WATER SYSTEM ANALYSIS

2400 HIGHLAND AVE

2400 HIGHLAND AVE
SAN BERNARDINO, CA 92407
APN: 264-431-18

October 2022

Project Applicant:
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This Water Study has been prepared by Kimley-Horn and Associates, Inc. under the direct supervision of the following Registered Civil engineer. The undersigned attests to the technical data contained in this study, and to the qualifications of technical specialists providing engineering computations upon which the recommendations and conclusions are based.

Registered Civil Engineer

September 30, 2022
Date

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Appendices

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1 PROJECT DESCRIPTION

1.1 INTRODUCTION

This report provides an analysis of the proposed water system for the 2400 Highland Ave project in the City of Rialto. The project is located in the Rialto community directly north of E Highland Ave and south of the Cajon Wash. Figure 1-1 below provides a location map for the project. The project address is 2400 Highland Ave.

The project encompasses 101.3 gross acres, and the existing land is developed as a quarry. The site is uniquely situated on a slope with an elevation change of roughly 100 feet, with the low point on the east end of the property and the high point on the west end of the property. The project proposes to redevelop the site to construct a ±30 acre industrial center. The proposed first level finished floor elevation for the project is 1339 ft.

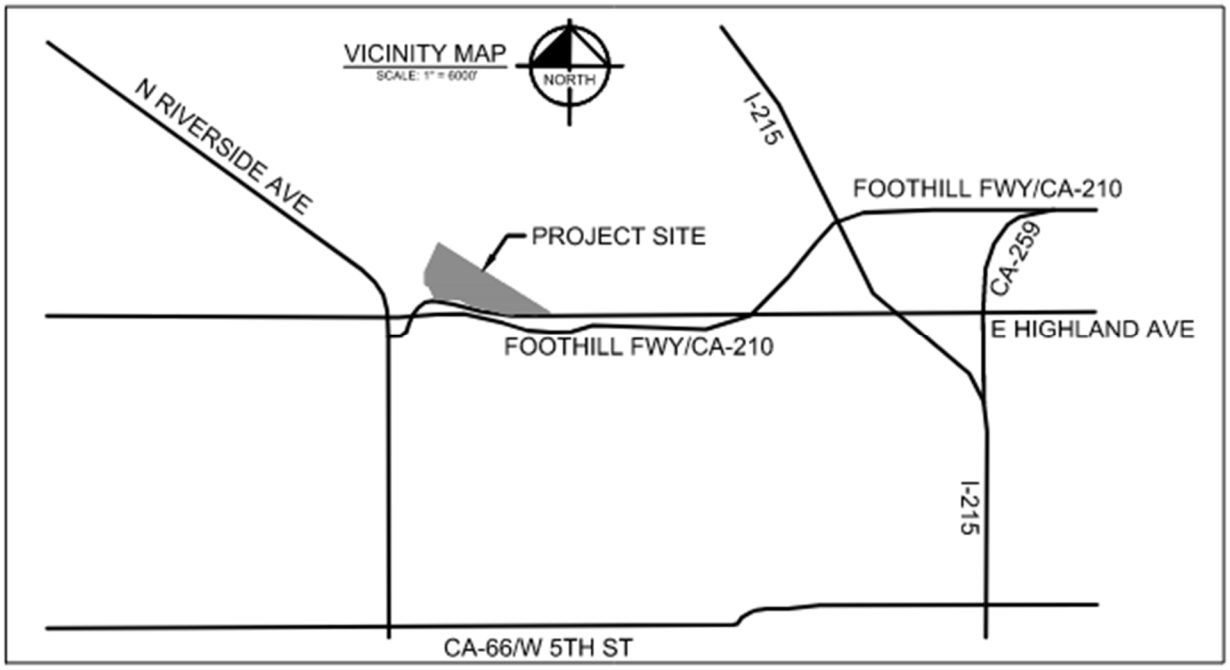

Figure 1–1 Vicinity Map

2 WATER STUDY

2.1 PURPOSE OF STUDY

The purpose of this study is to analyze and determine if the existing public water system is able to provide adequate domestic and fire protection service for the 2400 Highland project. This study will also detail the proposed onsite private domestic and fire water systems that will provide service to the redevelopment. This report will follow the West Valley Water District's water system design standards.

2.2 STUDY AREA

The study area for this report is the boundary of the 2400 Highland project and the water system surrounding the project. The extent of the existing water system which was incorporated into the analysis of the project site was based on information provided by the West Valley Water District (WVWD) in the County of San Bernardino.

Hydrant flow test data was provided by WVWD at one existing fire hydrant south of the project site, along Highland Ave, 580 feet west of N Pepper Avenue. A copy of the hydrant flow tests are included in Appendix D.

All onsite water lines will be private and will connect to the City's existing 16" public water main in Highland Ave via backflow preventers and meters. A preliminary analysis of the onsite domestic and private fire protection system is included in this report.

2.3 CITY OF SAN DIEGO DESIGN CRITERIA

The West Valley Water District Standards for Domestic Water Facilities (1999), and the West Valley Water District Water Facilities Master Plan (2020) developed by AKEL Engineering Group, were used to analyze the existing water system.

A summary of the design criteria from the District Standards and Water Facilities Master Plan is presented as Table 2-1.

Table 2–1 West Valley Water District Water System Design Criteria

Criteria	Design Requirement
Minimum Required Fire-Flow [7]	8,000 gpm, 4 hour duration
Minimum Required Fire Hydrant Flow with 50% auto-sprinkler reduction [5,7]	4,000 gpm, 4 hour duration
Minimum Static Pressure (service connections) [3]	65 psi
Maximum Static Pressure, (In mains) [3,4]	130 psi
Maximum Static Pressure, (service connections) [3,4]	80 psi
Minimum Residual Pressure – Peak Hour [2,4]	40 psi
Minimum Residual Pressure – Max Day plus Fire [2,4]	20 psi
Maximum Distribution Pipeline Velocity (Peak Hour) [2,4]	5 fps
Maximum Distribution Pipeline Velocity (Max Day plus Fire) [2,4]	10 fps
Maximum Recommended Service Line Velocity[6]	5 fps
Maximum Headloss[4]	5’/1000’

[1] West Valley Water District Standards, Section 1.1.2.b
[2] West Valley Water District Standards, Section 1.1.6.a
[3] West Valley Water District Standards, Section 1.1.6.b
[4] West Valley Water District, Water Facilities Master Plan, Table 3-3
[5] California Fire Code, Appendix B, B105.2
[6] West Valley Water District Standards, Section 1.1.6.j
[7] California Fire Code, Appendix B, Table B105.1

2.4 WATER DEMAND

The water demands were developed in accordance with the West Valley Water District Water Facilities Master Plan. Light industrial water demand is estimated as 500 gpd/acre, and landscape irrigation is estimated as 2,690 gpd/acre (Water Facilities Master Plan, Table 3.5). The 2400 Highland project proposes 85.5 acres of impervious area falling under the light industrial category, and 15.8 acres of pervious area falling under the landscape irrigation category, for a total site area of 101.3 acres

Table 2-2 presents the projected potable water demand for the 2400 Highland project.

Table 2–2 2400 Highland Project Domestic Water Demand

Demand Type	Land Use	Unit Demand	Residential Water Demand
Domestic Potable Use	Light Industrial	500 gpd/acre (0.35 gpm/acre)	42,748 gpd (29.9 gpm)
Irrigation Use		2,690 gpd/acre (1.87 gpm/acre)	42,541 gpd (16.8 gpm)
Total			**85,289 gpd (46.7 gpm)**

An irrigation water demand for the project is estimated to be 42,541 gpd (16.8 gpm) based on the proposed pervious acreage of our site.

From the WVWD Water Facilities Master Plan, Table 3.3, the peak day demand to average day demand ratio is 1.7, resulting in an estimated peak day demand (PDD) of 144,991 gpd (79 gpm).

From the WVWD Water Facilities Master Plan, Table 3.3, the peak hour demand to peak day demand ratio is 1.7. This results in an estimated peak hour demand (PHD) of 264,484 gpd (135 gpm).

The project's minimum required fire hydrant demand is determined to be 4,000 gpm after applying a 50% automatic-sprinkler reduction factor to the 8,000 gpm demand from Table B105.1 in the California Fire Code. Appendix B of the California Fire code is included in Appendix E of this report. Specific demand calculations for the proposed fire sprinkler system have not been conducted at this stage in the project, so the sprinklers are assumed to require 2,000 gpm for a total fire demand (hydrant and sprinklers) of 4,000 gpm. The resulting Maximum Day Demand Plus Fire Flow (MDFF) is 4079.4 gpm.

Table 2–3 Summary of Project Water Demands

Flow Type		Water Demand (gpd)	Water Demand (gpm)
Domestic Potable Water Demand [1]		42,748	29.9
Irrigation Water Demand [1]		42,541	16.8
Average Daily Water Demand (ADD)		85,289	46.7
Fire Demand [2,3]	Hydrant Demand	-	4000
	Sprinkler Demand	-	4000
Fire Flow Demand [2,3]		-	4000
Peak Day Demand (PDD) [4]		144,991	79
Peak Hour Demand (PHD) [4]		264,484	135
Maximum Day Demand Plus Fire Flow (MDFF)		-	4079

[1]West Valley Water District, Water Facilities Master Plan, Table 3.5
[2]California Fire Code, Appendix B, B105.2
[3]California Fire Code, Appendix B, Table B105.1
[4]West Valley Water District, Water Facilities Master Plan, Table 3.5

2.5 STATIC AND WORKING PRESSURES

Maximum static pressures within the 2400 Highland project are calculated based on the Pressure Zone 4 Elevation.

Hydrant flow test data was provided by the WVWD at one existing public fire hydrant south of the project site:

- FH #H-1, Highland Ave 580’ West of N Pepper Ave: 100 PSI static at 1307 FT = 1538 HGL

Using the static pressure data from WVWD’s fire hydrant flow test conducted at hydrant number H-1 on Highland Ave, south of the project site (100 psi at 1307 feet equates to 1538 HGL static), maximum static pressures within the project will range between 80 psi and 93 psi.

2.6 EXISTING AND PROPOSED WATER SYSTEM

There are existing public water facilities directly adjacent to the 2400 Highland project site, located in Pressure Zone 5. There is an existing 30” diameter public water transmission line along Highland Avenue that will remain untouched. The project will connect to an existing 16” water main along Highland Ave. The existing and proposed public and private water facilities in the vicinity of the project are shown on the exhibit in Appendix A. A map of the project’s Pressure Zone is located in Appendix C.

For domestic water, the project proposes two private connections on the southeastern face of our proposed building. These two connections were each modeled to require half of the given demands for ADD, PDD, PHD, and MDFF. For fire water, the system was modeled with four private fire connections, one at each corner of the proposed building. Although the project proposes additional fire hydrants to reach full building coverage, these additional hydrants were excluded from the model for simplicity. Each connection was modeled to require 1000 gpm of fire flow, for a total site demand equal to the 4000 gpm fire flow demand requirement.

