LARGER PIPE SHALL BE MINIMUM 42" OR AS SPECIFIED ON PLANS. ALL MEASUREMENTS FROM FINISHED GRADE.
7. ALL WATER MAINS SHALL BE FLUSHED AND DISINFECTED PER AWWA STANDARD C651 PRIOR TO USE AFTER INSTALLATION OR REPAIR.
8. CONSTRUCTION TO BE IN ACCORDANCE WITH THE WEST VALLEY WATER DISTRICT "STANDARDS FOR DOMESTIC WATER FACILITIES."
9. WATER SERVICE IS SUBJECT TO THE CURRENT DISTRICT RULES AND REGULATIONS AND ANY AMENDMENTS THERETO.
10. IF CONSTRUCTION HAS NOT COMMENCED WITHIN TWO YEARS OF THE DISTRICT APPROVAL DATE, THIS PLAN SHALL BE RESUBMITTED TO THE DISTRICT FOR REVIEW AND APPROVAL.
11. CONTRACTOR SHALL INSTALL WATERLINES ONLY AFTER THE CONSTRUCTION OF CONCRETE CURB AND GUTTER.
12. CONTRACTOR SHALL FURNISH A 2-YEAR WARRANTY BOND FOR ALL FACILITIES INSTALLED WITH THIS PLAN.

DESIGN CERTIFICATION

THIS CERTIFIES THAT THESE PLANS AND SPECIFICATIONS HAVE BEEN DESIGNED UNDER THE DIRECT SUPERVISION OF A CIVIL ENGINEER LICENSED IN THE STATE OF CALIFORNIA AND ARE IN ACCORDANCE WITH TITLE 22 CODE OF REGULATIONS CHAPTER 16 CALIFORNIA WATERWORK STANDARD OF THE STATE OF CALIFORNIA.

ROBERT R. OTTE, RCE 44120, Expires 06/30/21 DATE

WATER CERTIFICATION

THIS CERTIFIES THAT THESE PLANS AND SPECIFICATIONS HAVE BEEN REVIEWED BY AND ARE ACCEPTED BY THE WEST VALLEY WATER DISTRICT AND THAT THIS DISTRICT IS WILLING AND ABLE TO SUPPLY WATER TO THIS LOCATION.

SIGNATURE TITLE DATE

INDEX TO SHEETS

WATER CONSTRUCTION ITEMS

		QUANTITIES	
1	FURNISH & INSTALL 30", CLASS 150, 8 GA. CEMENT MORTAR LINED AND COATED STEEL PIPE; WELD BELL, FULLY WELDED	7,733	LF
2	FURNISH & INSTALL 30", CLASS 150, 8 GA. CEMENT MORTAR LINED AND COATED STEEL PIPE ELBOW; ANGLE AS NOTED	38	EA
3	FURNISH & INSTALL 30"BUTTERFLY VALVE	2	EA
4	FURNISH AND INSTALL 4" BLOW-OFF PER WEST VALLEY WATER DISTRICT STANDARD W-7	2	EA
5	FURNISH & INSTALL 4" AIR VALVE ASSEMBLY PER WEST VALLEY WATER DISTRICT STANDARD DRAWING No. W-6B	3	EA
6	TRENCH PATCH AND PAVEMENT REPAIR PER WEST VALLEY WATER DISTRICT STANDARD DRAWING No. W-1	150	SF
7	FURNISH AND INSTALL 4" DEAD-END FLUSH OUT PER WEST VALLEY WATER DISTRICT STANDARD DRAWING No. W-8	1	EA
8	FURNISH AND INSTALL FIRE HYDRANT ASSEMBLY PER WEST VALLEY WATER DISTRICT STANDARD DRAWING No. W-2. (FOR FLUSHING AND SAMPLING)	2	EA

NOTE: THE QUANTITIES SHOWN HEREON ARE PROVIDED ONLY FOR THE USE OF THE OWNER. PROSPECTIVE BIDDERS SHALL MAKE THEIR OWN DETERMINATION OF THE QUANTITIES REQUIRED, AND SHALL BASE THEIR BID ON THEIR OWN ESTIMATE.

NOTICE TO CONTRACTOR(S)

THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITY PIPES, CONDUITS OR STRUCTURES SHOWN ON THESE PLANS WERE OBTAINED BY A SEARCH OF THE AVAILABLE RECORDS. TO THE BEST OF OUR KNOWLEDGE, THERE ARE NO EXISTING UTILITIES EXCEPT AS SHOWN ON THESE PLANS. THE CONTRACTOR IS REQUIRED TO TAKE DUE PRECAUTIONARY MEASURES TO PROTECT THE UTILITY LINES SHOWN ON THESE DRAWINGS. THE CONTRACTOR FURTHER ASSUMES ALL LIABILITY AND RESPONSIBILITY FOR THE UTILITY PIPES, CONDUITS OR STRUCTURES SHOWN OR NOT SHOWN ON THESE DRAWINGS.

CONTRACTOR AGREES THAT HE SHALL ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION OF THIS PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY; THAT THIS REQUIREMENT SHALL APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS; THAT THE CONTRACTOR SHALL DEFEND, INDEMNIFY AND HOLD THE CITY, THE OWNER, AND THE ENGINEER HARMLESS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT EXCEPTING FOR LIABILITY ARISING FROM THE SOLE NEGLIGENCE OF THE OWNER OR THE ENGINEER.

MONUMENT PRESERVATION NOTE

SURVEY MONUMENTS THAT EXIST AS SHOWN ON RECORD MAPS, HIGHWAY MAPS, OR POINTS THAT PROVIDE SURVEY CONTROL WITHIN THE CONSTRUCTION AREA, SHALL BE LOCATED AND REFERENCED OUT BY A LICENSED LAND SURVEYOR OR REGISTERED CIVIL ENGINEER (AUTHORIZED TO PRACTICE LAND SURVEYING), AND CORNER RECORDS SHALL BE FILED WITH THE COUNTY SURVEYOR PRIOR TO THE START OF CONSTRUCTION. THESE CORNER RECORDS SHALL DESCRIBE THE MONUMENTS FOUND WITH THE DISTANCES TO REFERENCE POINTS FOR RESETTING OF THE SURVEY MONUMENT. WHEN CONSTRUCTION IS COMPLETED, MONUMENTS SHALL BE SET AND CORNER RECORDS SHALL BE FILED WITH THE COUNTY SURVEYOR SHOWING THE NEW MONUMENTS.

TOPOGRAPHY NOTE

AERIAL TOPOGRAPHY SHOWN PREPARED BY ANALYTICAL PHOTOGRAMMETRIC SURVEYS DATED JUNE 2006.

OWNER

LYTLE DEVELOPMENT COMPANY
285 W. RIALTO AVENUE, SUITE B
RIALTO, CALIFORNIA 92376
CONTACT: Mr. KEVIN LYNCH
(909) 937-4058

SOILS ENGINEER

GEOSOILS, Inc.
26590 MADISON AVENUE
MURRIETA, CALIFORNIA 92562
CONTACT: Mr. TODD A. GREER, CEG 2377
(951) 677-6951

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REGISTERED PROFESSIONAL ENGINEER
ROBERT R. OTTE
No. 44120
Exp. 06-30-21
CIVIL
STATE OF CALIFORNIA

BENCHMARK: 20-B-88 (CalTrans)
LOCATION:
2" BRASS DISK STAMPED CALIFORNIA DEPARTMENT OF TRANSPORTATION BM 20 -B-88 ON TOP OF WEST CURB SOUTH SIDE OF WILLOW AVENUE, 200 NORTH OF EASTON AVENUE
ELEVATION: 1416.110

PLANS PREPARED UNDER THE SUPERVISION OF
OTTE-BERKELEY GROUPE, INC.
575 E. CARREON DRIVE
COLTON, CA 92324-3000
TEL: (909) 370-0911 FAX: (909) 370-1211
E-mail: rob@obgcivil.com
ROBERT R. OTTE, RCE No. 44120 (Exp. 06/30/21) DATE

