Appendix I

Hydraulic Model Evaluation

CITY OF SANTA ANA

TECHNICAL MEMORANDUM

HYDRAULIC MODEL EVALUATION FOR THE VILLAGE PROJECT

Final

June 2024

Prepared For:

AQUATIC Informatics

Prepared By:

AKEL ENGINEERING GROUP, INC.

AKEL
ENGINEERING GROUP, INC.

June 26, 2024

City of Santa Ana
215 S Center Street
Santa Ana, CA 92703

Attention: Christine Le, Assistant Engineer

Subject: Hydraulic Model Evaluation for the Village Project

The objective of this technical memorandum is to present the findings of the hydraulic modeling analysis conducted for the Village Project development (project). The project is located at the northeast corner of Bear Street and Sunflower Avenue. The boundaries of the project encompass the areas bordered by South Plaza Drive to the east, Bear Street to the west, the multi-family housing communities to the north, and Sunflower Drive to the south. **Figure 1** illustrates the existing water infrastructure and the location of the project. The hydraulic analysis was performed to determine the required size for the water mains to serve the development and assess the impacts of the development on the system operations.

1.0 SUMMARY OF RESULTS

The hydraulic analysis was performed for maximum day demands, peak hour demands, and maximum day demands plus a 3,000 gallons per minute (gpm) fire flow to determine the impacts on the existing system and to recommend system improvements for the project. The hydraulic analysis indicated only minor impacts, summarized as follows:

- During peak hour demands only minor pressure reductions of 2.8 pound per square inch (psi) were observed and no major impacts to the existing system pipelines were evident.
- During maximum day demands plus 3,000 gpm fire flow, the existing system is capable of providing pressures above 20 psi and pipeline velocities under 7 feet per second (fps).
- An extended-period simulation (EPS) scenario was performed to determine if the project demands impacted the existing system operations. The analysis indicated no major impacts or deficiencies were caused by the project.

2.0 HYDRAULIC MODELING ASSUMPTIONS

The City's existing hydraulic model (WaterCAD) was used to simulate steady-state and extended-period simulations (EPS) to evaluate the development impacts. In order to reflect the recent water conservation efforts, the system water demands were updated as follows:

- Average Day Demand (ADD): 30.2 MGD = 20,947 gpm
- Maximum Day Demand (MDD): 60.3 MGD = 41,894 gpm
- Peak Hour Demand (PHD): 105.6 MGD = 73,315 gpm

These values are consistent with the annual demand documented in 2020 Urban Water Management Plan (2020 UWMP) and the peaking factors for MDD and PHD in Santa Ana Design Guidelines.

To account for the recent operational changes and newly constructed facilities, the hydraulic water model was updated as follows:

- Groundwater Wells 16, 22, 32, 42, and 43 were inactive.
- Interconnections SA-3, SA-4, SA-5, and SA-7 were inactive.
- Pump curves were updated based on the pump test reports provided by Santa Ana staff in December 2022.
- The storage reservoir levels were updated to the Tank Operational Ranges provided by Santa Staff in January 2023.
- The operational controls of reservoir pumping stations were updated to the SCADA- Reservoir Related Setpoints provided by Santa Ana staff in January 2023 (**Appendix A**).

The status of the water system wells, pump stations, tanks, interconnections, and pressure regulating stations in the hydraulic model is documented on **Table 1**.

3.0 ANALYSIS CRITERIA AND ASSUMPTIONS

The water system performance criteria used for the project were obtained from the City of Santa Ana Design Guidelines, which were published in November 2020. **Table 2** documents the development summary, peaking factors, unit factors, required fire flows, pipeline performance criteria, and system pressure criteria.

The project's fire flow requirement of 3,000 gpm at 20 psi for a duration of 3 hours was assumed based on the requirements provided in City's 2017 Water Master Plan. The actual fire flow requirements will be determined by the Orange County Fire Authority (OCFA) and may affect the final design requirements.

The demands of the development were estimated based on the project land use areas and the unit factors found in the City's criteria. The project land use area details are provided in **Appendix B** for reference purposes. Average occupants per unit value was set 2.41 capita/du based on Santa Ana 2045 General Plan's persons per household assumptions. **Table 3** documents the existing and estimated demands for land use types within the project.

The following project demands were estimated and incorporated into the hydraulic model:

- Average Day Demand (ADD): 345 gpm
- Maximum Day Demand (MDD): 690 gpm
- Peak Hour Demand (PHD): 1,207 gpm

4.0 STEADY STATE HYDRAULIC ANALYSIS SCENARIOS

The hydraulic analysis will be performed for 3 scenarios to determine the recommended pipelines for the development of the Village Project:

- Scenario 1: Maximum Day Demands
- Scenario 2: Peak Hour Demands
- Scenario 3: Maximum Day Demands + 3,000 gpm fire flow requirement.

5.0 STEADY STATE HYDRAULIC ANALYSIS RESULTS

Steady-state evaluations during maximum day demands (MDD), peak hour demands (PHD), and maximum day demands plus fire flow (MDD+FF) were performed for each scenario to identify deficiencies caused by the project.

Scenario 1: Maximum Day Demands

According to the hydraulic analysis, the service pressures drop approximately 0.5 psi during the maximum day demand scenario with the addition of the project, decreasing from 92.0 psi (existing) to 91.5 psi (buildout). However, both the pre- and post-development service pressures remain within the City's criteria, maintaining a minimum pressure of 40 psi. **Figure 2** documents the existing and buildout system pressures under maximum day demands.

Scenario 2: Peak Hour Demands

During this scenario, the service pressures drop approximately 2.8 psi with the addition of the project, dropping from the existing 82.7 psi to 79.9 psi at buildout. Despite this drop, the minimum pressure requirement of 40 psi set by City's criteria is still satisfied both before and after the project development. Additionally, the hydraulic analysis indicates that during the peak hour demand scenario, the pipeline velocities will maintain the City's criteria, which allows for a maximum velocity of 5 fps under peak hour demands. **Figure 2** documents the system pressures and pipeline velocities observed during the peak hour demand (PHD) scenario.

Scenario 3: Maximum Day Demands + 3,000 gpm Fire Flow

The hydraulic analysis indicates that during this scenario, the system will maintain fire flow residual pressures above 20 psi and pipeline velocities under 7 fps. The critical fire flow location is observed at the 12-inch pipe segment along Bear Street and the pipeline velocity during a fire flow event will be approximately 6.2 fps with a residual pressure of 86.8 psi. The fire flow results, and the pipeline velocities are documented in **Figure 3.**

6.0 WATER SYSTEM OPERATIONS EPS HYDRAULIC ANALYSIS SCENARIOS

In order to assess the overall system impact of adding the Village development to the domestic water system, City staff requested the extended-period simulation (EPS) scenarios to be conducted under the maximum day demand (MDD) conditions. The scenarios are as follows:

- Existing: Existing operations
- Buildout: Existing operations plus the Village Project

7.0 WATER SYSTEM OPERATIONS EPS HYDRAULIC ANALYSIS RESULTS

The hydraulic analysis was performed for buildout scenario and compared to the existing operations. The results of the EPS analysis provide valuable insights into the system's performance with the addition of the project.

The EPS analysis results/impacts for buildout condition are summarized in **Table 4.** This table documents the change in pressures and increase or decrease of production at each of the wells, booster stations, pressure reducing valves and turnouts (interconnections). The EPS exhibits for each facility are provided in **Appendix C**.

The hydraulic analysis indicates that the development of the project will not have major impacts on the existing system operations. The EPS modeled results are documented as follows:

Development's Demand and Pressure

The project adds an additional demand of 690 gpm to the system's maximum day demand. The average pressure in the MDD EPS scenario indicated a drop of approximately 0.6 psi, decreasing from 91.5 psi (existing) to 90.8 psi (buildout).

Groundwater Wells

Well-37 production increased from 1,345 gpm (existing) to 1,435 gpm (buildout), resulting in additional production of 90 gpm flow. Well-41 production increased from 536 gpm (existing) to 628 gpm (buildout), resulting in additional production of 93 gpm flow.

Booster Stations

South Booster Station outflow increased from 964 gpm (existing) to 1,356 gpm (buildout), resulting in additional outflow of 392 gpm.

Pressure Sustaining Valves

There was no significant impact to pressure sustaining valves during the EPS simulation with the addition of the project.

8.0 ANALYSIS RECOMMENDATION SUMMARY

The hydraulic analysis indicates that with the addition of the Village Project, the existing system does not require pipeline improvements based on the performance criteria documented on **Table 2**. During maximum day demands plus 3,000 gpm fire flow scenario, the residual pressures maintain above 20 psi, and the highest pipeline velocity of 6.2 fps is observed at the 12-inch pipe segment along Bear Street. During peak hour demands, the pipelines velocities remain under City's velocity criteria of 5 fps, and the service pressures indicate 79.5 psi which is only approximately 2.8 psi decrease from the existing conditions.

The extended-period simulation results indicated that with the addition of the Village Project, there were no major impacts to the system operations as documented on **Table 4**.

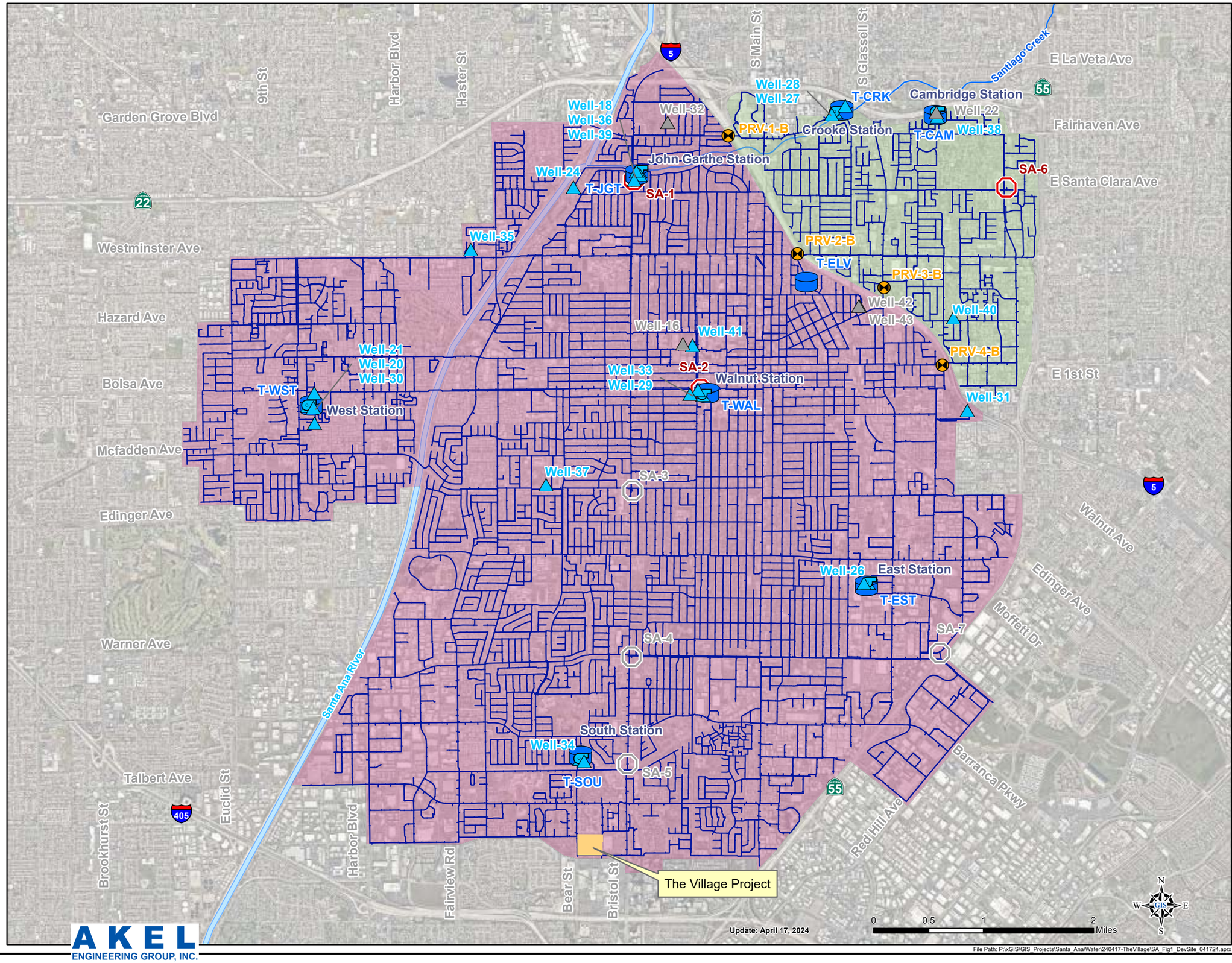
Sincerely,

AKEL ENGINEERING GROUP, INC.

Tony Akel

Tony Akel, P.E.
Principal

FIGURES



Legend

- Development Area

Inactive System

- Wells
- Interconnections

Existing System

- Tanks
- Wells
- Stations
- PRVs
- Interconnections
- Pipelines

Pressure Zone

- High Zone
- Low Zone

Rivers

- Santa Ana River
- Santiago Creek

Figure 1
The Village Project
Site Map

Hydraulic Model Evaluation
For The Village Project
City Of Santa Ana

AKEL ENGINEERING GROUP, INC.

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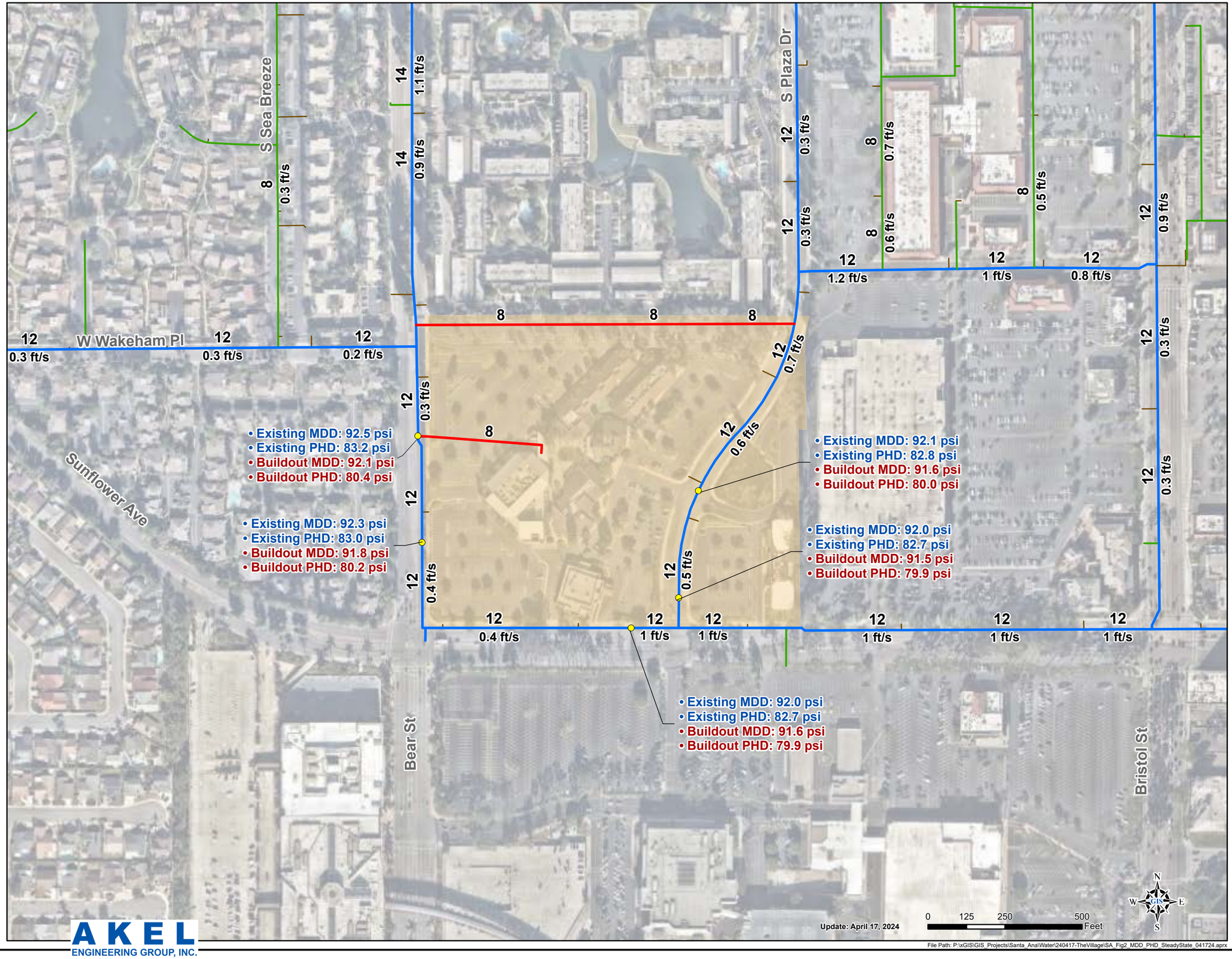

Legend

Hydraulic Analysis

1.2ft/s PHD Velocity

- Pressure Junction
- Proposed Private Pipelines

Existing System

Pipelines by Diameter

- 6" or Smaller
- 8" - 10"
- 12" or Larger
- Development Area

Figure 2
MDD and PHD
Steady State

Hydraulic Model Evaluation
For The Village Project
City Of Santa Ana

AKEL ENGINEERING GROUP, INC.

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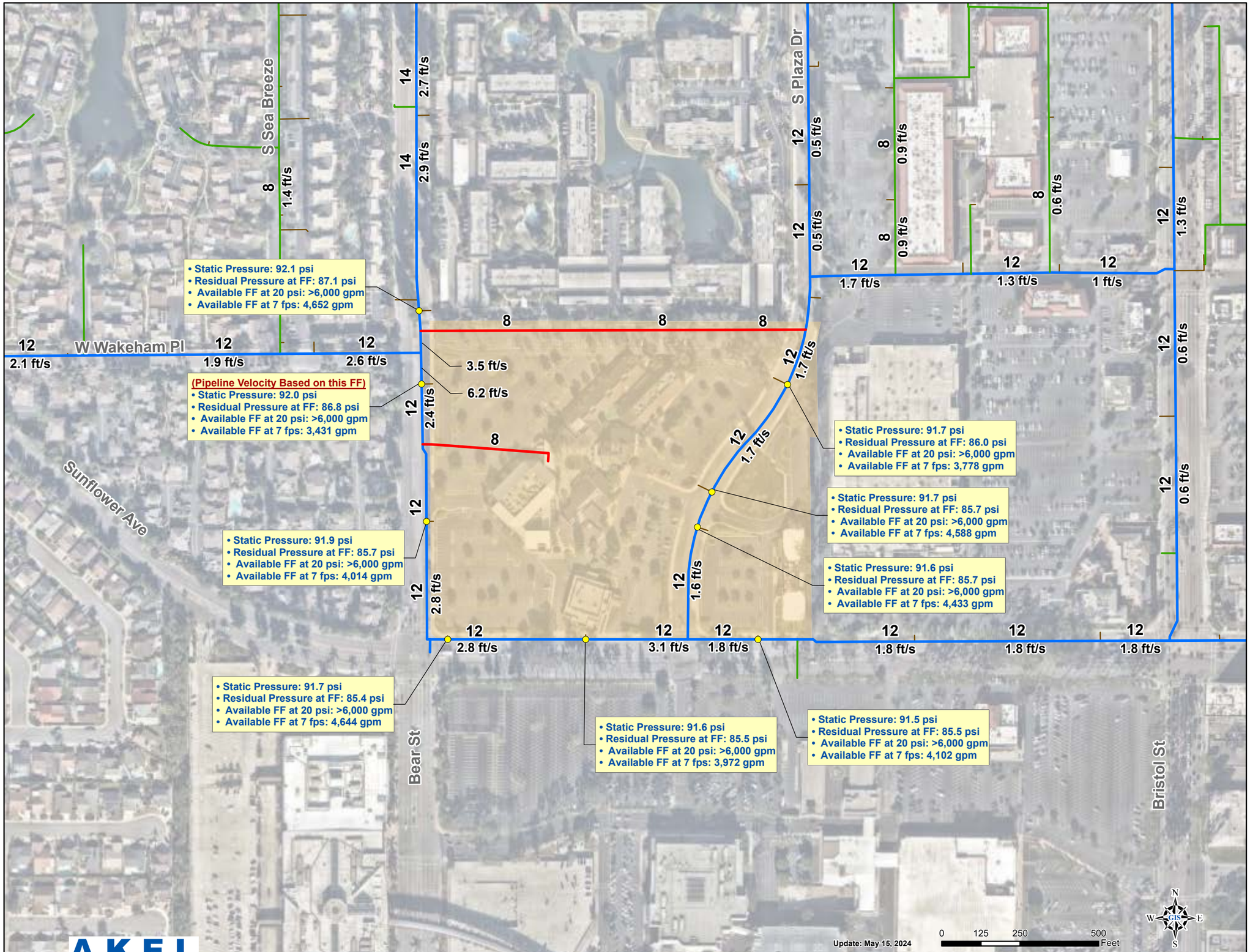

Legend

Hydraulic Analysis

1.2ft/s Velocity at 3,000 gpm FF

- Fire Flow Junction
- Proposed Private Pipelines

Existing System

Pipelines by Diameter

- 6" or Smaller
- 8" - 10"
- 12" or Larger
- Development Area

Note:
- Modeled Scenario: MDD + Fire
- Velocity Constraint: 7 fps
- Pressure Constraint: 20 psi
- Design Fire Flow: 3,000 gpm

Figure 3
3,000 gpm Fire Flow Analysis Results

Hydraulic Model Evaluation
For The Village Project
City Of Santa Ana

AKEL ENGINEERING GROUP, INC.

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TABLES

Table 1 Modeled Facility Inventory

Hydraulic Model Evaluation for The Village Project

City of Santa Ana

Facility	Pressure Zone	Status	Facility	Pressure Zone	Status
Groundwater Wells			**Pump Stations**		
Well 16	Low	Inactive	Cambridge	High	Active
Well 18	Low	Active	Crook	High	Active
Well 20	Low	Active	East	Low	Active
Well 21	Low	Active	John Garthe	Low	Active
Well 22	High	Inactive	South	Low	Active
Well 24	Low	Active	Walnut	Low	Active
Well 26	Low	Active	West	Low	Active
Well 27	High	Active	**Storage Tanks**		
Well 28	High	Active	Cambridge	High	Active
Well 29	Low	Active	Crook	High	Active
Well 30	Low	Active	East	Low	Active
Well 31	Low	Active	Elevated	Low	Active
Well 32	Low	Inactive	John Garthe	Low	Active
Well 33	Low	Active	South	Low	Active
Well 34	Low	Active	Walnut	Low	Active
Well 35	Low	Active	West	Low	Active
Well 36	Low	Active	**Interconnections**		
Well 37	Low	Active	SA-1	Low	Active
Well 38	High	Active	SA-2	Low	Active
Well 39	Low	Active	SA-3	Low	Inactive
Well 40	High	Active	SA-4	Low	Inactive
Well 41	Low	Active	SA-5	Low	Inactive
Well 42	Low	Inactive	SA-6	High	Active
Well 43	Low	Inactive	SA-7	Low	Inactive
Pressure Regulating Stations					
PRV-1	Low	Active	PRV-3	Low	Active
PRV-2	Low	Active	PRV-4	Low	Active

Notes:

1. The modeled elements are validated by Santa Ana Staff in December 2022.

Table 2 The Village Project Development Hydraulic Analysis Criteria

Hydraulic Model Evaluation for the Village Project

City of Santa Ana

No.	Item	Item Description		Comments
1.1	**Development Summary**	**Existing Land Use:** Retail/Commercial	Gross Land Area: 17 ac	Project Area extracted from The Village Specific Plan - Draft August 2023, Table 3-1.
		Proposed Land Use: Mixed Use (Residential, Commercial, Office)	Residential - 1,583 du Commercial - 80,000 sf Office - 300,000 sf Open Space (Public) - 158,300 sf Landscape - 90,000 sf	Development information extracted from The Village Specific Plan Draft August 2023, Table 3-1. Landscape area received from City staff (3/28/2024).
1.2	**Project Demands Estimates**	**Peaking Factors:** Average Day Demand Maximum Day Demand (2.0 x ADD) Peak Hour Demand (3.5 x ADD)	**Unit Factors:** 1. MFR: 120 gpd/capita (Occupants per Unit: 2.41) 2. Commercial: 2,500 gpd/ac 3. Open Space/Landscape: 3,000 gpd/ac	Water demand factors and peaking factors extracted from Design Guidelines and Standard Drawings for Water and Sewer Facilities, City of Santa Ana, November 2020. Average Occupants per unit value extracted from Santa Ana 2045 General Plan, persons per household assumptions.
1.3	**Fire Flows**	Minimum Required Fire Flow and Duration	3,000 gpm at 20 psi residual for a duration of 3 hours	It should be noted that, at the time of this hydraulic modeling effort, the project-specific fire flow requirements were not yet available. Therefore, infrastructure recommendations are based on the fire flow requirements based on land use provided in City's 2017 Water Master Plan. The actual fire flow requirements will be determined by the Orange County Fire Authority (OCFA) and may affect the final design requirements.
1.4	**Pipeline Criteria**	PHD Max Velocity: **5 fps** MDD +FF Max Velocity: **7 fps**		Extracted from City of Santa Ana Design Guidelines Published Nov. 2020
1.5	**Pressure Criteria**	Maximum static pressure: **100 psi**. Minimum residual pressure: **40 psi at PHD**. Minimum residual pressure: **20 psi at MDD + FF**		Extracted from City of Santa Ana Design Guidelines Published Nov. 2020

Table 3 Domestic Water Demands

Hydraulic Model Evaluation for the Village Project

City of Santa Ana

Classification	Development Information									Model Inputs [3]		
	Existing Units [1]	Proposed Units [1]	Average Occupants per Unit [2]	Water Duty Factor [3]	Existing Daily Water Demand (gpd)	Proposed Daily Water Demand (gpd)	Existing Annual Water Demand (AFY)	Proposed Annual Water Demand (AFY)	Change in Annual Demand (AFY)	ADD (gpm)	MDD (gpm)	PHD (gpm)
Residential Demands												
Residential	0	1,583 du	2.41 capita/du	120 gpd/capita	0	457,804	0	513	513	318	636	1,113
Non-Residential Demands												
Commercial	13.2 ac	80,000 sf		2,500 gpd/ac	33,000	4,591	37	5	-32	3	6	11
Office	0	300,000 sf		2,500 gpd/ac	0	17,218	0	19	19	12	24	42
Open Space (Public)	0.5 ac	3.6 ac		3,000 gpd/ac	1,500	10,902	2	12	11	8	15	26
Landscape Area	0	2.1 ac		3,000 gpd/ac	0	6,198	0	7	7	4	9	15
AKEL ENGINEERING GROUP, INC.				**Total**	**34,500**	**496,713**	**39**	**556**	**518**	**345**	**690**	**1,207**

Note:

1. Data extracted from The Village Santa Ana Specific Draft Plan (August 2023), Table 1-1 and Table 3-1, and the project information received from City staff (3/28/2024).
2. Average occupants per unit value extracted from Santa Ana 2045 General Plan, persons per household assumptions.
3. Water duty factors and peaking factors based on Design Guidelines, City of Santa Ana, November 2020.