2.7 WATER SYSTEM COMPUTER MODEL

The Bentley WaterCAD computer program is used to conduct a hydraulic model of the proposed fire water service pipes within the study area. This computer program utilizes the Hazen-Williams equation for determining headloss in pipes; the Hazen-Williams “C” value for PVC pipes is 150, however a more conservative value of 130 was utilized to account for minor losses.

This analysis includes only the proposed fire water service loop connecting our project site to the existing 16” water main along Highland Ave; the larger public network was not included. The project proposes two connections to the existing water main. The hydraulic grade line (HGL) for both connections was determined by a hydrant flow test performed by the WVWD. The static pressure from the flow test was used to determine the HGL in the existing 16” water main along Highland Ave. The location of this test hydrant is on Highland Avenue, 580’ west of N Pepper Ave.

A copy of the hydrant flow test is included in Appendix D and the WaterCAD model is included in Appendix B.

The Bentley Flowmaster computer program is used to conduct a hydraulic model of the proposed domestic water service pipes within the study area. This computer program utilizes the Hazen-Williams equation for determining headloss in pipes; the Hazen-Williams “C” value used for Ductile Iron (DI) pipes is 140.

This analysis includes only the proposed domestic water laterals connecting our project site to the existing 16” water main along Highland Ave; the larger public network was also not included. The project proposes one connection to the existing water main. Four demand scenarios were computed in Flowmaster to determine the resulting pressure at the two building connections. The static pressure at the connection to the existing main, the elevations of the connection to the main and the connection to the building, the length, roughness coefficient, diameter, and demand were all input into Flowmaster to compute the resulting pressure at the building connection.

A copy of the Flowmaster results is included in Appendix B.

2.8 WATER SYSTEM ANALYSIS AND RESULTS

Utilizing the hydrant flow test, and an assumed 1307.056 invert of the existing fire hydrant, an HGL of approximately 1538.616 was determined for the static condition for the hydrant. Running the WaterCAD model with no demands on the system yielded a range of static pressures for the site between 80 psi and 93 psi. Running the WaterCAD model with 1000 gpm demand at fire hydrants located near each of the four corners of the building (for a total fire flow demand of 4000 gpm), yielded a range of residual pressure for the site between 23 psi and 48 psi, and a maximum velocity of 8.45 fps.

For an Average Daily Demand (ADD) of 23.25 psi at each building connection (46.5 psi total), an unrestricted pressure of 86 psi was determined for both building connections, prior to any losses being applied to the analysis. For a Peak Daily Demand (PDD) of 39.5 psi at each building connection (79 psi total), an unrestricted pressure of 86 psi was also determined for both building connections. For a Peak Hour Demand (PHD) of 67.5 psi at each building connection (135 psi total), an unrestricted pressure of 86 psi was determined for the southern of the two connection, and a raw pressure of 84 psi was determined for the northern of the two connections. Finally, for a Max Daily Plus Fire Flow Demand (MDFF) of 4079 psi, which models the fire water and domestic water lines running simultaneously under fire flow and PDD conditions, an unrestricted pressure of 39 psi was determined for both building connections. These pressures are summarized in Table 2-4.

The initial pressures computed from Flowmaster do not take into account the losses associated with the backflow preventers and water meter that will be apart of the system. An approved FEBCO backflow was chosen, based on WVWD’s list of approved backflow preventers, and a 7.5psi pressure loss was

determined from the available product sheet. An approved Badger FSAA water meter was chosen based on San Bernardino Municipal Water District's list of approved water meters, and a 7.5psi pressure loss was determined from the available product sheet. Based on the total losses of 15 psi that the domestic water service will experience, the raw pressures must be adjusted accordingly. The adjusted pressures for each demand scenario is summarized in Table 2-4, as well as the resulting pipe velocities.

Excerpts from the WVWD standards, SBMWD approved water meter list, FEBCO product sheet, and Badger FSAA product sheet are included in Appendix F.

Table 2–4 Summary of Resulting Domestic Water Pressures and Velocities at Building Connections

Demand Scenario	Water Demand (gpm)	Building Connection 1 (Southern Connection)			Building Connection 2 (Northern Connection)		
		Initial Pressure (psi)	Adjusted Pressure (psi)	Pipe Velocity (fps)	Initial Pressure (psi)	Adjusted Pressure (psi)	Pipe Velocity (fps)
Average Daily Demand (ADD)	46.7	86	71	0.6	86	71	0.6
Peak Daily Demand (PDD)	79	86	71	1.01	86	71	1.01
Peak Hour Demand (PHD)	135	86	71	1.72	84	69	1.72
Max Day Plus Fire Flow (MDFF)	4079	39	24	1.01	39	24	1.01

3 CONCLUSIONS AND RECOMMENDATIONS

Fire service will be provided throughout the site by a new 10” PVC fire water loop with 12” laterals connecting the fire service loop to the existing 16” water main located in Highland Avenue. Domestic water service will be provided by a new 4” ductile iron pipe that will connect the existing 16” water main to the southeast side of the proposed industrial center. Maximum static pressures within the 2400 Highland project site will range between 80 psi and 93 psi. Individual pressure regulators will be installed for building services to comply with the California Plumbing Code which limit pressure inside a dwelling unit to a maximum of 80 psi. Additionally, velocities for all fire and domestic water lines will remain below 10 fps to comply with the WVWD Standards.

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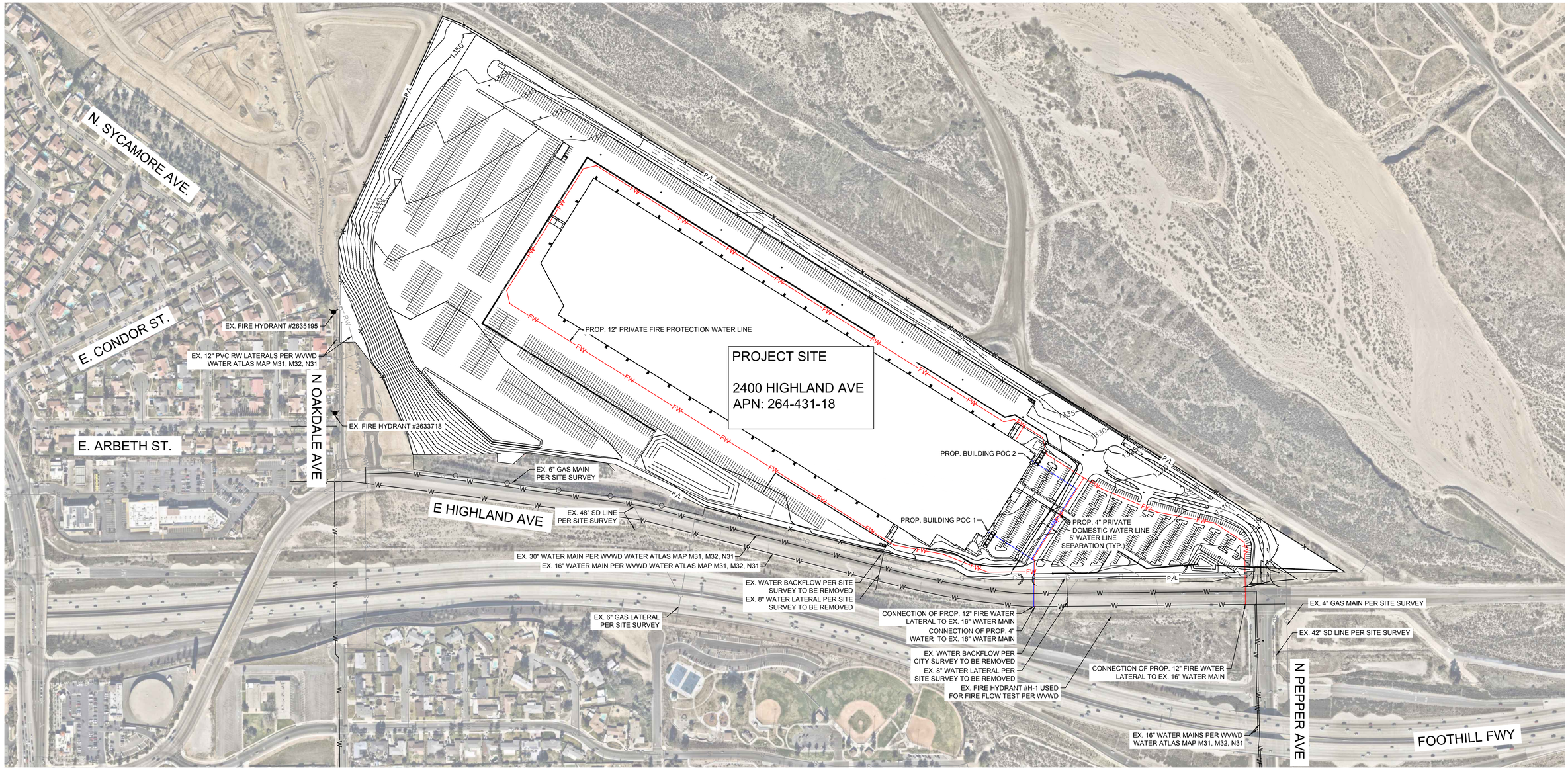
APPENDIX A

EXISTING AND PROPOSED WATER SERVICE EXHIBIT

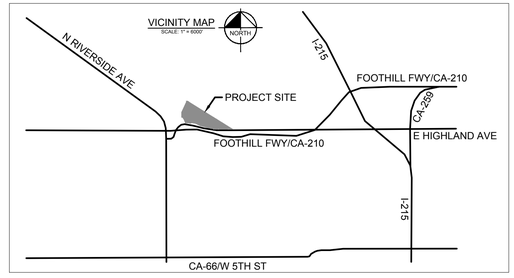


LEGEND

EX WATERLINE	W
EX SEWER	S
PROP. WATER LINE	W
PROP. FIREWATER LINE	FW
FIRE COVERAGE (200' RADIUS)	
POINT OF CONNECTION	
EXISTING FIRE HYDRANT	
PROPOSED FIRE HYDRANT	
EX GAS LINE	G

GENERAL NOTES:

1. PER WVWD STANDARDS, FIRE HYDRANTS FOR INDUSTRIAL SITES CAN NOT BE SPACED MORE THAN 300' APART, AND MUST BE WITHIN 200' OF THE FURTHEST SERVICE POINTS
2. FIRE HYDRANTS WITHIN THE TRUCK COURT WILL FOLLOW WVWD STANDARDS AND WILL BE CONSTRUCTED IN FRONT OF EXTERIOR STAIRCASES, 5' PAST THE APRON LINE, TO PROVIDE FULL BUILDING COVERAGE