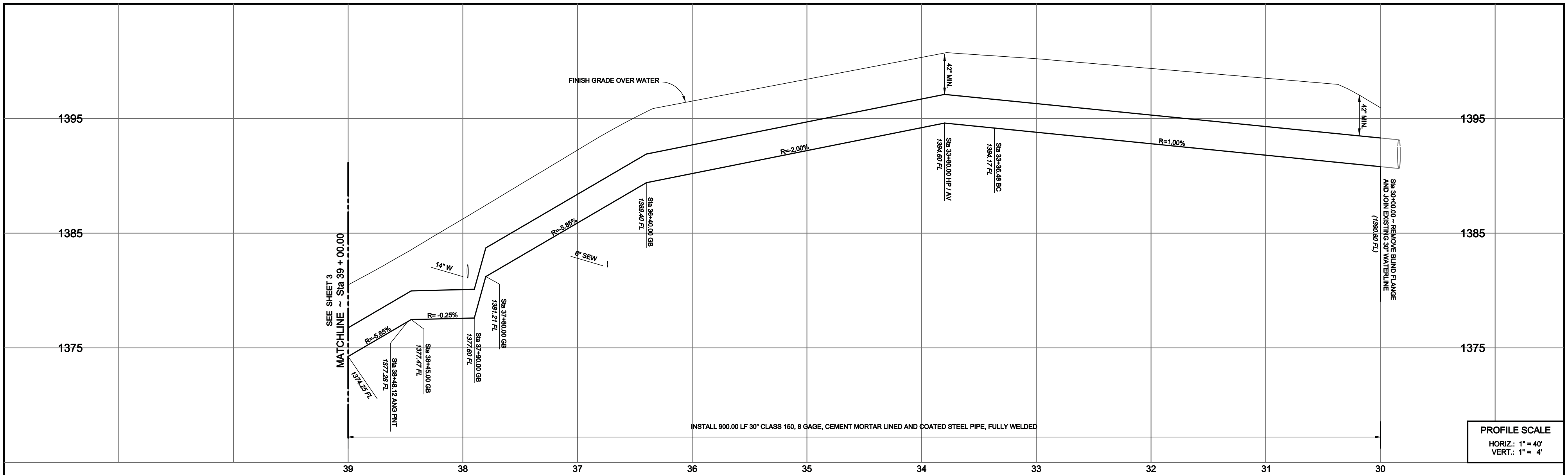
FIELD BOOK NOTES
MARK DESCRIPTION APPR DATE

WEST VALLEY WATER DISTRICT
DESIGNED BY R. OTTE
DRAWN BY R. OTTE
CHECKED BY J. BERKELEY
APPROVED BY
DATE
DATE

WATER IMPROVEMENT PLANS
TITLE SHEET
ZONE 4 - 30" TRANSMISSION LINE IMPROV

DRAWING No. D19002
PRESSURE ZONE: 4
FILE No.
SHEET 1 of 9

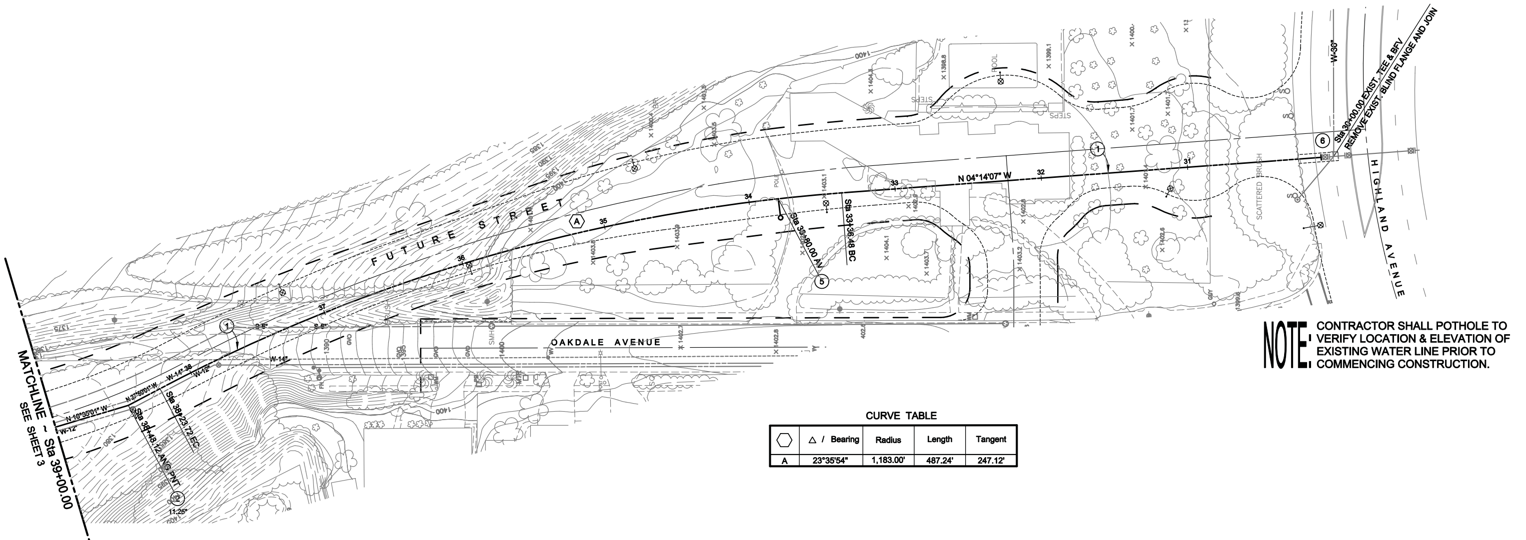
6.3.b



SCALE: 1" = 40'

0 20 40 80

SCALE FEET



NOTE: CONTRACTOR SHALL POTHOLE TO VERIFY LOCATION & ELEVATION OF EXISTING WATER LINE PRIOR TO COMMENCING CONSTRUCTION.

WATER CONSTRUCTION ITEMS

1. FURNISH & INSTALL 30", CLASS 150, 8 GA. CEMENT MORTAR LINED AND COATED STEEL PIPE; WELD BELL, FULLY WELDED
2. FURNISH & INSTALL 30", CLASS 150, 8 GA. CEMENT MORTAR LINED AND COATED STEEL PIPE ELBOW; ANGLE AS NOTED
- FURNISH & INSTALL 30"BUTTERFLY VALVE
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- FURNISH AND INSTALL 4" DEAD-END FLUSH OUT PER WEST VALLEY WATER DISTRICT STANDARD DRAWING No. W-8
- FURNISH AND INSTALL FIRE HYDRANT ASSEMBLY PER WEST VALLEY WATER DISTRICT STANDARD DRAWING No. W-2. (FOR FLUSHING AND SAMPLING)

CURVE TABLE

⬡	Δ / Bearing	Radius	Length	Tangent
A	23°35'54"	1,183.00'	487.24'	247.12'

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REGISTERED PROFESSIONAL ENGINEER ROBERT R. OTTE No. 44120 Exp. 06-30-21 CIVIL STATE OF CALIFORNIA

BENCHMARK: 20-B-88 (CalTrans)

LOCATION:

2" BRASS DISK STAMPED CALIFORNIA DEPARTMENT OF TRANSPORTATION BM 20 -B-88 ON TOP OF WEST CURB SOUTH SIDE OF WILLOW AVENUE, 200 NORTH OF EASTON AVENUE

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PLANS PREPARED UNDER THE SUPERVISION OF

OTTE-BERKELEY GROUPE, INC.