4/4/2024

Table 4 Water Facility Impacts

Hydraulic Model Evaluation for the The Village Project

City of Santa Ana

Facility ID	Pressure Zone	Data Type	Existing EPS	Buildout EPS	
				Results	Changes
1	2	3	4	7	8
The Village Development			(gpm)	(gpm)	(gpm)
The Village	Low	Demand	0	690	+690
The Village	Low	Pressure (psi)	91.5	90.8	-0.6
Groundwater Wells			(gpm)	(gpm)	(gpm)
Well 31	Low	Outflow	1,286	1,288	+3
Well 35	Low	Outflow	1,916	1,929	+13
Well 37	Low	Outflow	1,345	1,435	+90
Well 41	Low	Outflow	536	628	+93
Well 28	High	Outflow	2,497	2,496	0
Well 38	High	Outflow	0	0	0
Well 40	High	Outflow	0	0	0
Booster Stations			(gpm)	(gpm)	(gpm)
John Garthe	Low	Outflow	7,403	7,449	+46
Walnut	Low	Outflow	5,133	5,122	-11
East	Low	Outflow	2,446	2,453	+7
West	Low	Outflow	5,983	6,036	+52
South	Low	Outflow	964	1,356	+392
Cambridge	High	Outflow	1	1	0
Crook	High	Outflow	0	0	0

APPENDICES

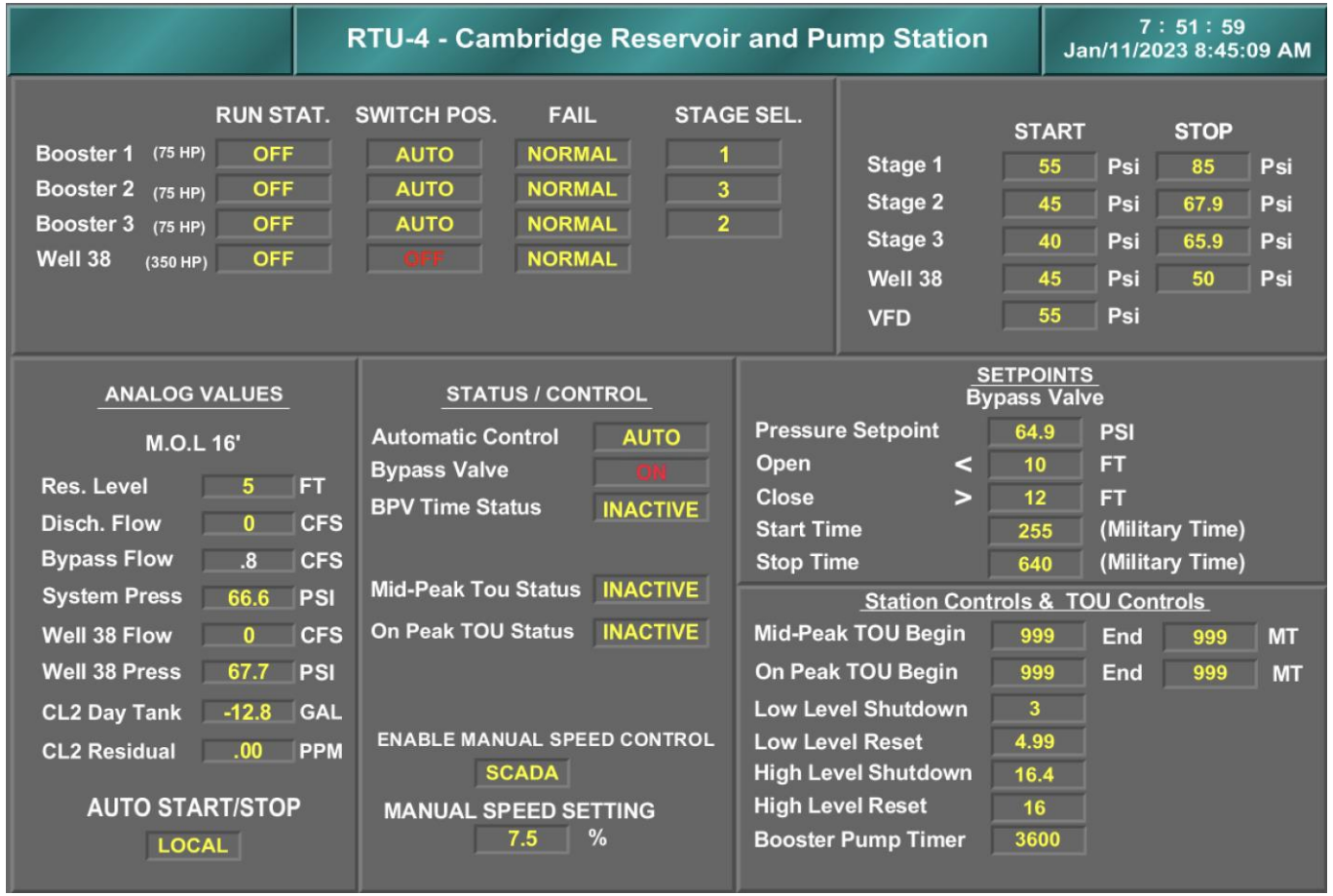
Appendix A

City of Santa Ana
SCADA – Reservoir Related Set Points

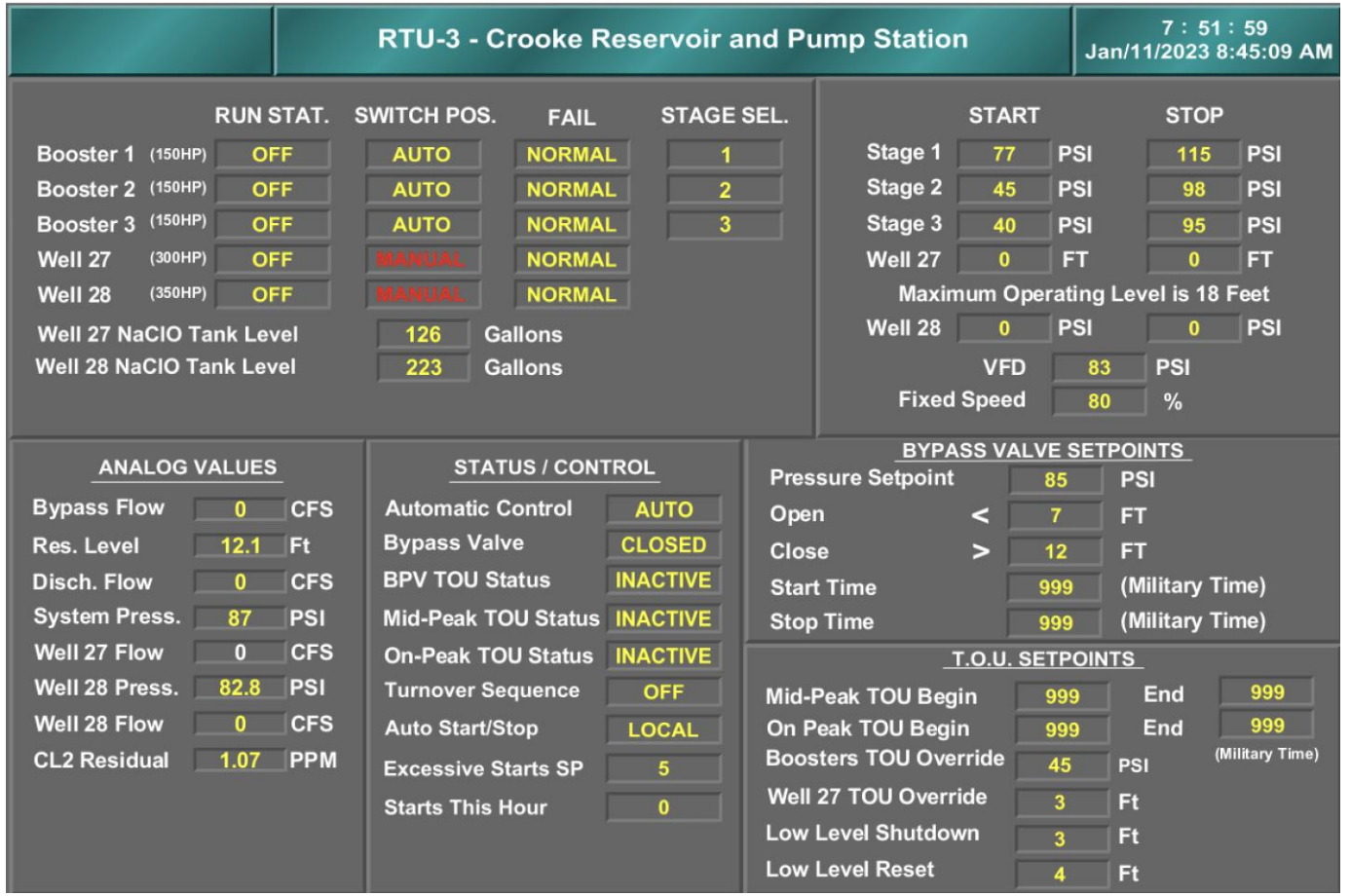
City of Santa Ana

SCADA – Reservoir Related Setpoints

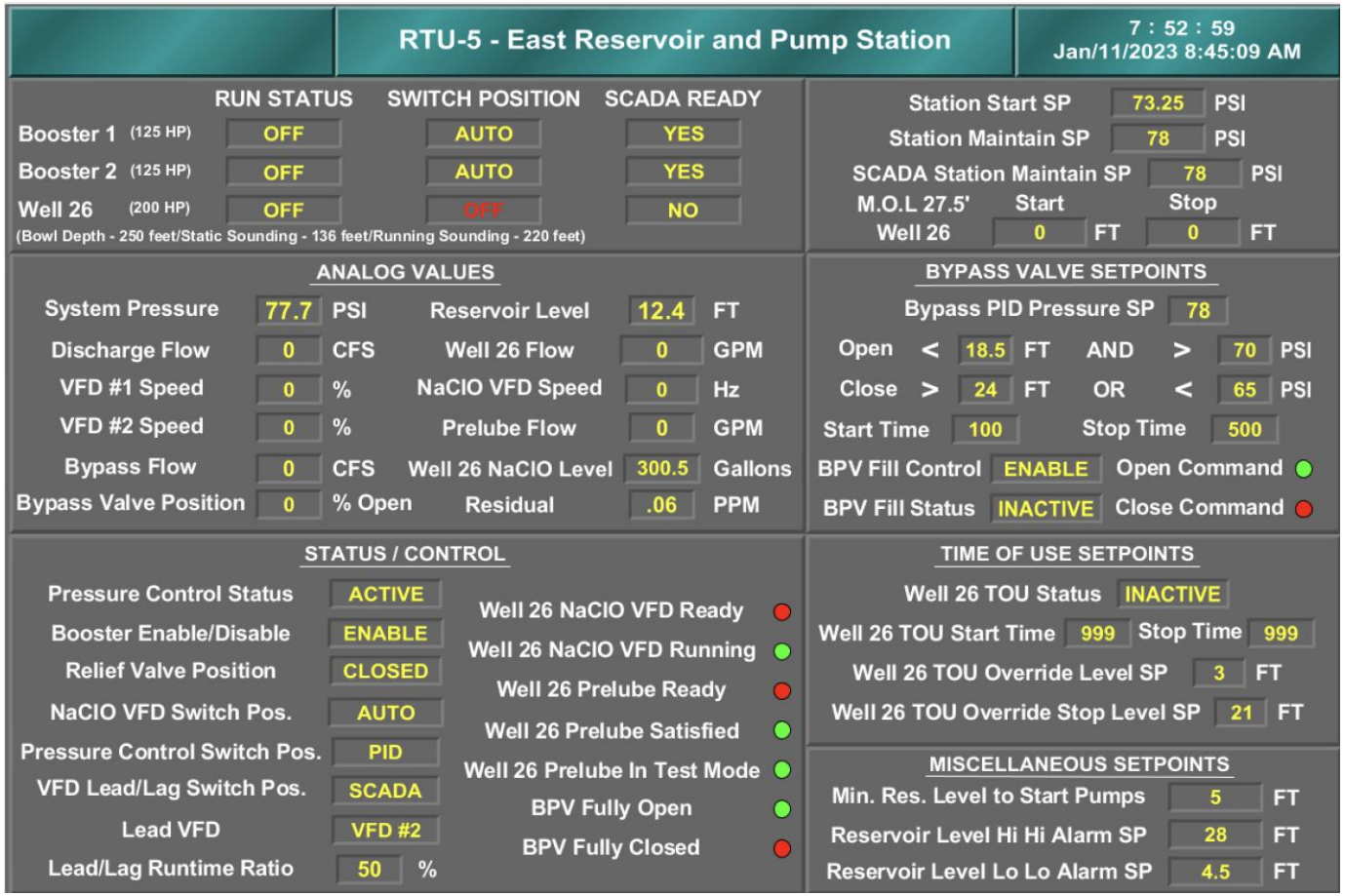
Cambridge


RTU-4 - Cambridge Reservoir and Pump Station
7 : 51 : 59
Jan/11/2023 8:45:09 AM
RUN STAT.
SWITCH POS.
FAIL
STAGE SEL.
Booster 1 (75 HP) OFF AUTO NORMAL 1
Booster 2 (75 HP) OFF AUTO NORMAL 3
Booster 3 (75 HP) OFF AUTO NORMAL 2
Well 38 (350 HP) OFF OFF NORMAL
START
STOP
Stage 1 55 Psi 85 Psi
Stage 2 45 Psi 67.9 Psi
Stage 3 40 Psi 65.9 Psi
Well 38 45 Psi 50 Psi
VFD 55 Psi
ANALOG VALUES
M.O.L 16'
Res. Level 5 FT
Disch. Flow 0 CFS
Bypass Flow .8 CFS
System Press 66.6 PSI
Well 38 Flow 0 CFS
Well 38 Press 67.7 PSI
CL2 Day Tank -12.8 GAL
CL2 Residual .00 PPM
AUTO START/STOP
LOCAL
STATUS / CONTROL
Automatic Control AUTO
Bypass Valve ON
BPV Time Status INACTIVE
Mid-Peak Tou Status INACTIVE
On Peak TOU Status INACTIVE
ENABLE MANUAL SPEED CONTROL
SCADA
MANUAL SPEED SETTING
7.5 %
SETPOINTS
Bypass Valve
Pressure Setpoint 64.9 PSI
Open < 10 FT
Close > 12 FT
Start Time 255 (Military Time)
Stop Time 640 (Military Time)
Station Controls & TOU Controls
Mid-Peak TOU Begin 999 End 999 MT
On Peak TOU Begin 999 End 999 MT
Low Level Shutdown 3
Low Level Reset 4.99
High Level Shutdown 16.4
High Level Reset 16
Booster Pump Timer 3600

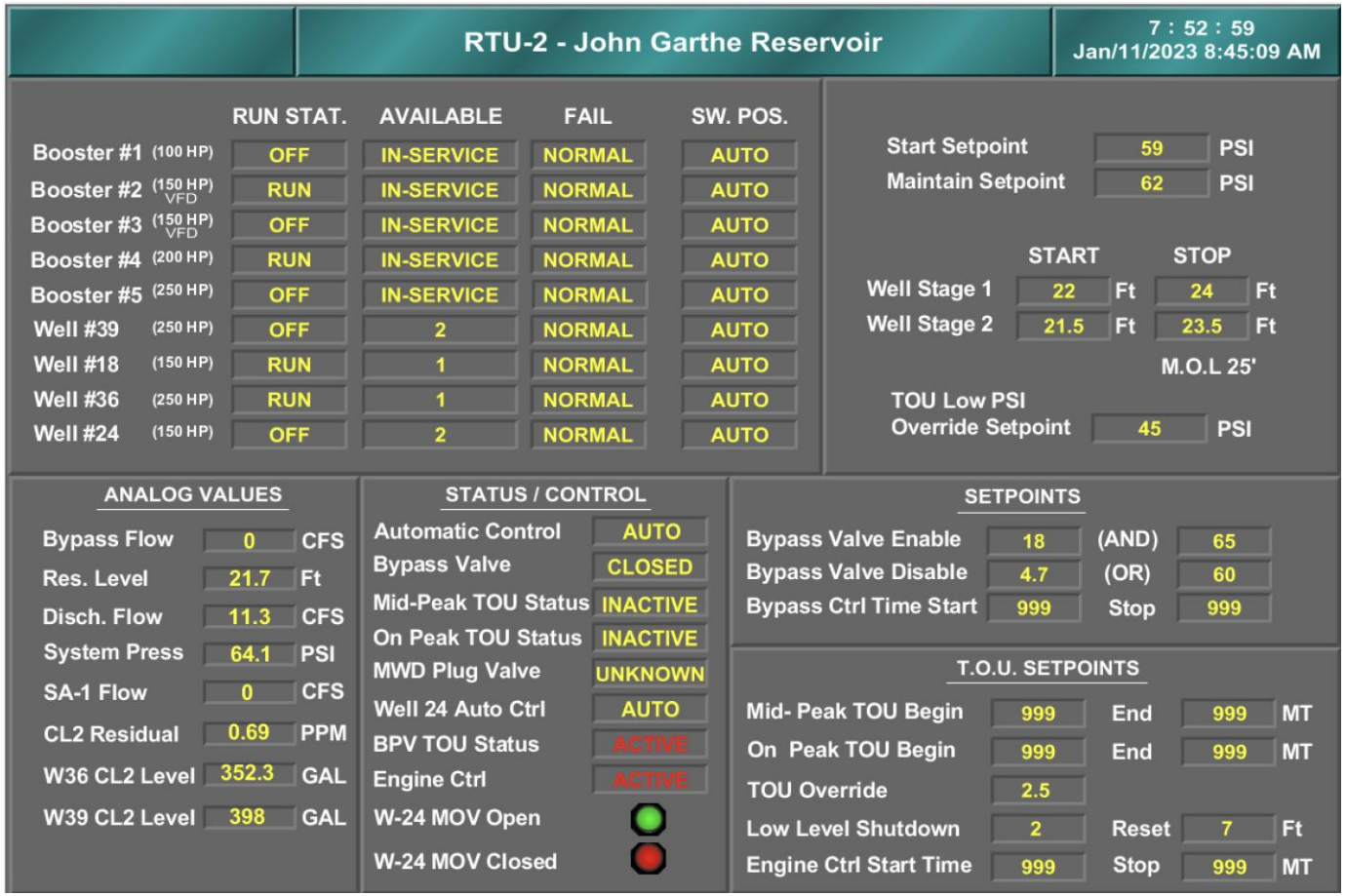
Crooke


RTU-3 - Crooke Reservoir and Pump Station
7 : 51 : 59
Jan/11/2023 8:45:09 AM
RUN STAT.
SWITCH POS.
FAIL
STAGE SEL.
Booster 1 (150HP) OFF AUTO NORMAL 1
Booster 2 (150HP) OFF AUTO NORMAL 2
Booster 3 (150HP) OFF AUTO NORMAL 3
Well 27 (300HP) OFF MANUAL NORMAL
Well 28 (350HP) OFF MANUAL NORMAL
Well 27 NaClO Tank Level 126 Gallons
Well 28 NaClO Tank Level 223 Gallons
START
STOP
Stage 1 77 PSI 115 PSI
Stage 2 45 PSI 98 PSI
Stage 3 40 PSI 95 PSI
Well 27 0 FT 0 FT
Maximum Operating Level is 18 Feet
Well 28 0 PSI 0 PSI
VFD 83 PSI
Fixed Speed 80 %
ANALOG VALUES
Bypass Flow 0 CFS
Res. Level 12.1 Ft
Disch. Flow 0 CFS
System Press. 87 PSI
Well 27 Flow 0 CFS
Well 28 Press. 82.8 PSI
Well 28 Flow 0 CFS
CL2 Residual 1.07 PPM
STATUS / CONTROL
Automatic Control AUTO
Bypass Valve CLOSED
BPV TOU Status INACTIVE
Mid-Peak TOU Status INACTIVE
On-Peak TOU Status INACTIVE
Turnover Sequence OFF
Auto Start/Stop LOCAL
Excessive Starts SP 5
Starts This Hour 0
BYPASS VALVE SETPOINTS
Pressure Setpoint 85 PSI
Open < 7 FT
Close > 12 FT
Start Time 999 (Military Time)
Stop Time 999 (Military Time)
T.O.U. SETPOINTS
Mid-Peak TOU Begin 999 End 999
On Peak TOU Begin 999 End 999
(Military Time)
Boosters TOU Override 45 PSI
Well 27 TOU Override 3 Ft
Low Level Shutdown 3 Ft
Low Level Reset 4 Ft

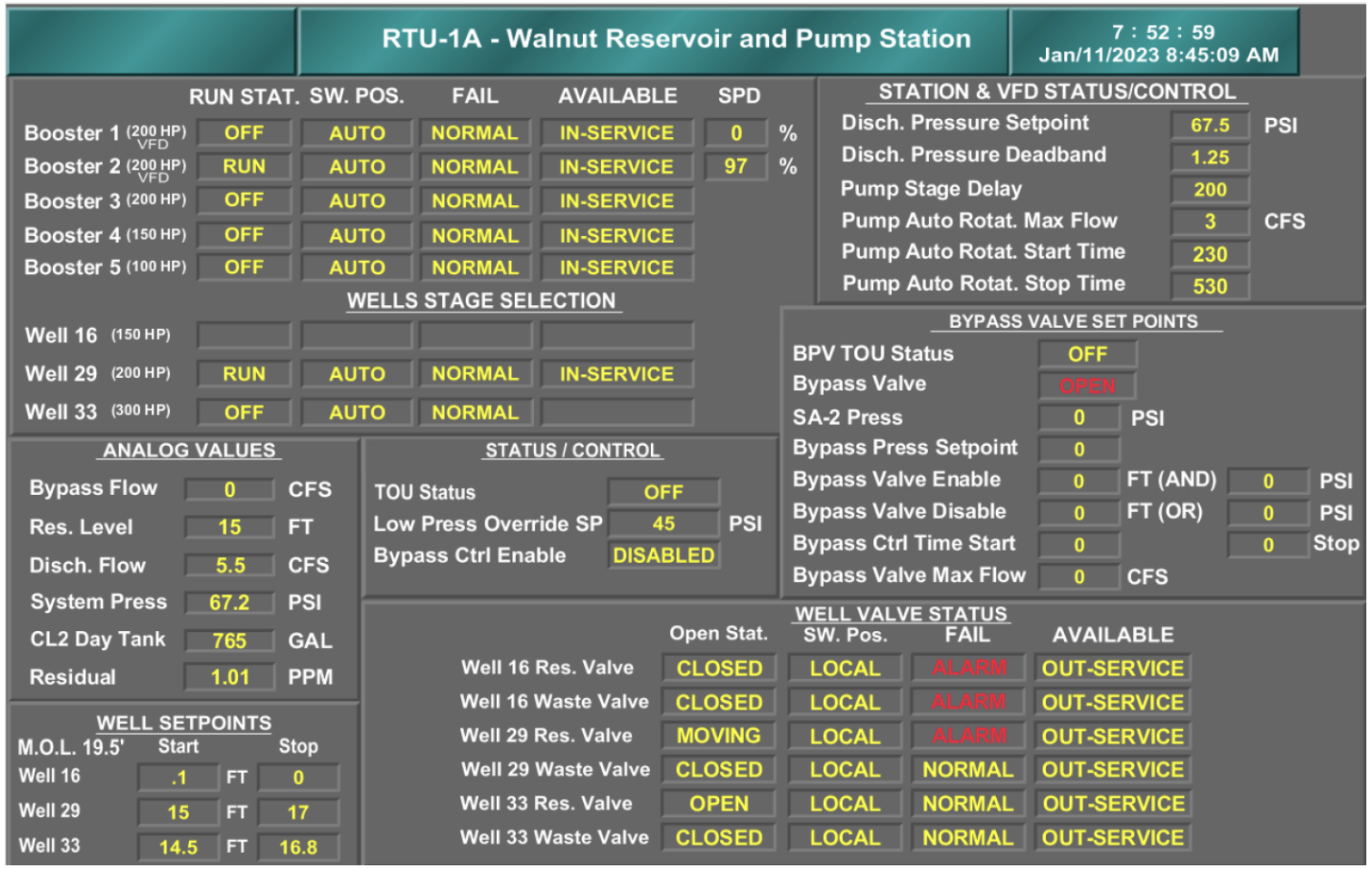
East


RTU-5 - East Reservoir and Pump Station
7 : 52 : 59
Jan/11/2023 8:45:09 AM
RUN STATUS
SWITCH POSITION
SCADA READY
Booster 1 (125 HP) OFF AUTO YES
Booster 2 (125 HP) OFF AUTO YES
Well 26 (200 HP) OFF OFF NO
(Bowl Depth - 250 feet/Static Sounding - 136 feet/Running Sounding - 220 feet)
Station Start SP 73.25 PSI
Station Maintain SP 78 PSI
SCADA Station Maintain SP 78 PSI
M.O.L 27.5' Start Stop
Well 26 0 FT 0 FT
ANALOG VALUES
System Pressure 77.7 PSI
Reservoir Level 12.4 FT
Discharge Flow 0 CFS
Well 26 Flow 0 GPM
VFD #1 Speed 0 %
NaClO VFD Speed 0 Hz
VFD #2 Speed 0 %
Prelube Flow 0 GPM
Bypass Flow 0 CFS
Well 26 NaClO Level 300.5 Gallons
Bypass Valve Position 0 % Open
Residual .06 PPM
BYPASS VALVE SETPOINTS
Bypass PID Pressure SP 78
Open < 18.5 FT AND > 70 PSI
Close > 24 FT OR < 65 PSI
Start Time 100 Stop Time 500
BPV Fill Control ENABLE Open Command
BPV Fill Status INACTIVE Close Command
STATUS / CONTROL
Pressure Control Status ACTIVE
Booster Enable/Disable ENABLE
Relief Valve Position CLOSED
NaClO VFD Switch Pos. AUTO
Pressure Control Switch Pos. PID
VFD Lead/Lag Switch Pos. SCADA
Lead VFD VFD #2
Lead/Lag Runtime Ratio 50 %
Well 26 NaClO VFD Ready
Well 26 NaClO VFD Running
Well 26 Prelube Ready
Well 26 Prelube Satisfied
Well 26 Prelube In Test Mode
BPV Fully Open
BPV Fully Closed
TIME OF USE SETPOINTS
Well 26 TOU Status INACTIVE
Well 26 TOU Start Time 999 Stop Time 999
Well 26 TOU Override Level SP 3 FT
Well 26 TOU Override Stop Level SP 21 FT
MISCELLANEOUS SETPOINTS
Min. Res. Level to Start Pumps 5 FT
Reservoir Level Hi Hi Alarm SP 28 FT
Reservoir Level Lo Lo Alarm SP 4.5 FT

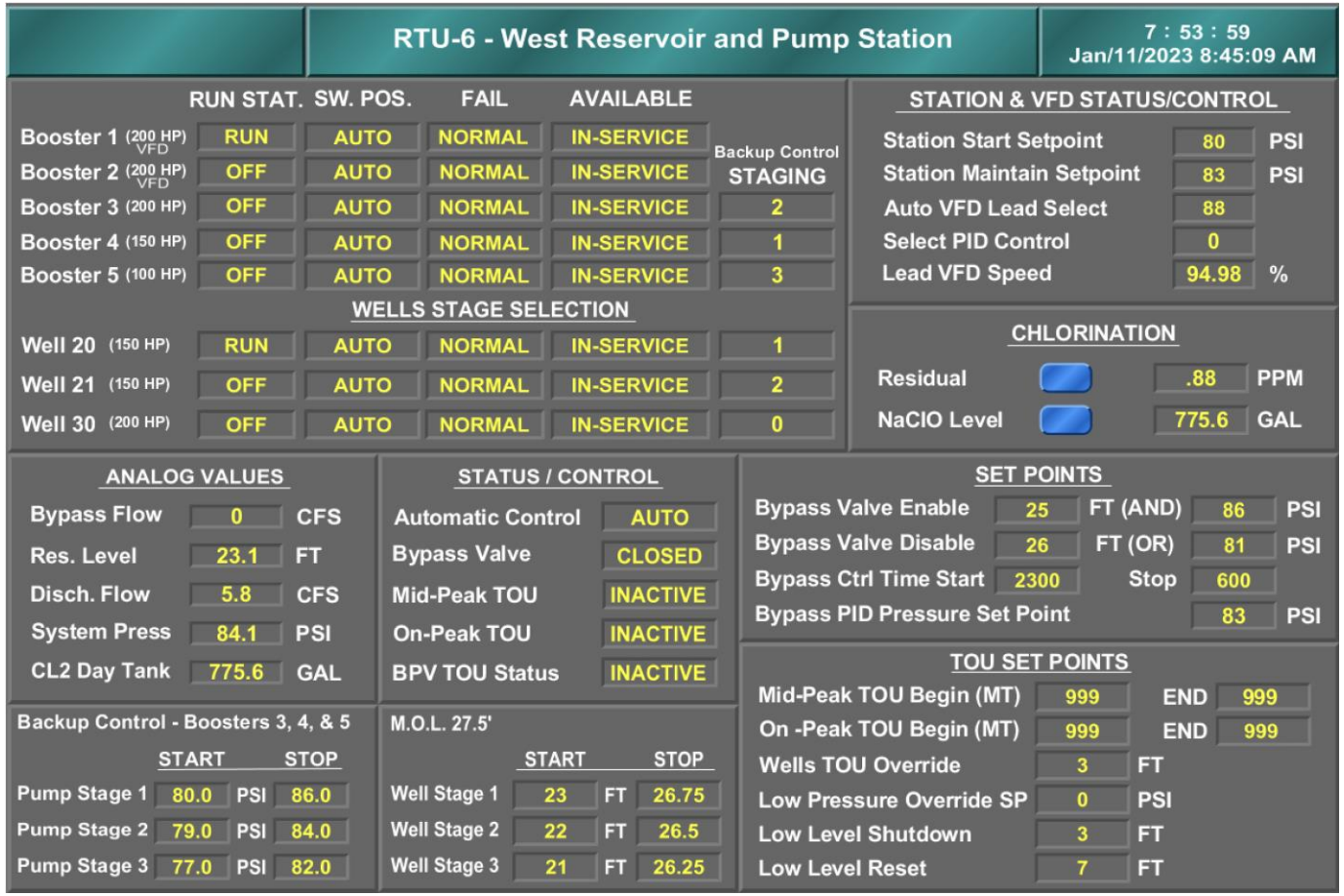
Garthe


RTU-2 - John Garthe Reservoir
7 : 52 : 59
Jan/11/2023 8:45:09 AM
RUN STAT.
AVAILABLE
FAIL
SW. POS.
Booster #1 (100 HP) OFF IN-SERVICE NORMAL AUTO
Booster #2 (150 HP) VFD RUN IN-SERVICE NORMAL AUTO
Booster #3 (150 HP) VFD OFF IN-SERVICE NORMAL AUTO
Booster #4 (200 HP) RUN IN-SERVICE NORMAL AUTO
Booster #5 (250 HP) OFF IN-SERVICE NORMAL AUTO
Well #39 (250 HP) OFF 2 NORMAL AUTO
Well #18 (150 HP) RUN 1 NORMAL AUTO
Well #36 (250 HP) RUN 1 NORMAL AUTO
Well #24 (150 HP) OFF 2 NORMAL AUTO
Start Setpoint 59 PSI
Maintain Setpoint 62 PSI
START
STOP
Well Stage 1 22 Ft 24 Ft
Well Stage 2 21.5 Ft 23.5 Ft
M.O.L 25'
TOU Low PSI Override Setpoint 45 PSI
ANALOG VALUES
Bypass Flow 0 CFS
Res. Level 21.7 Ft
Disch. Flow 11.3 CFS
System Press 64.1 PSI
SA-1 Flow 0 CFS
CL2 Residual 0.69 PPM
W36 CL2 Level 352.3 GAL
W39 CL2 Level 398 GAL
STATUS / CONTROL
Automatic Control AUTO
Bypass Valve CLOSED
Mid-Peak TOU Status INACTIVE
On Peak TOU Status INACTIVE
MWD Plug Valve UNKNOWN
Well 24 Auto Ctrl AUTO
BPV TOU Status ACTIVE
Engine Ctrl ACTIVE
W-24 MOV Open
W-24 MOV Closed
SETPOINTS
Bypass Valve Enable 18 (AND) 65
Bypass Valve Disable 4.7 (OR) 60
Bypass Ctrl Time Start 999 Stop 999
T.O.U. SETPOINTS
Mid- Peak TOU Begin 999 End 999 MT
On Peak TOU Begin 999 End 999 MT
TOU Override 2.5
Low Level Shutdown 2 Reset 7 Ft
Engine Ctrl Start Time 999 Stop 999 MT