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2400 HIGHLAND AVE

EXISTING AND PROPOSED WATER EXHIBIT

RIALTO, CA

NORTH

GRAPHIC SCALE IN FEET
0 100 200 400

JOB NO.:	195425001
DATE:	2023/11/09

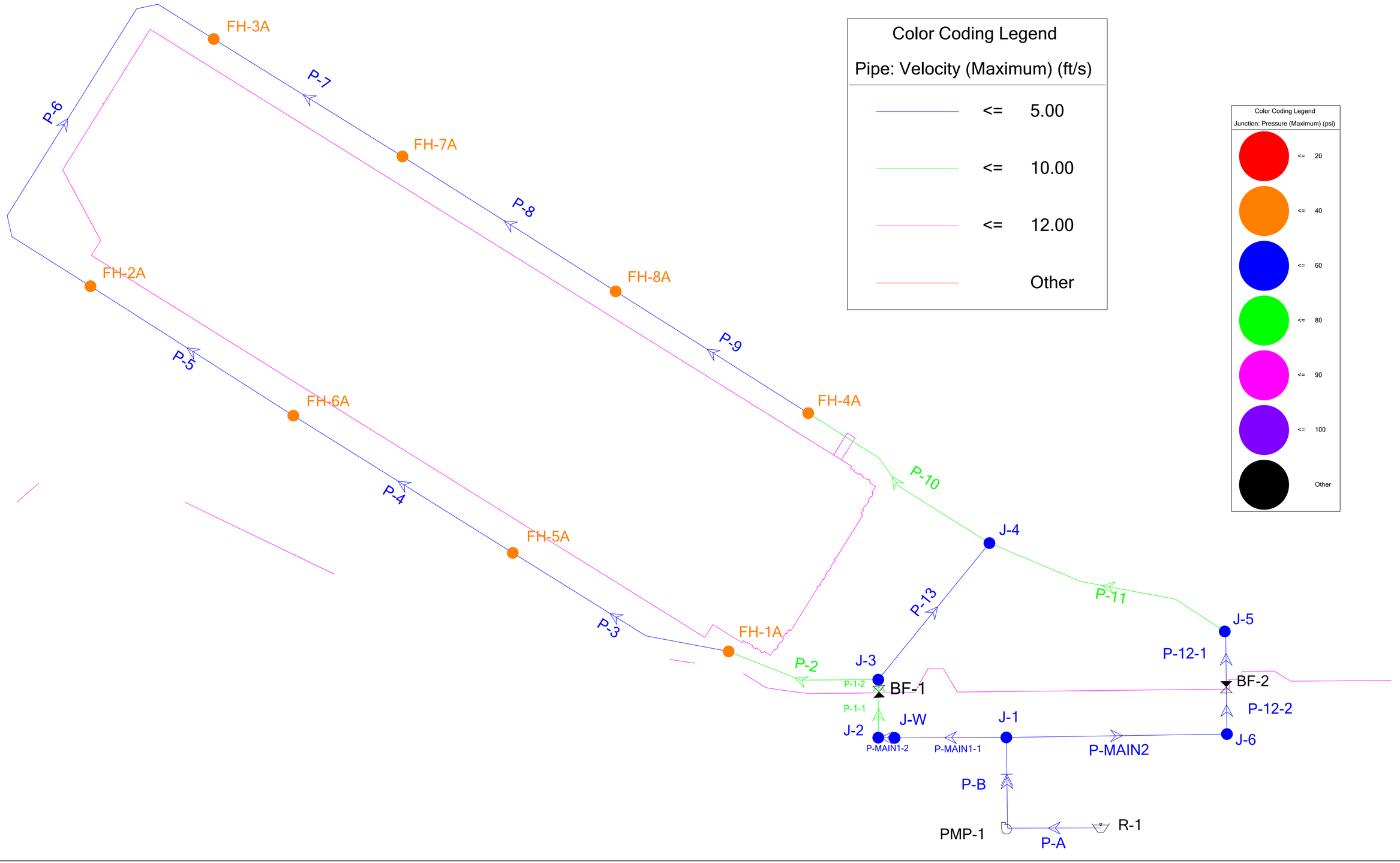
1 OF 1

APPENDIX B

COMPUTER MODELING RESULTS

WATERCAD MODEL: FIRE FLOW DEMAND CONDITIONS

Named View - 1



Color Coding Legend

Pipe: Velocity (Maximum) (ft/s)

	<=	5.00
	<=	10.00
	<=	12.00
		Other

Color Coding Legend

Junction: Pressure (Maximum) (psi)

<=	20
<=	40
<=	60
<=	80
<=	90
<=	100
	Other

Scenario Summary

ID	108
Label	1000 GPM, 4 CORNER FH
Notes	

FlexTable: Pipe Table

ID	Label	Length (Scaled) (ft)	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
45	P-A	238	60.0	Ductile Iron	130.0	4,000	0.45	0.000
68	P-2	397	10.0	Ductile Iron	130.0	2,068	8.45	0.024
124	P-MAIN2	564	16.0	Ductile Iron	130.0	1,383	2.21	0.001
134	P-B	232	60.0	Ductile Iron	130.0	4,000	0.45	0.000
136	P-11	650	10.0	Ductile Iron	130.0	1,383	5.65	0.011
137	P-10	576	10.0	Ductile Iron	130.0	1,932	7.89	0.021
138	P-13	450	10.0	Ductile Iron	130.0	548	2.24	0.002
140	P-1-1	117	12.0	Ductile Iron	130.0	2,617	7.42	0.015
141	P-1-2	31	12.0	Ductile Iron	130.0	2,617	7.42	0.015
143	P-12-1	142	12.0	Ductile Iron	130.0	-1,383	3.92	0.005
144	P-12-2	120	12.0	Ductile Iron	130.0	-1,383	3.92	0.005
145	P-6	1,141	10.0	Ductile Iron	130.0	68	0.28	0.000
152	P-9	583	10.0	Ductile Iron	130.0	-932	3.81	0.005
154	P-7	569	10.0	Ductile Iron	130.0	-932	3.81	0.005
155	P-8	645	10.0	Ductile Iron	130.0	-932	3.81	0.005
157	P-3	616	10.0	Ductile Iron	130.0	1,068	4.36	0.007
160	P-4	662	10.0	Ductile Iron	130.0	1,068	4.36	0.007
161	P-5	615	10.0	Ductile Iron	130.0	1,068	4.36	0.007
204	P-MAIN1-1	286	16.0	Ductile Iron	130.0	2,617	4.18	0.004
205	P-MAIN1-2	42	16.0	Ductile Iron	130.0	2,617	4.18	0.004

FlexTable: Junction Table

ID	Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
30	J-1	1,313.86	0	1,430.90	51
31	J-3	1,313.34	0	1,410.48	42
34	J-5	1,306.02	0	1,416.87	48
35	J-6	1,300.20	0	1,430.26	56
67	FH-1A	1,315.03	1,000	1,401.09	37
82	FH-2A	1,331.60	1,000	1,387.90	24
85	FH-3A	1,335.36	1,000	1,387.85	23
94	FH-4A	1,317.33	1,000	1,397.55	35
121	J-2	1,313.57	0	1,429.69	50
135	J-4	1,311.37	0	1,409.56	42
150	FH-8A	1,323.18	0	1,394.41	31
153	FH-7A	1,329.65	0	1,390.92	27
156	FH-5A	1,320.42	0	1,396.79	33
159	FH-6A	1,326.21	0	1,392.18	29
203	J-W	1,313.59	0	1,429.84	50

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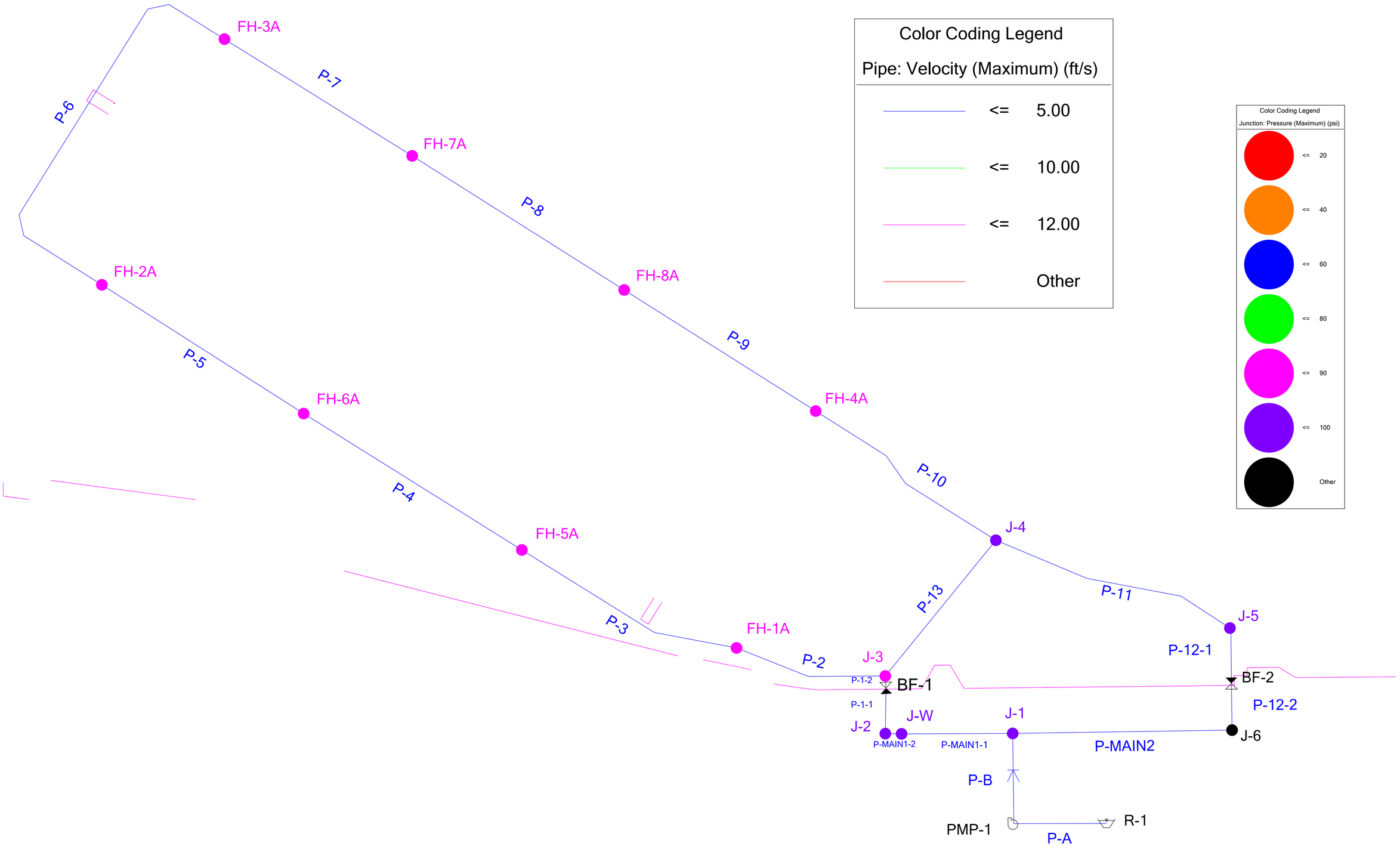
WATERCAD MODEL: STATIC CONDITIONS



