City of Campbell River

Water System Strategic Action Plan Update

FINAL REPORT

February 2017

KOERS & ASSOCIATES ENGINEERING LTD.
Consulting Engineers

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Consulting Engineers

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February 28, 2017

City of Campbell River
301 St. Ann's Road
Campbell River, B.C. V9W 4C7

Attention: **Ms. Jennifer Peters, P.Eng.**
Utilities Manager

Re: City of Campbell River
Water System Strategic Action Plan (WSSAP) Update – FINAL Report

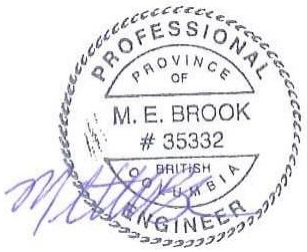
We are pleased to submit an electronic (pdf) copy of our report entitled "City of Campbell River – Water System Strategic Action Plan (WSSAP) Update – FINAL Report".

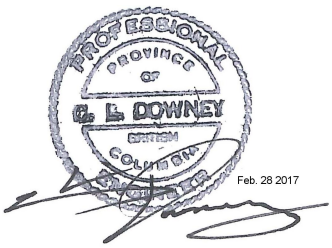
The report outlines the results of the computer model analysis of the City's water transmission system and provides recommendations on the water network improvements required to service the anticipated growth to build out conditions.

We would be pleased to present the report to staff, at the City's convenience, and we look forward to opportunities to assist the City in the implementation of the recommendations.

Yours truly,

KOERS & ASSOCIATES ENGINEERING LTD.





Mitchell Brook, P.Eng
Project Engineer

Chris Downey, PEng
Project Manager

Enclosures

City of Campbell River

CITY OF CAMPBELL RIVER

WATER SYSTEM STRATEGIC ACTION PLAN (WSSAP) UPDATE

-FINAL REPORT-

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APPENDICES

1 INTRODUCTION

1.1 Background

The City's water is currently supplied from connections to the BC Hydro penstocks, serving the John Hart Generating Station, which draws water from John Hart Lake. The water is disinfected with UV disinfection, at the Elk Falls Water Quality Center, and gas chlorination, at the John Hart Water Quality Center, prior to being supplied to the distribution system via gravity.

In addition the City's Industrial Park water system is supplied from the John Hart Pump Station which draws water from John Hart Lake. The water is pumped to the Snowden Reservoir, where is then flows by gravity to the Snowden Forest Water Quality Center (SFWQC) where it is disinfected with UV disinfection and chlorination prior to being supplied to the distribution system.

BC Hydro is currently in the process upgrading its John Hart Generating Station, which will include the removal of the existing penstocks. As a result of the BC Hydro project, the City will require a new independent water intake at John Hart Lake and supply infrastructure to deliver water to the City's water distribution system.

The new system will include a new intake, water quality center (WQC), and pump station to supply water from John Hart Lake to the water supply main on Highway 28. The pump station will result in the increase of the supply pressure for the existing water system. In order to ensure that the long term water infrastructure planning reflects the water source, the City is proceeding with an update to its Water System Strategic Action Plan.

In addition, BC Hydro is also planning a dam safety upgrade project that will require lowering of the John Hart Lake level below the existing intake of the pump station supplying the Industrial Park system for up to four years beginning as early as 2019. As a result, the City is required to make modifications to this water intake such that water can continue to be delivered to the Industrial Park system. The City requires an assessment of the existing and proposed systems to determine the additional modifications required to allow this system to continue to operate.

As both the main system and the Industrial Park system will receive water through the new pump station, the City would like the updated Water System Strategic Action Plan to include long term plans for both systems.

1.2 Project Scope of Work

To complete this project, the City of Campbell River has identified the following scope:

1. Update the City's existing water model to:
    a. Reflect recent system improvements and modifications that have been completed.
    b. Reflect the new water supply infrastructure that is currently under construction.

c. Include the Industrial Park water system which will be supplied by the new pump station.

2. Provide recommendations on:
   a. System modifications required to address the increased pressure that will result from the new pump station.
   b. Required modifications (concept level) to the Industrial Park water system as a result of the new intake supply, including pumping, storage, and disinfection systems.
   c. Long term capital plans for upgrades to allow for community growth within both systems.

3. Update the Water System Strategic Action Plan report to include the above items. Recommendations shall be provided for immediate, 5, 10, 20, 30-year, and build-out population projection. The report shall be similar in content to the 2012 Water System Strategic Action Plan, including design demands, system maps for each planning period, and cost estimates for all proposed improvements.

A copy of the project terms and reference is included in **Appendix A**.