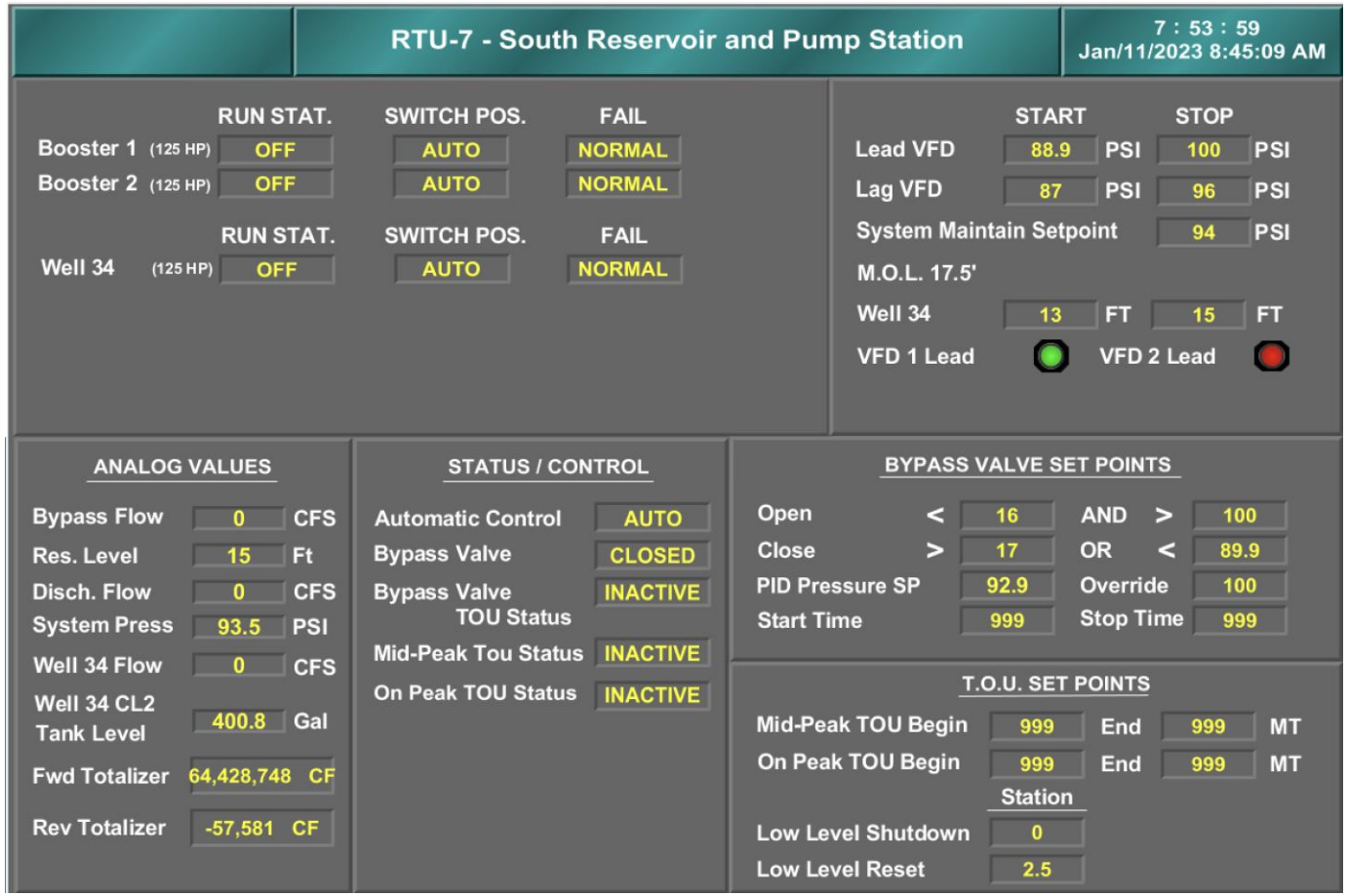
Walnut


RTU-1A - Walnut Reservoir and Pump Station
7 : 52 : 59
Jan/11/2023 8:45:09 AM
RUN STAT. SW. POS. FAIL AVAILABLE SPD
Booster 1 (200 HP) VFD OFF AUTO NORMAL IN-SERVICE 0 %
Booster 2 (200 HP) VFD RUN AUTO NORMAL IN-SERVICE 97 %
Booster 3 (200 HP) OFF AUTO NORMAL IN-SERVICE
Booster 4 (150 HP) OFF AUTO NORMAL IN-SERVICE
Booster 5 (100 HP) OFF AUTO NORMAL IN-SERVICE
WELLS STAGE SELECTION
Well 16 (150 HP)
Well 29 (200 HP) RUN AUTO NORMAL IN-SERVICE
Well 33 (300 HP) OFF AUTO NORMAL
STATION & VFD STATUS/CONTROL
Disch. Pressure Setpoint 67.5 PSI
Disch. Pressure Deadband 1.25
Pump Stage Delay 200
Pump Auto Rotat. Max Flow 3 CFS
Pump Auto Rotat. Start Time 230
Pump Auto Rotat. Stop Time 530
BYPASS VALVE SET POINTS
BPV TOU Status OFF
Bypass Valve OPEN
SA-2 Press 0 PSI
Bypass Press Setpoint 0
Bypass Valve Enable 0 FT (AND) 0 PSI
Bypass Valve Disable 0 FT (OR) 0 PSI
Bypass Ctrl Time Start 0 0 Stop
Bypass Valve Max Flow 0 CFS
ANALOG VALUES
Bypass Flow 0 CFS
Res. Level 15 FT
Disch. Flow 5.5 CFS
System Press 67.2 PSI
CL2 Day Tank 765 GAL
Residual 1.01 PPM
STATUS / CONTROL
TOU Status OFF
Low Press Override SP 45 PSI
Bypass Ctrl Enable DISABLED
WELL SETPOINTS
M.O.L. 19.5' Start Stop
Well 16 .1 FT 0
Well 29 15 FT 17
Well 33 14.5 FT 16.8
WELL VALVE STATUS
Open Stat. SW. Pos. FAIL AVAILABLE
Well 16 Res. Valve CLOSED LOCAL ALARM OUT-SERVICE
Well 16 Waste Valve CLOSED LOCAL ALARM OUT-SERVICE
Well 29 Res. Valve MOVING LOCAL ALARM OUT-SERVICE
Well 29 Waste Valve CLOSED LOCAL NORMAL OUT-SERVICE
Well 33 Res. Valve OPEN LOCAL NORMAL OUT-SERVICE
Well 33 Waste Valve CLOSED LOCAL NORMAL OUT-SERVICE

West


RTU-6 - West Reservoir and Pump Station
7 : 53 : 59
Jan/11/2023 8:45:09 AM
RUN STAT. SW. POS. FAIL AVAILABLE
Booster 1 (200 HP) VFD RUN AUTO NORMAL IN-SERVICE
Booster 2 (200 HP) VFD OFF AUTO NORMAL IN-SERVICE
Booster 3 (200 HP) OFF AUTO NORMAL IN-SERVICE
Booster 4 (150 HP) OFF AUTO NORMAL IN-SERVICE
Booster 5 (100 HP) OFF AUTO NORMAL IN-SERVICE
Backup Control STAGING
2
1
3
WELLS STAGE SELECTION
Well 20 (150 HP) RUN AUTO NORMAL IN-SERVICE 1
Well 21 (150 HP) OFF AUTO NORMAL IN-SERVICE 2
Well 30 (200 HP) OFF AUTO NORMAL IN-SERVICE 0
STATION & VFD STATUS/CONTROL
Station Start Setpoint 80 PSI
Station Maintain Setpoint 83 PSI
Auto VFD Lead Select 88
Select PID Control 0
Lead VFD Speed 94.98 %
CHLORINATION
Residual .88 PPM
NaClO Level 775.6 GAL
ANALOG VALUES
Bypass Flow 0 CFS
Res. Level 23.1 FT
Disch. Flow 5.8 CFS
System Press 84.1 PSI
CL2 Day Tank 775.6 GAL
STATUS / CONTROL
Automatic Control AUTO
Bypass Valve CLOSED
Mid-Peak TOU INACTIVE
On-Peak TOU INACTIVE
BPV TOU Status INACTIVE
SET POINTS
Bypass Valve Enable 25 FT (AND) 86 PSI
Bypass Valve Disable 26 FT (OR) 81 PSI
Bypass Ctrl Time Start 2300 Stop 600
Bypass PID Pressure Set Point 83 PSI
Backup Control - Boosters 3, 4, & 5
START STOP
Pump Stage 1 80.0 PSI 86.0
Pump Stage 2 79.0 PSI 84.0
Pump Stage 3 77.0 PSI 82.0
M.O.L. 27.5'
START STOP
Well Stage 1 23 FT 26.75
Well Stage 2 22 FT 26.5
Well Stage 3 21 FT 26.25
TOU SET POINTS
Mid-Peak TOU Begin (MT) 999 END 999
On -Peak TOU Begin (MT) 999 END 999
Wells TOU Override 3 FT
Low Pressure Override SP 0 PSI
Low Level Shutdown 3 FT
Low Level Reset 7 FT

South


RTU-7 - South Reservoir and Pump Station
7 : 53 : 59
Jan/11/2023 8:45:09 AM
RUN STAT.
SWITCH POS.
FAIL
Booster 1 (125 HP) OFF AUTO NORMAL
Booster 2 (125 HP) OFF AUTO NORMAL
RUN STAT.
SWITCH POS.
FAIL
Well 34 (125 HP) OFF AUTO NORMAL
START
STOP
Lead VFD 88.9 PSI 100 PSI
Lag VFD 87 PSI 96 PSI
System Maintain Setpoint 94 PSI
M.O.L. 17.5'
Well 34 13 FT 15 FT
VFD 1 Lead
VFD 2 Lead
ANALOG VALUES
Bypass Flow 0 CFS
Res. Level 15 Ft
Disch. Flow 0 CFS
System Press 93.5 PSI
Well 34 Flow 0 CFS
Well 34 CL2 Tank Level 400.8 Gal
Fwd Totalizer 64,428,748 CF
Rev Totalizer -57,581 CF
STATUS / CONTROL
Automatic Control AUTO
Bypass Valve CLOSED
Bypass Valve TOU Status INACTIVE
Mid-Peak Tou Status INACTIVE
On Peak TOU Status INACTIVE
BYPASS VALVE SET POINTS
Open < 16 AND > 100
Close > 17 OR < 89.9
PID Pressure SP 92.9 Override 100
Start Time 999 Stop Time 999
T.O.U. SET POINTS
Mid-Peak TOU Begin 999 End 999 MT
On Peak TOU Begin 999 End 999 MT
Station
Low Level Shutdown 0
Low Level Reset 2.5

Appendix B

The Village Project
Proposed Land Use Plan

3.2 Land Use Plan

The land use plan is the basis for establishing the range of uses, maximum buildout, and development standards for the Village. The Village is a mixed-use community that allows for vertical and horizontal mixed use across the site. As shown on Figure 3-1, *Proposed Land Use Plan*, a variety of residential, commercial, and community uses are planned throughout the Village. A central commercial area in a park setting allows for restaurants and retail uses to activate the area during both day and night. A continuation of those commercial uses is encouraged at the ground floor of adjacent residential buildings. Parking would be readily available in at-grade and underground structures. Figure 3-2a, *Conceptual Site Plan*, depicts how the plan could be implemented. As noted in the figure, various commercial uses, including restaurants, retail shops, and a grocery store/market, may enhance the plaza and create a sense of place at the heart of the Village. Stand-alone residential and mixed-use buildings provide a variety of housing opportunities for residents who seek a unique community in the city's South Bristol Focus Area.

3.2.1 Maximum Buildout

The maximum buildout for the Village is provided in Table 3-1, *Land Use Statistical Summary*. This Specific Plan allows up to 1,583 dwelling units, 80,000 square feet of commercial space, 300,000 square feet of office, and over 3.6 acres of open space. Chapter 4, *Development Regulations*, provides more detail regarding permitted uses and development standards for each use.

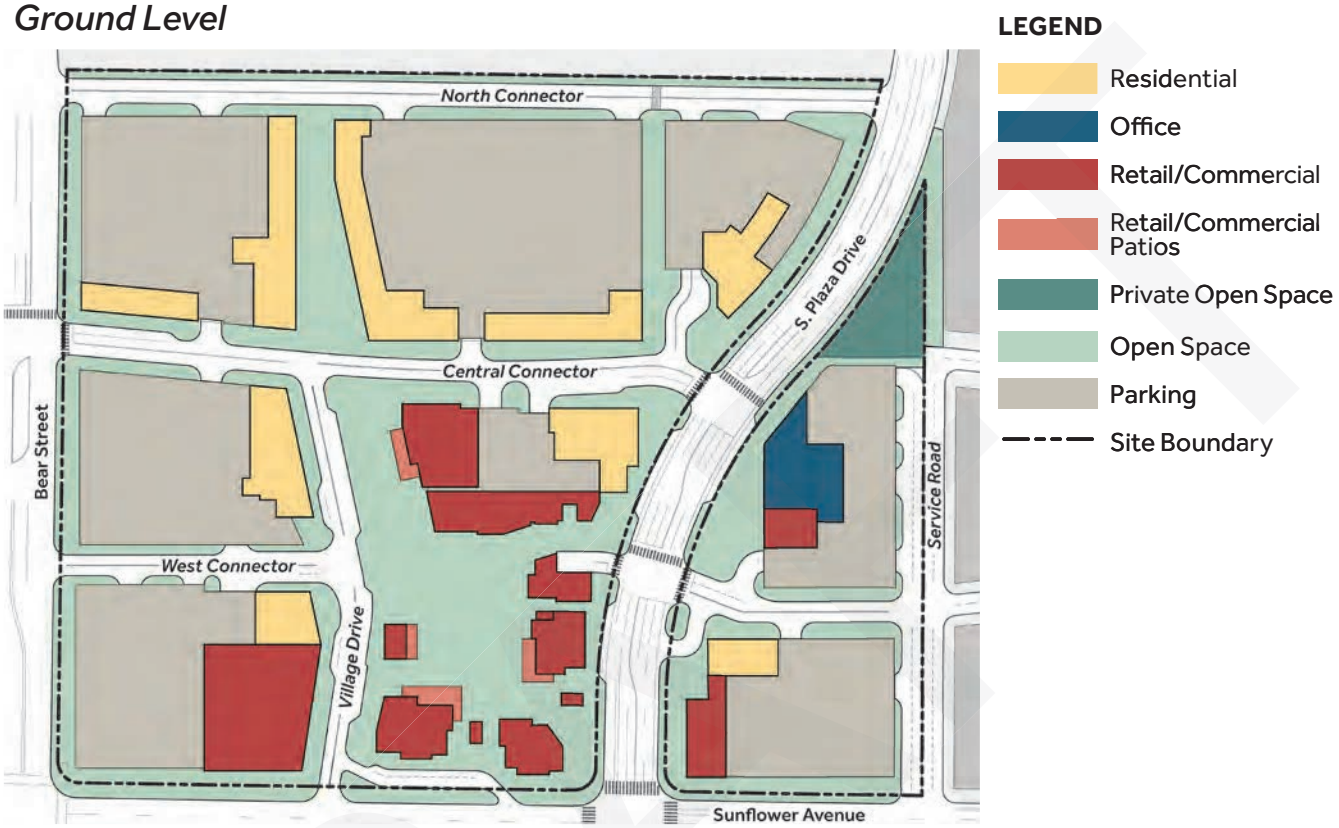
Table 3-1: Land Use Statistical Summary

Uses[1]	Development	Site Size
Residential	1,583 units (maximum)	17 Acres
Commercial	80,000 sq ft (maximum)	
Office	300,000 sq ft (maximum)	
Open Space[2]	158,300 sq ft (approximately 3.6 acres, minimum)	

Notes:
1. Uses are permitted as vertical and/or horizontal mixed use.
2. Open Space areas consist of passive and active areas as defined by the City of Santa Ana 2022 Housing Element.

Figure 3-1: Proposed Land Use Plan

Ground Level

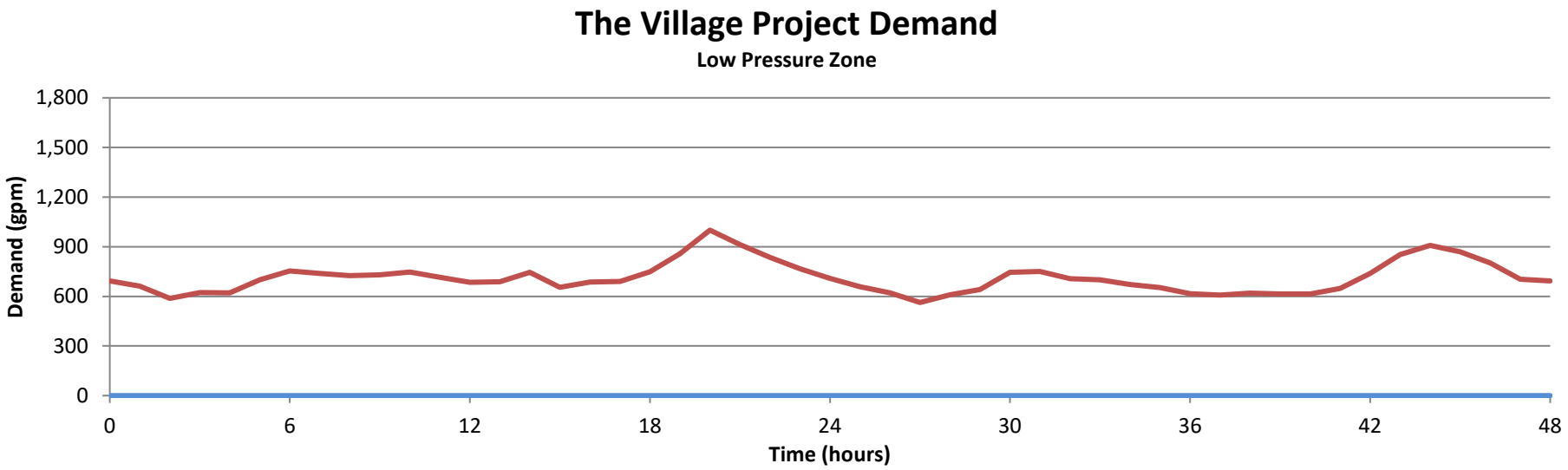


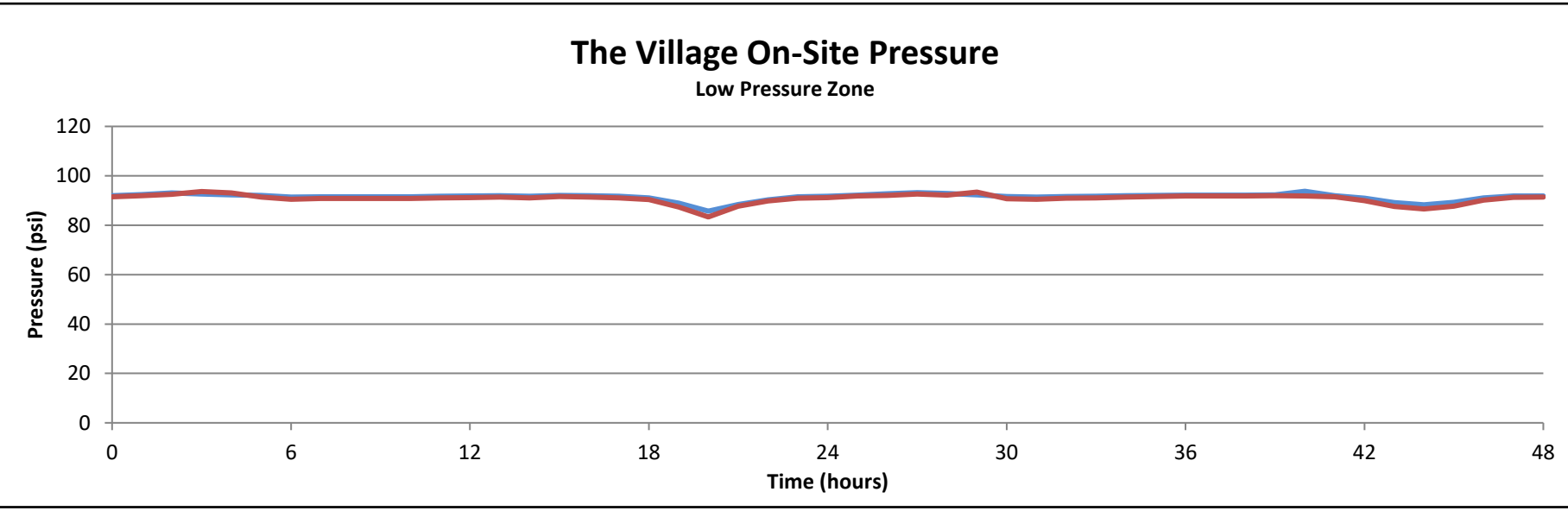
Rooftop

Source: Gensler, PlaceWorks

Appendix C

Extended-Period Simulation Results





LEGEND

- Existing
- Existing + The Village

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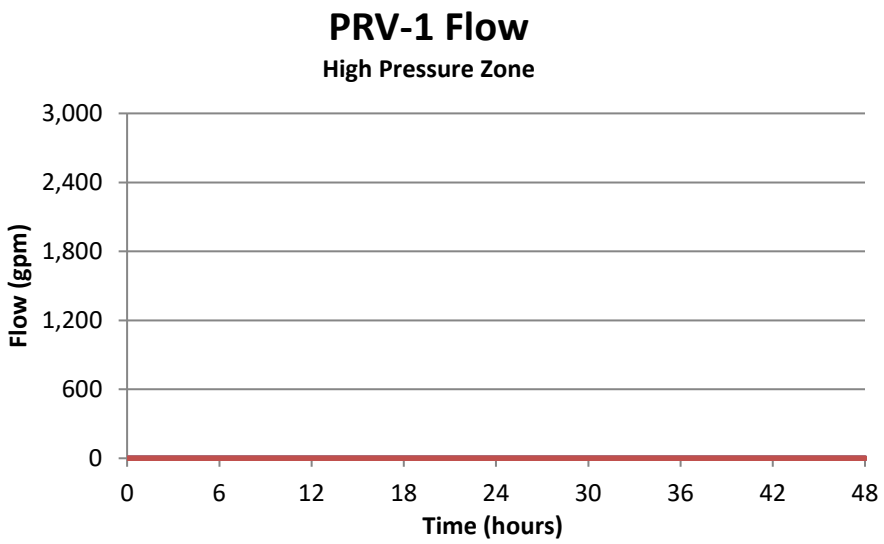
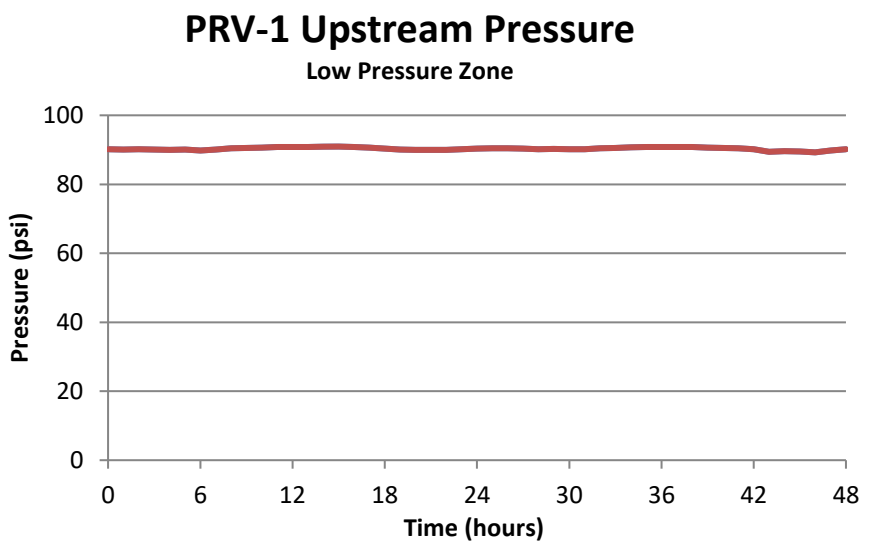
Figure A.1

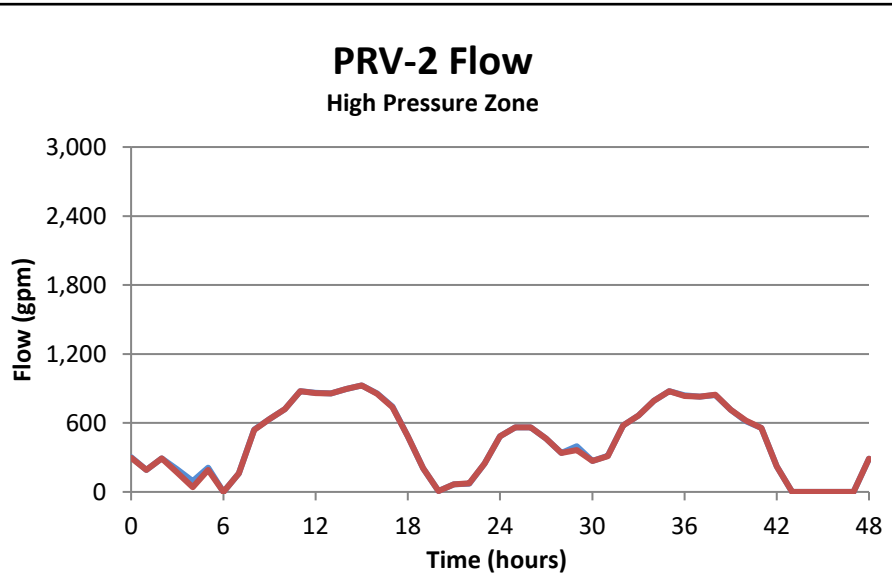
Onsite Comparison

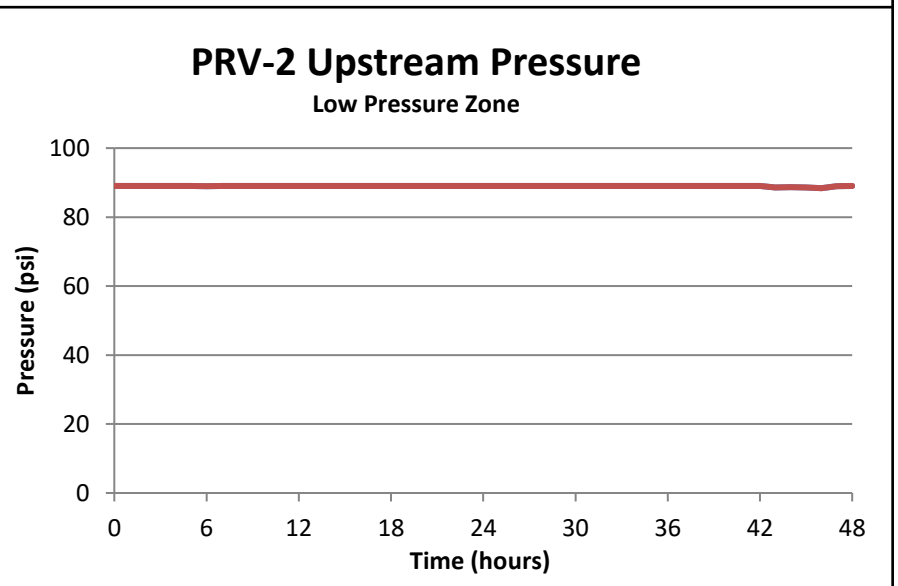
Hydraulic Model Evaluation for
The Village Project
City of Santa Ana