Color Coding Legend

Pipe: Velocity (Maximum) (ft/s)

	<=	5.00
	<=	10.00
	<=	12.00
		Other

Color Coding Legend

Junction: Pressure (Maximum) (psi)

<=	20
<=	40
<=	60
<=	80
<=	90
<=	100
	Other

FlexTable: Junction Table

ID	Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
30	J-1	1,313.86	0	1,538.16	97
31	J-3	1,313.34	0	1,555.49	105
34	J-5	1,306.02	0	1,555.49	108
35	J-6	1,300.20	0	1,538.16	103
67	FH-1A	1,315.03	0	1,555.49	104
82	FH-2A	1,331.60	0	1,555.49	97
85	FH-3A	1,335.36	0	1,555.49	95
94	FH-4A	1,317.33	0	1,555.49	103
121	J-2	1,313.57	0	1,538.16	97
135	J-4	1,311.37	0	1,555.49	106
150	FH-8A	1,323.18	0	1,555.49	101
153	FH-7A	1,329.65	0	1,555.49	98
156	FH-5A	1,320.42	0	1,555.49	102
159	FH-6A	1,326.21	0	1,555.49	99
203	J-W	1,313.59	0	1,538.16	97

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FLOWMASTER: DOMESTIC WATER DEMAND RESULTS

MDFF - CONNECTION1

Project Description	
Friction Method	Manning Formula
Solve For	Pressure at 2

Input Data		
Pressure 1	50	psi
Elevation 1	1,313.81	ft
Elevation 2	1,338.00	ft
Length	423.0	ft
Roughness Coefficient	0.012	
Diameter	4.0	in
Discharge	39.50	gpm

Results		
Pressure 2	39	psi
Headloss	0.77	ft
Energy Grade 1	1,429.16	ft
Energy Grade 2	1,428.39	ft
Hydraulic Grade 1	1,429.14	ft
Hydraulic Grade 2	1,428.37	ft
Flow Area	0.1	ft^2
Wetted Perimeter	1.0	ft
Velocity	1.01	ft/s
Velocity Head	0.02	ft
Friction Slope	0.002	ft/ft

MDFF - CONNECTION 2

Project Description	
Friction Method	Manning Formula
Solve For	Pressure at 2

Input Data		
Pressure 1	50	psi
Elevation 1	1,313.81	ft
Elevation 2	1,338.88	ft
Length	781.0	ft
Roughness Coefficient	0.012	
Diameter	4.0	in
Discharge	39.50	gpm

Results		
Pressure 2	39	psi
Headloss	1.42	ft
Energy Grade 1	1,429.16	ft
Energy Grade 2	1,427.73	ft
Hydraulic Grade 1	1,429.14	ft
Hydraulic Grade 2	1,427.72	ft
Flow Area	0.1	ft^2
Wetted Perimeter	1.0	ft
Velocity	1.01	ft/s
Velocity Head	0.02	ft
Friction Slope	0.002	ft/ft

ADD - CONNECTION 1

Project Description	
Friction Method	Manning Formula
Solve For	Pressure at 2

Input Data	
Pressure 1	97 psi
Elevation 1	1,313.81 ft
Elevation 2	1,338.00 ft
Length	423.0 ft
Roughness Coefficient	0.012
Diameter	4.0 in
Discharge	23.35 gpm

Results	
Pressure 2	86 psi
Headloss	0.27 ft
Energy Grade 1	1,537.56 ft
Energy Grade 2	1,537.29 ft
Hydraulic Grade 1	1,537.55 ft
Hydraulic Grade 2	1,537.28 ft
Flow Area	0.1 ft²
Wetted Perimeter	1.0 ft
Velocity	0.60 ft/s
Velocity Head	0.01 ft
Friction Slope	0.001 ft/ft

ADD - CONNECTION 2

Project Description	
Friction Method	Manning Formula
Solve For	Pressure at 2

Input Data		
Pressure 1	97	psi
Elevation 1	1,313.81	ft
Elevation 2	1,338.88	ft
Length	781.0	ft
Roughness Coefficient	0.012	
Diameter	4.0	in
Discharge	23.35	gpm

Results		
Pressure 2	86	psi
Headloss	0.50	ft
Energy Grade 1	1,537.56	ft
Energy Grade 2	1,537.06	ft
Hydraulic Grade 1	1,537.55	ft
Hydraulic Grade 2	1,537.05	ft
Flow Area	0.1	ft^2
Wetted Perimeter	1.0	ft
Velocity	0.60	ft/s
Velocity Head	0.01	ft
Friction Slope	0.001	ft/ft

PDD - CONNECTION 1

Project Description	
Friction Method	Manning Formula
Solve For	Pressure at 2

Input Data	
Pressure 1	97 psi
Elevation 1	1,313.81 ft
Elevation 2	1,338.00 ft
Length	423.0 ft
Roughness Coefficient	0.012
Diameter	4.0 in
Discharge	39.50 gpm

Results	
Pressure 2	86 psi
Headloss	0.77 ft
Energy Grade 1	1,537.57 ft
Energy Grade 2	1,536.80 ft
Hydraulic Grade 1	1,537.55 ft
Hydraulic Grade 2	1,536.78 ft
Flow Area	0.1 ft²
Wetted Perimeter	1.0 ft
Velocity	1.01 ft/s
Velocity Head	0.02 ft
Friction Slope	0.002 ft/ft

PDD - CONNECTION 2

Project Description	
Friction Method	Manning Formula
Solve For	Pressure at 2

Input Data		
Pressure 1	97	psi
Elevation 1	1,313.81	ft
Elevation 2	1,338.88	ft
Length	781.0	ft
Roughness Coefficient	0.012	
Diameter	4.0	in
Discharge	39.50	gpm

Results		
Pressure 2	86	psi
Headloss	1.42	ft
Energy Grade 1	1,537.57	ft
Energy Grade 2	1,536.14	ft
Hydraulic Grade 1	1,537.55	ft
Hydraulic Grade 2	1,536.13	ft
Flow Area	0.1	ft^2
Wetted Perimeter	1.0	ft
Velocity	1.01	ft/s
Velocity Head	0.02	ft
Friction Slope	0.002	ft/ft

PHD - CONNECTION 1

Project Description	
Friction Method	Manning Formula
Solve For	Pressure at 2

Input Data		
Pressure 1	97	psi
Elevation 1	1,313.81	ft
Elevation 2	1,338.00	ft
Length	423.0	ft
Roughness Coefficient	0.012	
Diameter	4.0	in
Discharge	67.50	gpm

Results		
Pressure 2	86	psi
Headloss	2.25	ft
Energy Grade 1	1,537.60	ft
Energy Grade 2	1,535.35	ft
Hydraulic Grade 1	1,537.55	ft
Hydraulic Grade 2	1,535.30	ft
Flow Area	0.1	ft^2
Wetted Perimeter	1.0	ft
Velocity	1.72	ft/s
Velocity Head	0.05	ft
Friction Slope	0.005	ft/ft

PHD - CONNECTION 2

Project Description	
Friction Method	Manning Formula
Solve For	Pressure at 2

Input Data		
Pressure 1	97	psi
Elevation 1	1,313.81	ft
Elevation 2	1,338.88	ft
Length	781.0	ft
Roughness Coefficient	0.012	
Diameter	4.0	in
Discharge	67.50	gpm

Results		
Pressure 2	84	psi
Headloss	4.16	ft
Energy Grade 1	1,537.60	ft
Energy Grade 2	1,533.44	ft
Hydraulic Grade 1	1,537.55	ft
Hydraulic Grade 2	1,533.39	ft
Flow Area	0.1	ft^2
Wetted Perimeter	1.0	ft
Velocity	1.72	ft/s
Velocity Head	0.05	ft
Friction Slope	0.005	ft/ft

APPENDIX C

EXCERPTS FROM WEST VALLEY WATER DISTRICT STANDARDS

PRESSURE ZONES MAP

WEST VALLEY WATER DISTRICT
BOUNDARY MAP

West Valley Water District

N
W E
S

8
7
7
6
5
4
3A
3
3
2

PROJECT SITE

Rancho Cucamonga
Muscoy
Rialto
San Bernardino
Fontana
Bloomington
Colton
San Bernardino County
Riverside County
Jurupa Valley
Grand Terrace
Riverside
Highgrove

LYTLE CREEK RD
GLEN HELEN PKWY
SYCAMORE CREEK DR
SIERRA AVE
RIVERSIDE AVE
LYTLE CREEK WASH
TERRA VISTA DR
DUNCAN CANYON RD
COYOTE CANYON RD
PALMETTO AVE
CASA GRANDE DR
SUMMIT AVE
SAN SEVAINE RD
LYTLE CREEK RD
CITRUS AVE
CASMALIA AVE
LOCUST AVE
LINDEN AVE
CEDAR AVE
AYALA AVE
SPRUCE AVE
BOHNERT AVE
CACTUS AVE
HIGHLAND AVE
WALNUT AVE
BASE LINE RD
ETIWANDA AVE
BASELINE AVE
MILLER AVE
FOOTHILL BLVD
ARROW BLVD
ALDER AVE
LARCH AVE
LILAC AVE
WILLOW AVE
RIVERSIDE AVE
SYCAMORE AVE
ACACIA AVE
EUCALYPTUS AVE
PEPPER AVE
MERIDIAN AVE
RIALTO AVE
MILL ST
MERRILL AVE
FONTANA AVE
RANDALL AVE
SAN BERNARDINO AVE
VALLEY BLVD
SLOVER AVE
SANTA ANA AVE
JURUPA AVE
BLOOMINGTON AVE
11TH ST
14TH ST
7TH ST
EL RIVINO RD
AGUA MANSA RD
RUBIDOUX BLVD
SIERRA AVE
ARMSTRONG RD
Santa Ana River

15
210
10
60
215

LEGEND

- CITY OF BLOOMINGTON
- CITY OF COLTON
- CITY OF FONTANA
- CITY OF GRAND TERRACE
- CITY OF HIGHGROVE
- CITY OF JURUPA VALLEY
- CITY OF MUSCOY
- CITY OF RANCHO CUCAMONGA
- CITY OF RIALTO
- CITY OF RIVERSIDE
- CITY OF SAN BERNARDINO
- UNINCORPORATED AREA
- WVWD SERVICE AREA
- DISTRICT SPHERE OF INFLUENCE
- COUNTY BOUNDARY
- PRESSURE ZONE BOUNDARY

Date: 8/3/2016

G:\Projects\Maps\BoundaryMap\BoundaryMap.mxd

EXCERPTS FROM WVWD STANDARDS FOR DOMESTIC WATER FACILITIES (1999)

WEST VALLEY WATER DISTRICT

SECTION 1.1
OF
DESIGN CRITERIA

DESIGN CRITERIA

1.1.1 General

a. Scope - All water system components including water services, meters, fire hydrants, pressure regulation stations, backflow preventer, pressure relief valves, transmission and distribution mains, storage reservoirs, wells and booster stations to be owned, maintained and/or operated by the District, shall be designed and constructed in accordance with the criteria set forth in this section, and in conformance with all applicable Federal, State and local laws, ordinances and regulations.

b. Design Competence - All water facilities shall be designed by Professional Engineers licensed in the state of California, according to accepted practice in the water field.

c. Legal Access - Each lot to be served by water shall abut a public street or recorded easement containing a waterline, or be provided with permanent legal access to such a waterline.

d. Deviations - Deviations from any of the criteria adopted herein shall be permitted only upon written request to and approval by the General Manager.