1.3 Acknowledgements

Koers & Associates Engineering Ltd. acknowledges with thanks the assistance provided by the following City staff during the course of this study:

- Mrs. Jennifer Peters, P.Eng – Utilities Manager

2 Existing System

2.1 Water Source and Treatment

The water source for the City`s water system is John Hart Lake (average lake level of 139 m geodetic).

The City of Campbell water system is currently comprised of two separate supply and distribution areas:

1) The main distribution
2) The Industrial Park system

The supply connection for the main system is currently from the BC Hydro Penstocks, which produces a hydraulic grade line (HGL) of 134 m at the City connection. The City's water is initially disinfected with ultra violet (UV) at the Elk Falls Water Quality Centre (EFWQC). The water is chlorinated at the John Hart Water Quality Centre (JHWQC), downstream of the EFWQC, prior to supply to the distribution system.

The City's Industrial Park system is supplied from the John Hart Pump Station which draws water from John Hart Lake. The water is pumped to the Snowden Reservoir (HGL 162m), where it then flows by gravity to the Snowden Forest Water Quality Center (SFWQC) where it is disinfected with UV disinfection and chlorination prior to being supplied to the distribution system.

BC Hydro is currently in the process upgrading its John Hart Generating Station which will include the removal of the existing penstocks. As a result of that project, the City will require a new independent water intake and supply infrastructure to deliver water to the City's water distribution system. Design and construction are currently underway for this new system with an anticipated in-service date of early 2018.

The new water infrastructure will include the following:

- Intake and pipeline from John Hart Lake to the proposed WQC.
- WQC consisting of UV and Chlorine disinfection and pump station to the surge tank.
- Pipeline on Highway 28 to existing supply mains downstream of the JHWQC.

As part of the works the existing disinfection facilities at the EFWQC and JHWQC will be abandoned. The UV disinfection at the SFWQC will no longer be required however the chlorine disinfection will be maintained to the provide secondary chlorination if the chlorine residuals in the Industrial Park distribution system fall below acceptable levels.

2.2 Distribution System

The main City of Campbell River distribution system spans 6 separate pressure zones which are serviced by 25 pressure reducing valve (PRV) stations with a total of 56 PRV units, as listed in Table 1. The system includes 2 reservoir facilities (Evergreen Reservoir and Beaver Lodge Reservoir) and 2 pump stations.

The Industrial Park system is located in the northern part of Campbell River and spans 2 pressure zones which are serviced by 1 PRV station with a total of 2 PRV units, as listed in Table 1. The system also includes one reservoir facility (Snowden Reservoir) and one pump station (John Hart pump station) that delivers water from John Hart Lake to the reservoir.

The pressure zone boundaries, PRV stations, reservoir and pump station locations are shown on **Figure 1**. The City currently also supplies water to Strathcona Regional District Area D, and the We Wai Kai, Wei Wai Kum, and Homalco First Nations.

Improvements to the distribution system since the 2012 WSSAP are noted below:

WSSAP Project #1 Construct Water Intake at the John Hart Lake

- This project is currently underway and is scheduled for completion in early 2018. The supply main from the JHWQC to Brewster Lake Road and the John Hart Lake intake have been constructed, however the WQC and pump station are currently under construction.

WSSAP Project #2 - Improve Transmission Capacity in the Alder main and Create Pressure Zone (89 m)