SANTA ANA









LEGEND

Existing
Buildout

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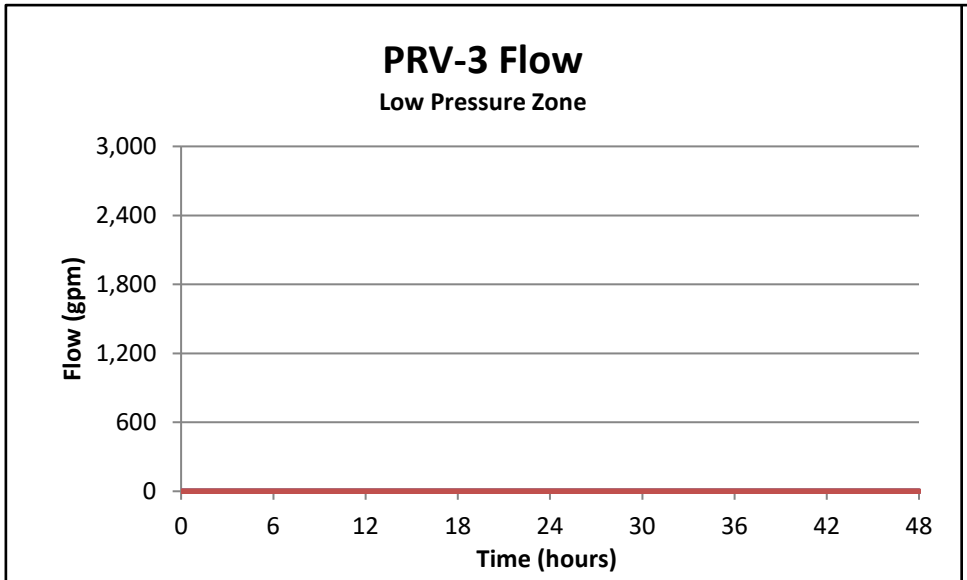
April 18, 2024

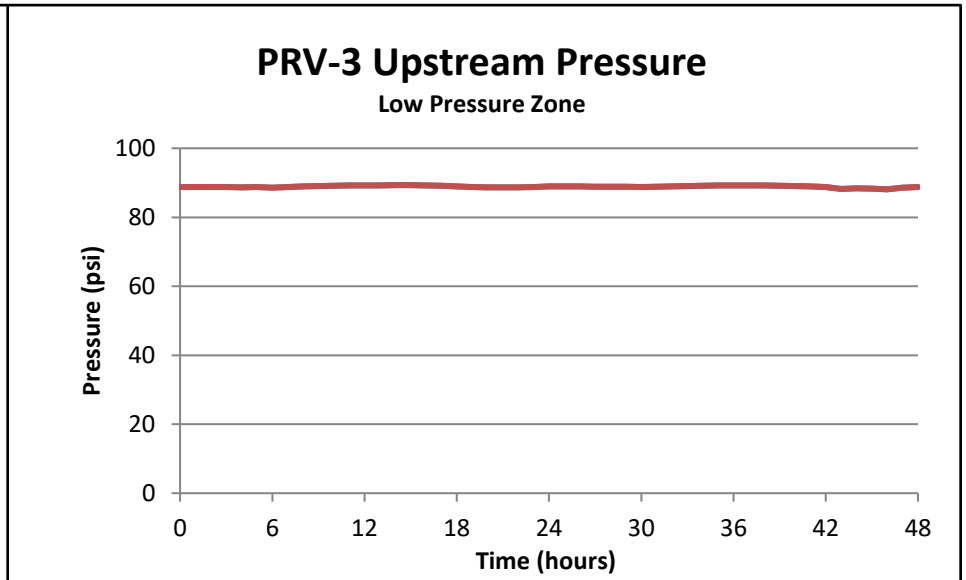
Figure A.2

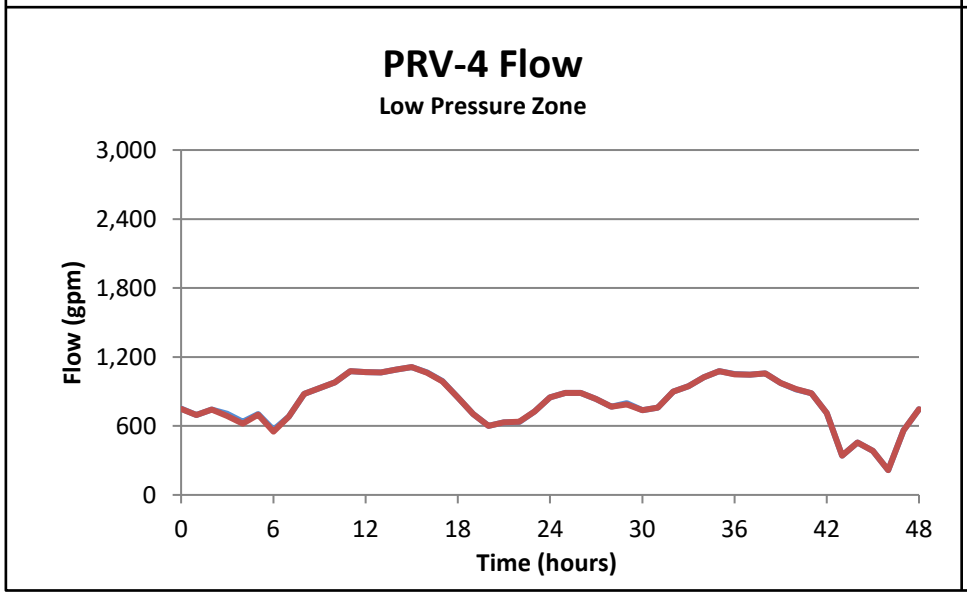
PRV Comparison

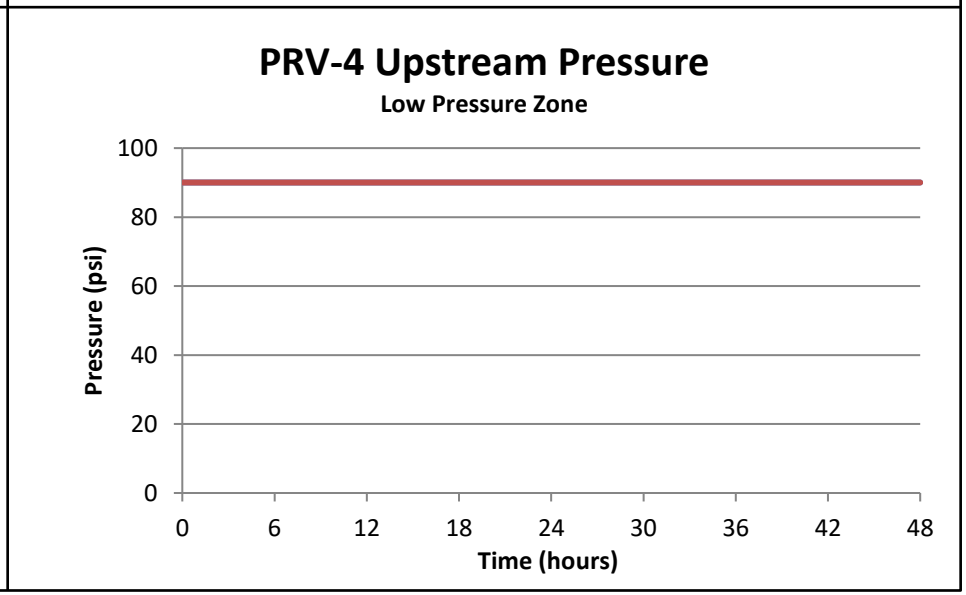
Hydraulic Model Evaluation for
The Village Project
City of Santa Ana

SANTA ANA









LEGEND

Existing
Buildout

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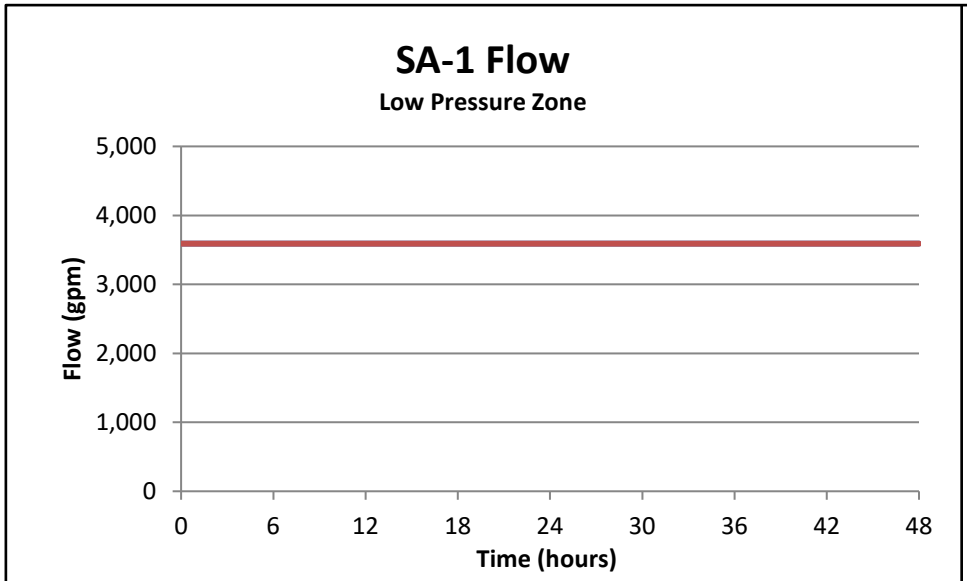
April 18, 2024

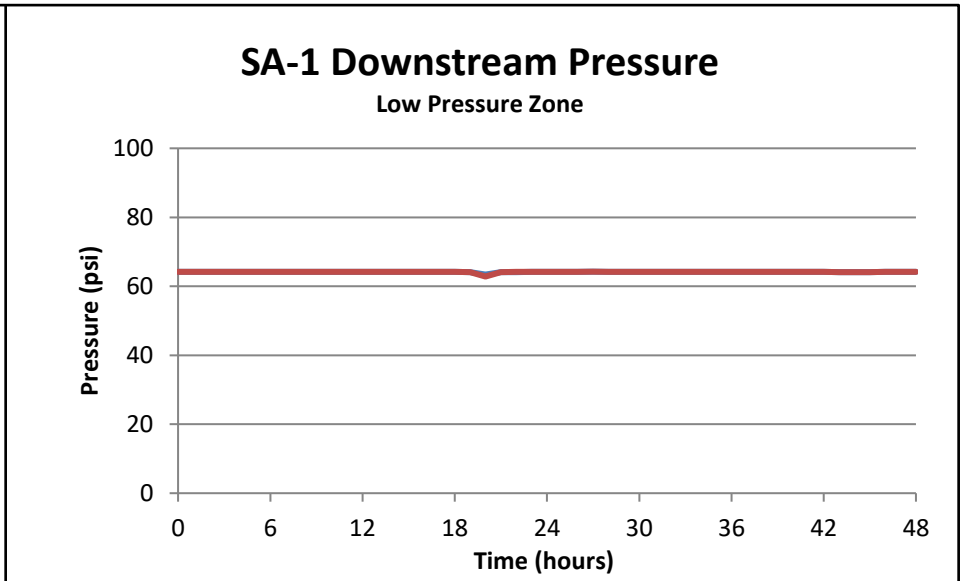
Figure A.3

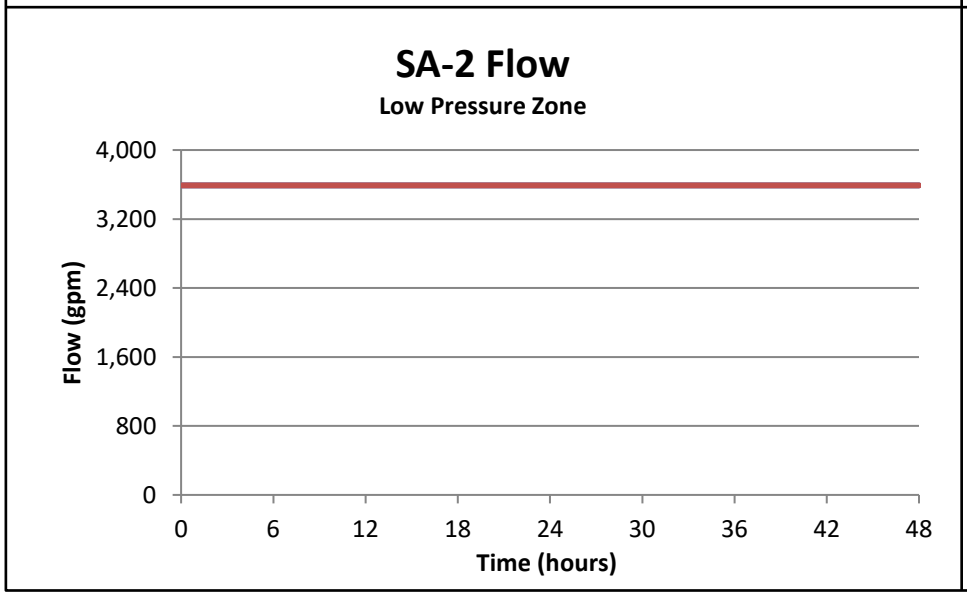
PRV Comparison

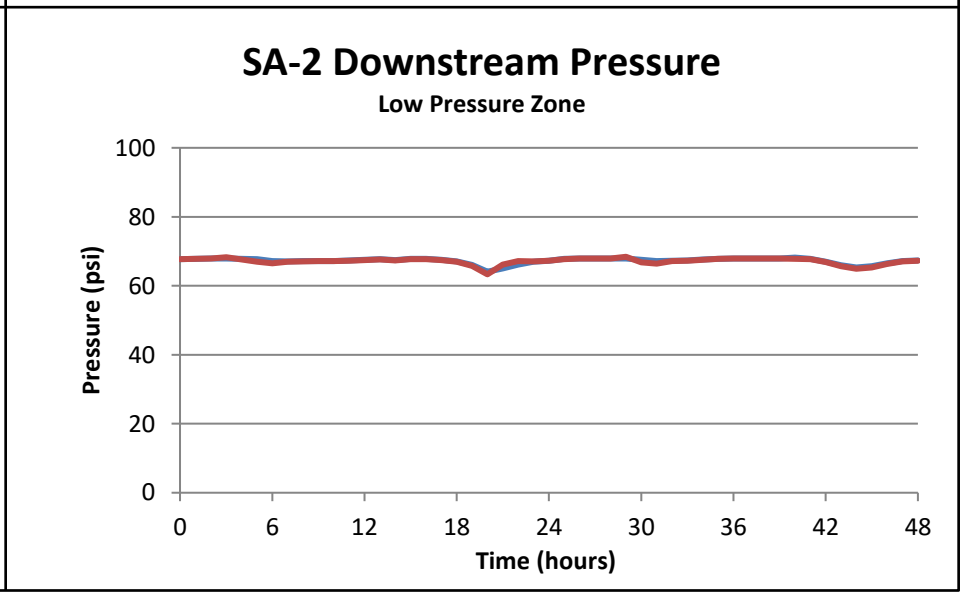
Hydraulic Model Evaluation for
The Village Project
City of Santa Ana

SANTA ANA









LEGEND

Existing

Buildout

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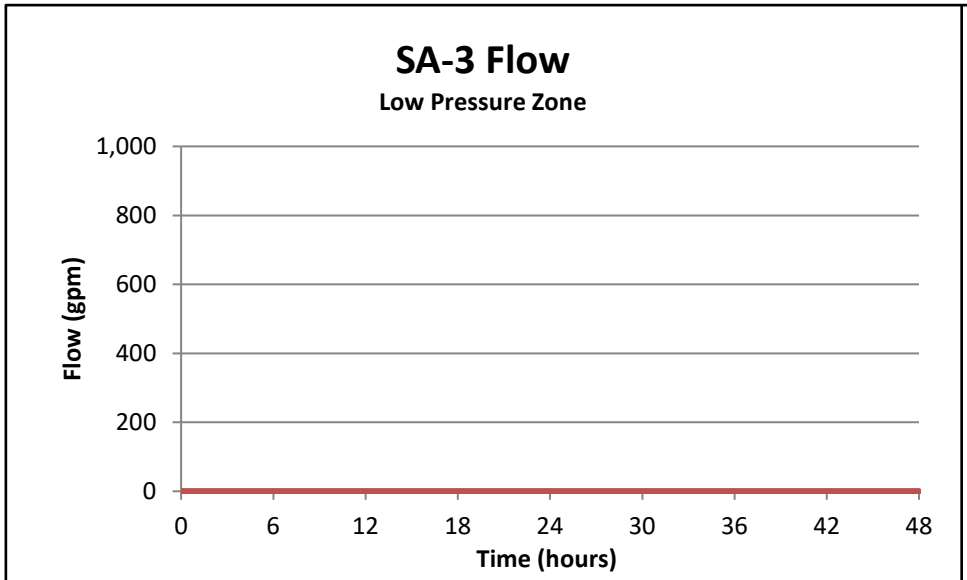
April 18, 2024

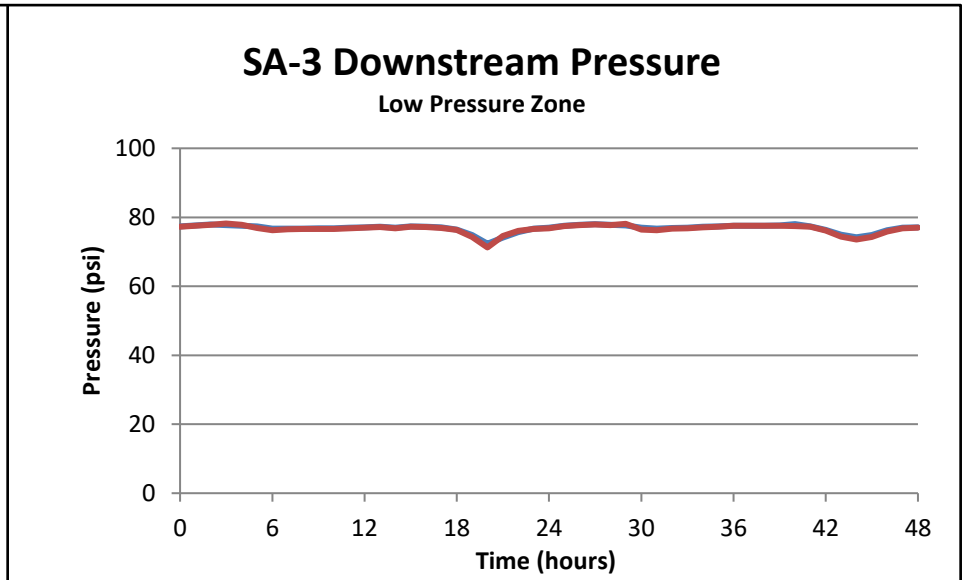
Figure A.4

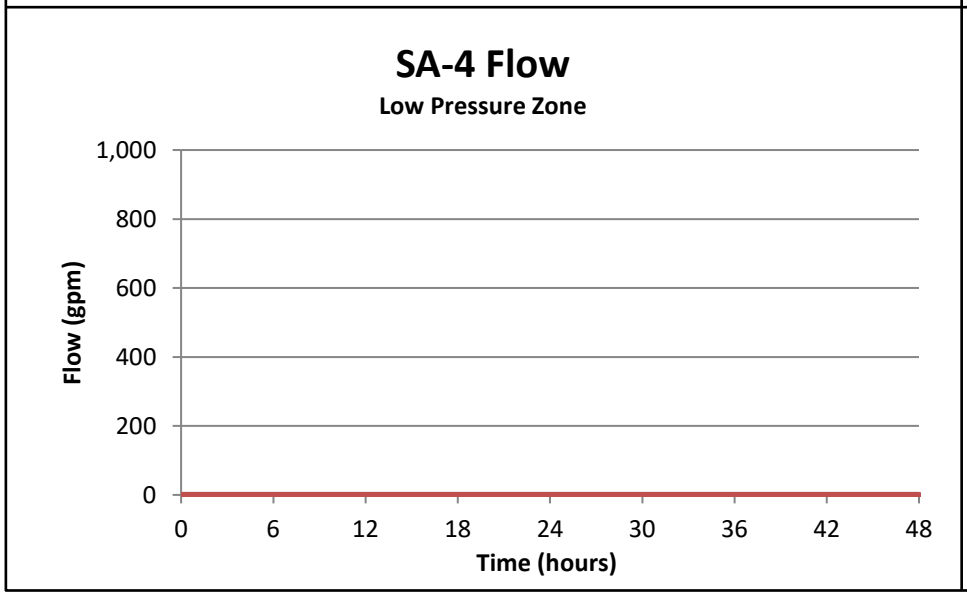
Turnout Comparison

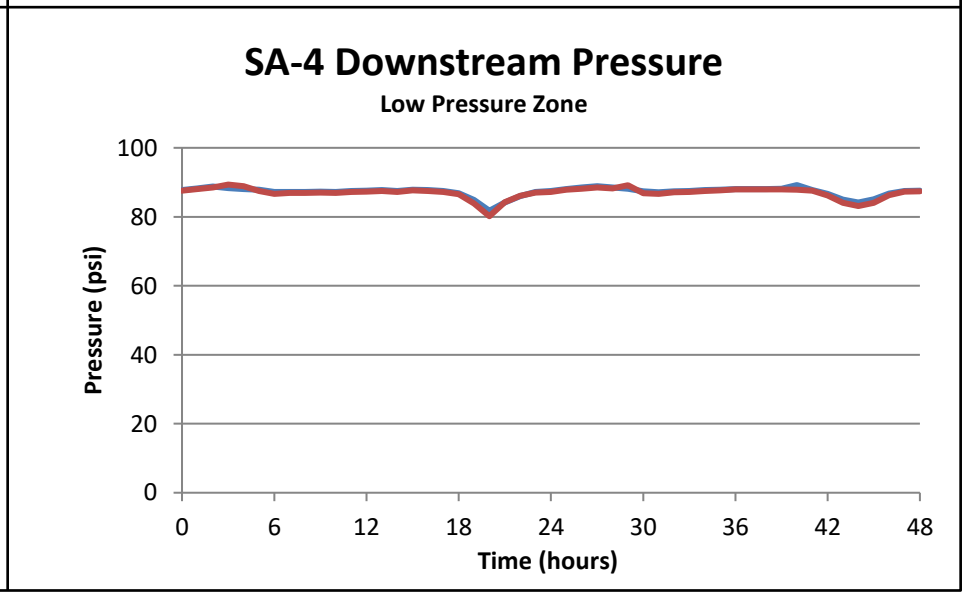
Hydraulic Model Evaluation for
The Village Project
City of Santa Ana

SANTA ANA









LEGEND

- Existing
- Buildout

April 18, 2024

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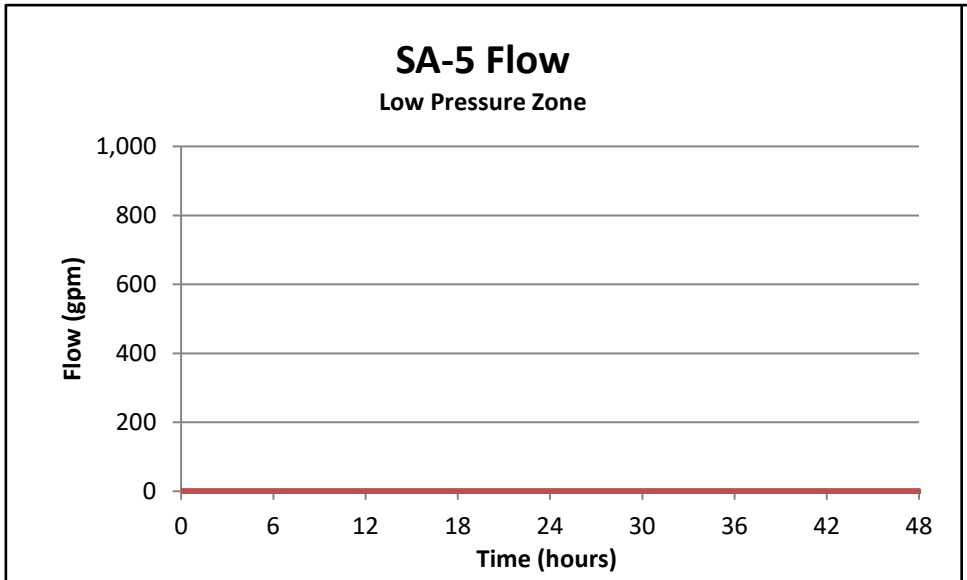
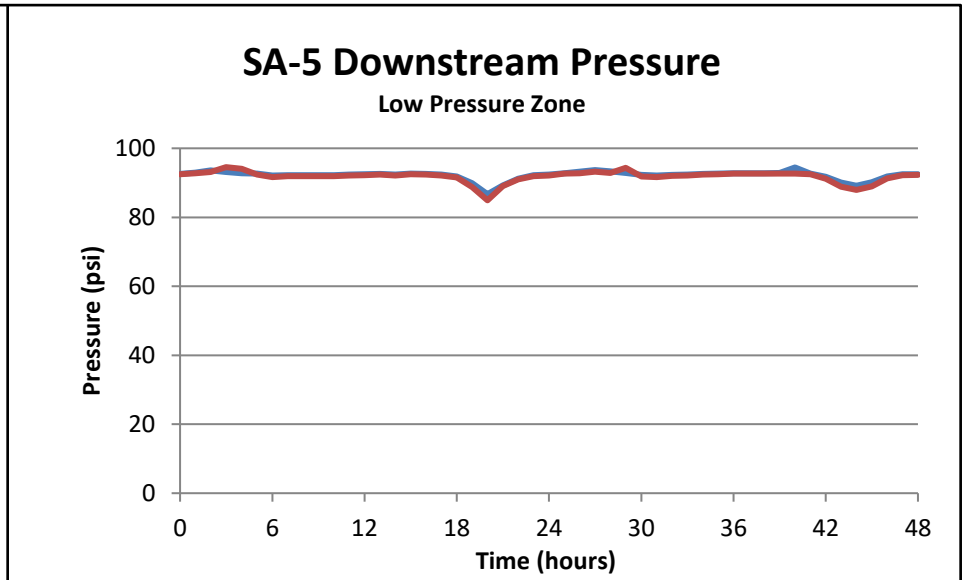
Figure A.5