1.1.2 Water Demand

a. Domestic. Use - Domestic flows shall be based on the following:

   An average daily demand of 200 gallons per capita per day (gpcd) and three person per dwelling unit or 600 gallon per day (gpd) per dwelling unit.

   The water systems average daily flow shall be equal to the average daily demand times the number of dwelling units in each service area; a peak daily flow of two times the average daily flow; and a peak hourly flow of two times the peak daily flow.

b. Fire Flow - Minimum fire flow demand on the system shall be as follows: (or as required by the local fire agency, if higher fire flow demand is required).

Minimum fire flow demand per WVWD; Minimum fire flow demand per California Fire Code (appendix E) is 8000 gpm for 4 hours.

Low Density Residential (R-1)	1,500 gpm for 2 hours
High Density Residential (R-2 & R-3)	2,000 gpm for 4 hours
School/Commercial	3,000 gpm for 6 hours
Office/Light Industrial	3,000 gpm for 6 hours
USFS	2,000 gpm for 2 hours

1.1.3 Supply

a. General - The supply system shall be designed as a multi-source system, capable of handling peak daily demand, with the largest source of supply not in operation.

b. Wells- Wells shall be housed in a weather tight structure compatible with the surroundings. Provisions within this structure shall be made to facilitate removing of pumps, motors and other equipment. Wells shall be located upon land to which legal access is provided and for which a permanent easement or title is recorded. Vertical turbine pumps shall meet the standards set forth in AWWA Standard E- 10 1. The minimum size of well site shall be 100 feet by 100 feet. Well site shall be protected with chain link fence and shall have asphalt concrete paving or slag surfacing. Legal access shall be provided.

1.1.4 Storage

Storage capacity shall consist of operational storage plus fire flow storage as related to each pressure zone. Operational storage shall consist of peak daily flow for one day. The inclusion of emergency storage should be considered depending upon the reliability of supply.

Storage reservoir shall be either reinforced concrete or welded steel construction. Design of welded steel water reservoirs shall conform to AWWA Standard D-100. Appurtenances shall include two (2) wall access hatches, gauge board, overflow and drain pipe, proper ventilation, roof hatch, inside stainless steel ladder with safety climbs outside ladder with safety cage and anti-climb devices, hose bib, and paint/coatings, in conformance with all Federal, State, Local, and District requirements.

The design shall also include, but not limited to, containment, berm, drainage, aesthetics, and landscaping,

Storage facilities shall be located upon land to which legal access is provided and for which a permanent easement or title is recorded. Access road shall be paved and the site protected by a chain-link fence.

1.1.5 Booster Stations

a. General - Booster stations shall be located in areas accessible to both District personnel and equipment. Legal access shall be provided and for which a permanent easement or title is recorded. Access road shall be paved.

b. Pumps - Booster stations shall be designed with a minimum of two pumps. In systems where pumps shall meet instantaneous peak demands, without supplementary flows from storage, the pump capacity shall be based on peak hour demand with one pump out of service. In systems with adequate available flows from storage to supplement pumping, pump capacity shall be based on peak day demand with one pump out of service. Protection shall be provided to prevent pumps from operating under no-flow conditions, overpurnping and overloading by means of appropriate automatic controls. Vertical turbine pumps shall meet or exceed the standards set forth by AWWA Standard E- 10 1.

c. Structure - Booster pumps shall be housed in a weather-tight structure compatible with the surroundings. Provisions within this structure shall be made to facilitate removing of pumps, motors and other equipment.

1.1.6 Transmission and Distribution Mains

a. Pipe Size - Mains shall be sized to accommodate the greater of the following, while maintaining a minimum pressure as specified herein, at street service connections.

1) Peak hour demand with a minimum 40 psi residual pressure

2) Peak day demand plus fire flow with a minimum 20 psi residual pressure

3) Size as indicated on District's Master Plan

The capacity of water mains and water service laterals shall be determined by using the William's & Hazen Formula with a "C" value = 120. The velocity of the water in the pipe shall be limited to 5-feet per second maximum during peak hour demand flow or 10-feet per second maximum during peak day demand flow plus fire flow.

The minimum pipe diameter shall be 6-inch or 8-inch minimum when supporting fire hydrants. Deadend line supporting two or more fire hydrants shall be 12 inches diameter minimum.

b. Operating Pressures - Maximum pressure in mains shall not exceed 130 psi. Pressure reducers will be required on service connections having greater than 80 psi to reduce service pressure to 65 psi.

c. Depth of cover - A minimum cover depth is required from top of pipe to the proposed finished grade. In cases where sub-grade base is required, the cut for the base shall be added to the minimum cover. Minimum cover for pipelines shall be as follows: pipelines up to 10" diameter shall have 36" of cover; 12" and larger pipelines shall have 42" of cover. Sub-grade is to be maintained on pipelines at all times.

d. Location and Alignment - Wherever possible, water mains shall be located in public streets parallel to street centerlines. On a typical road section the main shall be located 7 feet off curb face on south or west side of street.

e. Clearance from Sewer Lines - A minimum horizontal clear distance of 10 feet shall be provided between water mains and sewer lines. A minimum vertical clearance of I foot shall be provided with the sewer under the water line. Water service laterals shall be a minimum of 5 feet from sewer lateral, horizontally and 1 feet minimum above sewer laterals.

If the above conditions cannot be met, special construction shall be required according to the Section 4.6 of Detailed Technical Specification herein and subjected to approval by the Governing Health Agency.

f. Mains Under Structures - No water mains shall be located beneath a structure except as approved in writing by the District.

g. Looped Lines and Flushouts - All water lines shall be looped. Where deadends are necessary, provisions for flushing shall be included. Maximum length of deadend lines shall be limited to 660 feet. Approval will be required from the General Manager to deviate from these Standards. No flushing device shall be connected directly to a sewer. Flushout assembly and size required shall conform to Standard Drawing No. W-8.

Fire hydrants may be used for flushout, where applicable, and upon approval by the District.

h. Valves - Provide sufficient valves to permit isolation and repair of leaks and breaks in accordance with good water works practice. Provide at least two valves at each 3-way junction and three valves at each 4-way junction. For transmission lines, no length of pipe greater than 1000 feet or as required by the District, shall be left without valve control. A valve box and cover shall be provided for all valves below grade and shall conform to Standard Drawings No. W-11 herein. Control valve 12" and smaller shall be of a resilient wedge gate valve, 14" and larger shall be a butterfly valve.

i. Fire Hydrants (FH) - Fire hydrants shall be spaced along distribution mains as follows:

	Spacing	Distance to Farthest Service Point
Low Density Residential (R- 1)	500 Ft. Maximum	250 Ft. Maximum
High Density Residential, Commercial Industrial, and School	300 Ft. Maximum	200 Ft. Maximum

Spacing of fire hydrants shall not exceed the above maximum distances, but hydrants may be spaced at closer intervals in conformance with requirements of local fire control authorities. Hydrant installation assemblies shall conform to Standard Drawing No. W-2 herein.

j. Service Connection - Service connection assemblies shall conform to Standard Drawing No. W-4 herein. Service lateral shall be sized to limit the water flow velocity to 5-feet per second.

EXCERPTS FROM WVWD WATER FACILITIES MASTER PLAN (1999)

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

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.

APPENDIX D

FIRE HYDRANT FLOW TESTS

HYDRANT FLOW TEST REPORT

West Valley Water District
Physical Address: 855 West Base Line, Rialto, CA 92376
Phone: (909) 875-1804, Fax: (909) 875-1849

Date 07.22.2022

APPLICANT **Kimberly-Horn**

Address 401 B Street, Suite 600

City/State San Diego, CA Zip Code 92101

Phone No. 619.272.7104 Email taylor.thorig@kimberly-horn.com

FLOW TEST REQUIRED FOR: ***(PLEASE COMPLETE ONE OR MORE)***

Address 2400 Highland Ave., San Bernardino, CA 92407

Assessor's Parcel No. 0264-431-15-0000 Tract/Lot

Location

DISTRICT USE ONLY

TEST DATE 07.20.2022 TIME 11:00 am
GENERAL LOCATION Flow hydrant located on the South side of Highland Ave 580' West of Pepper Gauge flush out located on the South East corner of Highland and Pepper
MAIN SIZE/TYPE 16"CMLC PRESSURE ZONE 4 MAP PRESSURE N-31
HYDRANT NO. H-1 HYDRANT MODEL Clow 850 HYDRANT SIZE 6"

	FLOW HYDRANT	**GAUGE HYDRANT**	
STATIC PRESSURE (PSI)	97	100	
RESIDUAL PRESSURE (PSI)	90	95	
PITOT PRESSURE (PSI)	65		
OBSERVED FLOW (GPM)	1202		2½" OUTLET, C Factor of .80
CALCULATED WATER LOSS	1350		GALLONS

This is a non-certified fire flow test. Test results indicate the capability of the water system at the time the test was taken. Since the capacity of the water system may vary as a result of many factors, including demand placed on the system by the District's customers, we recommend that you give adequate consideration to these variations when performing your analysis.

Sincerely,

Bertha Perez, P.E.
Senior Engineer
WEST VALLEY WATER DISTRICT

APPENDIX E

EXCERPTS FROM THE CALIFORNIA FIRE CODE

CALIFORNIA FIRE CODE – MATRIX ADOPTION TABLE
APPENDIX B – FIRE-FLOW REQUIREMENTS FOR BUILDINGS

(Matrix Adoption Tables are non-regulatory, intended only as an aid to the user.
See Chapter 1 for state agency authority and building applications.)

Adopting Agency	BSC	SFM		HCD			DSA		OSHPD				BSCC	DHS	AGR	DWR	CEC	CA	SL	SLC
		T-24	T-19*	1	2	1/AC	AC	SS	1	2	3	4								
Adopt Entire Chapter																				
Adopt Entire Chapter as amended (amended sections listed below)		X																		
Adopt only those sections that are listed below																				
[California Code of Regulations, Title 19, Division 1]																				
Chapter / Section																				
B105.2		X																		

* The *California Code of Regulations* (CCR), Title 19, Division 1 provisions that are found in the *California Fire Code* are a reprint from the current CCR, Title 19, Division 1 text for the code user's convenience only. The scope, applicability and appeals procedures of CCR, Title 19, Division I remain the same.