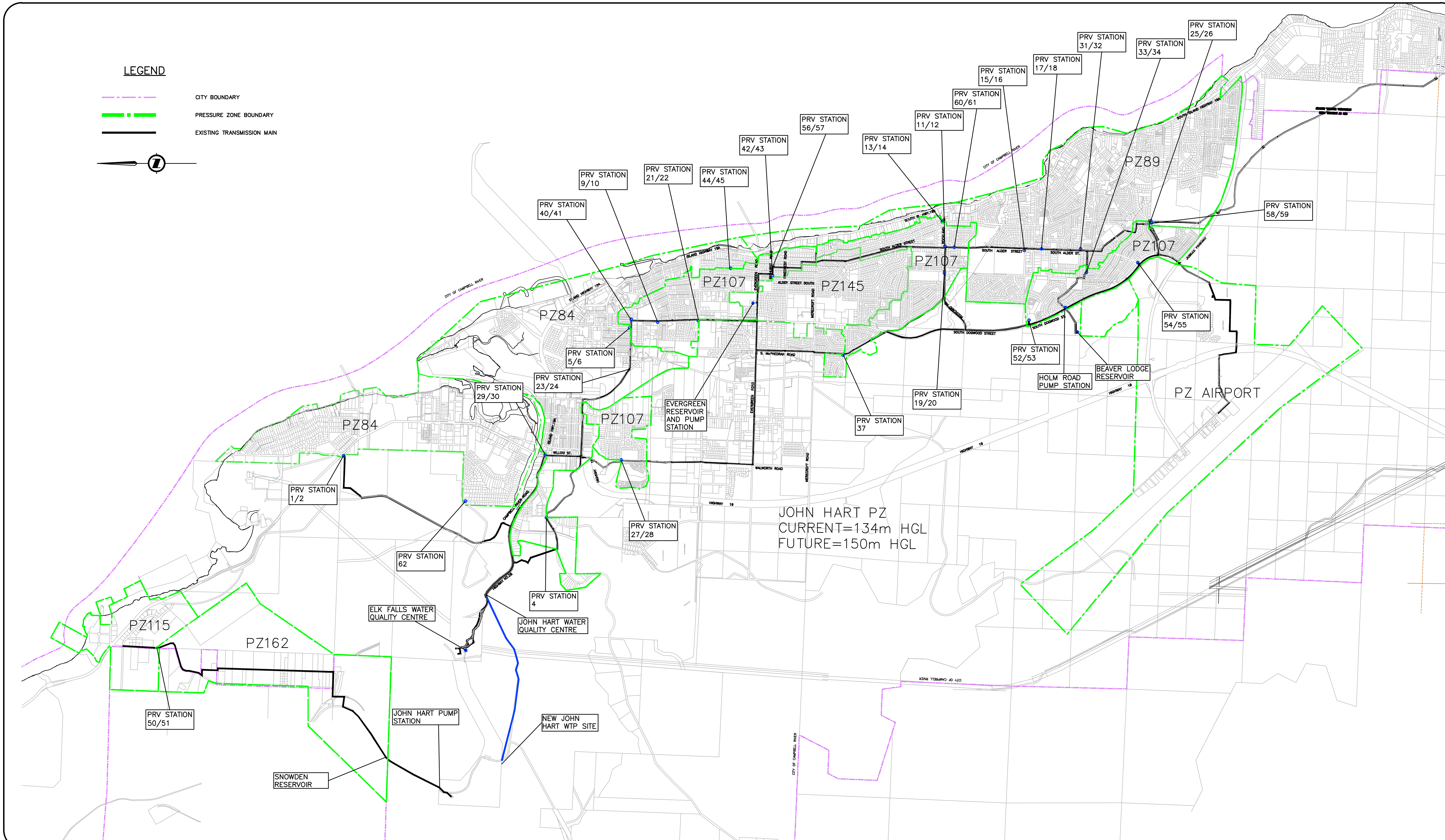
- The existing Bathurst and Thulin PRV (Station #56/57) has been abandoned and a new PRV station has been installed at Rockland Road and South Alder Street. The SCADA upgrades at the station are still outstanding and will be completed in 2017 to allow the station to be fully operational.
- The inlet piping at the Beaver Lodge Reservoir has be modified, but will not be fully operational until the SCADA upgrades are completed.
- The check valve has been installed on the 250 mm dia. main at the intersection of Evergreen Road and Highway 19A.

WSSAP Project #3 – Improvements to Supply Water to Island Cogen.

- The Woodburn PRV has been isolated and is currently not in use. The valve has been maintained and is fully functional if needed in emergencies.
- The new Holly Hills PRV has been installed at the intersection of Woodburn Road and Dollyvarden.
- A new 250 mm dia. main has been installed on Highway 19 from the existing 250 mm dia. main on the Campbell River Bridge to the 250 mm dia. main adjacent to the abandoned Woodburn Road PRV site.
- A new 250 mm dia. main has been installed on Highway 19 from the 250 mm dia. ductile iron main near Perkins Road to the 300 mm dia ductile iron main at inlet side of the Pengelley Road PRV.

WSSAP Project #5 – Improvements near 7th Avenue and Dogwood Street

- Replaced the existing 100 mm dia. cast iron main on Dogwood St. from 4th Avenue to 7th Avenue with a 200 mm dia. main.
- Removed the existing 6th Avenue and Dogwood Street PRV station (#48/49).



KOERS & ASSOCIATES ENGINEERING LTD.
Consulting Engineers

CLIENT: CITY OF CAMPBELL RIVER

PROJECT: WATER SYSTEM STRATEGIC ACTION PLAN 2016 UPDATE

TITLE: EXISTING PRESSURE ZONE AND TRANSMISSION MAINS

APPROVED		SCALE	1:50,000
DATE	12OCT16	DWG No.	FIGURE 1
JOB No.	1631		

File: H:\1002 Campbell River\1631 WSSAP Update\03 Drawings\1631-Figures REV1.dwg Plot Time: Feb 28, 2017 - 11:56am User: mbrook

WSSAP Project #8 – Alternate project identified in Technical Memorandum 1140-TM-2 Rev 2

- Installed a new 200 mm dia. watermain on Timberline Road from Penfield Road. A copy of Technical Memorandum 1140-TM-2 Rev 2 is included in Appendix B for reference.