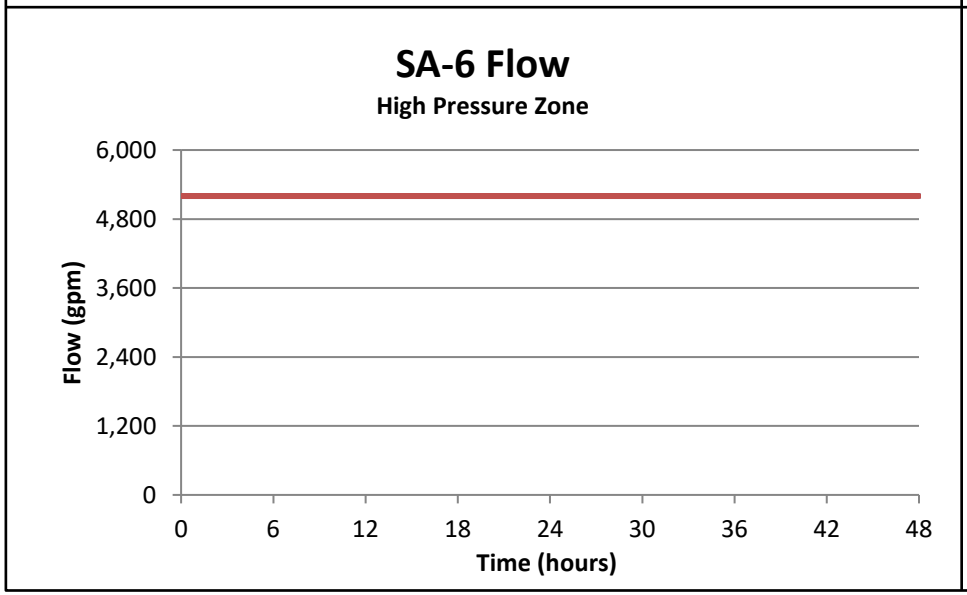
Turnout Comparison

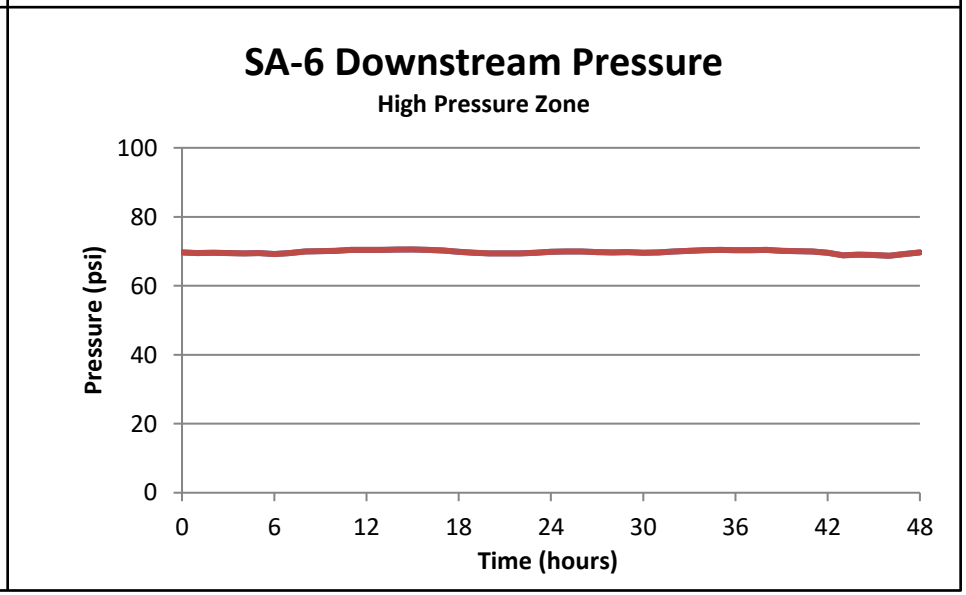
Hydraulic Model Evaluation for
The Village Project
City of Santa Ana

SANTA ANA









LEGEND

Existing

Buildout

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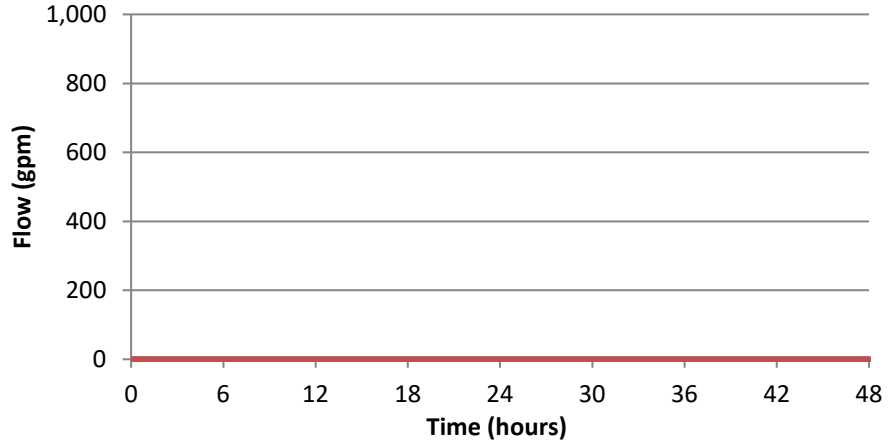
April 18, 2024

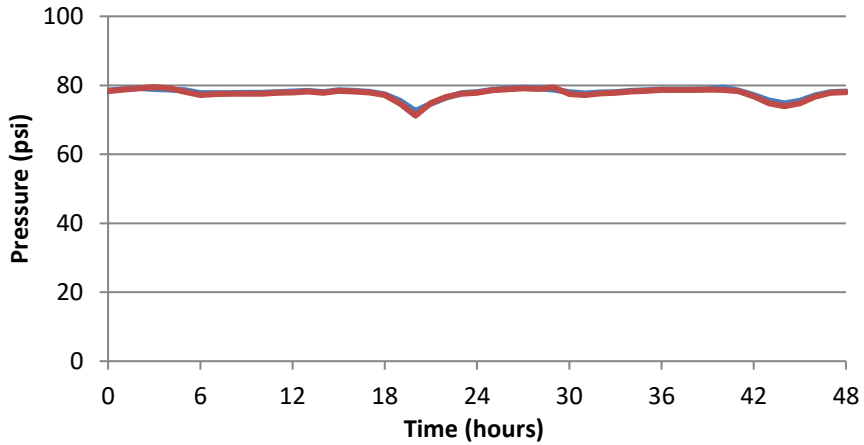
Figure A.6

Turnout Comparison

Hydraulic Model Evaluation for
The Village Project
City of Santa Ana

SANTA ANA





LEGEND

Existing

Buildout

April 18, 2024

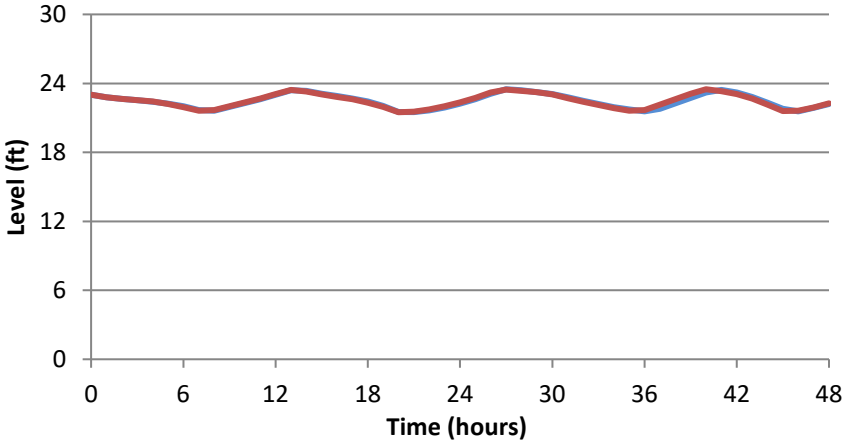
AKEL ENGINEERING GROUP, INC.

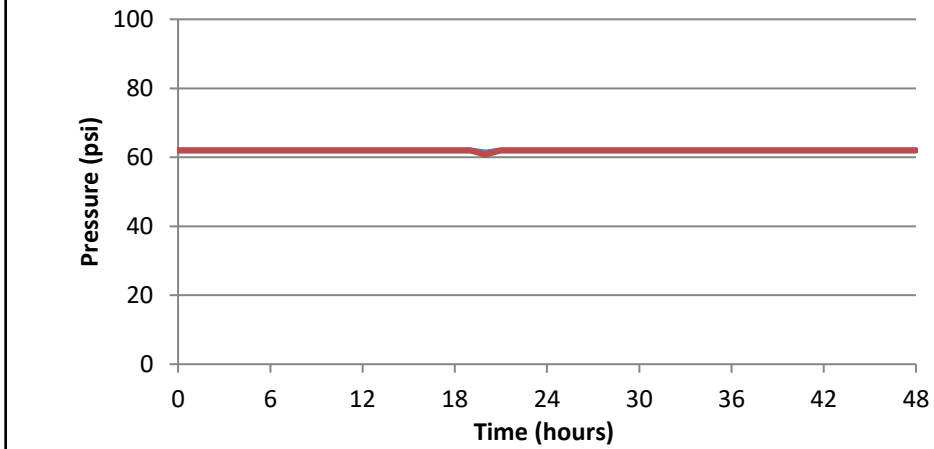
Figure A.7

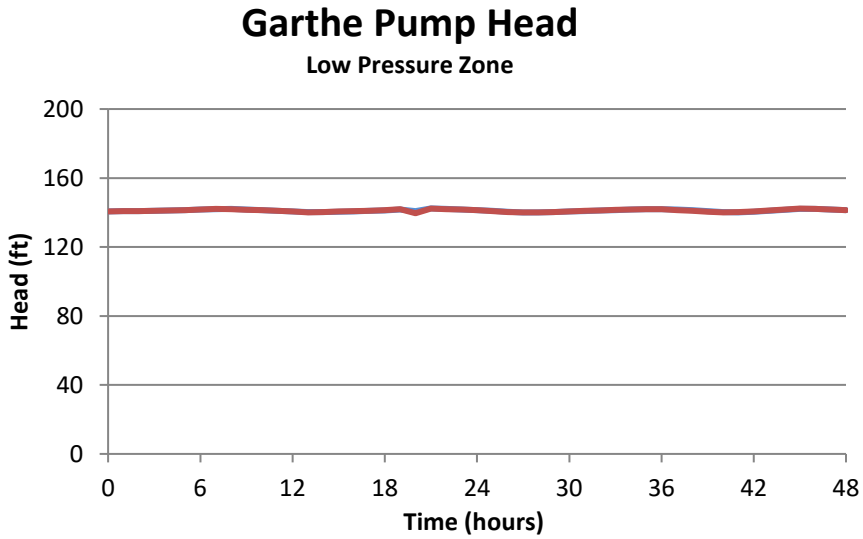
Turnout Comparison

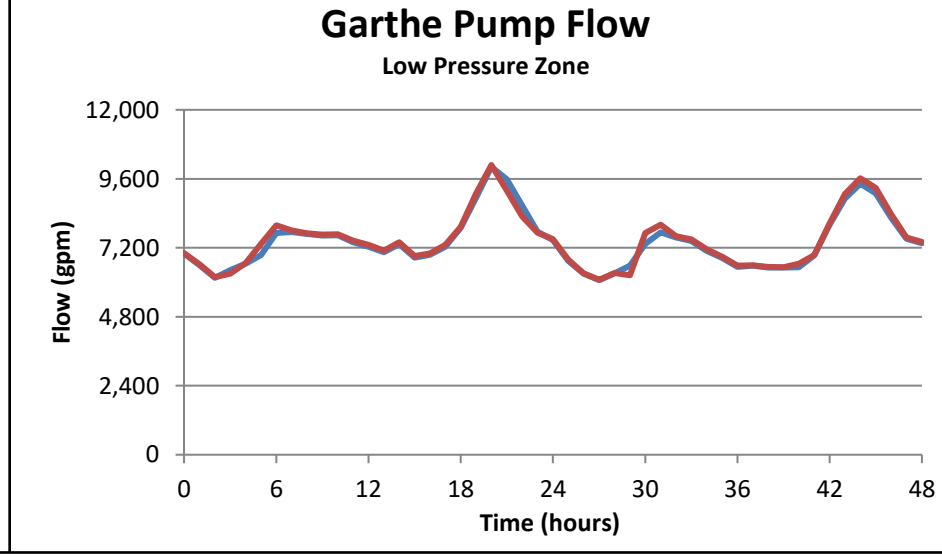
Hydraulic Model Evaluation for
The Village Project
City of Santa Ana

SANTA ANA









LEGEND

- Existing
- Buildout

AKEL ENGINEERING GROUP, INC.

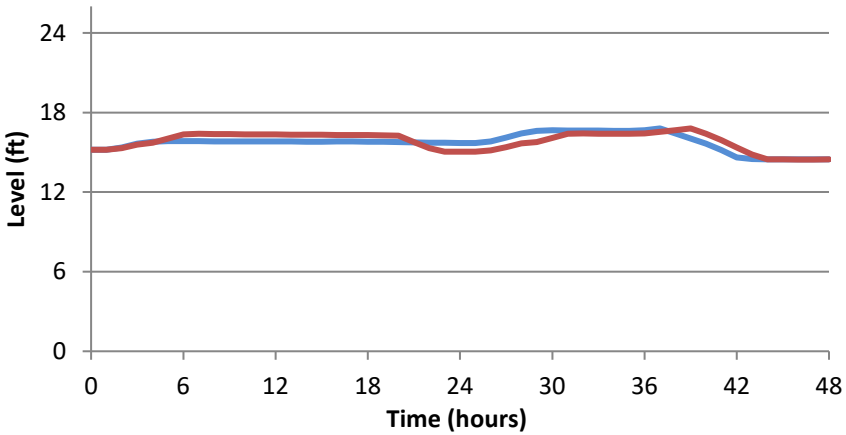
April 18, 2024

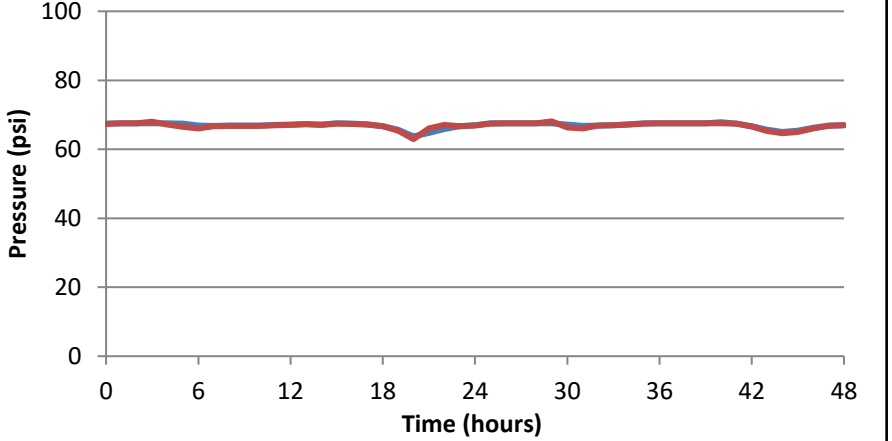
Figure A.8

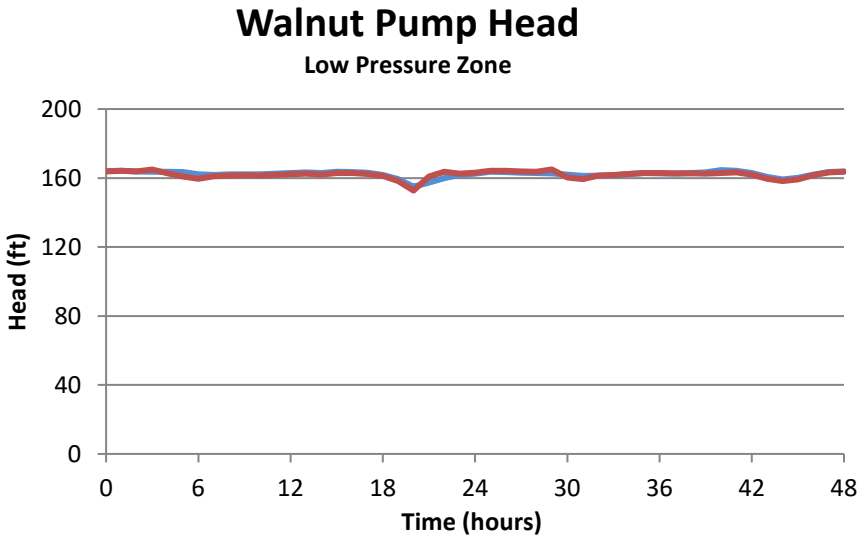
Station Comparison

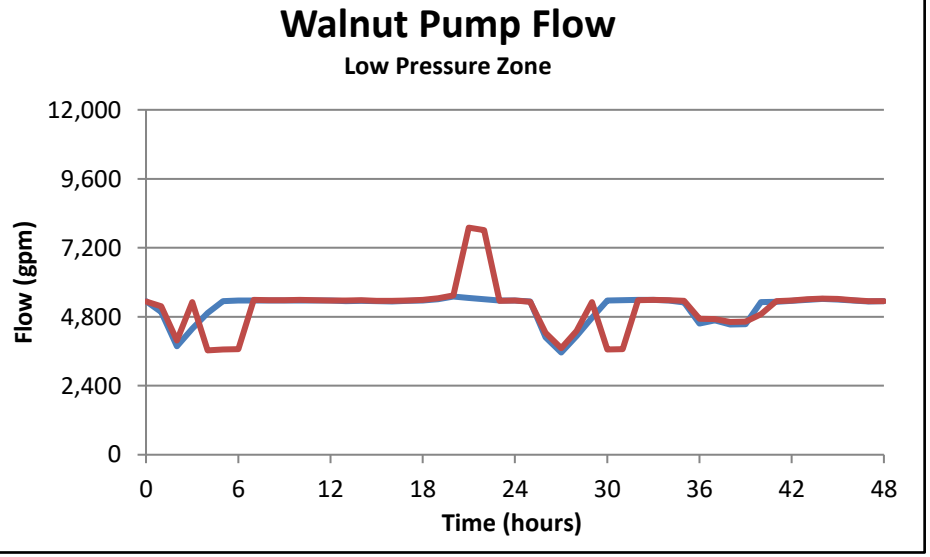
Hydraulic Model Evaluation for
The Village Project
City of Santa Ana

SANTA ANA









LEGEND

- Existing
- Buildout

AKEL ENGINEERING GROUP, INC.

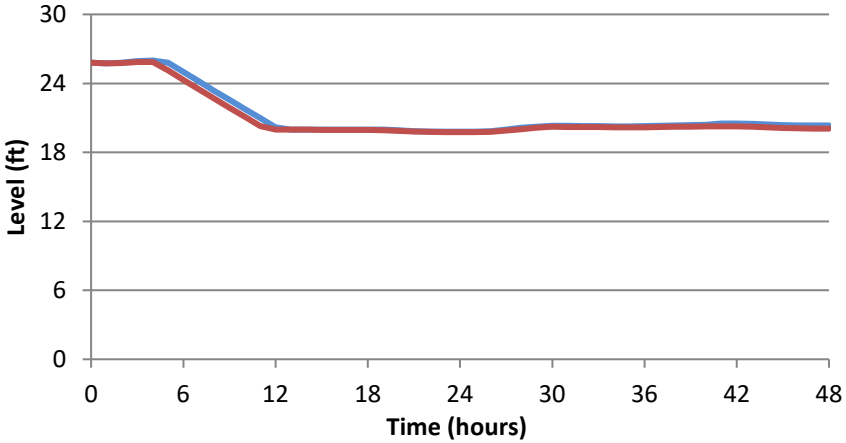
April 18, 2024

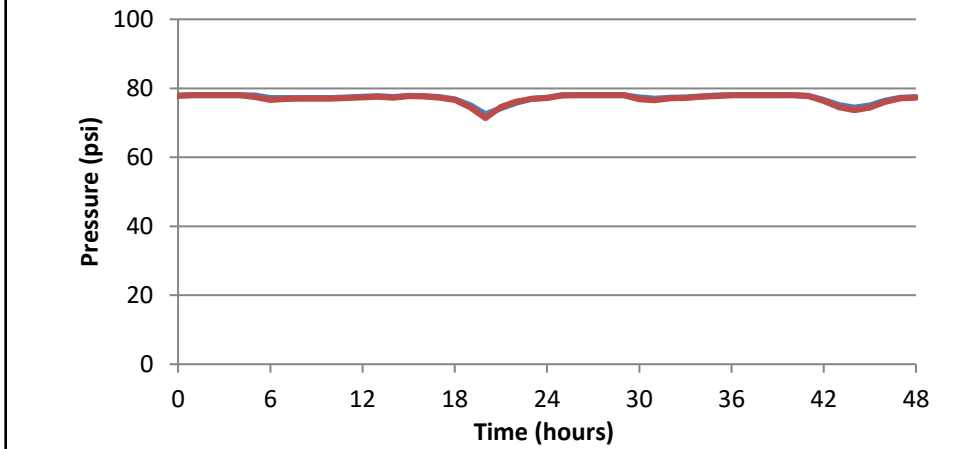
Figure A.9

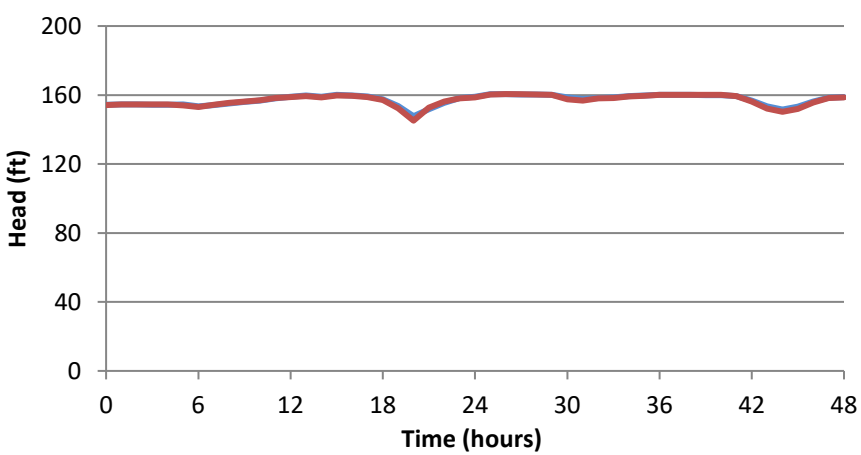
Station Comparison

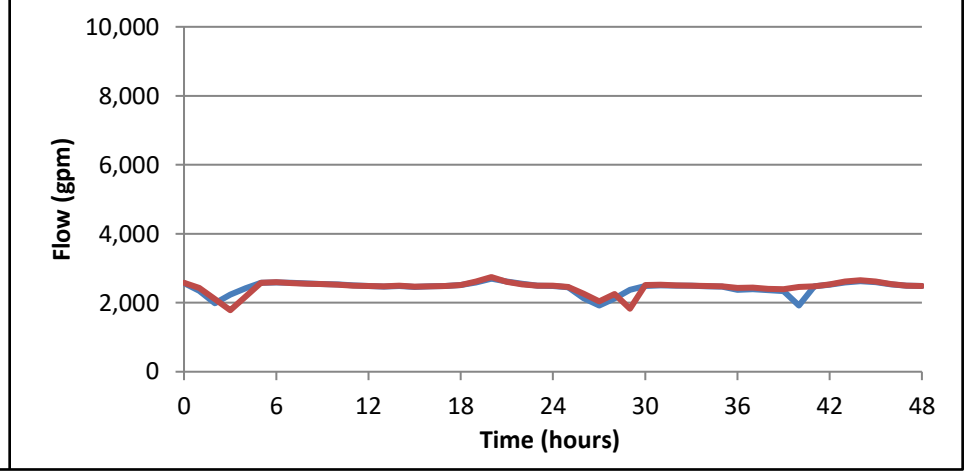
Hydraulic Model Evaluation for
The Village Project
City of Santa Ana

SANTA ANA









LEGEND

- Existing
- Buildout

April 18, 2024

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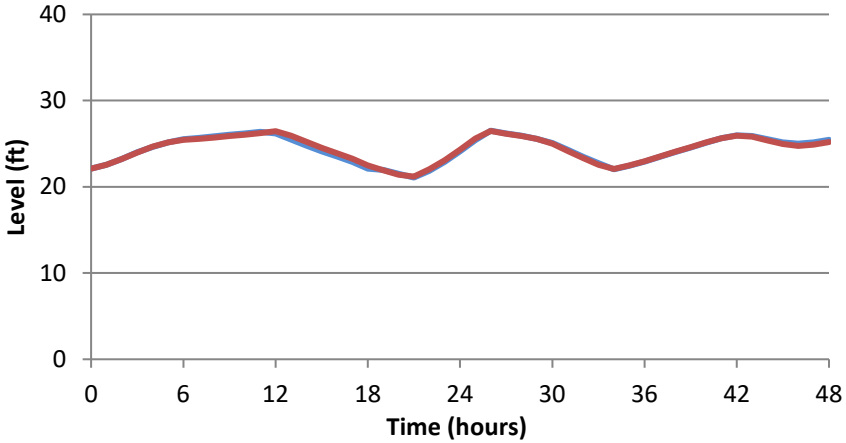
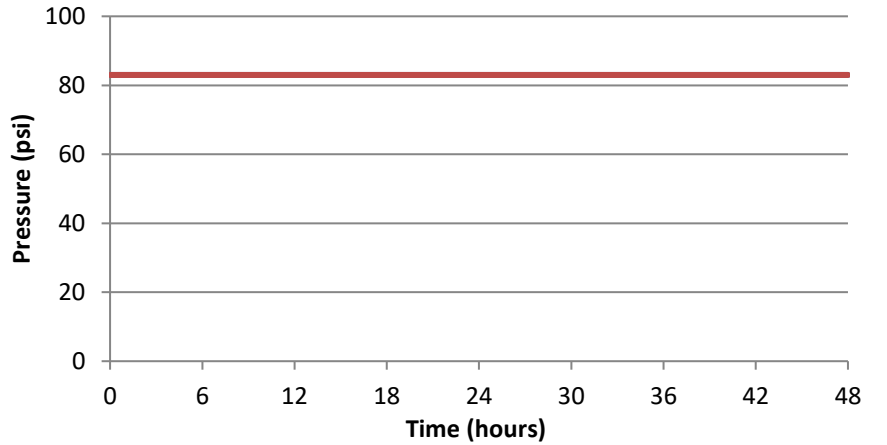
Figure A.10

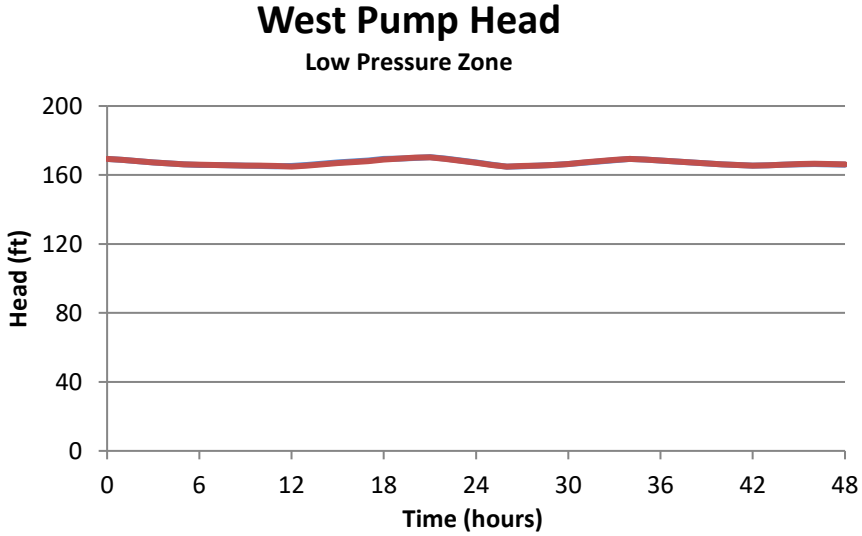
Station Comparison

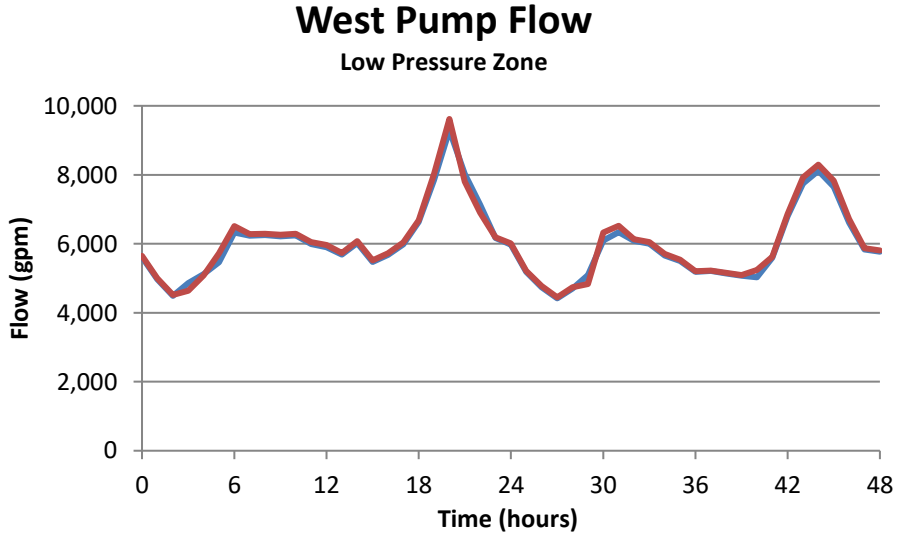
Hydraulic Model Evaluation for
The Village Project
City of Santa Ana

SANTA ANA









LEGEND

- Existing
- Buildout

AKEL ENGINEERING GROUP, INC.