APPENDIX B

FIRE-FLOW REQUIREMENTS FOR BUILDINGS

The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance.

SECTION B101
GENERAL

B101.1 Scope. The procedure for determining fire-flow requirements for buildings or portions of buildings hereafter constructed shall be in accordance with this appendix. This appendix does not apply to structures other than buildings.

SECTION B102
DEFINITIONS

B102.1 Definitions. For the purpose of this appendix, certain terms are defined as follows:

FIRE-FLOW. The flow rate of a water supply, measured at 20 pounds per square inch (psi) (138 kPa) residual pressure, that is available for fire fighting.

FIRE-FLOW CALCULATION AREA. The floor area, in square feet (m^2), used to determine the required fire flow.

SECTION B103
MODIFICATIONS

B103.1 Decreases. The fire chief is authorized to reduce the fire-flow requirements for isolated buildings or a group of buildings in rural areas or small communities where the development of full fire-flow requirements is impractical.

B103.2 Increases. The fire chief is authorized to increase the fire-flow requirements where conditions indicate an unusual susceptibility to group fires or conflagrations. An increase shall not be more than twice that required for the building under consideration.

B103.3 Areas without water supply systems. For information regarding water supplies for fire-fighting purposes in rural and suburban areas in which adequate and reliable water supply systems do not exist, the fire code official is authorized to utilize NFPA 1142 or the *California Wildland-Urban Interface Code.*

SECTION B104
FIRE-FLOW CALCULATION AREA

B104.1 General. The fire-flow calculation area shall be the total floor area of all floor levels within the exterior walls, and under the horizontal projections of the roof of a building, except as modified in Section B104.3.

B104.2 Area separation. Portions of buildings which are separated by fire walls without openings, constructed in accordance with the *California Building Code,* are allowed to be considered as separate fire-flow calculation areas.

B104.3 Type IA and Type IB construction. The fire-flow calculation area of buildings constructed of Type IA and Type IB construction shall be the area of the three largest successive floors.

Exception: Fire-flow calculation area for open parking garages shall be determined by the area of the largest floor.

SECTION B105
FIRE-FLOW REQUIREMENTS FOR BUILDINGS

B105.1 One- and two-family dwellings. The minimum fire-flow and flow duration requirements for one- and two-family

dwellings having a fire-flow calculation area that does not exceed 3,600 square feet (344.5 m^2) shall be 1,000 gallons per minute (3785.4 L/min) for 1 hour. Fire-flow and flow duration for dwellings having a fire-flow calculation area in excess of 3,600 square feet (344.5m^2) shall not be less than that specified in Table B105.1.

Exception: A reduction in required fire-flow of 50 percent, as approved, is allowed when the building is equipped with an approved automatic sprinkler system.

B105.2 Buildings other than one- and two-family dwellings. The minimum fire-flow and flow duration for buildings other than one- and two-family dwellings shall be as specified in Table B105.1.

Exceptions:

1. A reduction in required fire-flow of up to 75 percent, as approved, is allowed when the building is provided with an approved automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2. The resulting fire-flow shall not be less than 1,500 gallons per minute (5678 L/min) for the prescribed duration as specified in Table B105.1.
2. *[SFM] Group B, S-2 and U occupancies having a floor area not exceeding 1,000 square feet, primarily constructed of noncombustible exterior walls with wood or steel roof framing, having a Class A roof assembly, with uses limited to the following or similar uses:*
   - *2.1. California State Parks buildings of an accessory nature (restrooms).*
   - *2.2. Safety roadside rest areas, (SRRA), public restrooms.*
   - *2.3. Truck inspection facilities, (TIF), CHP office space and vehicle inspection bays.*
   - *2.4. Sand/salt storage buildings, storage of sand and salt.*

TABLE B105.1
MINIMUM REQUIRED FIRE-FLOW AND FLOW DURATION FOR BUILDINGS

FIRE-FLOW CALCULATION AREA (square feet)					FIRE-FLOW (gallons per minute)[b]	FLOW DURATION (hours)
Type IA and IB[a]	Type IIA and IIIA[a]	Type IV and V-A[a]	Type IIB and IIIB[a]	Type V-B[a]		
0-22,700	0-12,700	0-8,200	0-5,900	0-3,600	1,500	2
22,701-30,200	12,701-17,000	8,201-10,900	5,901-7,900	3,601-4,800	1,750	
30,201-38,700	17,001-21,800	10,901-12,900	7,901-9,800	4,801-6,200	2,000	
38,701-48,300	21,801-24,200	12,901-17,400	9,801-12,600	6,201-7,700	2,250	
48,301-59,000	24,201-33,200	17,401-21,300	12,601-15,400	7,701-9,400	2,500	
59,001-70,900	33,201-39,700	21,301-25,500	15,401-18,400	9,401-11,300	2,750	
70,901-83,700	39,701-47,100	25,501-30,100	18,401-21,800	11,301-13,400	3,000	3
83,701-97,700	47,101-54,900	30,101-35,200	21,801-25,900	13,401-15,600	3,250	
97,701-112,700	54,901-63,400	35,201-40,600	25,901-29,300	15,601-18,000	3,500	
112,701-128,700	63,401-72,400	40,601-46,400	29,301-33,500	18,001-20,600	3,750	
128,701-145,900	72,401-82,100	46,401-52,500	33,501-37,900	20,601-23,300	4,000	4
145,901-164,200	82,101-92,400	52,501-59,100	37,901-42,700	23,301-26,300	4,250	
164,201-183,400	92,401-103,100	59,101-66,000	42,701-47,700	26,301-29,300	4,500	
183,401-203,700	103,101-114,600	66,001-73,300	47,701-53,000	29,301-32,600	4,750	
203,701-225,200	114,601-126,700	73,301-81,100	53,001-58,600	32,601-36,000	5,000	
225,201-247,700	126,701-139,400	81,101-89,200	58,601-65,400	36,001-39,600	5,250	
247,701-271,200	139,401-152,600	89,201-97,700	65,401-70,600	39,601-43,400	5,500	
271,201-295,900	152,601-166,500	97,701-106,500	70,601-77,000	43,401-47,400	5,750	
295,901-Greater	166,501-Greater	106,501-115,800	77,001-83,700	47,401-51,500	6,000	
—	—	115,801-125,500	83,701-90,600	51,501-55,700	6,250	
—	—	125,501-135,500	90,601-97,900	55,701-60,200	6,500	
—	—	135,501-145,800	97,901-106,800	60,201-64,800	6,750	
—	—	145,801-156,700	106,801-113,200	64,801-69,600	7,000	
—	—	156,701-167,900	113,201-121,300	69,601-74,600	7,250	
—	—	167,901-179,400	121,301-129,600	74,601-79,800	7,500	
—	—	179,401-191,400	129,601-138,300	79,801-85,100	7,750	
—	—	191,401-Greater	138,301-Greater	85,101-Greater	8,000	

For SI: 1 square foot = 0.0929 m^2, 1 gallon per minute = 3.785 L/m, 1 pound per square inch = 6.895 kPa.

a. Types of construction are based on the *California Building Code*.

b. Measured at 20 psi residual pressure.

SECTION B106
REFERENCED STANDARDS

> ICC	IWUIC—12	California Wildland-Urban Interface Code	B103.3
NFPA	1142—12	Standard on Water Supplies for Suburban and Rural Fire Fighting	B103.3

APPENDIX F

BACKFLOW AND WATER METER DATA

WVWD DESIGN STANDARDS, PAGE 4.16-1, APPROVED BACKFLOW PREVENTERS

WEST VALLEY WATER DISTRICT

SECTION 4.16
OF
DETAILED TECHNICAL SPECIFICATIONS

BACKFLOW PREVENTERS

4.16.01 General

Water user shall comply with all orders, instructions, regulations, and notices from the State Department of Health with respect to the installation, testing and maintenance of backflow prevention devices.

Water user shall be responsible for all costs associated with the installation, testing and maintenance of backflow prevention devices as authorized in section 11 6800 and section 11 6805 of Health and Safety Code, Chapter 5 Water Equipment and Control, Article 2 Cross-Connection Control by Water User.

4.16.02 Type of Protection

The type of protection shall be approved by the District and shall be in accordance with State Code of Regulations, Title 17, Division 1, Chapter 5, Group 4, Section 7583, 7584, 7585, 7586, 7601, 7602, 7603, 7604 and 7605.

As a minimum, all commercial and irrigation water service shall be protected with a reduced pressure principal type backflow prevention assemble. All fire service lines shall be protected with a double check valve with detector check backflow prevention assembly.

4.16.03 Installation

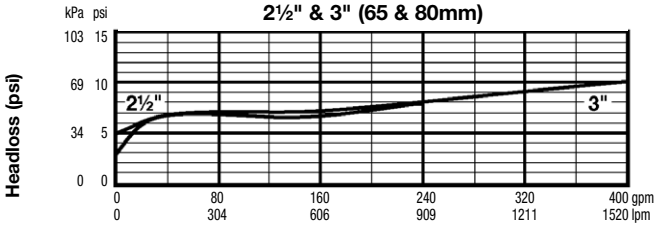
Installation of backflow prevention shall be in accordance with Standard Drawing W-15 and W-18.

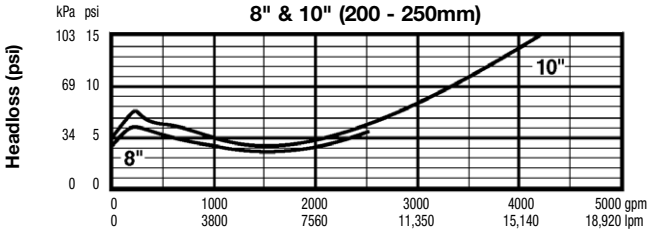
4.16.04 Manufactures

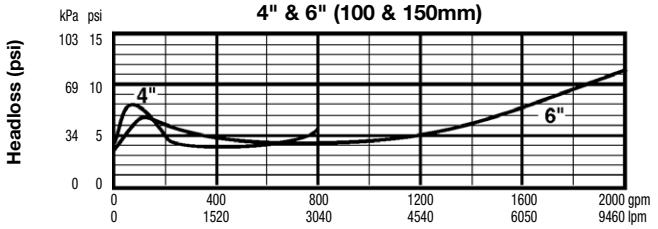
Backflow preventer shall be approved by University of Southern California Foundation for cross connection control and Hydraulic research and shall be FEBCO or approved equal.