WSSAP Project #16 - Improve Fire Flows and Residual Pressures in Pressure Zone 89A

- Installed a 250 mm dia. main on Highway 19A from Pinecrest Road to Merecroft Road.
- Isolated the Carnegie/Merecroft PRV station (#38/39) and watermain between Carnegie and Highway 19A. Formal abandonment is still outstanding.

Other distribution system improvements:

- Replacement of the existing watermain on Alder Street from10th Ave to St Ann's Road.
- Replacement of the existing watermain on St Ann's Road from Shoppers Row/Hwy 19A to Alder Street.

2.3 Pressure Zones

Listed below is a summary of the existing pressure zones in the City's water system. The pressure zone boundaries, PRV stations, reservoir and pump station locations are shown on **Figure 1.**

2.3.1 Pressure Zone 84

Pressure zone 84 services the lower elevations in the City extending from sea level to an approximate geodetic elevation of 38 m. The pressure zone is separated into two sections; the area South of the Campbell River and the area north of the Campbell River. The areas south of the Campbell River are supplied directly from the Evergreen Reservoir and supplemented by the PRVs listed in Table 1. The area north of the Campbell River is supplied directly from PRV Station 1/2 (Pengelley/Highway 19) and PRV Station 61/62 (Holly Hills) as listed in Table 1.

2.3.2 Pressure Zone 89

Pressure zone 89 services the lower elevations in the City extending from sea level to an approximate geodetic elevation of 40 m. It is supplied directly from the Beaver Lodge Reservoir and the PRV stations listed in Table 1. The pressure zone is supplemented by the check valve installed along the Highway at Evergreen Road, which will allow the Evergreen Reservoir to flow south if the system HGL drops below 84 m.

There are outstanding SCADA improvements required at the Beaver Lodge Reservoir to fully utilize the reservoir and PRVs located at the Rockland/Alder PRV station. The SCADA improvements will also allow the PRVs located on South Alder Street (PRV stations 15/16, 17/18, 25/26 and 31/32) to be abandoned.

2.3.3 Pressure Zone 107

Pressure zone 107 services the mid-range elevations in the City from elevation 38 m to 55 m. It is supplied directly from the City transmission mains through the PRVs listed in Table 1. There is currently no storage reservoir in this pressure zone and all peaking and fire flows requirements are supplied through the transmission main directly from the source.

2.3.4 John Hart Lake Pressure Zone (134 m)

The John Hart Lake Pressure Zone services the areas in the City above elevation 55 m. It is supplied directly from the City transmission mains. There is currently no storage reservoir in the pressure zone with all peaking and fire flow requirements supplied through the transmission main directly from the source. The HGL of the pressure zone is typically 134 m based on the pressure measured at the EFWQC, however with the completion of the new intake and water treatment plant, the HGL will be increased to 150 m.

2.3.5 Airport Pressure Zone

The Airport Pressure Zone services the airport and Homalco First Nation. This pressure zone is supplied via the Beaver Lodge Pump Station when required. The booster station increases the pressure in the City transmission main (134 m pressure zone) when the inlet pressure falls below 80 psi (125 m HGL) and shuts down when inlet pressure increases to 90 psi (132 m HGL).

2.3.6 Pressure Zone 145

Pressure zone 145 services a localized area in the central part of the City above 60 m elevation. This pressure zone is currently supplied from pressure zone 84 via the Evergreen Pump Station which draws water directly from the Evergreen Reservoir.

2.3.7 Pressure Zone 162

Pressure zone 162 is located in the Industrial Park system and services the areas along Gordon Road and Duncan Bay Road above 70m. The pressure zone is supplied by the Snowden Reservoir.

2.3.8 Pressure Zone 115

Pressure zone 115 services the mid-range elevations in the Industrial Park system on Duncan Bay Road North from elevation 20 m to 70 m. The pressure zone is supplied by the Duncan Bay PRV Station 50/51 listed in Table 1.

2.4 Pressure Reducing Valve Stations

Listed below in **Table 1** is a summary of the existing PRV stations including valve diameters, assumed elevations, and existing pressure settings.