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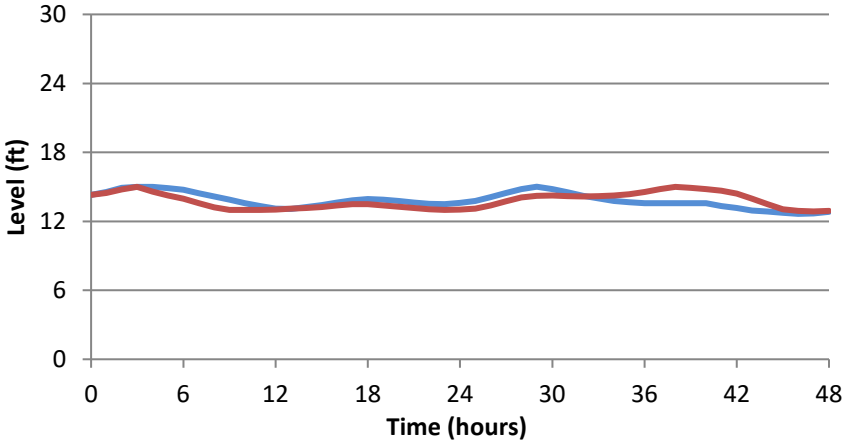
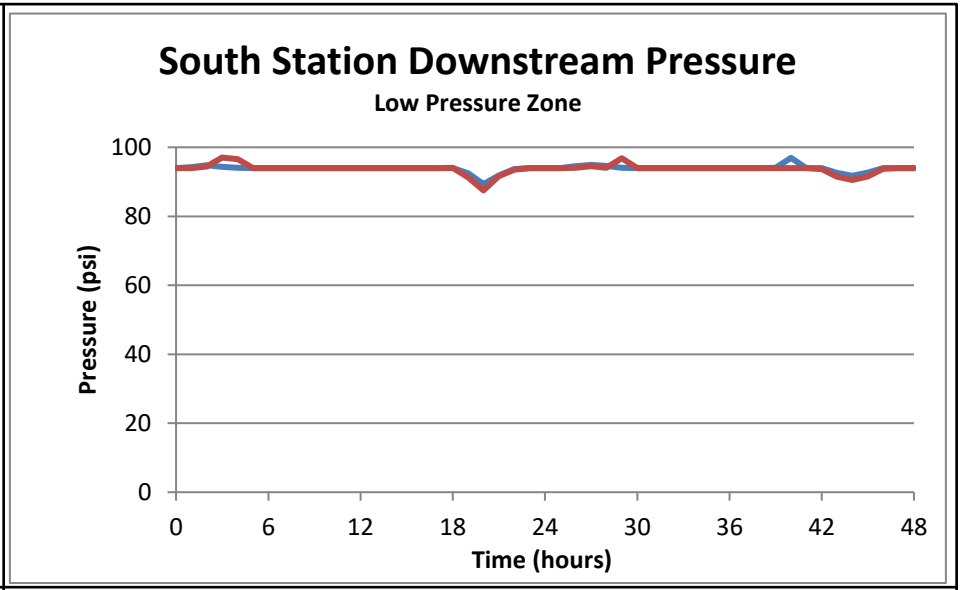
Figure A.11

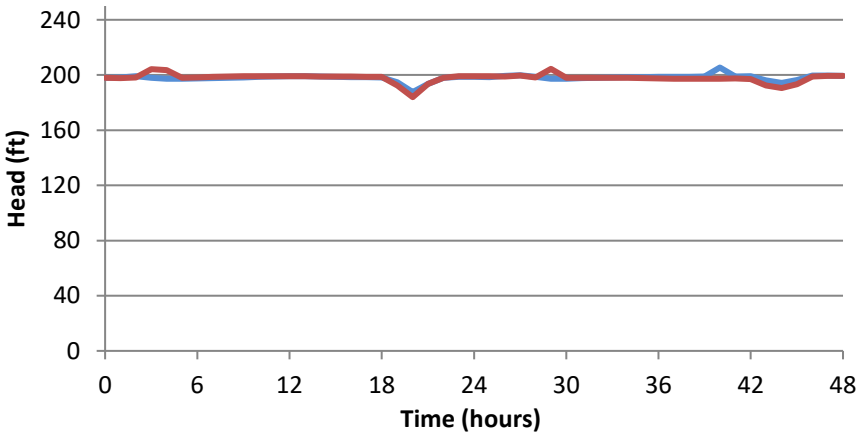
Station Comparison

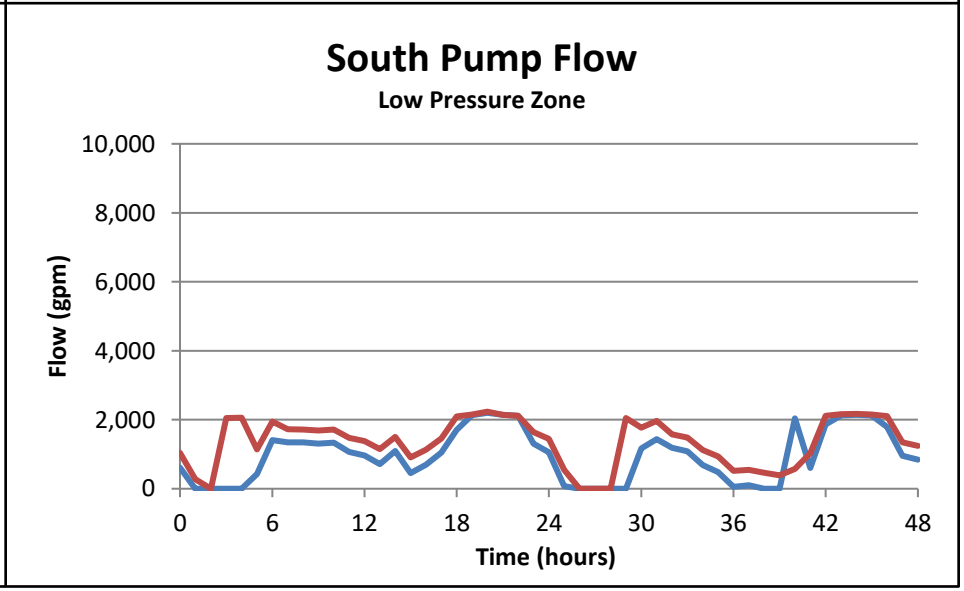
Hydraulic Model Evaluation for
The Village Project
City of Santa Ana

SANTA ANA









LEGEND

- Existing
- Buildout

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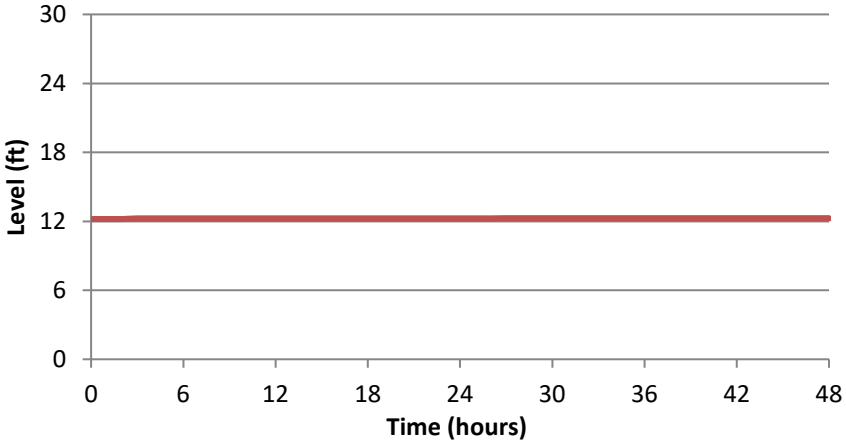
AKEL ENGINEERING GROUP, INC.

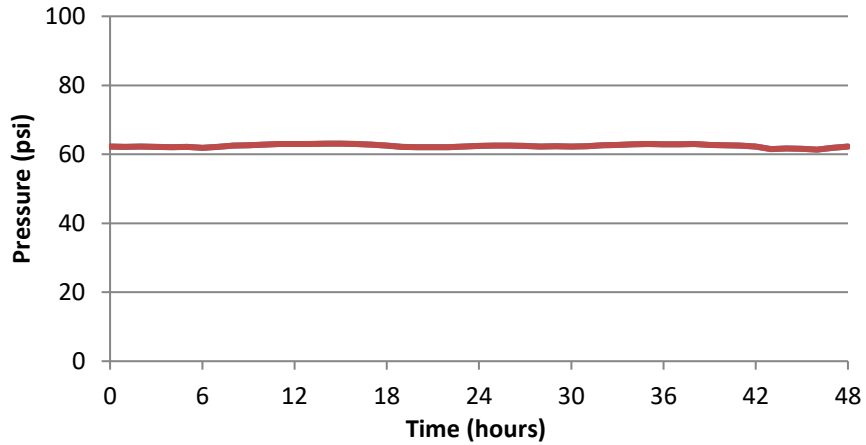
Figure A.12

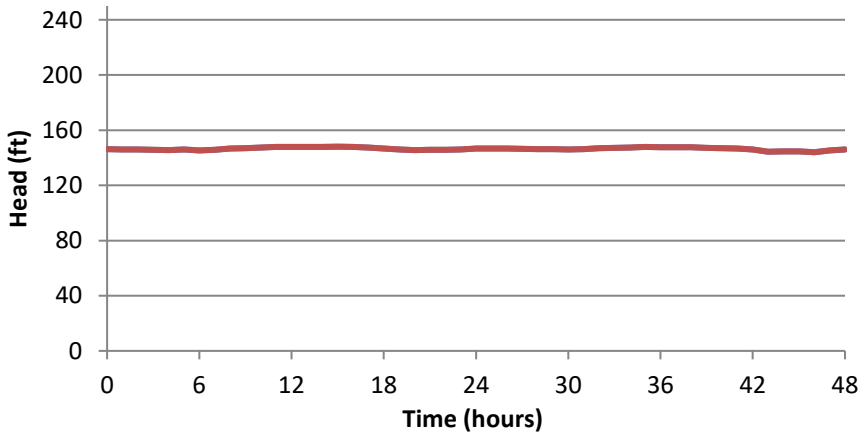
Station Comparison

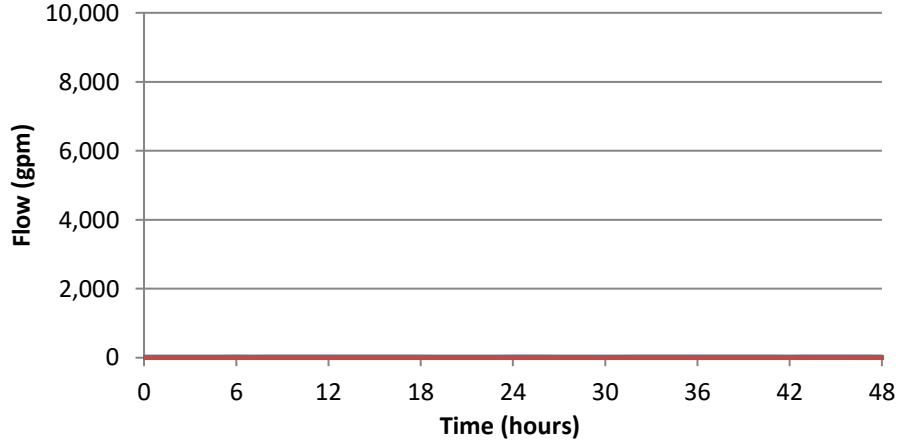
Hydraulic Model Evaluation for
The Village Project
City of Santa Ana

SANTA ANA









LEGEND

- Existing
- Buildout

AKEL ENGINEERING GROUP, INC.

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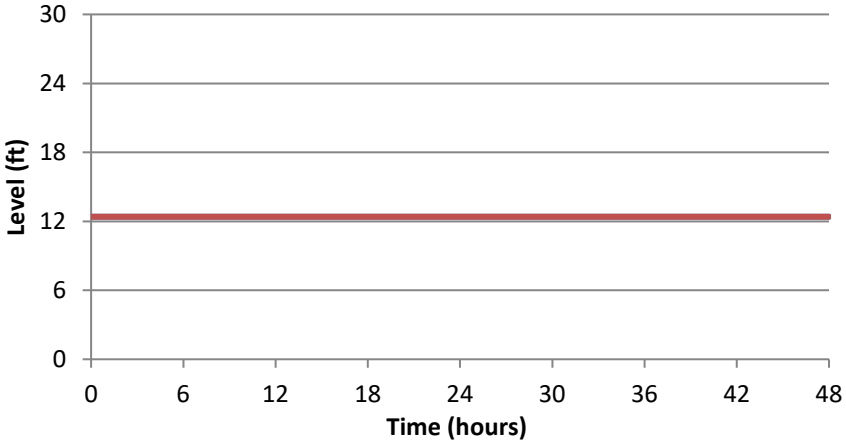
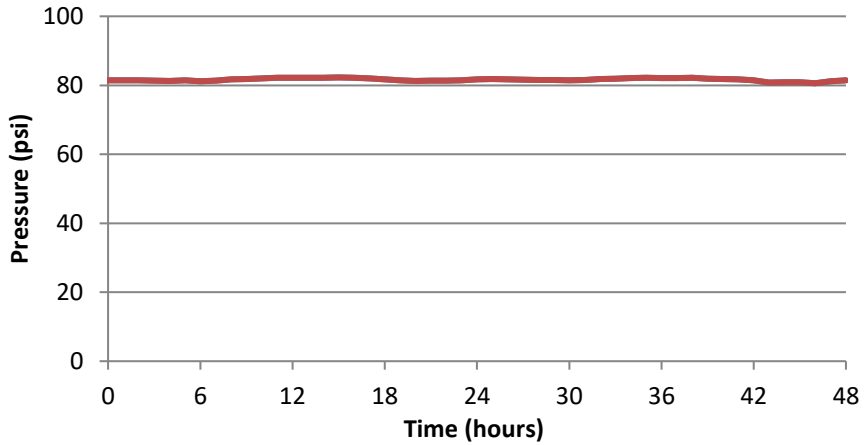
Figure A.13

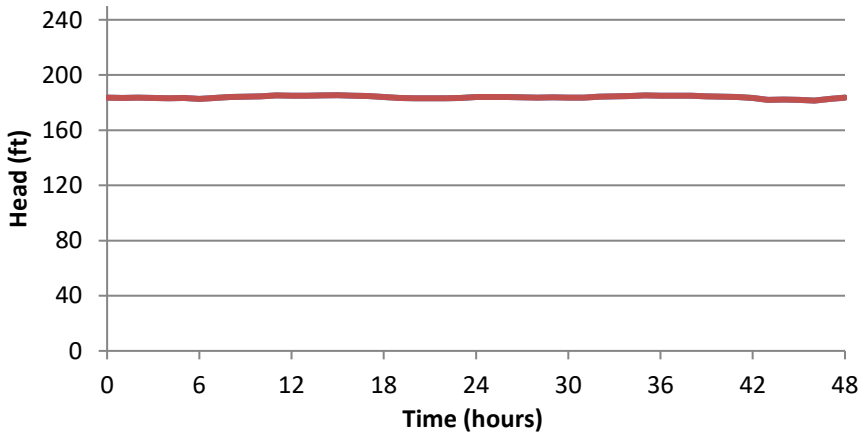
Station Comparison

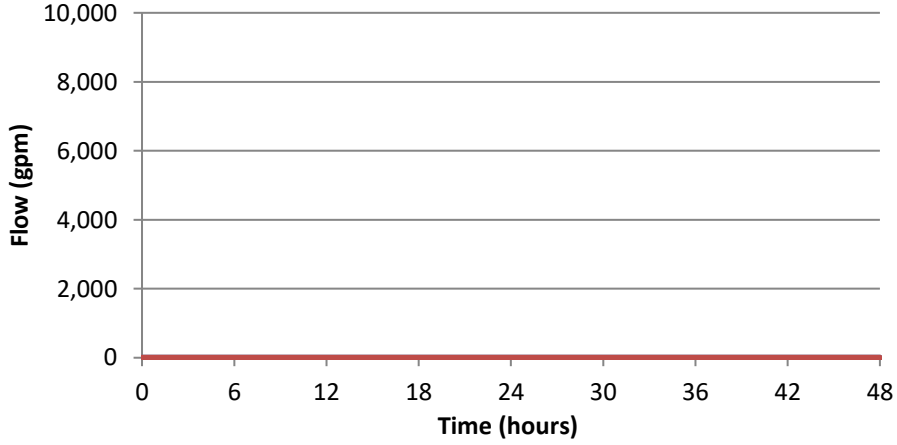
Hydraulic Model Evaluation for
The Village Project
City of Santa Ana

SANTA ANA









LEGEND

- Existing
- Buildout

AKEL ENGINEERING GROUP, INC.

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Figure A.14

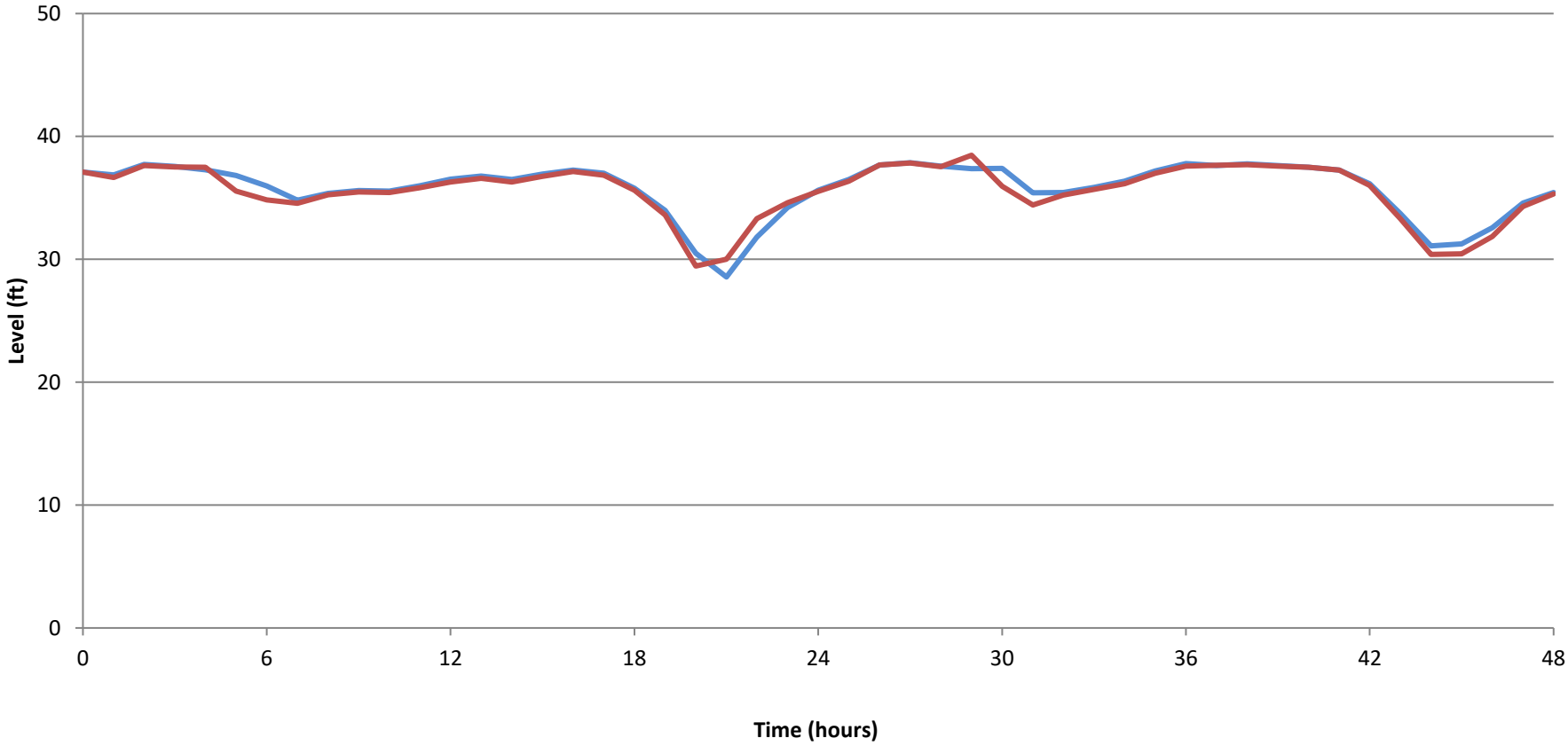
Station Comparison

Hydraulic Model Evaluation for
The Village Project
City of Santa Ana

SANTA ANA

Elevated Tank Level

Low Pressure Zone



LEGEND

Existing
Buildout

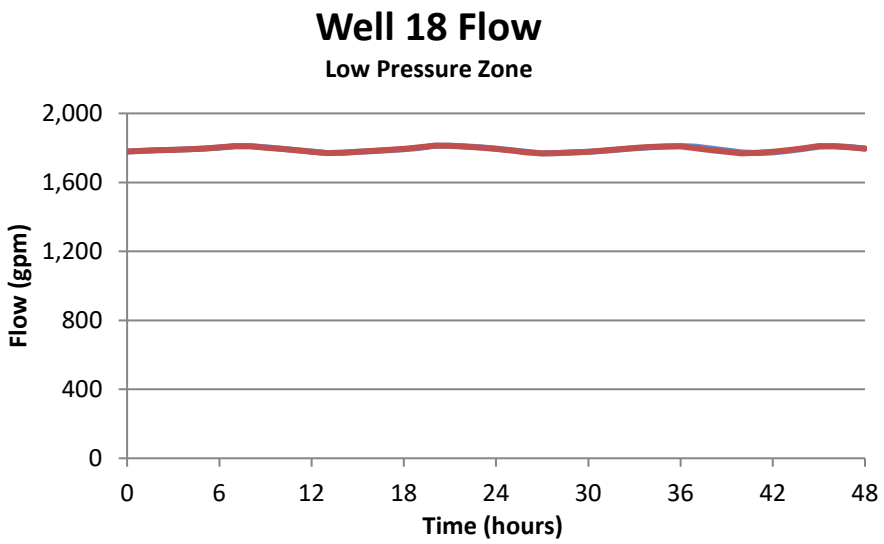
April 18, 2024

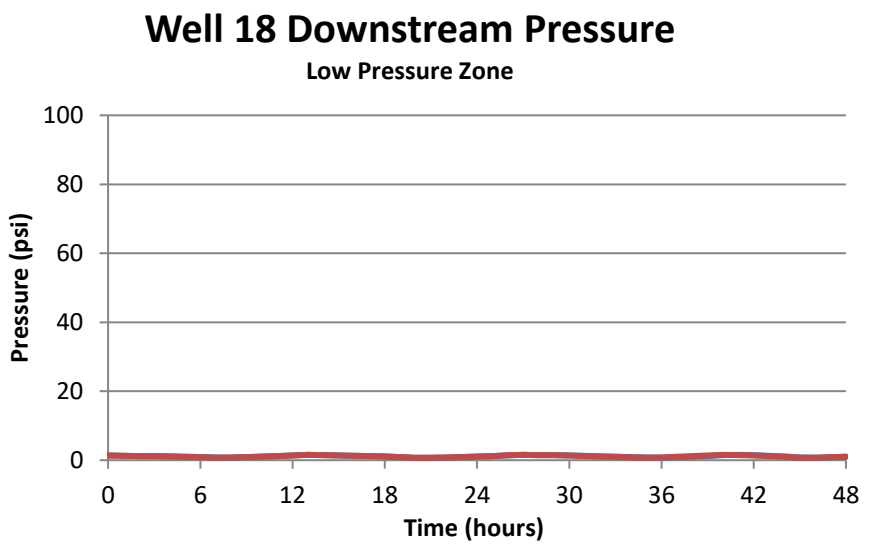
Figure A.15

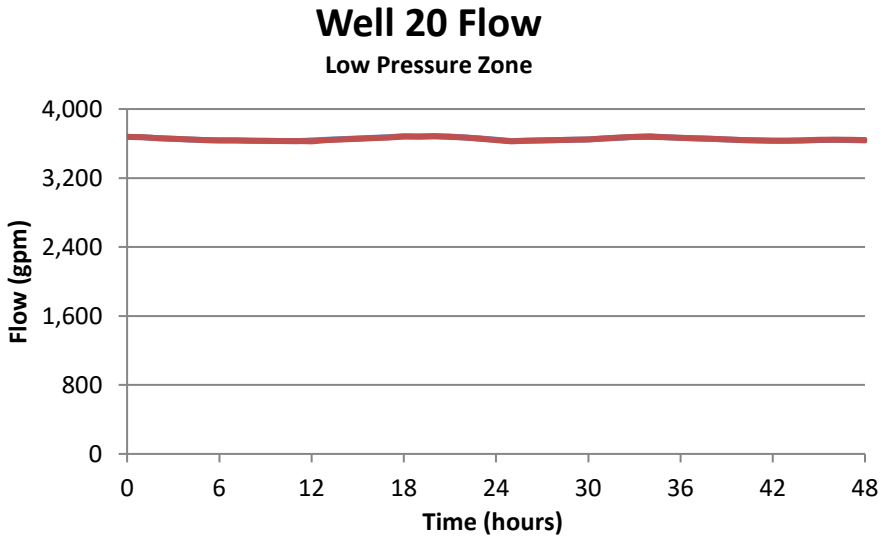
Station Comparison

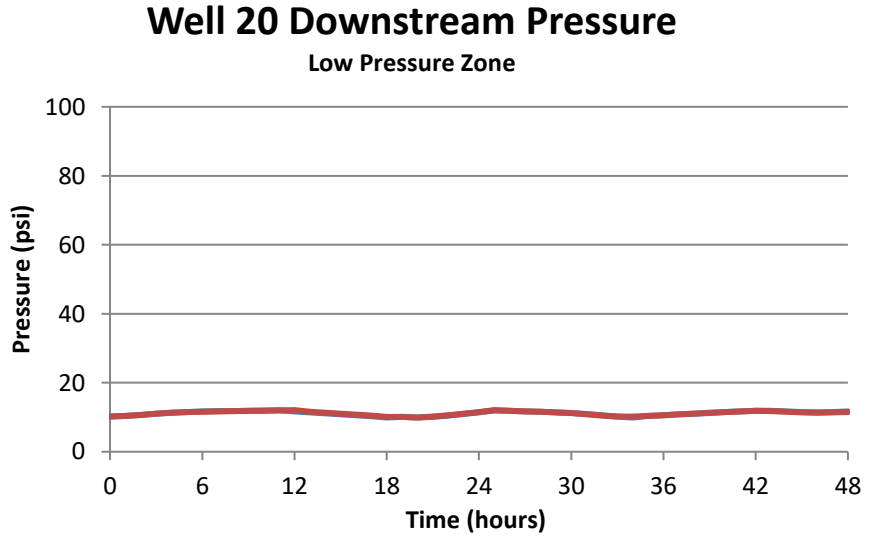
Hydraulic Model Evaluation for
The Village Project
City of Santa Ana

AKEL ENGINEERING GROUP, INC.









LEGEND

Existing

Buildout

AKEL ENGINEERING GROUP, INC.