FEBCO BACKFLOW PREVENTER PRODUCT SHEETS

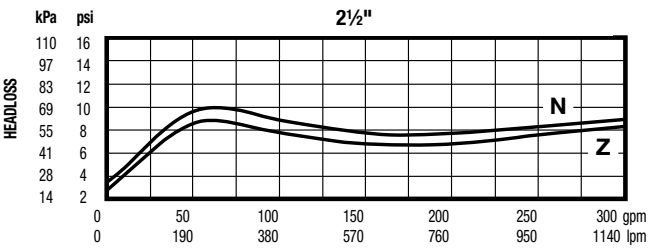
Series 856ST

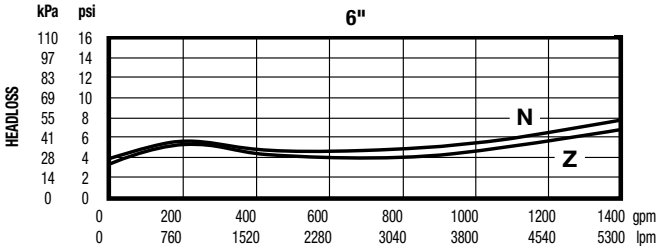


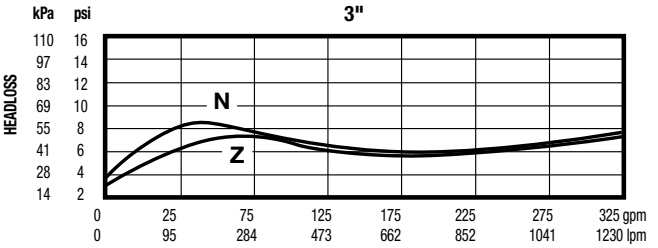


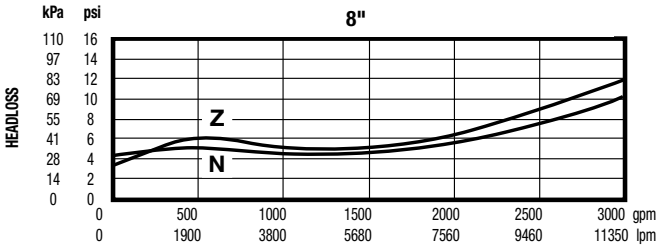


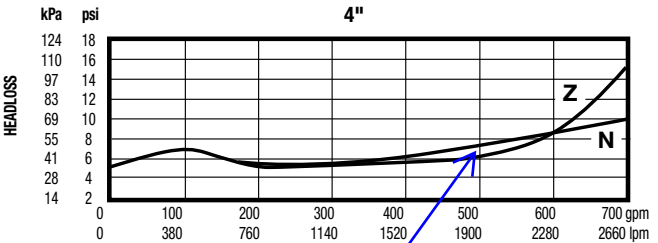
Series 876VST

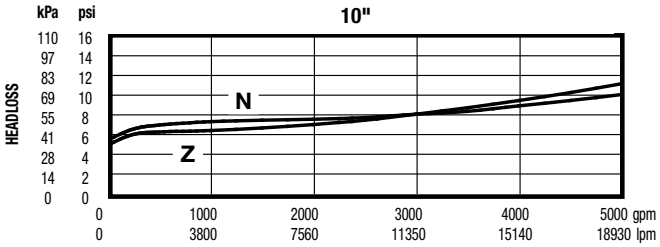








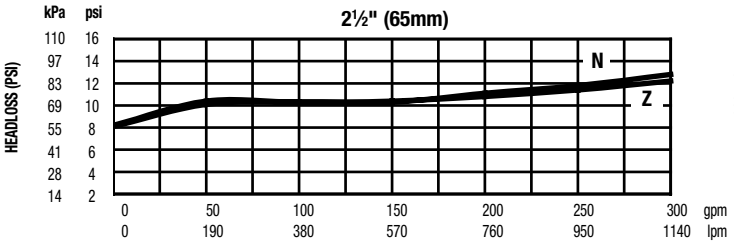


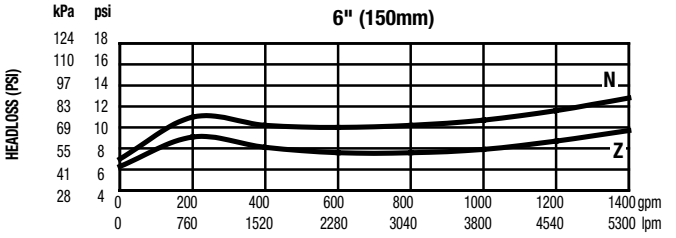


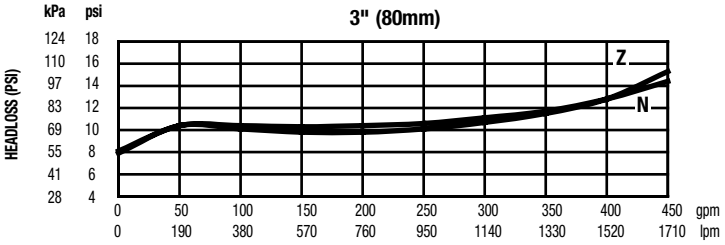
@500gpm, head loss = 7.5psi(2.31) = 17.33'

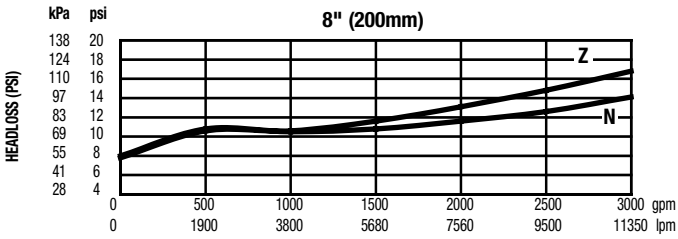
The 6" and 10" flow curves (N-standard orientation) include the FEBCO Valve Setter Series 611.

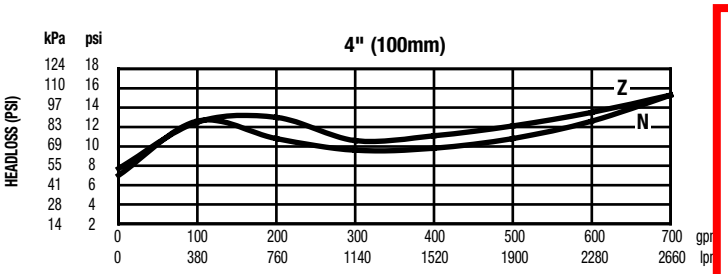
Series LF880V

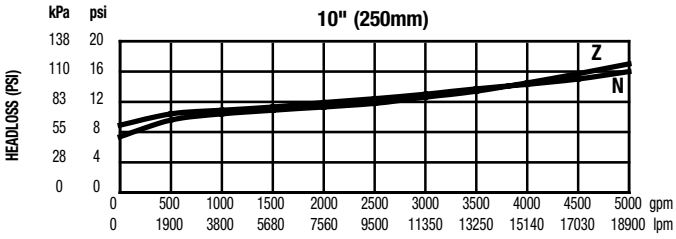












Z-Vertical orientation
N-Standard orientation

The 6" and 10" flow curves (N-standard orientation) include the FEBCO valve setter model 611.

SAN BERNARDINO MUNICIPAL WATER DEPARTMENT LIST OF APPROVED WATER METERS

Irrigation or Industrial ≥ 3" Turbine Meters				
* Requires Purchase of Strainer				
Badger				
Recordall Turbo Series Meters W/Absolute Digital Encoder W/Itron Connector (5 ft. Lead)				
3"	4"	6" *	8" *	10" *
Turbo 450 W/Integral Strainer	Turbo 450 W/Integral Strainer	Turbo 2000	Turbo 3500	Turbo 5500
Neptune				
High Performance Turbine Meter W/E- Coder Solid State Absolute Encoder Registers W/Itron Connector (5 ft. lead)				
3" *	4" *	6" *	8" *	10" *
High Performance Turbine Meter	High Performance Turbine Meter	High Performance Turbine Meter	High Performance Turbine Meter	High Performance Turbine Meter
Master Meter				
Dual Body Compound W/AccuLinx Register W/Itron Connector (5 ft. lead)				
3" *	4" *	6" *	8" *	10"
DC14-2V2-NAA-2	DC15-2V2-NAA-2	TM16-2V2-NAA-2	TM17-2V2-NAA-2	N/A

Domestic and Fire Services ≥ 3"				
Badger				
Recordall Fire Series Assemblies (FSA) W/Disc By-Pass Meter & Absolute Digital Encoder (ADE) Registers W/Itron Connector (5 ft. lead)				
3"	4"	6"	8"	10"
N/A	FSAA-01 DB4"	FSAA-01 DB6"	FSAA-01 DB8"	FSAA-01 DB10"
Neptune				
HP Protectus III Stainless Steel (s) Fire Service Meter W/E-Coder Solid State Absolute Encoder Registers W/Itron Connector (5 ft. lead)				
3"	4"	6"	8"	10"
N/A	HP Protectus III S	HP Protectus III S	HP Protectus III S	HP Protectus III S

REVISION DATE: 7/3/2014

F.D.L.	JUL 14
F.D.L.	JUL 13
F.D.L.	DEC 10
C.L.R.	SEPT 05
REVISION	DATE
SCALE:	NONE

APPROVED WATER METERS

APPROVED _____ DATE 07/04/2019

WARREN HUANG, P.E. RCE 49208

DRAWING NUMBER

SBMWD

W1.15

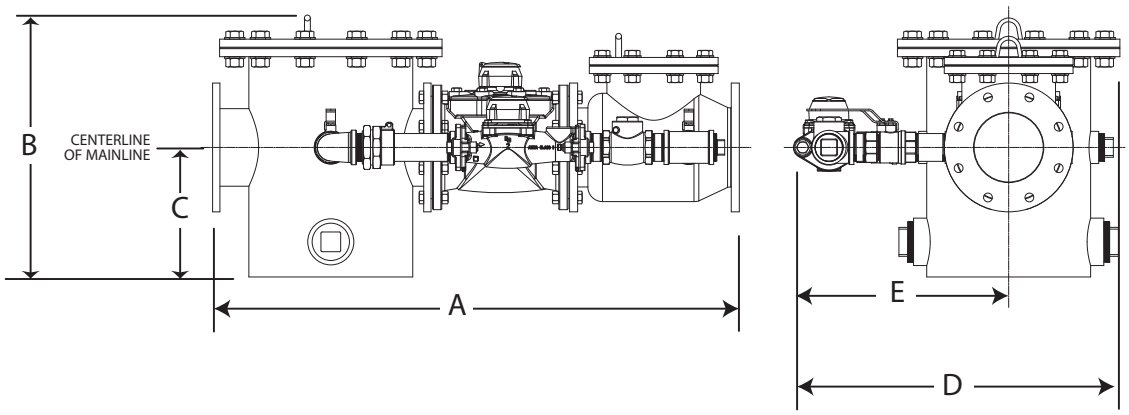
3 OF 3

BADGER RECORDALL FSAA WATER METER PRODUCT SHEET

Optional—Encoders for AMR/AMI Reading Solutions

AMR/AMI solutions are available for all Recordall Disc Series meters. All reading options can be removed from the meter without disrupting water service. Badger Meter encoders provide years of reliable, accurate readings for a variety of applications and are also available pre-wired to Badger Meter approved AMR/AMI solutions. See details at *www.badgermeter.com*.