575 E. CARREON DRIVE

COLTON, CA 92324-3000

TEL: (909) 370-0911 FAX: (909) 370-1211

E-mail: rob@obgcivil.com

ROBERT R. OTTE, RCE No. 44120 (Exp. 06/30/21) DATE

FIELD BOOK NOTES

MARK	DESCRIPTION	APPR	DATE

WEST VALLEY WATER DISTRICT

DESIGNED BY R. OTTE

DRAWN BY R. OTTE

CHECKED BY J. BERKELEY

APPROVED BY

DATE

DATE

WATER IMPROVEMENT PLANS

EL RANCHO VERDE PKWY

Sta 30+00.00 to Sta 39+00.00

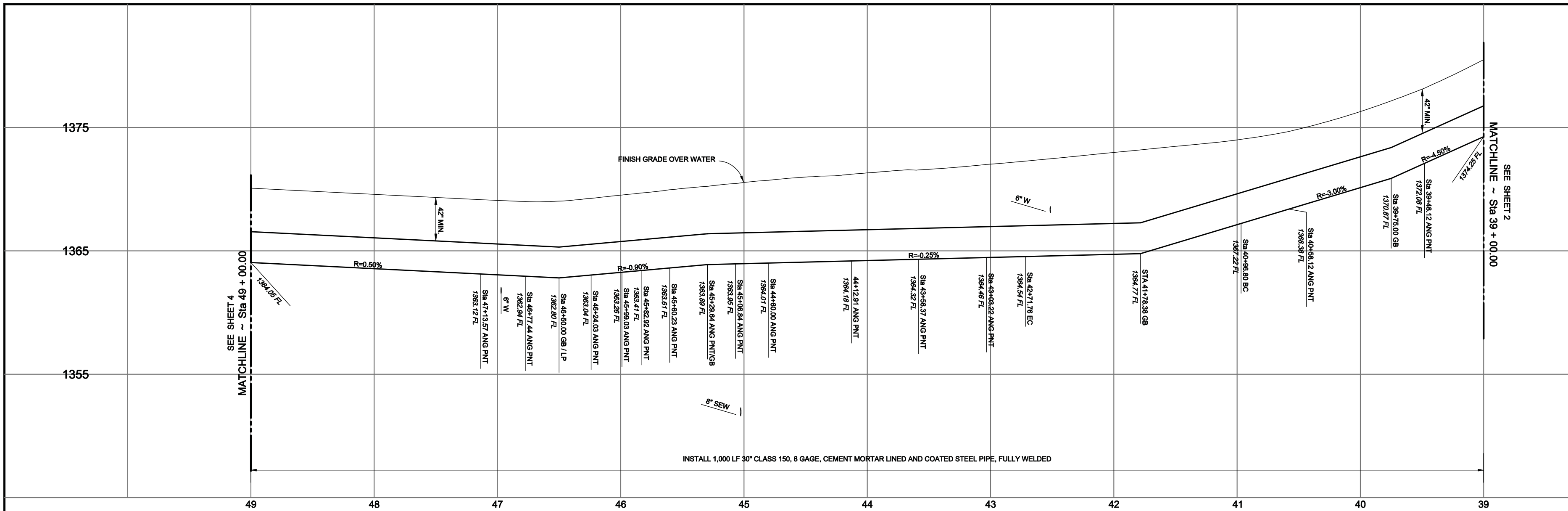
DRAWING No. D19002

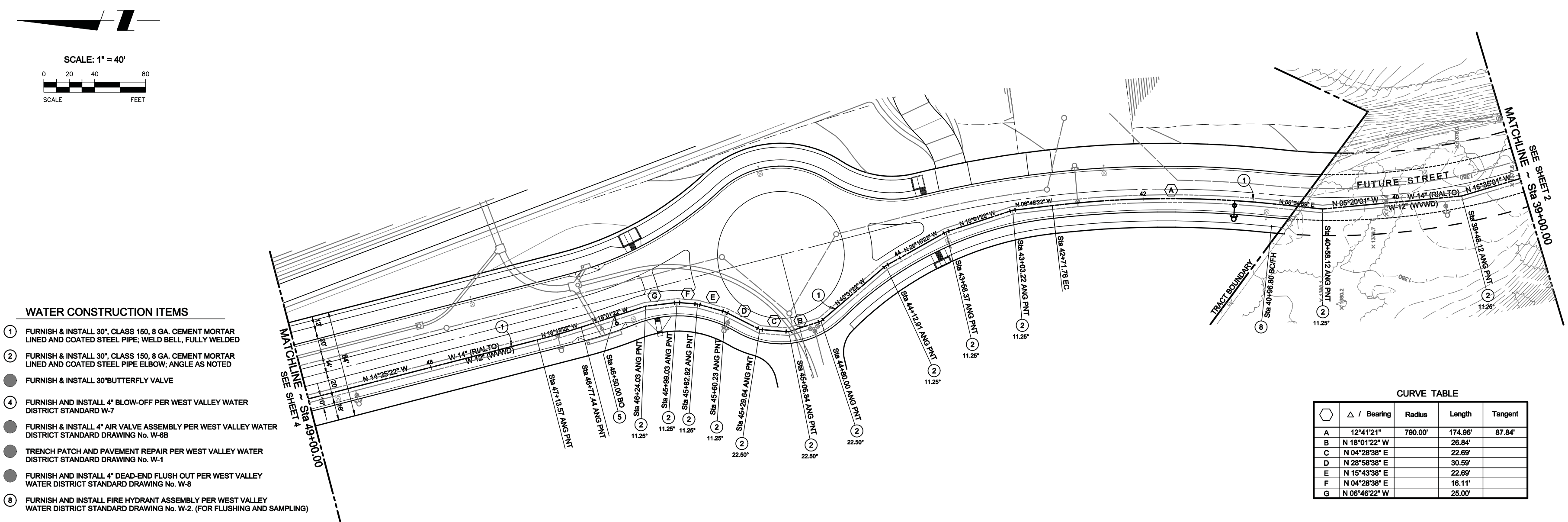
PRESSURE ZONE: 4

FILE No.

SHEET 2 of 9

6.3.b





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CURVE TABLE

⬡	Δ / Bearing	Radius	Length	Tangent
A	12°41'21"	790.00'	174.96'	87.84'
B	N 18°01'22" W		26.84'	
C	N 04°28'38" E		22.69'	
D	N 28°58'38" E		30.59'	
E	N 15°43'38" E		22.69'	
F	N 04°28'38" E		16.11'	
G	N 06°46'22" W		25.00'	

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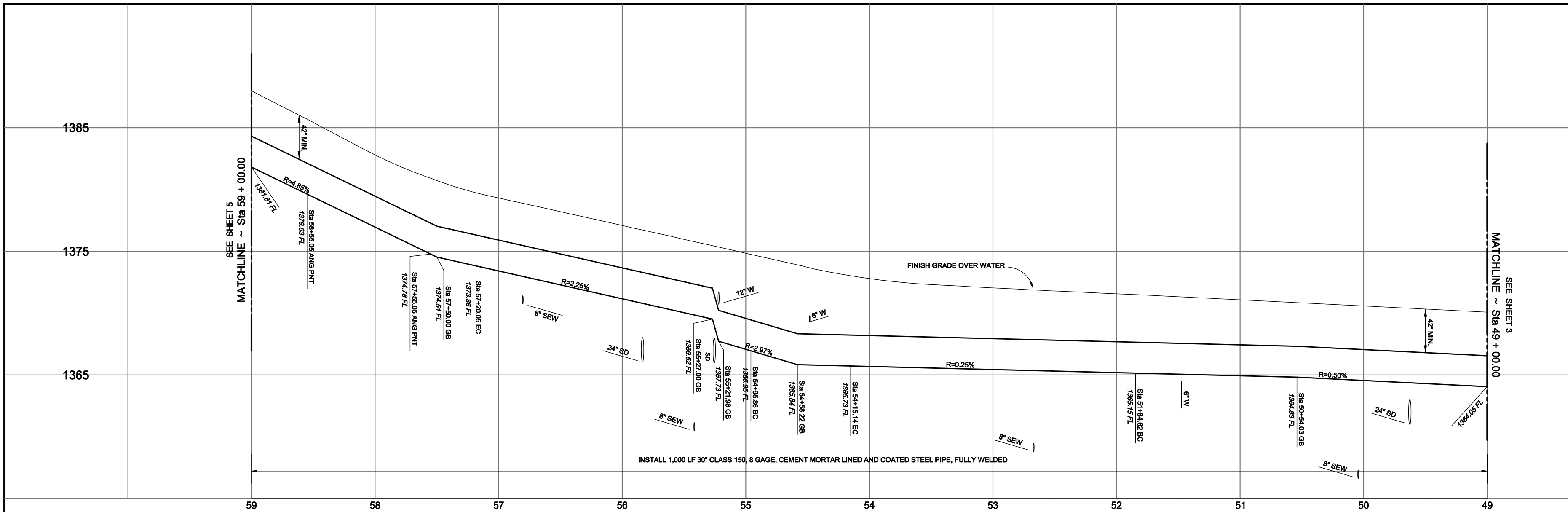
DRAWN BY R. OTTE
CHECKED BY J. BERKELEY
APPROVED BY
DATE
DATE