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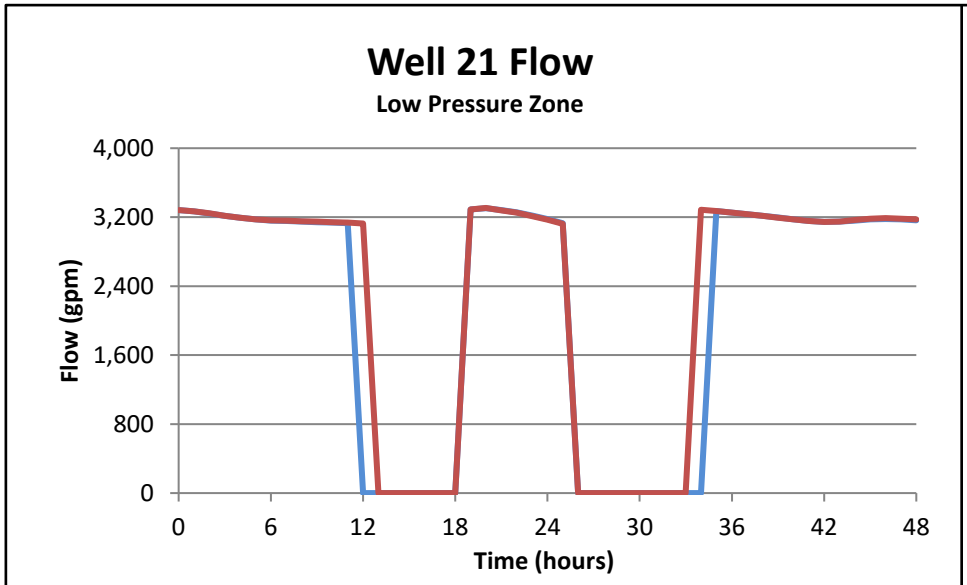
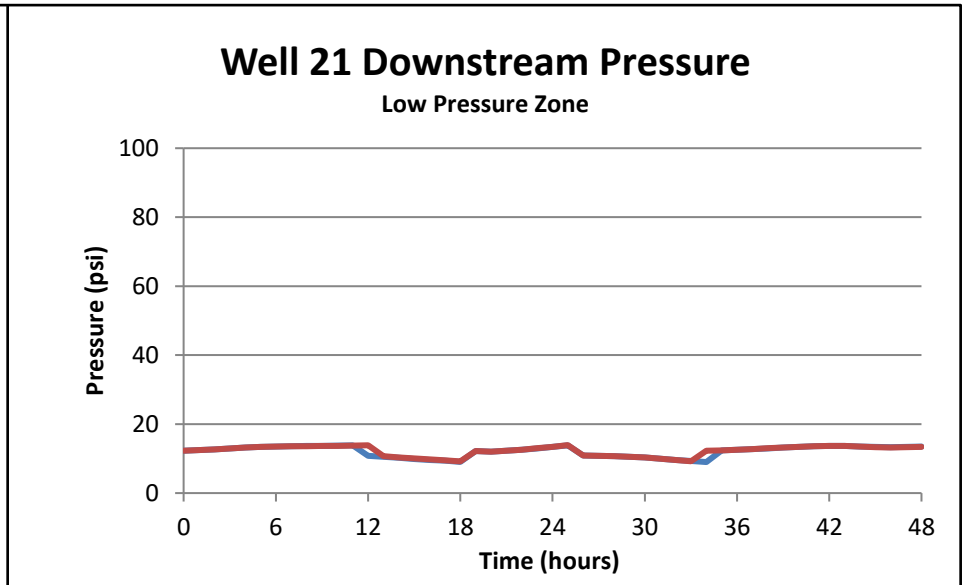
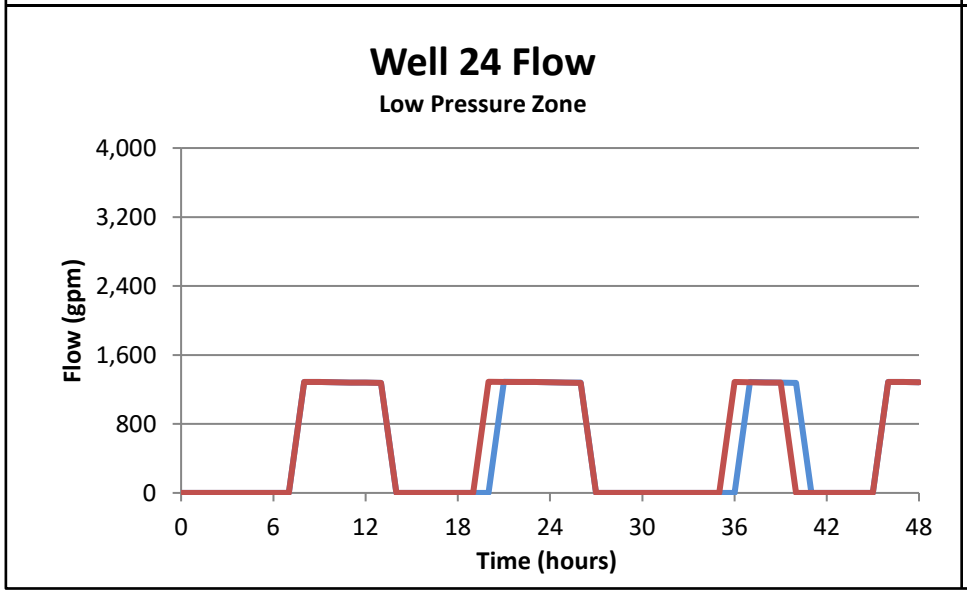
Figure A.16

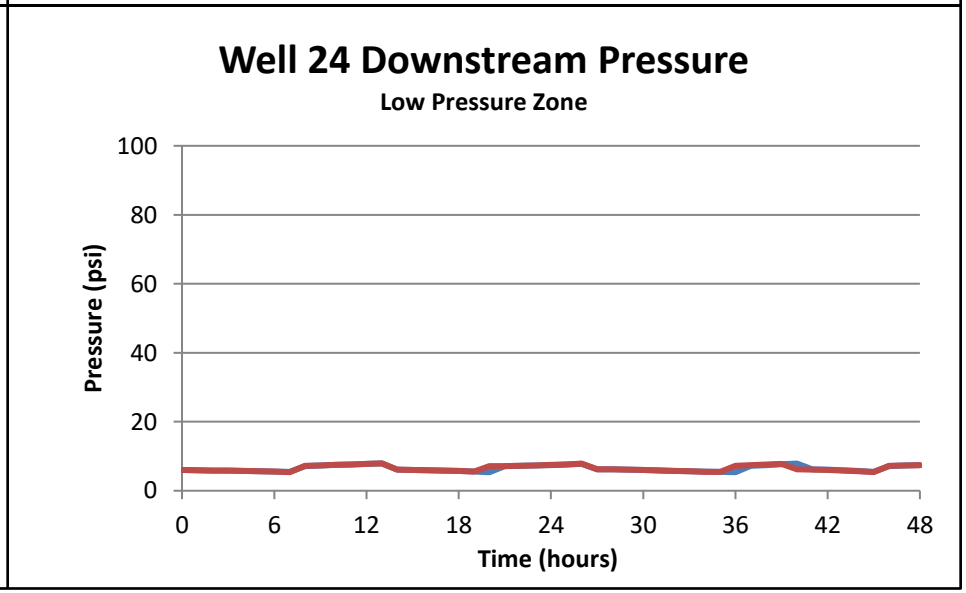
Well Comparison

Hydraulic Model Evaluation for
The Village Project
City of Santa Ana









LEGEND

- Existing
- Buildout

AKEL ENGINEERING GROUP, INC.

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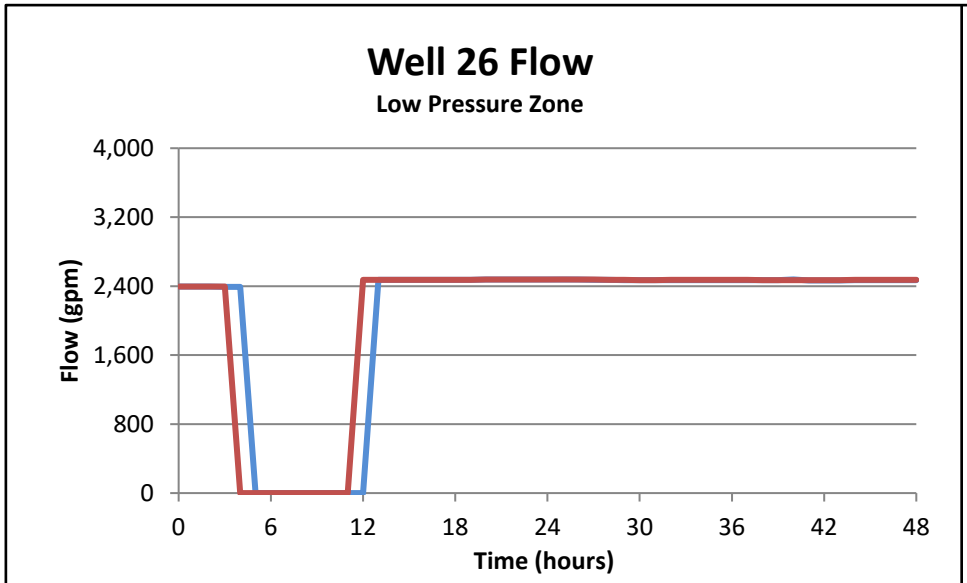
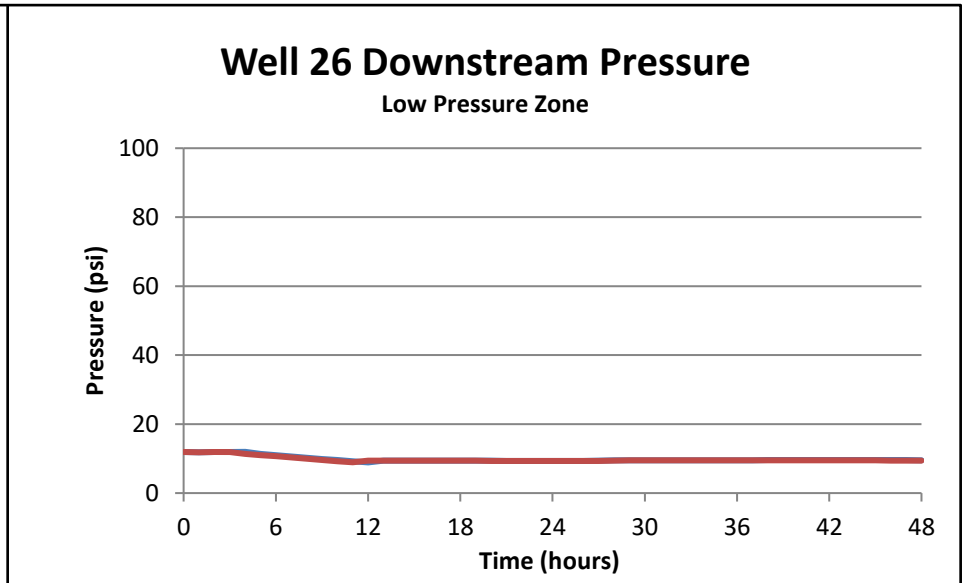
Figure A.17

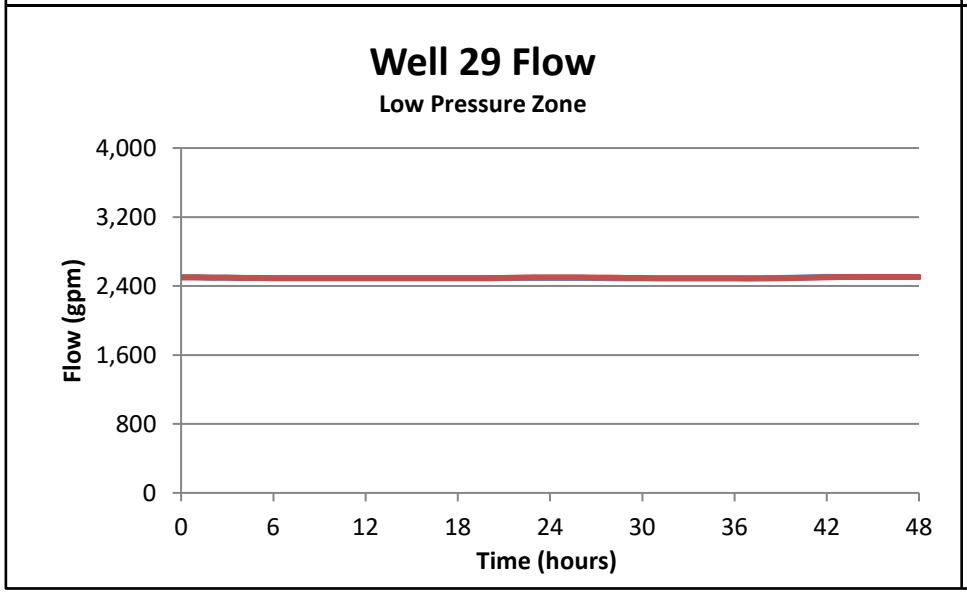
Well Comparison

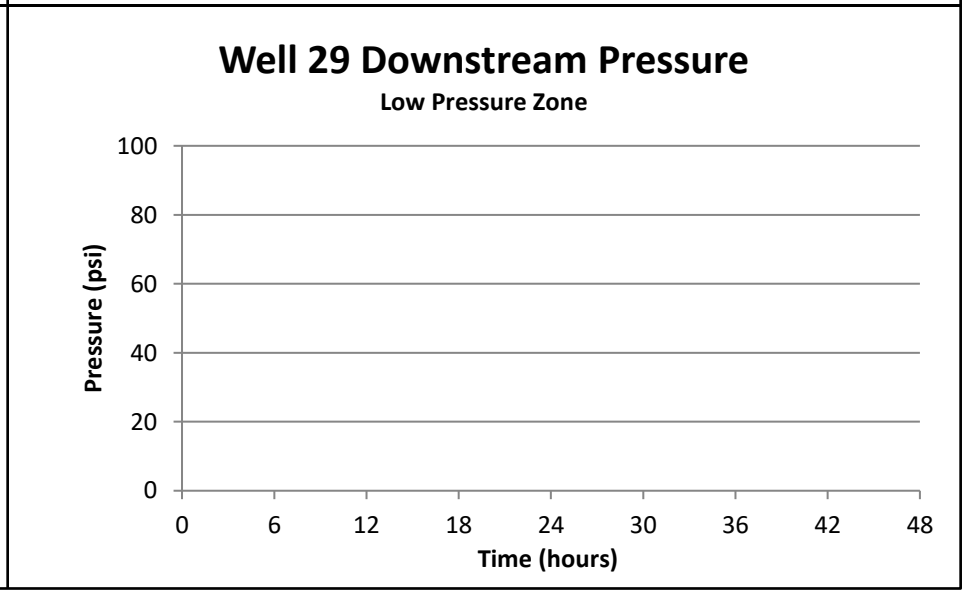
Hydraulic Model Evaluation for
The Village Project
City of Santa Ana

SANTA ANA









LEGEND

Existing

Buildout

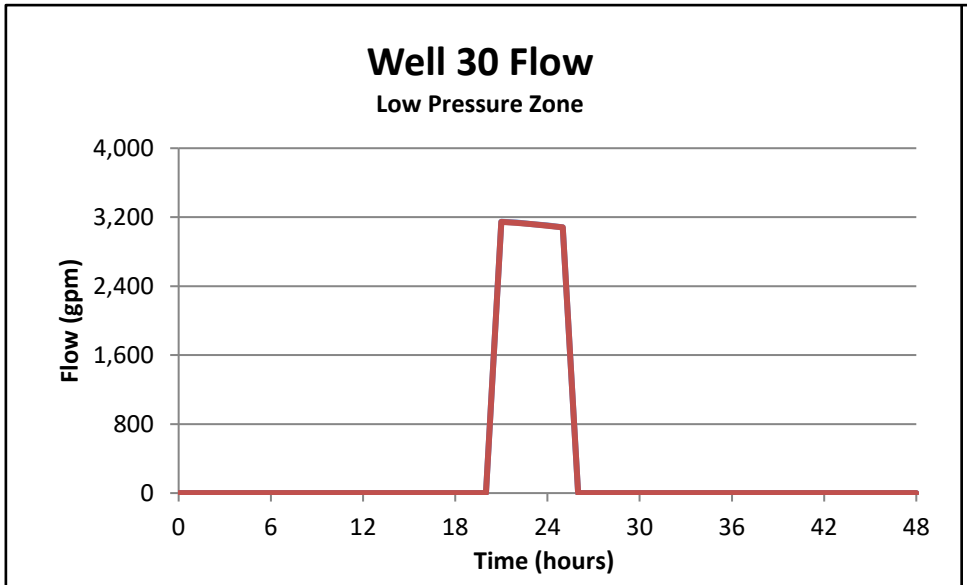
AKEL ENGINEERING GROUP, INC.

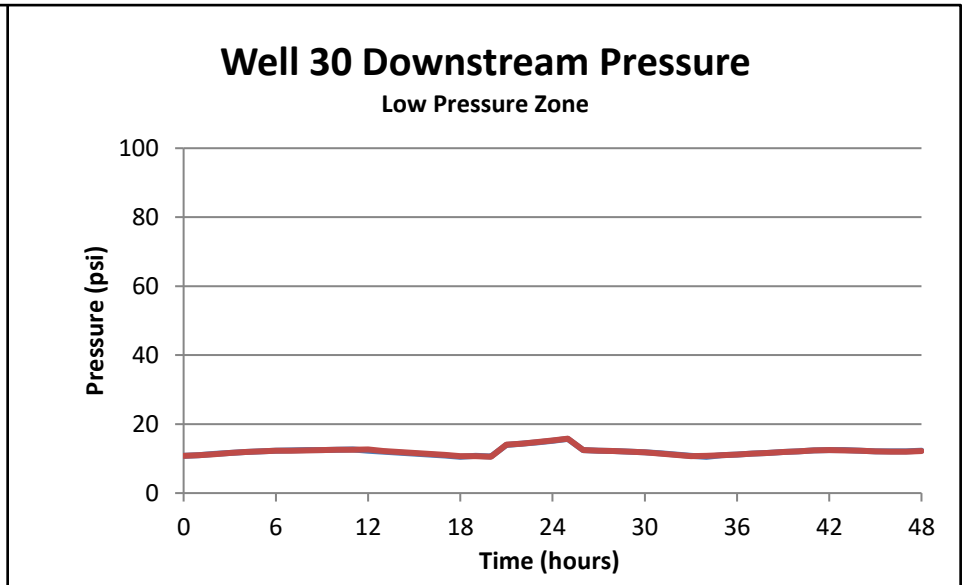
April 18, 2024

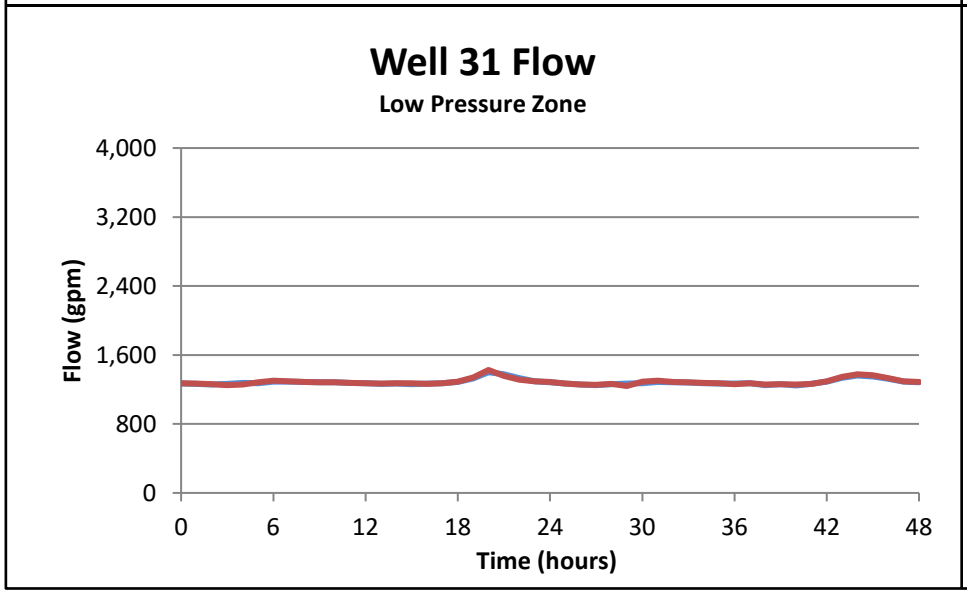
Figure A.18

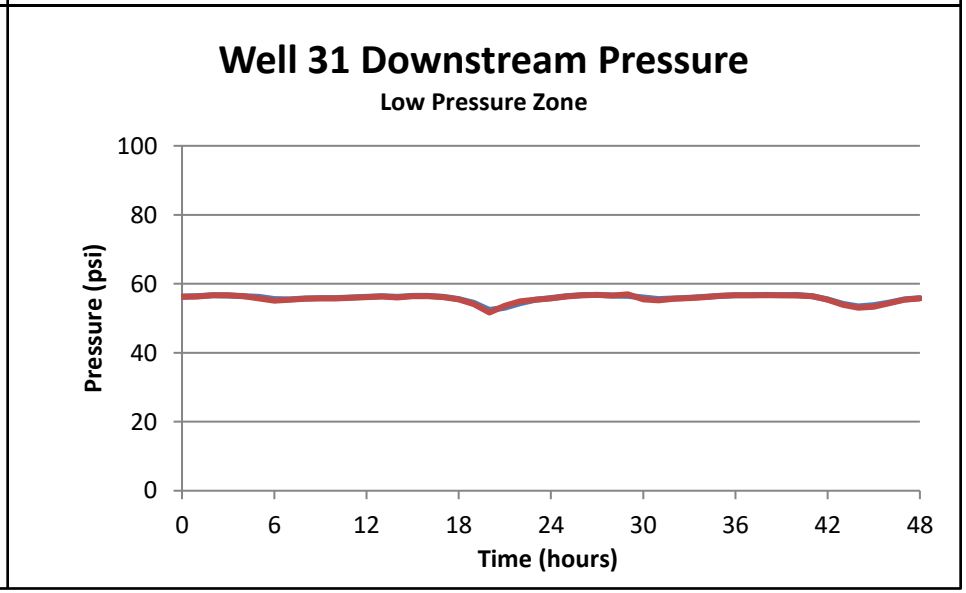
Well Comparison

Hydraulic Model Evaluation for
The Village Project
City of Santa Ana









LEGEND

- Existing
- Buildout

AKEL ENGINEERING GROUP, INC.

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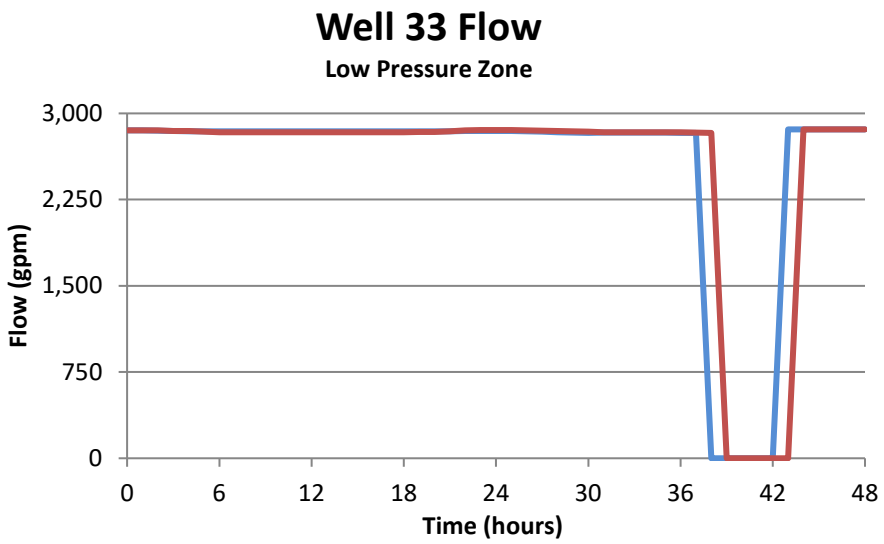
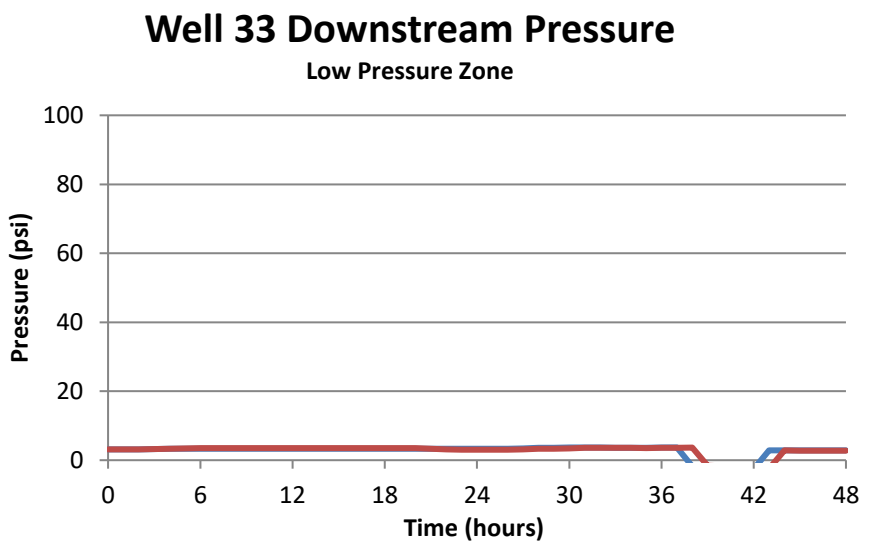
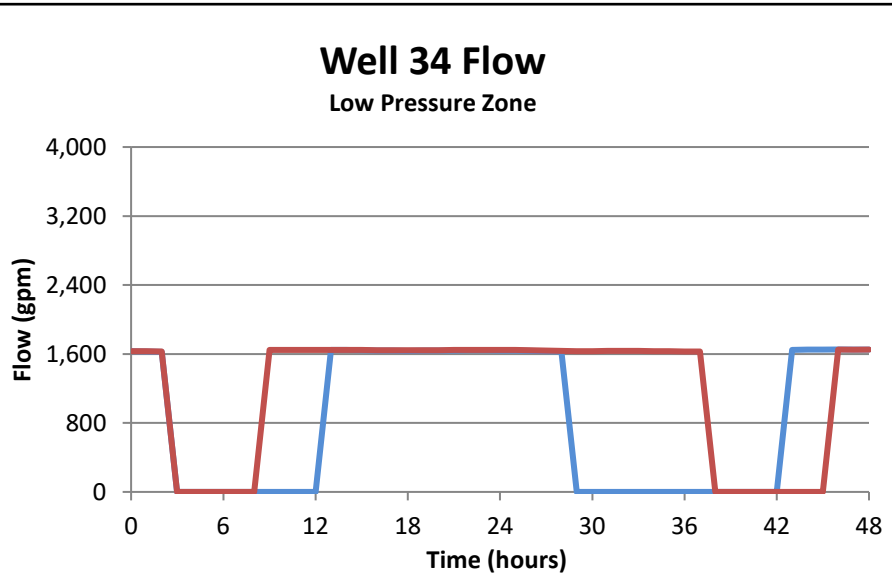
Figure A.19

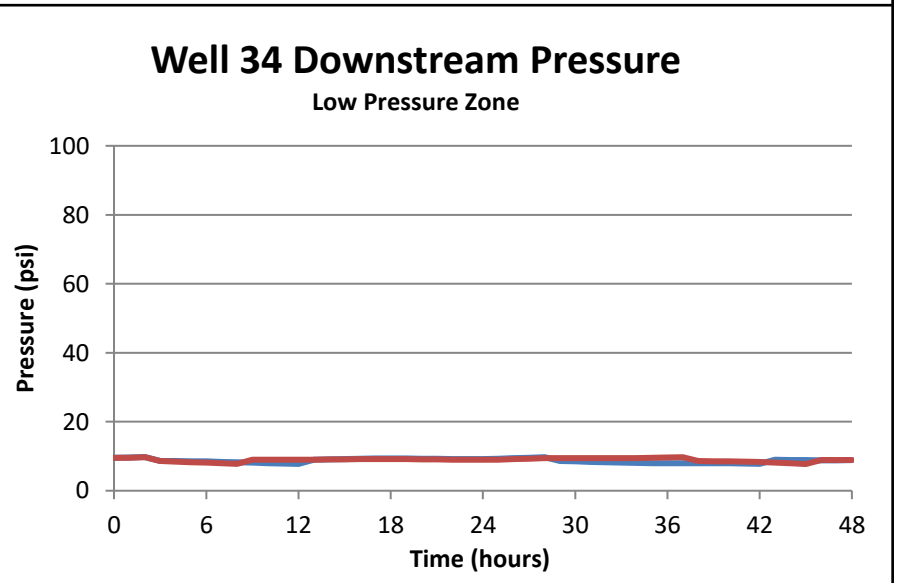
Well Comparison

Hydraulic Model Evaluation for
The Village Project
City of Santa Ana









LEGEND

Existing

Buildout

April 18, 2024

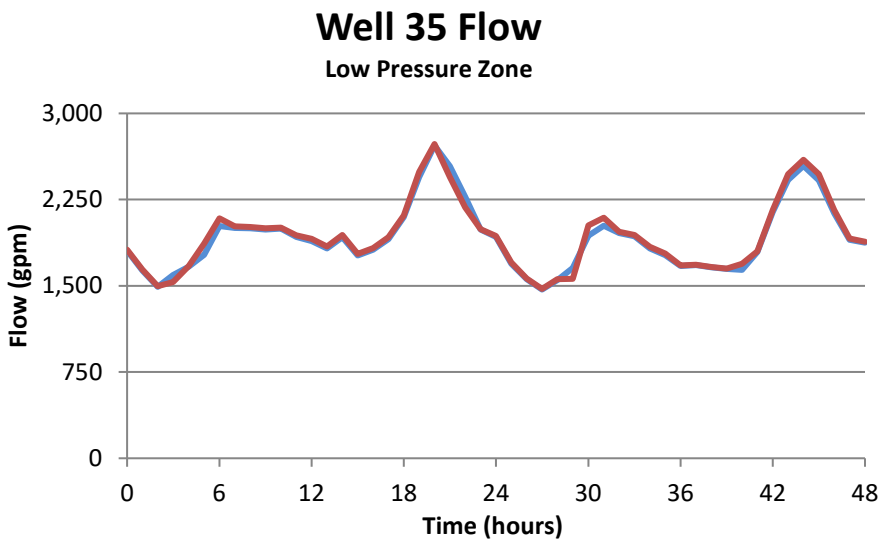
AKEL ENGINEERING GROUP, INC.