Table 1: PRV Summary

PRV Station	PRV ID	PRV Dia. (mm)	Elev (m)	Exist Press (psi)	Exist HGL (m)	Source
84 m Pressure Zone north of Campbell River						
Pengelley/Hwy 19	1	100	17.8	95	84.0	John Hart
	2	200	17.8	90	81.0	John Hart
Woodburn/Hwy 19	46	100	2.8	109	79.4	John Hart
(Isolated/Not Active)	47	150	2.8	105	76.6	John Hart
Holly Hills	61	100	44	55	82.6	John Hart
	62	200	44	50	80.0	John Hart

Table 1: PRV Summary						
PRV Station	**PRV ID**	**PRV Dia. (mm)**	**Elev (m)**	**Exist Press (psi)**	**Exist HGL (m)**	**Source**
Evergreen Reservoir 84 m Pressure Zone						
Willow/Hwy28	29	100	3.8	111	81.9	John Hart
	30	250	3.8	107	79.1	John Hart
9th & Homewood	23	38	10.7	97	78.9	John Hart
(Isolated/Not Active)	24	100	10.7	93	76.1	John Hart
9th & Elm	5	75	36.0	62	79.5	John Hart
	6	150	36.0	60	78.1	John Hart
Quinsam	4	150	24.4	70	73.6	John Hart
2nd & McLean	44	75	38.1	58	78.9	107 PZ
	45	150	38.1	55	76.8	107 PZ
Beaver Lodge Reservoir 89 m Pressure Zone						
Rockland/Alder	60	300	42.7	80	98.9	John Hart
	61	300	42.7	50	77.8	John Hart
Galerno/Rockland	13	100	36.9	60	79	107 PZ
	14	150	36.9	56	76.5	107 PZ
Parkway/Alder	15	100	25.6	80	81.9	John Hart
	16	150	25.6	76	79.0	John Hart
Goodwin/Alder	17	100	23.3	84	82.4	John Hart
	18	150	23.3	80	79.5	John Hart
Hudson/Erickson	25	100	36.0	67	83.0	John Hart
	26	200	36.0	63	80.2	John Hart
Holm/Alder	31	100	22.5	85	82.3	John Hart
	32	150	22.5	81	79.5	John Hart
Bathurst/Thulin	56	75Red	43.4	62	87.0	John Hart
(Isolated/Not Active)	57	250Red	43.4	57	83.5	John Hart
Erickson West	58	75Red	37.6	63	81.9	Airport PZ
	59	150Red	37.6	60	79.8	Airport PZ
107 m Pressure Zone (Georgia Park)						
Hilchey/Dogwood	52	75Red	48.1	85	107.9	John Hart
	53	200Red	48.1	80	104.4	John Hart
Alder South/Dogwood	54	75 Red	65.2	60	107.4	Airport PZ
	55	200Red	65.2	50	100.3	Airport PZ
Georgia	33	75	42.8	96	110.3	John Hart
(Isolated/Not Active)	34	200	42.8	92	107.5	John Hart
107 m Pressure Zone (Mid Mountain)						
9th Ave/Dogwood	40	100	41.0	75	107.4	John Hart
	41	150	41.0	71	104.5	John Hart
7th Ave/Dogwood	9	75	54.6	75	107.4	John Hart
	10	150	54.6	71	104.5	John Hart
4th Ave/Dogwood	21	75	62.1	75	107.4	John Hart

Table 1: PRV Summary						
PRV Station	**PRV ID**	**PRV Dia. (mm)**	**Elev (m)**	**Exist Press (psi)**	**Exist HGL (m)**	**Source**
	22	150	62.1	71	104.5	John Hart
Bathurst/McLean	42	50	53.5	75	106.2	John Hart
	43	150	53.5	70	102.7	John Hart
Rockland/Alder	11	100	49.1	82	106.7	John Hart
	12	150	49.1	78	103.9	John Hart
Rockland/Shellbourne	19	75	29.6	110	106.9	John Hart
	20	150	29.6	106	104.1	John Hart
S Macphedran/Cortez	37	200	56.3	72	107.0	John Hart
107 m Pressure Zone (Highway 19)						
Cheviot/Walworth	27	75	53.7	74	105.7	John Hart
	28	150	53.7	70	102.9	John Hart
Industrial Park						
Duncan Bay Road	50	75	65.4	71	115.3	Snowden
	51	250	65.4	67	112.5	Snowden

Red = Reduced Port Valve

2.5 Storage Reservoirs

Listed in **Table 2** below is a summary of the existing storage reservoirs in the City of Campbell River Water System.

Table 2: Existing Reservoir Summary

Reservoir	Style	Material	Volume	Top Water Level
Beaver Lodge	Buried rectangular with sloped floor	Concrete	5,200 m^3	±89m
Evergreen	Buried rectangular with sloped floor	Concrete	5,000 m^3	±83.5m
Snowden	Circular (12 m dia. x 8.85 m high)	Concrete	1,000m^3	± 162.85 m

2.6 Pump Stations

2.6.1 John Hart Pump Station

The Industrial Park area is supplied from John Hart Lake through the John Hart Pump Station. The water supply to the pump station is currently through a submerged intake line approximately 10 m below the low water level in the lake. The intake pipe connects to a 1.8 m diameter, 4.6 m deep concrete wet well which consists of 2 – 45 l/s (600 igpm) submersible pumps, a cement block control building, and a standby propane powered generator. There is a provision for a third 45 l/s pump at the wet well, allowing for two pumps to deliver 68 l/s (900 igpm).