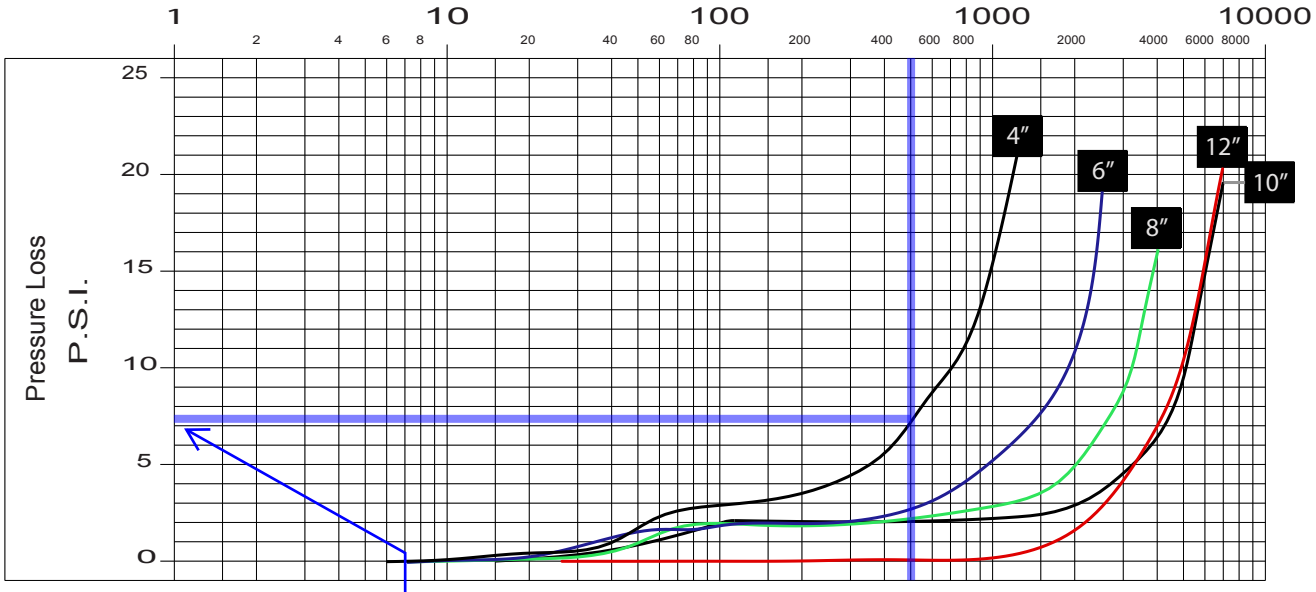
PHYSICAL DIMENSIONS



Fire Series FSAA Model	4 in. (100 mm)	6 in. (150 mm)	8 in. (200 mm)	10 in. (250 mm)	12 in. (305 mm)
Meter & Pipe Size	4 in. (100 mm)	6 in. (150 mm)	8 in. (200 mm)	10 in. (250 mm)	12 in. (305 mm)
Shipping Weight-Fully Assembled	312 lb (142 kg)	507 lb (230 kg)	767 lb (348 kg)	1073 lb (487 kg)	1073 lb (487 kg)
Length (A)	33 in. (838 mm)	45 in. (1143 mm)	53 in. (1346 mm)	68 in. (1727 mm)	68 in. (3727 mm)
Height (B)	20-5/8 in. (524 mm)	22-3/8 in. (mm)	25-1/16 in. (637 mm)	25-5/16 in. (643 mm)	33 in. (838 mm)
Height (C)	10-5/8 in. (270 mm)	11-1/16 in. (mm)	12-1/16 in. (306 mm)	14-13/16 in. (mm)	15-3/4 in. (mm)
Length (D) Standard Bypass	22-7/8 in. (581 mm)	25-7/8 in. (657 mm)	29-5/8 in. (752 mm)	33-7/16 in. (849 mm)	33-7/16 in. (849 mm)
Length (D) Optional 2nd Bypass	N/A	29 in. (737 mm)	30-1/4 in. (368 mm)	34-1/16 in. (865 mm)	34-1/16 in. (865 mm)
Length (E) Standard Bypass	16-1/8 in. (410 mm)	16-3/8 in. (416 mm)	17-1/8 in. (435 mm)	19-11/16 in. (500 mm)	19-11/16 in. (500 mm)
Length (E) Optional 2nd Bypass	N/A	19-1/2 in. (241 mm)	17-3/4 in. (451 mm)	20-5/16 in. (516 mm)	20-5/16 in. (516 mm)

PRESSURE LOSS CHART

Rate of flow in gallons per minute (gpm).



APPENDIX G

WEST VALLEY WATER DISTRICT WATER ATLAS MAPS

SEE MAP M32

SEE MAP L31

SEE MAP N31

16" STL CML&C 2002
16" BFV V-10
V-11
16" BFV V-1
16" STL CML&C 2002
16" BFV V-2
30" BFV V-16
30" STL CML&C CL50 2018
16" BFV V-3
N. OAKDALE AVE
24" STL CASING
12" STL CML&C 2002
HIGHLAND AVE
HIGHLAND AVE
HIGHLAND AVE
TRACT 6723
TRACT 6304
TRACT 8672
TRACT 13704
ZONE 4
10" BFV V-5
V-6
H-6 6"x4"x2.5"
SYCAMORE AVE
OAK DALE AVE
SAGE AVE
JOYCE AVE
ACACIA AVE
FRISBIE PARK
EUCALYPTUS AVE
H-2 6"x4"x2.5"
V-8
H-1 6"x4"x2.5"
V-7
H-3 6"x4"x2.5"
V-9
H-4 6"x4"x2.5"
V-15
V-13
6" GV V-12
6" GV V-11
6" GV V-10
6" GV V-14
12" GV V-18
V-20
H-5 6"x4"x2.5"
V-16
8" GV V-17
8" ACP
6" GV V-55
EASTON ST
EASTON ST
EASTON ST
12" GV V-21
6" GV V-22
V-23
H-7 6"x4"x2.5"
8" GV V-19
H-6 6"x4"x2.5"
8" GV V-24
V-25
8" ACP CL150 1977
H-8 6"x4"x2.5"
6" GV V-27
6" GV V-26
MAGNOLIA AVE
MAGNOLIA AVE
OAKDALE DR
SAGE AVE
MARCELLA AVE
JOYCE AVE
ACACIA AVE
2" BO 2" GV V-28
6"x2"
6" PVC
ENCINA AVE
LOMITA DR
H-11 6"x4"x2.5"
V-31
H-12 6"x4"x2.5"
V-32
H-10 6"x4"x2.5"
V-30
H-9 6"x4"x2.5"
V-29
8" GV V-37
8" PVC
6" GV V-33
8" GV V-42
V-41
H-13 6"x4"x2.5"
8" GV V-40
CHAPARRAL ST
H-14 6"x4"x2.5"
V-43
4" GV V-47
V-48
H-15 6"x4"x2.5"
V-44
4" STL
4" GV V-45
4" GV V-46
8" GV V-50
8" PVC
H-17 6"x4"x2.5"
V-51
H-16 6"x4"x2.5"
8" GV V-49
LOMITA ST
6" PVC CL200 2002
6" GV V-54
6" GV V-52
6" GV V-53
H-1 6"x4"x2.5"
8" GV V-36
8" GV V-39
6" GV V-35
8" GV V-34
8" GV V-38
8" ACP CL150 1977

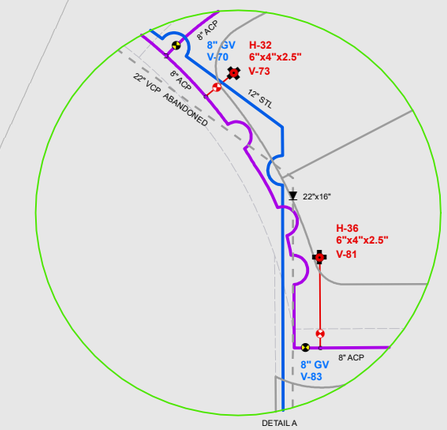
M31	SCALE: 1" = 200' NOT FOR CONSTRUCTION USE	0 200 400 Feet	WATER ATLAS	West Valley Water District	December 2020	West Valley Water District makes every effort to ensure this map is free of errors but does not warrant the map or its features are either spatially or temporally accurate or fit for a particular use. The District provides this map without any warranty of any kind whatsoever, either express or implied. However, notification of any errors will be appreciated.	M31

SEE MAP M30

SEE MAP M33

SEE MAP L32

SEE MAP N32



RESTRICTIVE ZONE

SAN BERNARDINO COUNTY FLOOD CONTROL

RESTRICTIVE ZONE

12" PVC 2022

12" PVC 2022

12" PVC 2022

12" PVC

2" BO
2" GV
V-1
6" AC
H-1
6"x4"x2.5"
V-2
8" ACP
TRACT 9746
OAKDALE AVE
H-2
6"x4"x2.5"
V-3
8" GV
V-4
8" GV
V-5
10" ACP
12"x10"
10" BFV
V-6
4" GV
V-15
12" STL CML&C 2002
4" AV
30" BFV
V-12
CLOSED
16" BFV
V-7
16" BFV
V-11
16" BFV
V-8
16" BFV
V-10
16" STL CML&C 2002
ZONE BREAK 4/5
ZONE 5
ZONE 4
2400
2187
2184
2177
2172
2167
2158
2157
2146
2145
2132
2131
2135
1976
L D&W L150
287
275
2025

M32	SCALE: 1" = 200' NOT FOR CONSTRUCTION USE 0 200 400 Feet	N	WATER ATLAS	West Valley Water District	May 2022	West Valley Water District makes every effort to ensure this map is free of errors but does not warrant the map or its features are either spatially or temporally accurate or fit for a particular use. The District provides this map without any warranty of any kind whatsoever, either express or implied. However, notification of any errors will be appreciated.	M32

SEE MAP M31

SEE MAP N32

SEE MAP M31

SEE MAP O31

16" BFV
V-3

16" STL CML&C CL150 2002

V-4

H-1
6"x4"x2.5"

16" BFV
V-2

16" BFV
V-5

16"x4"

4" FO
4" GV
V-1

16" STL CML&C CL150 2002

H-2
6"x4"x2.5"

V-8

ZONE 4

16" BFV
V-6

30"x16"

30" BFV
V-7

30" STL CML&C CL150 2013

N31	SCALE: 1" = 200' NOT FOR CONSTRUCTION USE	0 200 400 Feet	WATER ATLAS	West Valley Water District	December 2020	West Valley Water District makes every effort to ensure this map is free of errors but does not warrant the map or its features are either spatially or temporally accurate or fit for a particular use. The District provides this map without any warranty of any kind whatsoever, either express or implied. However, notification of any errors will be appreciated.	N31

SEE MAP N30