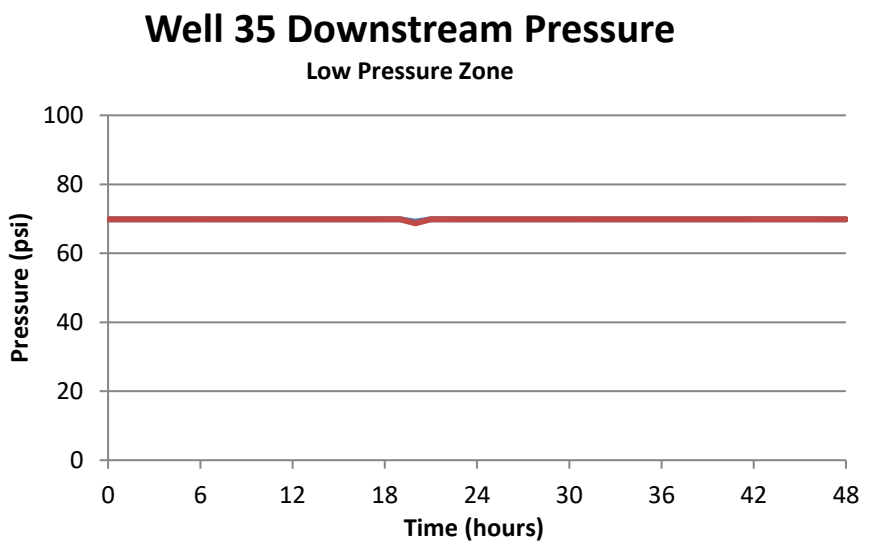
Figure A.20

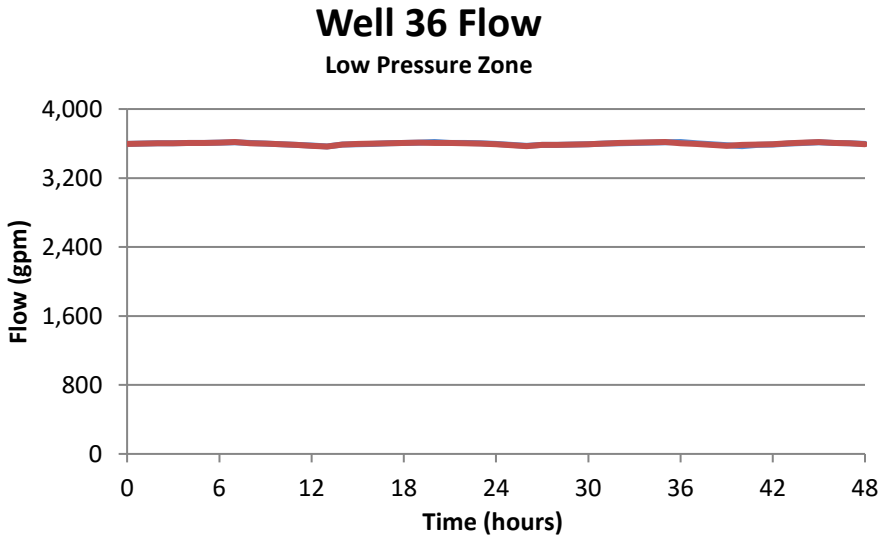
Well Comparison

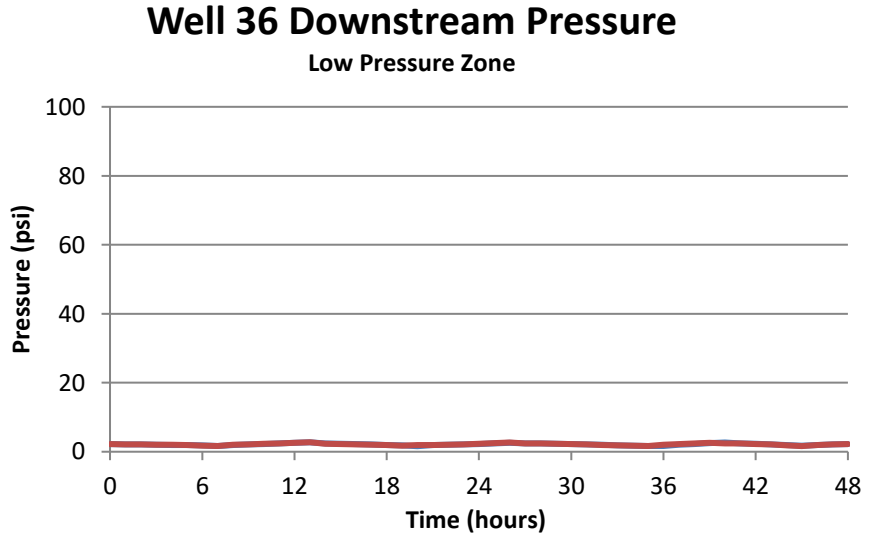
Hydraulic Model Evaluation for
The Village Project
City of Santa Ana

SANTA ANA









LEGEND

Existing

Buildout

AKEL ENGINEERING GROUP, INC.

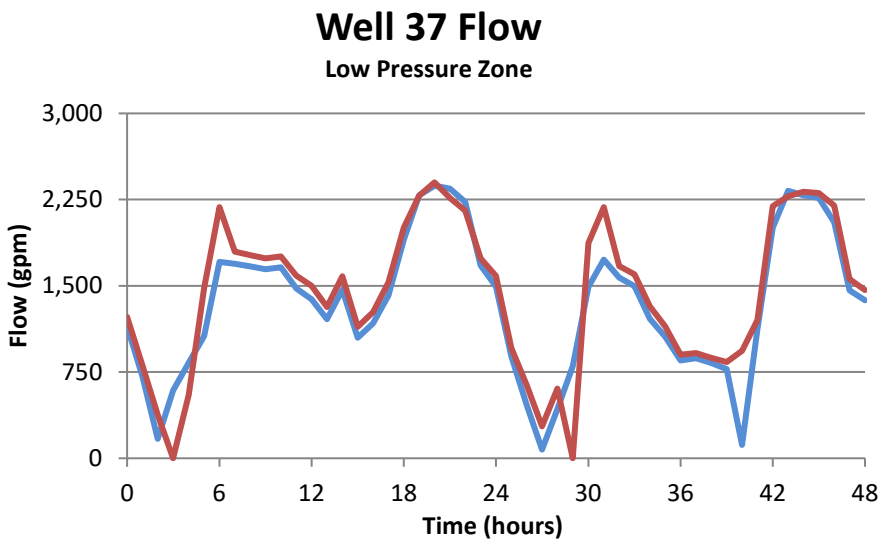
April 18, 2024

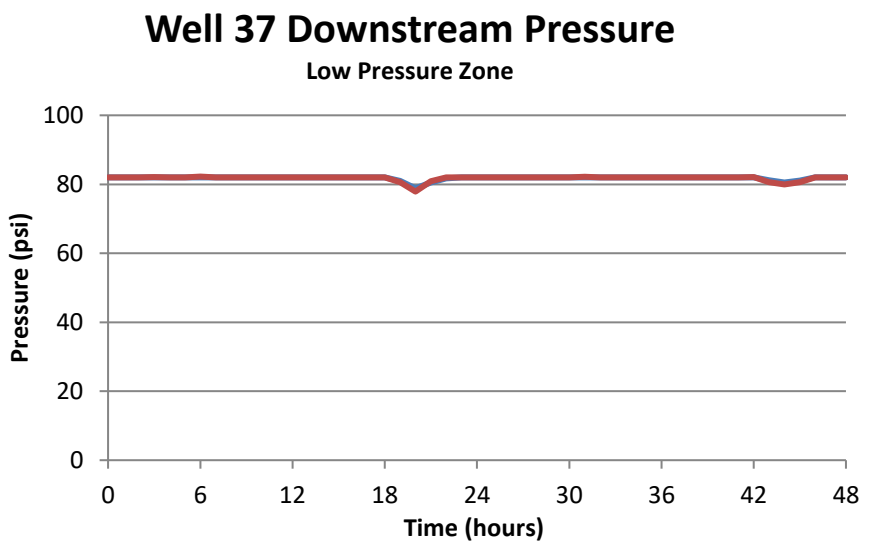
Figure A.21

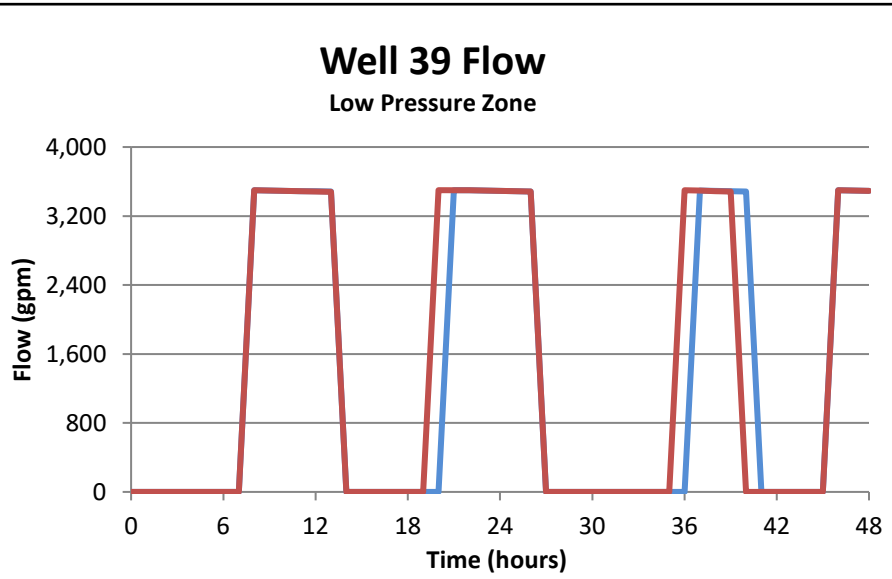
Well Comparison

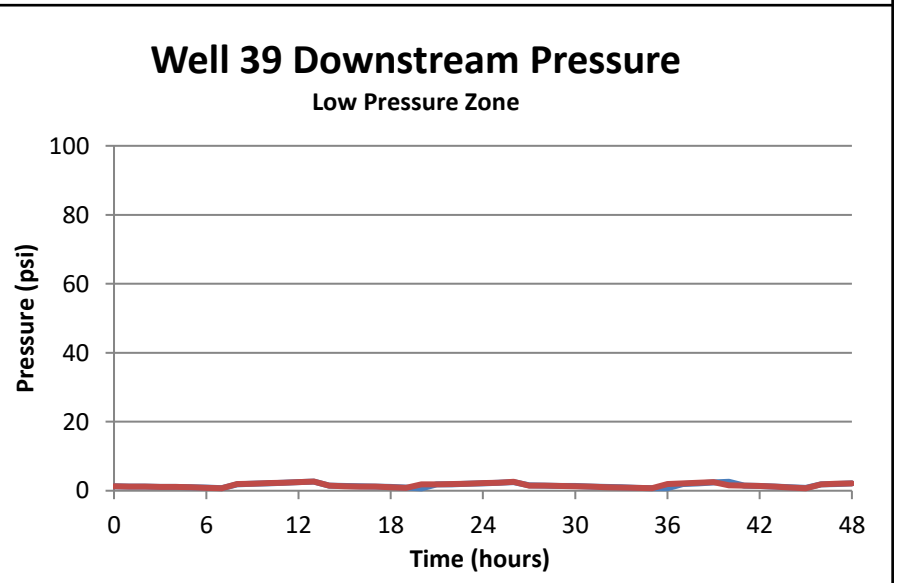
Hydraulic Model Evaluation for
The Village Project
City of Santa Ana

SANTA ANA









LEGEND

Existing

Buildout

AKEL ENGINEERING GROUP, INC.

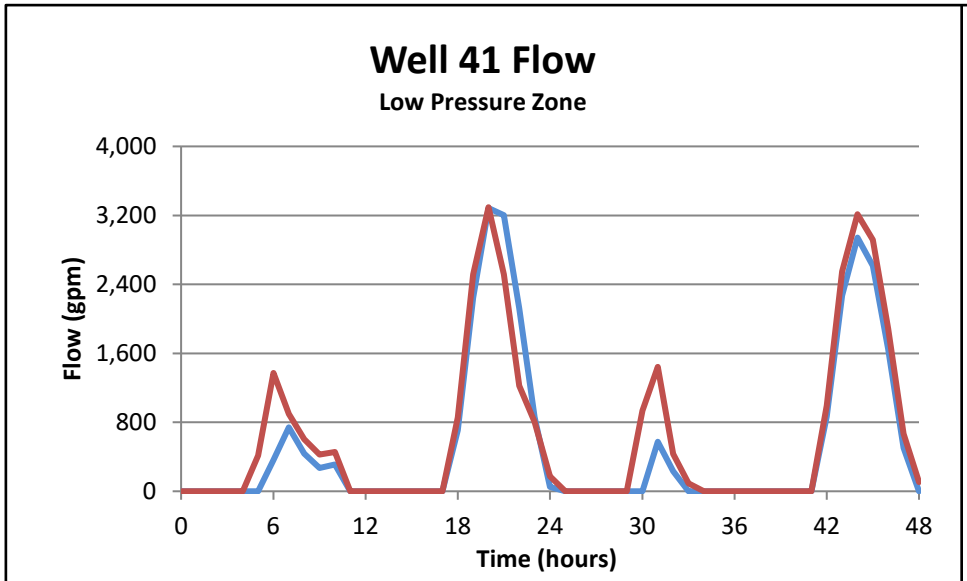
April 18, 2024

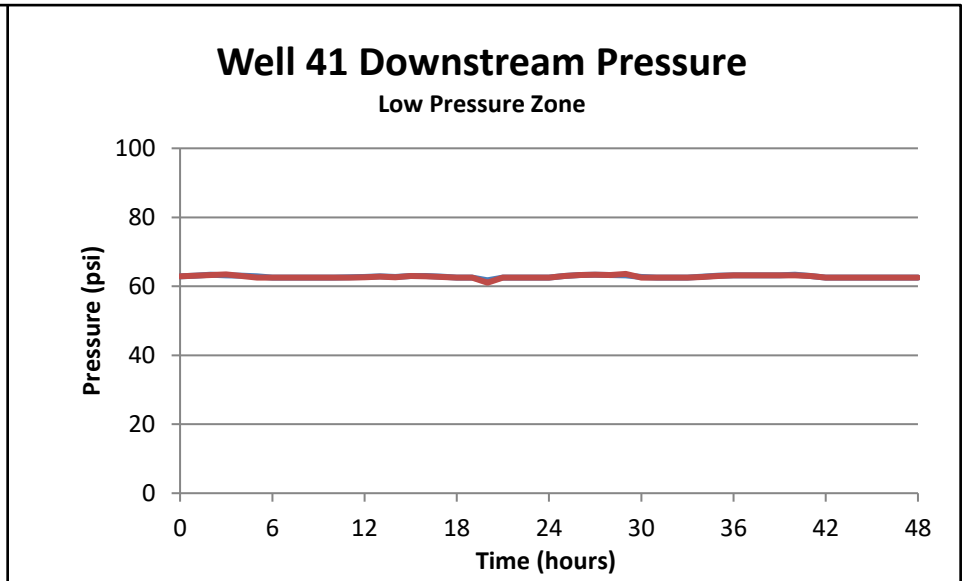
Figure A.22

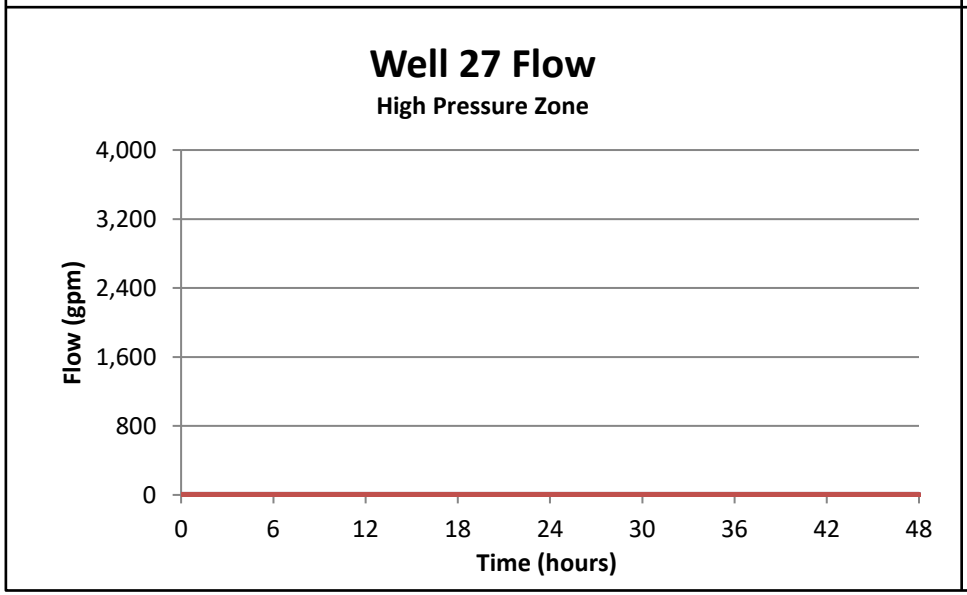
Well Comparison

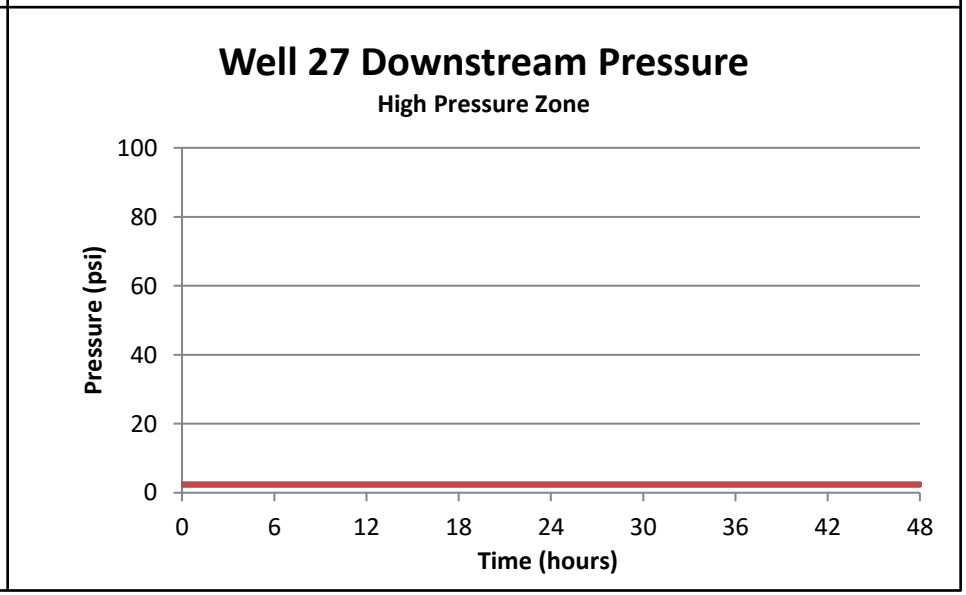
Hydraulic Model Evaluation for
The Village Project
City of Santa Ana

SANTA ANA









LEGEND

- Existing
- Buildout

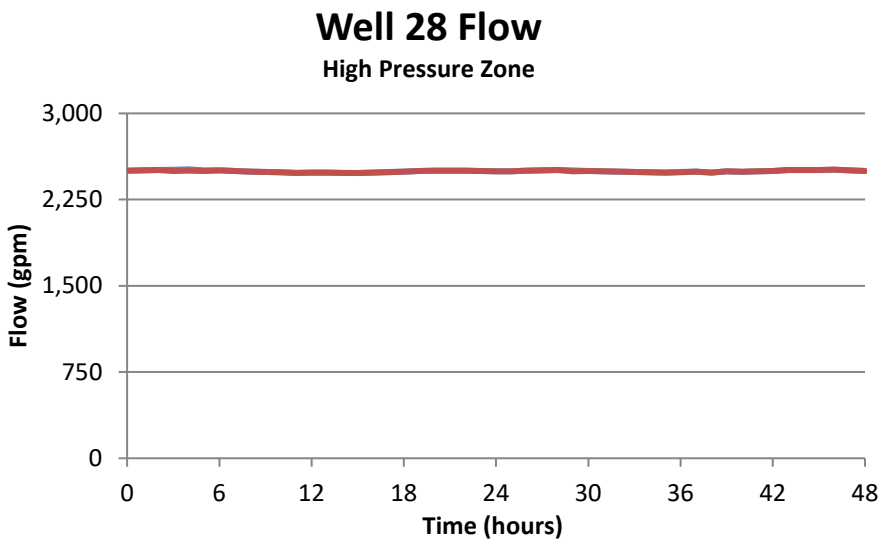
AKEL ENGINEERING GROUP, INC.

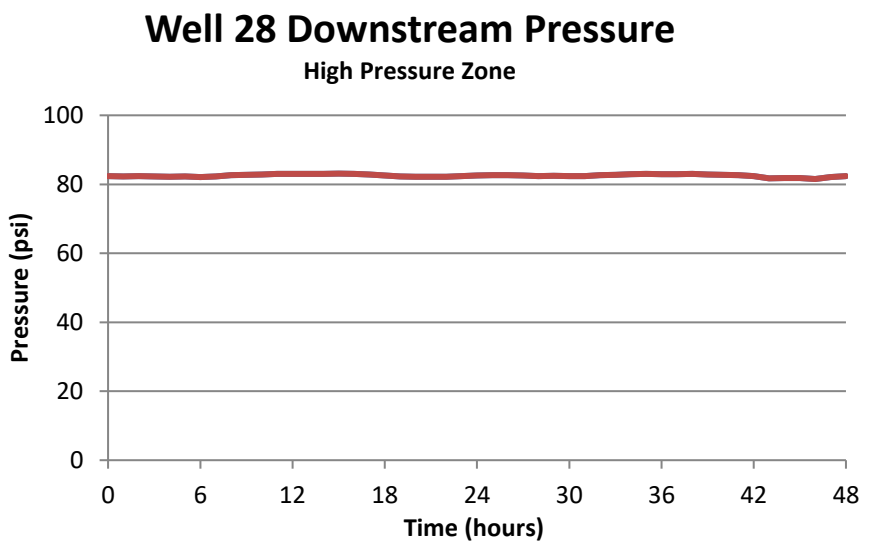
April 18, 2024

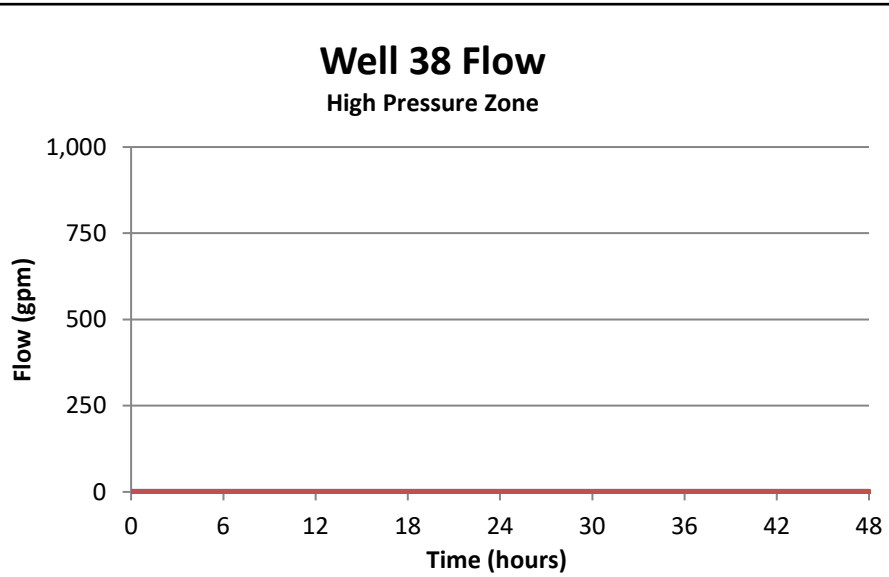
Figure A.23

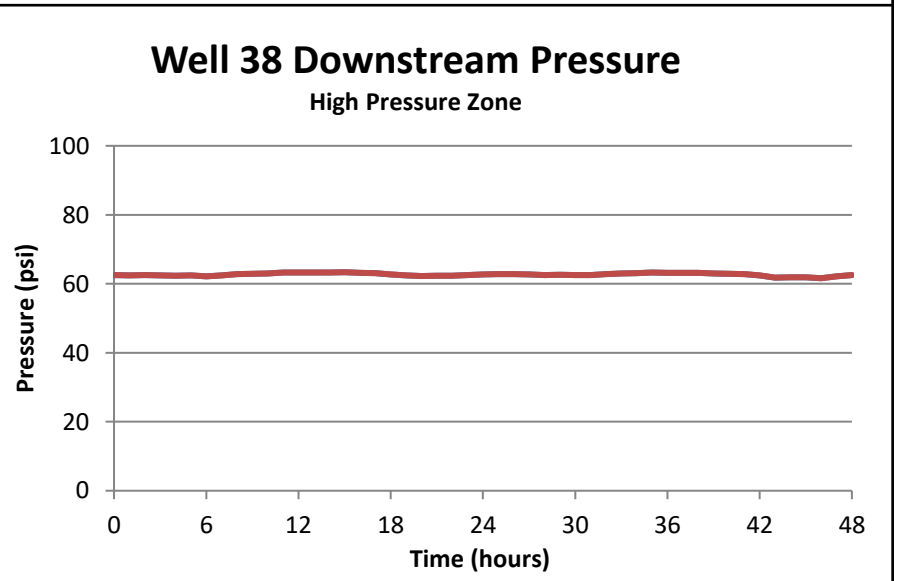
Well Comparison

Hydraulic Model Evaluation for
The Village Project
City of Santa Ana









LEGEND

- Existing
- Buildout

AKEL ENGINEERING GROUP, INC.

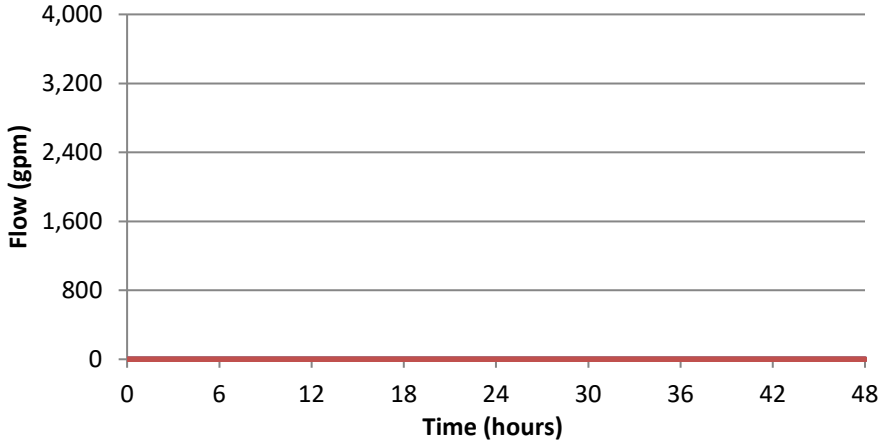
April 18, 2024

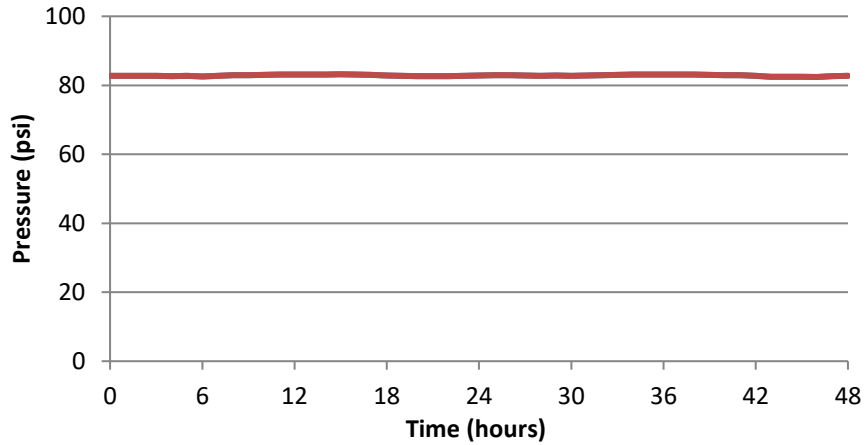
Figure A.24

Well Comparison

Hydraulic Model Evaluation for
The Village Project
City of Santa Ana

SANTA ANA





LEGEND

Existing

Buildout

AKEL ENGINEERING GROUP, INC.

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Figure A.25

Well Comparison

Hydraulic Model Evaluation for
The Village Project
City of Santa Ana

SANTA ANA