The pump station discharges into the concrete storage reservoir located approximately 1 km northeast of the pumphouse, on land permitted from BC Park within Elk Falls Provincial Park and controls the pump start and stop cycles. As the water level drops in the reservoir, a level signal transmitted via buried cable starts the pump. When the water reaches the predetermined full elevation, a level signal shuts the pump down.

2.6.2 Evergreen Pump Station

The Evergreen Pump Station is located at the Evergreen Reservoir Site and supplies Pressure Zone 145. The station currently contains one 60 hp variable speed pump for domestic flows and two 100 hp fixed speed pumps to supply peak demands and fire flows. The pump station is controlled by pressure and flow at the outlet of the pump station. The 60 hp variable speed pump is controlled by the pressure controller in the station PLC and the fixed speed pumps will be started when the demand in the pump zone exceeds the 60 hp pump capacity. The PLC will not allow all three pumps to operate at the same time due to power service limitations at the station, which is not seen as a major concern as the two larger pumps will provide the required flows in the event of the large demand.

2.6.3 Holm Road Pump Station

The Holm Road Pump Station is located on South Dogwood Road near the Beaver Lodge Reservoir and services the Airport Pressure Zone. The station currently contains two 75 lps fire pumps and two 15 lps duty pumps. The pump station currently monitors the HGL in the Dogwood main and when it drops below a set valve of 125 m (80 psi) the first duty booster pump (15 lps capacity) is turned on. The second duty pump (15 lps capacity) followed by the fire pumps (75 lps capacity each) are turned on based on the flow rate. Similarly, the shut down sequence for the pumps is based on flow except for the first booster pump, which shuts down once the HGL in the Dogwood main returns to 132 m (90 psi).

With the increase of the supply HGL to 150 m the pump station will only be required to operate under heavy periods of flow, such as a fire flow event in the service area serviced by the pump station. The control logic for the pump station can remain in place, however it is recommended that flow tests be completed after commissioning of the new WQC to confirm the set points are still valid.

3 DESIGN POPULATION AND DEMANDS

3.1 General

For the purposes of this report it has been assumed that the population and demand projections from the 2012 WSSAP Study are still considered valid and detailed calculations can be found in that report. A summary of the population and demand projections is listed below.

3.2 Population Estimates

Population projections to 2041, based on an assumed average annual population growth rate of 0.7% for the City of Campbell River and 1.0% for Area D, are shown in **Table 3**.

The projected population at OCP build-out for the City of Campbell River water service area is 69,024, including a projected 4,024 in Area D provided by the Strathcona Regional District (SRD).

Table 3: Population History (2002-2011) and Projections

	Population		
Year	Campbell River*	Area D**	Total
2005	29,540	3,194	32,734
2006	30,054	3,199	33,253
2007	30,447	3,204	33,651
2008	31,005	3,210	34,215
2009	31,369	3,215	34,584
2010	31,580	3,220	34,800
2011	31,805	3,226	35,031
2016	32,930	3,391	36,321
2021	34,105	3,564	37,669
2031	36,580	3,936	40,516
2041	39,210	4,024	43,234
Build Out	65,000	4,024	69,024

* Campbell River Populations are based on BC Stats information and a 0.7% annual growth rate beyond 2011.

** Area D Populations are based on a 1% annual growth rate from the 2011 Area D population estimated for the Strathcona Regional District to a build out population of 4,024.

3.3 Design Demands

3.3.1 Projected System Demands

The projected future water demands for the City of Campbell River are in listed in **Table 4**:

Table 4: Projected System Demands

	Population			Demand in ML/d		
Year	Campbell River	Area D	Total	ADD	PDD	PHD
2016	32,930	3,391	36,321	37.6	73.4	96.6
2021	34,105	3,564	37,669	39.2	76.3	100.4
2031	36,580	3,936	40,516	42.4	82.3	108.3
2041	39,210	4,024	43,234	45.6	88.2	115.9
Build Out	65,000	4,024	69,024	67.7	135.7	179.9

3.3.2 Industrial Park Demands

In the absence of reliable meter data for the Industrial Park system the water demands listed in the 2001 Industrial Park Water Study are considered valid for this report. The projected water demands are listed in **Table 5**.

Table 5: Projected Industrial Park System Demands

	Peak Day Demand in ML/d		
Year	ICI	PRT	Total
2016	1.30	2.04	3.34
2041	3.10	3.07	6.17

4 SYSTEM ANALYSIS

4.1 Computer Model Update

4.1.1 Original Model

The water model software used for this report is WaterCAD Version 8*i*. The model from the 2012 WSSAP Report was updated to reflect the recent water supply and distribution projects listed in Section 2.2 as well as the Industrial Park water system. The model was also updated to reflect the WQC and proposed supply mains associated with the development of the intake at John Hart Lake.