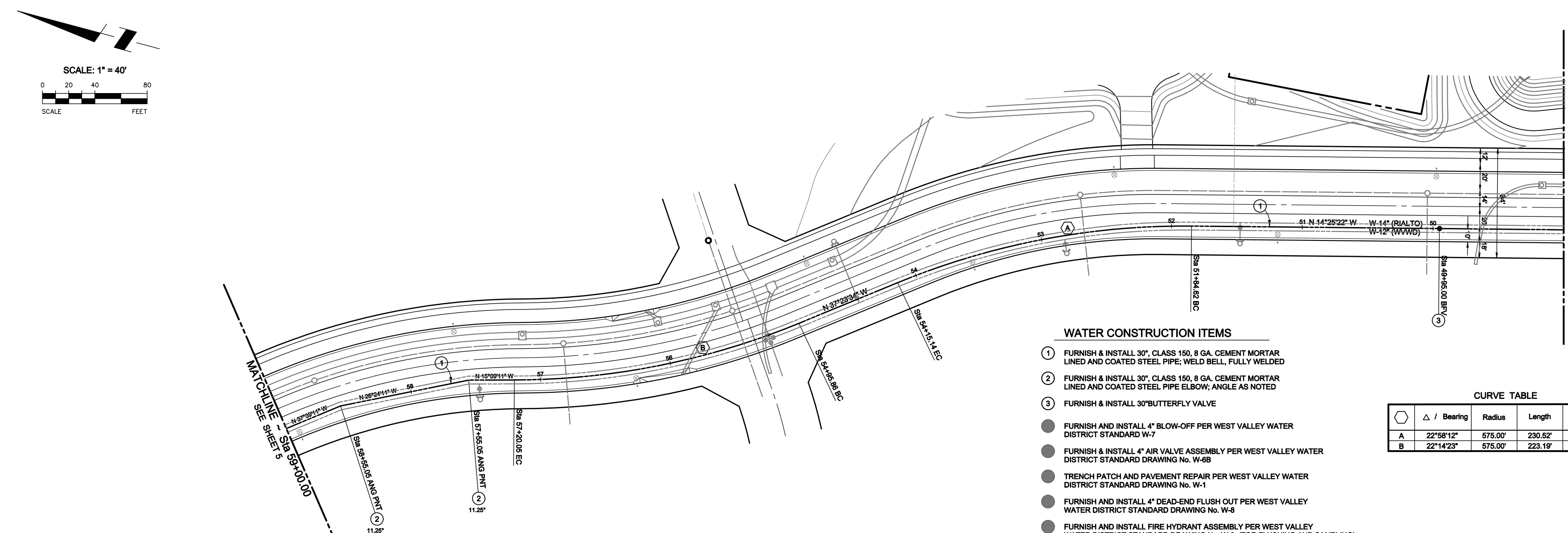
WATER IMPROVEMENT PLANS
EL RANCHO VERDE PKWY
Sta 39+00.00to Sta 49+00.00

DRAWING No. D19002
PRESSURE ZONE: 4
FILE No.
SHEET 3 of 9

6.3.b



PROFILE SCALE
HORIZ.: 1" = 40'
VERT.: 1" = 4'



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CURVE TABLE

	Δ / Bearing	Radius	Length	Tangent
A	22°58'12"	575.00'	230.52'	116.83'
B	22°14'23"	575.00'	223.19'	113.02'

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REGISTERED PROFESSIONAL ENGINEER
ROBERT R. OTTE
No. 44120
Exp. 06-30-21
CIVIL
STATE OF CALIFORNIA

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ROBERT R. OTTE, RCE No. 44120 (Exp. 06/30/21) DATE

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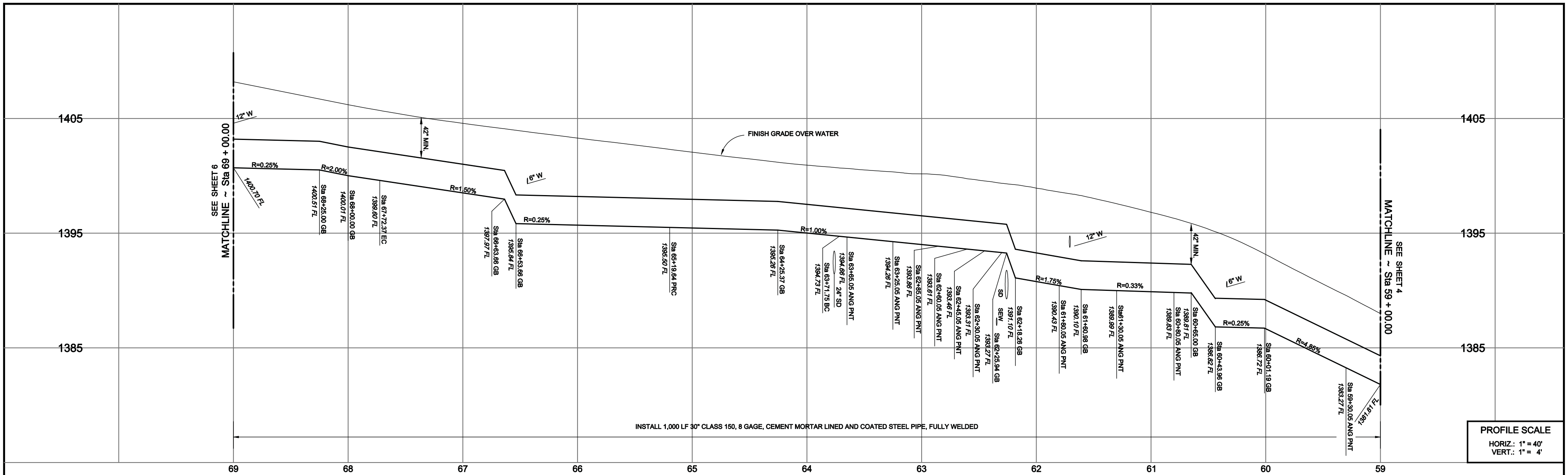
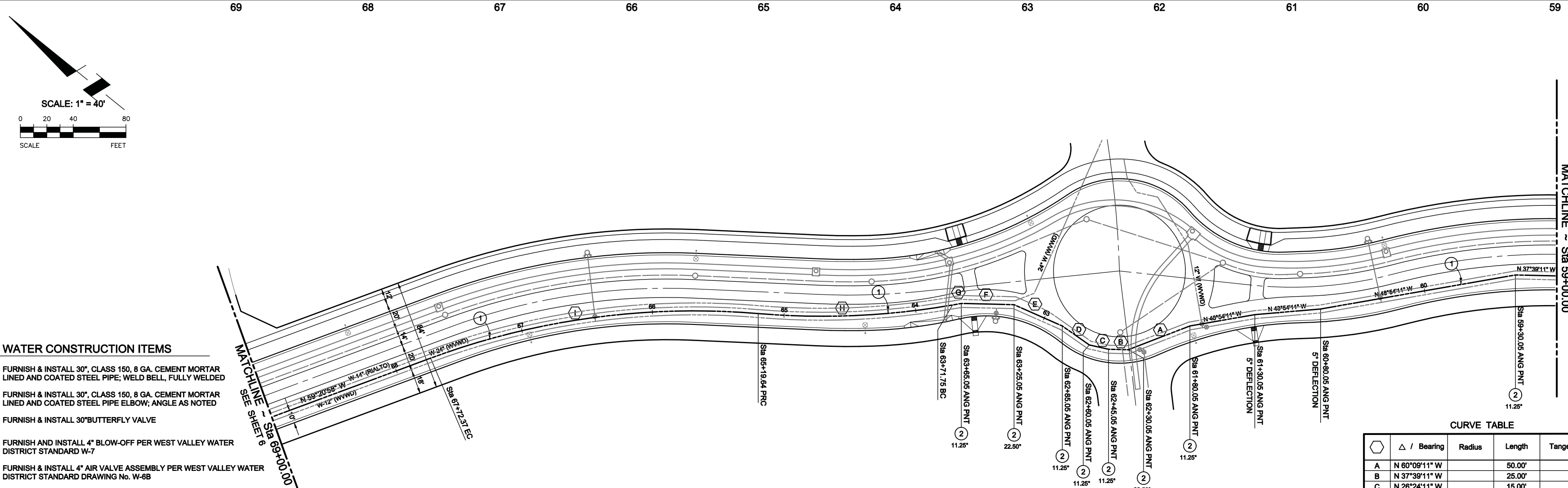
DESIGNED BY R. OTTE
DRAWN BY R. OTTE
CHECKED BY J. BERKELEY
APPROVED BY
DATE
DATE