The pressure settings for the existing PRV stations were reviewed and updated to reflect the in-field settings recorded by the City's operations staff. The control logic for the Evergreen and Beaver Lodge Reservoirs and pump stations were reviewed and the model was updated to reflect the City's SCADA system settings.

A Hazen Williams friction factor for each pipe was entered in the model, based on the type of pipe and values listed in the City of Campbell River standards and specifications for PVC and Ductile Iron. **Table 6** shows the friction factors used.

Table 6: Pipe Friction Factors

Pipe Material		Friction Factor, "C" (Hazen Williams formula)
Name	**Abbreviation**	
High Density Polyethylene	HDPE	155
Polyvinyl Chloride	PVC	150
Asbestos Cement	AC	130
Ductile Iron	DI	140
Steel with Coating	SC	110
Cast Iron	CI	110

4.2 Analysis Criteria

The service pressure requirements listed in the City of Campbell River Design Standards are listed below in **Table 7**:

Table 7: Service Pressure Requirements

Parameter	Value
Under Peak Hour Demand Conditions	
Minimum residual pressure at property line	300 kPa (44 psi)
Under Fire Flow Demand Conditions (during Maximum Day Demands)	
Minimum residual pressure at hydrant	150kPa (22 psi)
Under Static Conditions	
Maximum service pressure	850 kPa (123 psi)

4.3 Water Storage Requirements

The water storage requirements within the distribution system are based on the formula from the MMCD Design Guideline Manual, which is:
Water Storage Volume = A + B + C
Where:

A = Fire Storage (from Fire Underwriters Survey Guide)
B = Equalization (Peaking) Storage (25% of Maximum Day Demands)
C = Emergency Storage (25% of A + B)

The requirement for Emergency Storage (C) can be reduced or eliminated based on several factors, including water source dependability; reliability of the supply system (e.g. gravity vs pumped, duplication of mains and treatment, standby emergency power); multiple sources; more than one storage reservoir; and reservoir water circulation needs.

Assumed minimum fire flow requirements for the distribution system are detailed in **Table 8**. The fire flow requirements are based on the 2014 MMCD Design Guidelines, with allowances for increased fire flows for larger commercial and industrial applications.

Table 8: Fire Flow Demands

Land Use	Assumed Minimum Required Fire Flow		Volume (m^3)
	Demand (L/s)	Duration (hrs)	
Single Family	75	1.5	405
Apartments, Townhouses	90	1.75	567
Commercial	150 - 300	2 - 4	1,080 - 4,320
Institutional	150	2	1,080
Industrial	150 - 300	2 -4	1,080 - 4,320

Detailed calculations for future storage requirements are listed in **Section 5.**

4.4 Water Model Scenarios

The current model was set up to analyze the City system under increment flows to year 2041 and OCP build-out demand conditions. For each of these growth scenarios the model was analyzed for peak hour conditions to check service pressures, and the velocities and headloss in the supply mains and for maximum day demand plus fire demands in strategic locations. Extended time modeling was used to analyze reservoir levels, flow conditions, and system control features for each growth scenario over 24 hours on the maximum day. For each successive analysis period, it is assumed that improvements identified in the previous period have been implemented.

This study assumes that John Hart Lake will continue to provide adequate supply to the City up to the 69,024 build-out population level.

Appendix C contains the output of computer modeling for the year 2041 peak hour demand condition, and for the build-out peak hour demand condition with all improvements recommended in this report being included. **Appendix C** contains level graphs of each reservoir's performance through the maximum day for year 2041, and for build-out conditions, assuming that all improvements recommended in this report have been implemented.

Extended time modeling of peak day demands was undertaken to check the ability of the system to adequately supply its reservoirs, and to ensure that a reservoir does not fall below acceptable levels at any time during the day. Under extended time modeling, the model output shows the water level fluctuation in a reservoir during the day and confirms whether or not the reservoir can recharge during the maximum day demand and/or supply the design fire flow event. The model output also shows when pump stations operate and for how long.

Modeling carried out for this study shows that with the recommended improvements to the supply system in place, as shown on **Figures 2 through 8,** the system has the ability to fill its reservoirs on the maximum day demand for future demands**.**

4.5 Proposed Phased Improvements

The modeling under existing demands showed several weak areas in the system. Improvements were modeled in an iterative process, to come up with a configuration that meets the City standards, and also builds efficiently towards the ultimate improvements while maintaining adequate standards of service as growth proceeds.