WATER IMPROVEMENT PLANS
EL RANCHO VERDE PKWY
Sta 49+00.00 to Sta 59+00.00

DRAWING No. D19002
PRESSURE ZONE: 4
FILE No.
SHEET 4 of 9

6.3.b





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- FURNISH AND INSTALL FIRE HYDRANT ASSEMBLY PER WEST VALLEY WATER DISTRICT STANDARD DRAWING No. W-2. (FOR FLUSHING AND SAMPLING)

CURVE TABLE

⬡	Δ / Bearing	Radius	Length	Tangent
A	N 60°09'11" W		50.00'	
B	N 37°39'11" W		25.00'	
C	N 26°24'11" W		15.00'	
D	N 03°54'11" W		25.00'	
E	N 15°09'11" W		40.00'	
F	N 37°39'11" W		40.00'	
G	N 48°54'11" W		6.69'	
H	14°44'14"	575.00'	147.90'	74.36'
I	25°11'00"	575.00'	252.73'	128.44'

Underground Service Alert
Call: TOLL FREE
1-800
227-2600
TWO WORKING DAYS BEFORE YOU DIG

REGISTERED PROFESSIONAL ENGINEER
ROBERT R. OTTE
No. 44120
Exp. 06-30-21
CIVIL
STATE OF CALIFORNIA

BENCHMARK: 20-B-88 (CalTrans)
LOCATION:
2" BRASS DISK STAMPED CALIFORNIA DEPARTMENT OF TRANSPORTATION BM 20 -B-88 ON TOP OF WEST CURB SOUTH SIDE OF WILLOW AVENUE, 200 NORTH OF EASTON AVENUE
ELEVATION: 1416.110

PLANS PREPARED UNDER THE SUPERVISION OF
OTTE-BERKELEY GROUPE, INC.
575 E. CARREON DRIVE
COLTON, CA 92324-3000
TEL: (909) 370-0911 FAX: (909) 370-1211
E-mail: rob@obgcivil.com
ROBERT R. OTTE, RCE No. 44120 (Exp. 06/30/21) DATE

FIELD BOOK NOTES

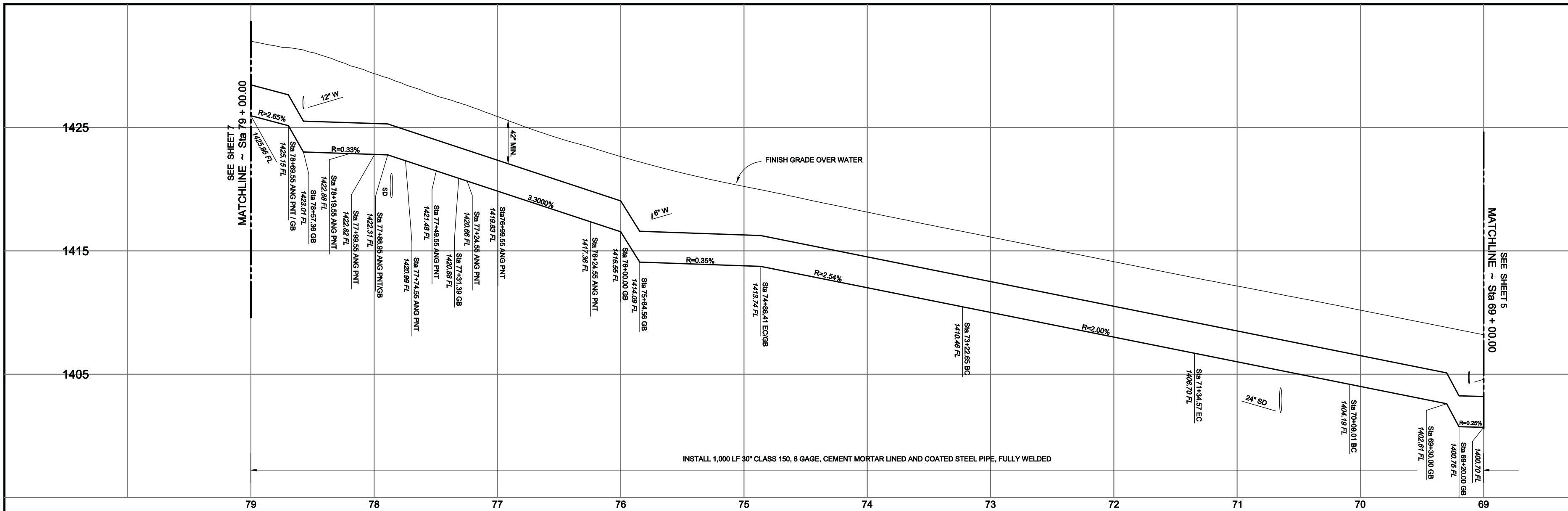
MARK	DESCRIPTION	APPR	DATE

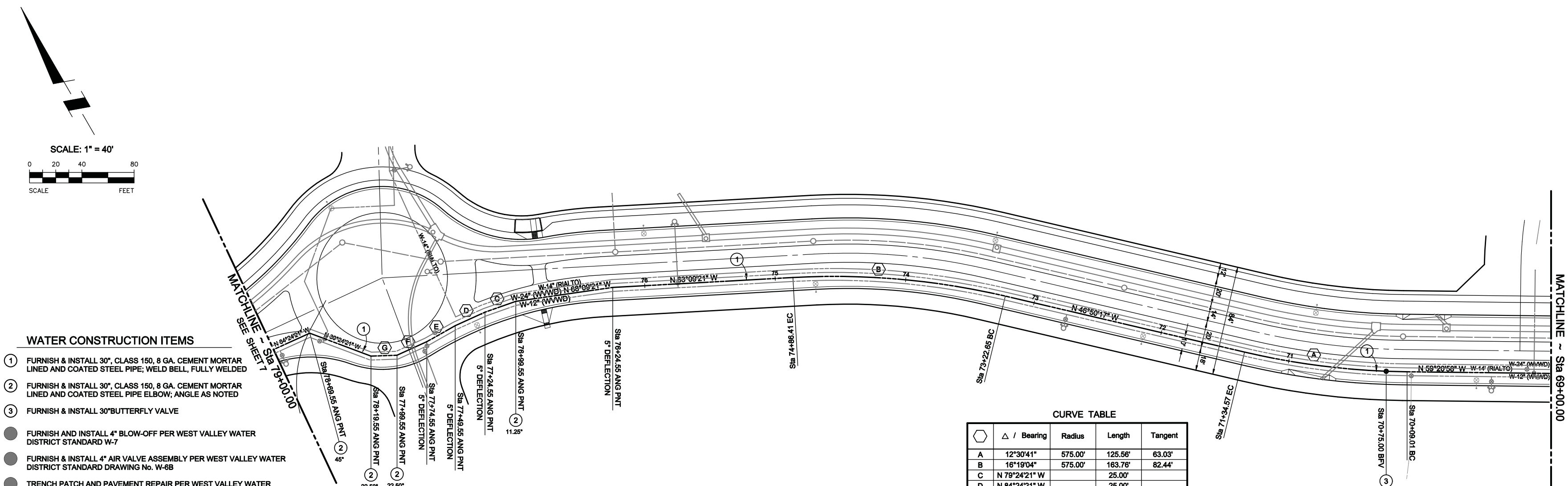
WEST VALLEY WATER DISTRICT
DESIGNED BY R. OTTE
DRAWN BY R. OTTE
CHECKED BY J. BERKELEY
APPROVED BY
DATE
DATE

WATER IMPROVEMENT PLANS
EL RANCHO VERDE PKWY
Sta 59+00.00 to Sta 69+00.00

DRAWING No. D19002
PRESSURE ZONE: 4
FILE No.
SHEET 5 of 9

6.3.b





CURVE TABLE

⬡	Δ / Bearing	Radius	Length	Tangent
A	12°30'41"	575.00'	125.56'	63.03'
B	16°19'04"	575.00'	163.76'	82.44'
C	N 79°24'21" W		25.00'	
D	N 84°24'21" W		25.00'	
E	N 89°24'21" W		25.00'	
F	N 84°24'21" W		25.00'	
G	N 61°54'21" W		20.00'	

WATER CONSTRUCTION ITEMS

1. FURNISH & INSTALL 30", CLASS 150, 8 GA. CEMENT MORTAR LINED AND COATED STEEL PIPE; WELD BELL, FULLY WELDED
2. FURNISH & INSTALL 30", CLASS 150, 8 GA. CEMENT MORTAR LINED AND COATED STEEL PIPE ELBOW; ANGLE AS NOTED
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- FURNISH & INSTALL 4" AIR VALVE ASSEMBLY PER WEST VALLEY WATER DISTRICT STANDARD DRAWING No. W-6B
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- FURNISH AND INSTALL 4" DEAD-END FLUSH OUT PER WEST VALLEY WATER DISTRICT STANDARD DRAWING No. W-8
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E-mail: rob@obgcivil.com
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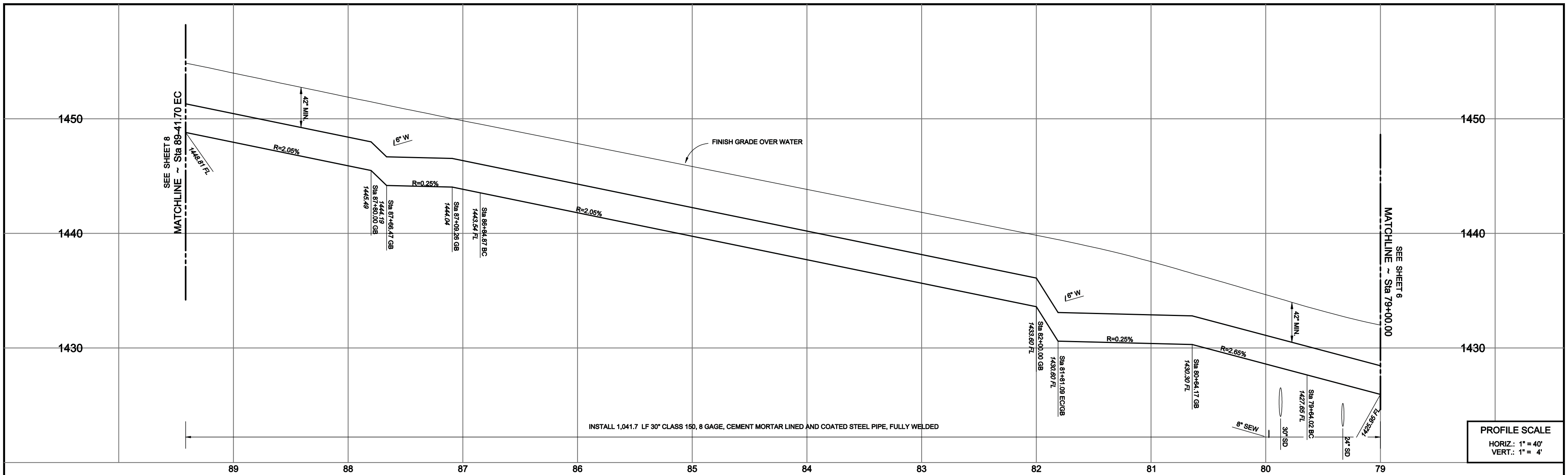
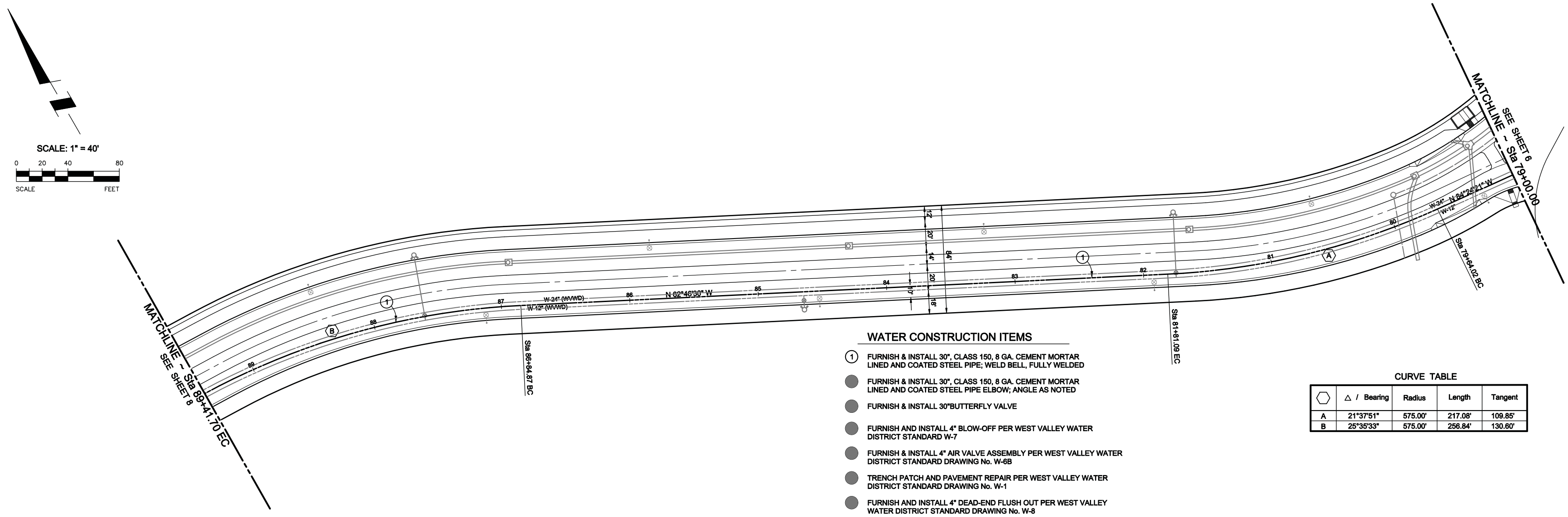
APPROVED BY
DATE
DATE

WATER IMPROVEMENT PLANS
EL RANCHO VERDE PKWY
Sta 69+00.00 to Sta 79+00.00

DRAWING No. D19002
PRESSURE ZONE: 4
FILE No.
SHEET 6 of 9

6.3.b





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CURVE TABLE

⬡	Δ / Bearing	Radius	Length	Tangent
A	21°37'51"	575.00'	217.08'	109.85'
B	25°35'33"	575.00'	256.84'	130.60'

Underground Service Alert
Call: TOLL FREE
1-800
227-2600
TWO WORKING DAYS BEFORE YOU DIG

REGISTERED PROFESSIONAL ENGINEER ROBERT R. OTTE No. 44120 Exp. 06-30-21 CIVIL STATE OF CALIFORNIA

BENCHMARK: 20-B-88 (CalTrans)
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E-mail: rob@obgcivil.com
ROBERT R. OTTE, RCE No. 44120 (Exp. 06/30/21) DATE

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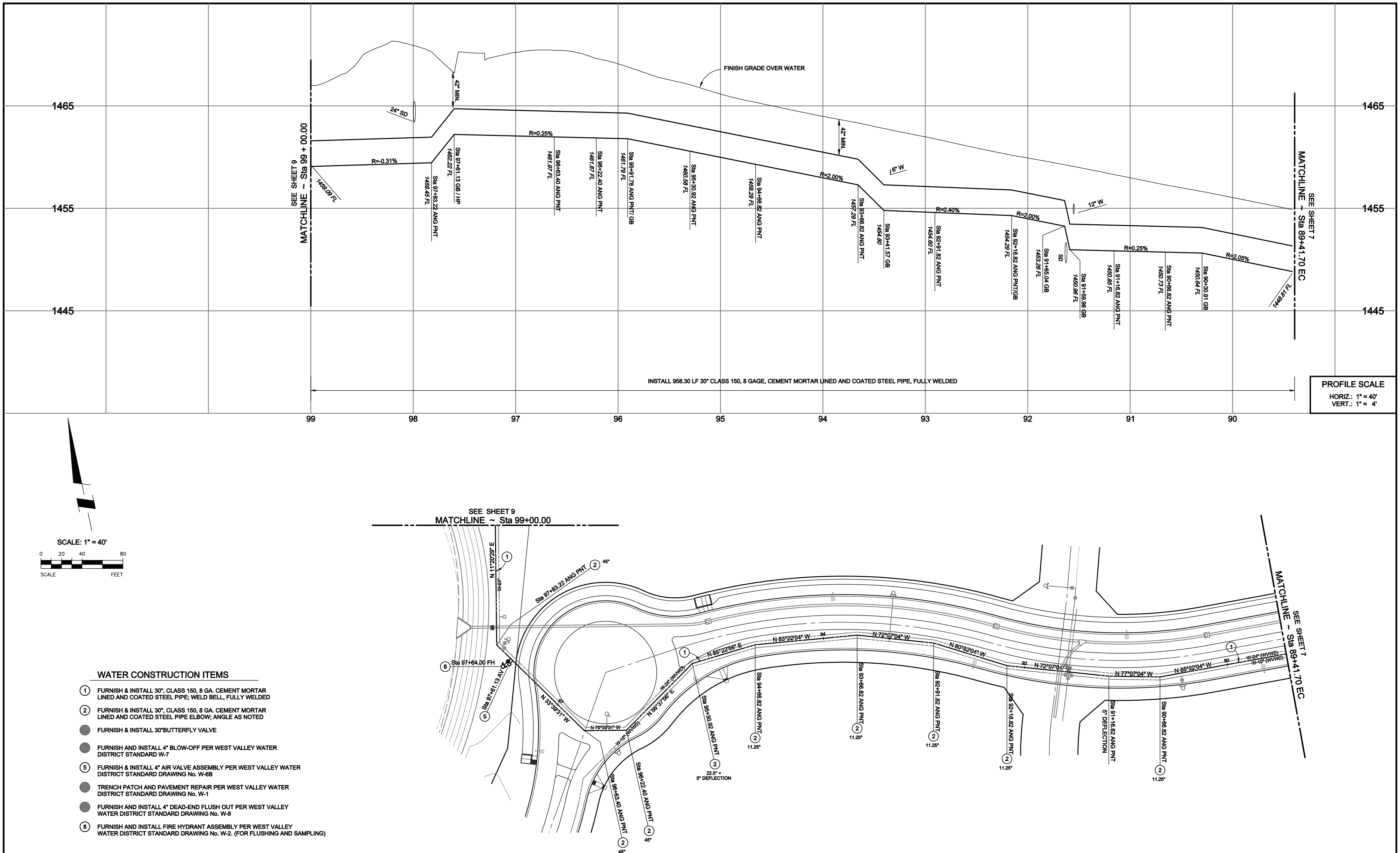
DRAWN BY R. OTTE
CHECKED BY J. BERKELEY
APPROVED BY
DATE
DATE

WATER IMPROVEMENT PLANS
EL RANCHO VERDE PKWY
Sta 79+00.00 to Sta 89+41.70

DRAWING No. D19002
PRESSURE ZONE: 4
FILE No.
SHEET 7 of 9

6.3.b



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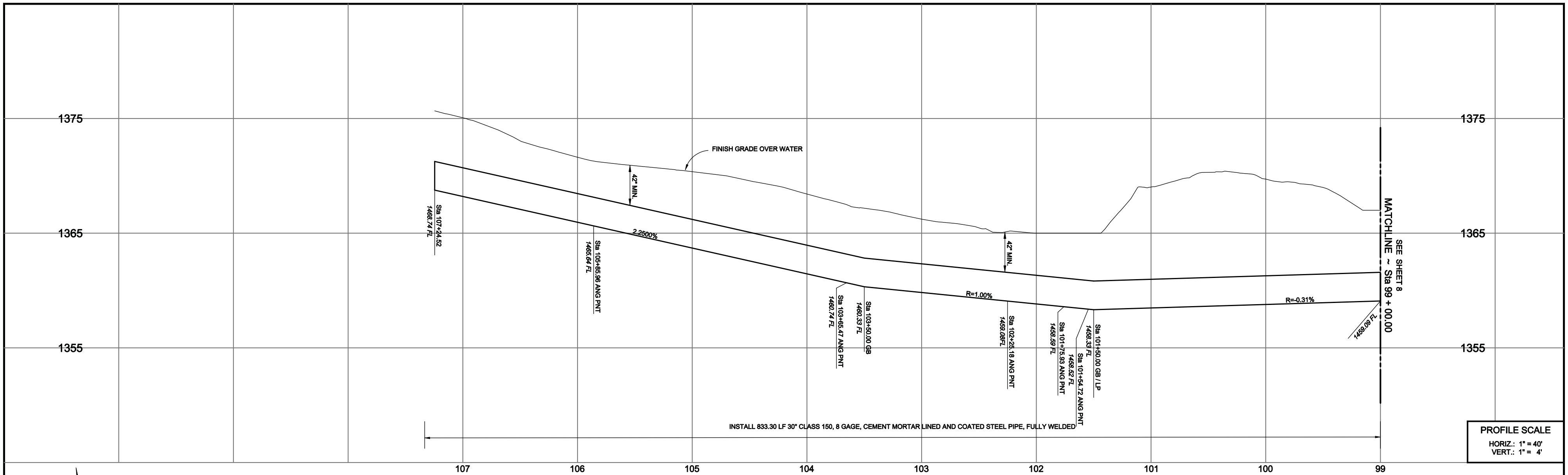
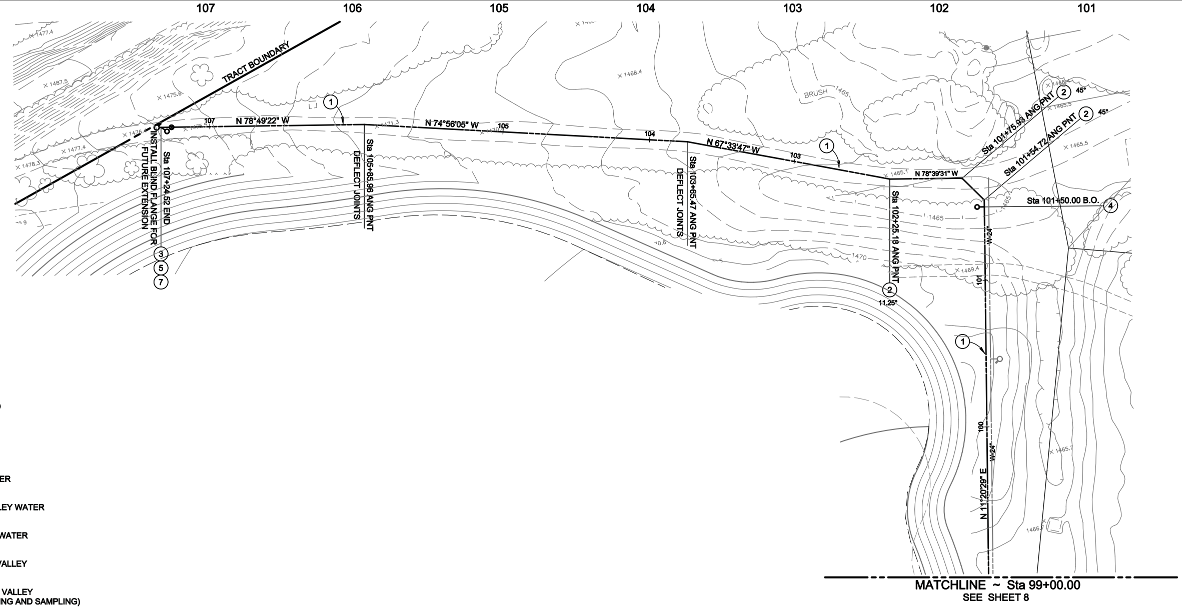
EL RANCHO VERDE PKWY
Sta 89-41.70 to Sta 99+00.00

DRAWING No. D19002
PRESSURE ZONE: 4
FILE No.
SHEET 8 of 9

6.3.b





SCALE: 1" = 40'

0 20 40 80

SCALE FEET

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EL RANCHO VERDE PKWY
Sta 99+00.00 to Sta 107+33.30

DRAWING No. D19002
PRESSURE ZONE: 4
FILE No.
SHEET 9 of 9

6.3.b

EXHIBIT "C"

NOTICE OF DETERMINATION

DATE FILED & POSTED
Posted On: 9/12/19
Removed On: 10/25/19
Receipt No: 30-09122019-63

NOTICE OF DETERMINATION

To: ☐ Office of Planning and Research
1400 Tenth Street, Room 121
Sacramento, CA 95814

☒ Clerk of the Board
County of San Bernardino
385 North Arrowhead Avenue
San Bernardino, CA 92415

From: City of Rialto
Development Services Department
150 South Palm Avenue
Rialto, CA 92376

Subject: Filing of Notice of Determination in compliance with Section 21152 of the Public Resources Code

Project Title: Revised Addendum to the Lytle Creek Ranch Specific Plan Final Environmental Impact Report

State Clearinghouse Number: 2009061113

Lead Agency Contact Person: Daniel Casey, Senior Planner **Lead Agency Phone** (909) 820-2525 ext. 2075

Project Location: The Lytle Creek Ranch Specific Plan is located on the north side of Lytle Creek Road, Riverside Avenue and Sycamore Avenue. Neighborhood II is located within the Specific Plan.

Project: The Lytle Creek Ranch Specific Plan, Environmental Impact Report and Recirculated Portions of the Environmental Impact Report (SCH #2009061113) were adopted by the City Council on August 14, 2012. The project involves a specific plan amendment (SPA 2017-0002) to revise the approved specific plan to eliminate Neighborhood I, modify the land use configuration of Neighborhoods II and III, and update the text, tables, charts and maps, and Tentative Tract Map No. 20092 (TTM 2017-0005) to create six (6) lots on a 188-acre site to facilitate a 776-lot residential subdivision in Neighborhood II of the Lytle Creek Specific Plan. The proposed Map will also create one (1) remainder lot and twelve (12) lettered lots for public open space, utilities and infrastructure, and fall within the scope of the previously-certified Environmental Impact Report ("LCRSP EIR"). No supplemental or subsequent EIR is required pursuant to Section 21166 of the Public Resources Code or Sections 15162 through 15164 of the CEQA Guidelines. A Revised Addendum to the LCRSP EIR has been prepared. All potential effects of the project have been analyzed in the LCRSP EIR and the Revised Addendum.

Proponent & Address: Lytle Development Company, Inc. 285 W. Rialto Avenue, Rialto CA 92376

Contact Info & Phone: Kevin Lynch, (909) 937-4058

A Revised Addendum to the LCRSP EIR was prepared, considered and approved in connection with the City's consideration and approval of the Project. The Revised Addendum confirmed that Project would not result in new unanalyzed significant adverse impacts and that none of the circumstances set forth in Public Resources Code section 21166 or CEQA Guideline 15162(a) were present, and that no further environmental review is necessary for the Project. This is to advise that the City of Rialto adopted the Revised Addendum to the LCRSP EIR and re-approved the Project on **September 10, 2019** and has made the following determinations regarding the above described Project:

1. The proposed project {☒ will ☐ will not} have a significant effect on the environment.
2. ☒ An Environmental Impact Report (SCH 2009061113) was prepared and certified for the Project pursuant to the provisions of CEQA. An Addendum to the certified LCRSP was prepared and approved for the proposed Specific Plan Amendment and the Tentative Map which confirmed that the proposed revisions did not trigger the need for supplemental or subsequent environmental review per Pub. Resource Code 21166.
3. Mitigation measures {☒ were ☐ were not} made a condition of the approval of the Project as carried forward from the LCRSP EIR.
4. A mitigation reporting or monitoring plan {☒ was ☐ was not} adopted for the Project as carried forward from the LCRSP EIR.
5. A Statement of Overriding Considerations {☒ was ☐ was not} adopted for this Project in connection with the approval of the LCRSP EIR.
6. Findings {☒ were ☐ were not} made pursuant to the provisions of CEQA.

This is to certify that the LCRSP EIR with comments and responses, the Revised Addendum and the record of Project is available to the general public at the City of Rialto, Development Services Department, Planning Division, 150 South Palm Avenue, Rialto, CA 92376.

DC

Daniel Casey, Senior Planner

Date: September 11, 2019

State of California - Department of Fish and Wildlife
2019 ENVIRONMENTAL FILING FEE CASH RECEIPT
DFW 753.5a (REV. 12/01/18) Previously DFG 753.5a

Print | StartOver | Finalize&Email

RECEIPT NUMBER:
36 — 09122019 — 635

STATE CLEARINGHOUSE NUMBER *(If applicable)*
2009061113

SEE INSTRUCTIONS ON REVERSE. TYPE OR PRINT CLEARLY.

LEAD AGENCY	LEAD AGENCY EMAIL	DATE
City of Rialto Development Services Department		09122019

COUNTY/STATE AGENCY OF FILING	DOCUMENT NUMBER
San Bernardino	

PROJECT TITLE

Revised Addendum to the Lytle Creek Ranch Specific Plan Final Environmental Impact Report

PROJECT APPLICANT NAME	PROJECT APPLICANT EMAIL	PHONE NUMBER
City of Rialto Development Services Department		(909) 820-2525 ext 2075

PROJECT APPLICANT ADDRESS	CITY	STATE	ZIP CODE
150 South Palm Avenue	Rialto	CA	92376

PROJECT APPLICANT *(Check appropriate box)*

☐ Local Public Agency ☐ School District ☐ Other Special District ☐ State Agency ☑ Private Entity

CHECK APPLICABLE FEES:

☐ Environmental Impact Report (EIR)	$3,271.00	$	0.00
☐ Mitigated/Negative Declaration (MND)(ND)	$2,354.75	$	0.00
☐ Certified Regulatory Program (CRP) document - payment due directly to CDFW	$1,112.00	$	0.00

☑ Exempt from fee
- ☐ Notice of Exemption (attach)
- ☐ CDFW No Effect Determination (attach)

☑ Fee previously paid (attach previously issued cash receipt copy)

☐ Water Right Application or Petition Fee (State Water Resources Control Board only)	$850.00	$	0.00
☑ County documentary handling fee		$	50.00
☐ Other		$	

822

PAYMENT METHOD:
☐ Cash ☐ Credit ☑ Check ☐ Other

TOTAL RECEIVED $ 50.00

SIGNATURE	AGENCY OF FILING PRINTED NAME AND TITLE
X Vicky Hernandez	Vicky Hernandez, Deputy Clerk

ORIGINAL - PROJECT APPLICANT COPY - CDFW/ASB COPY - LEAD AGENCY COPY - COUNTY CLERK

EXHIBIT "D"

BILL OF SALE

This is to acknowledge that ________________________________ ("Owner"), has this day, transferred to the West Valley Water District, a public agency of the State of California ("District") for good and valuable consideration, receipt of which is hereby acknowledged, the water facilities for ____ located on _________________________________ described below and as shown on Exhibit "A" attached hereto and by this reference incorporated herein ("District Facilities").

Water facilities description:

30" cement lined and mortar coated steel pipe and all other water facilities installed with approved plan and shown in "Exhibit A".

Owner warrants (1) that the District Facilities are free and clear of any encumbrances, and (2) that the District Facilities are free of all defects in material and workmanship for two (2) years from the date the Bill of Sale is executed. It shall be the Owner's responsibility to pay for all repairs required within said two (2) year period which are due to defects in material and workmanship.

Owner hereby agrees to indemnify, defend and hold District and its officers, directors, employees and agents harmless from and against any and all claims, liabilities, damages, actions, costs, including attorneys' fees and costs of any nature to which they may be subjected or put, by reason of, or resulting from the design, engineering and construction of the District Facilities.

OWNER:

____

By:___________________________

Print Name:____________________

Its:___________________________

Dated:_________________________

Accepted

DISTRICT:

WEST VALLEY WATER DISTRICT,

a public agency of the State of California

By:___________________________

Print Name:____________________

Its: General Manager

Dated:_________________________

EXHIBIT A TO BILL OF SALE