The phased improvements have been identified on the following priority scale:

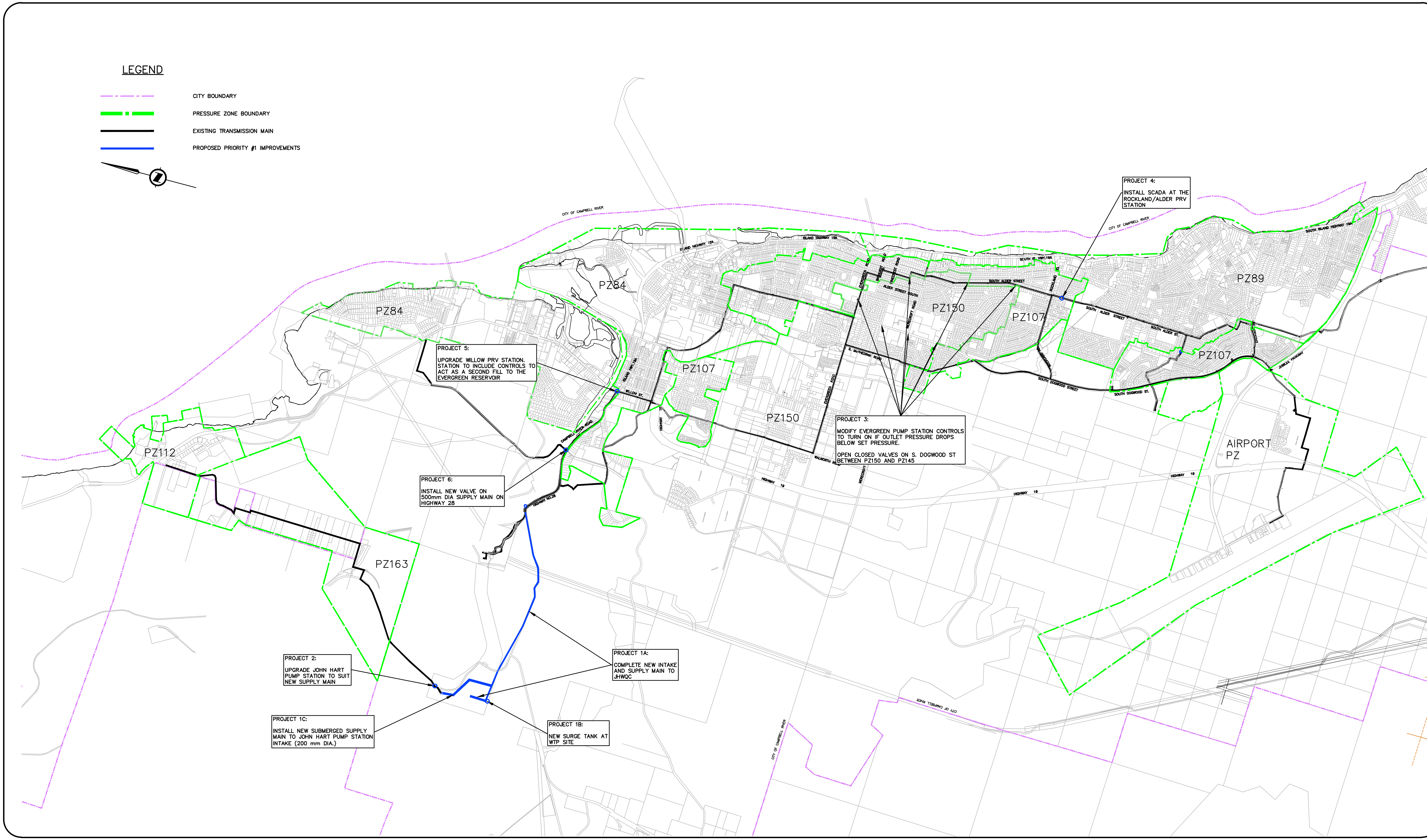
- **Priority #1** – Projects that are required immediately as a result of the new water intake at John Hart Lake.
- **Priority #2** – Projects that are required for existing system demands, but can be delayed until the new water system has been completed.
- **Priority #3 to #6** – Projects that are required to service the supply and distribution network as the system flows increase over time.
- **Development Projects**- Projects that are required to service specific areas of known development in the distribution system and can be required at any time, however if the developments do not proceed, the improvements are not required.

4.5.1 Priority #1 Projects

The Priority #1 improvement projects that are required as a result of the new water intake works at John Hart Lake are listed below and shown in **Figure 2**:

Project #1: Construct Water Intake at the John Hart Lake

The new intake and WQC at John Hart Lake is currently under construction. The proposed intake and WQC will be located west of Brewster Lake Road south of John Hart Lake and will be



KOERS & ASSOCIATES ENGINEERING LTD.
Consulting Engineers

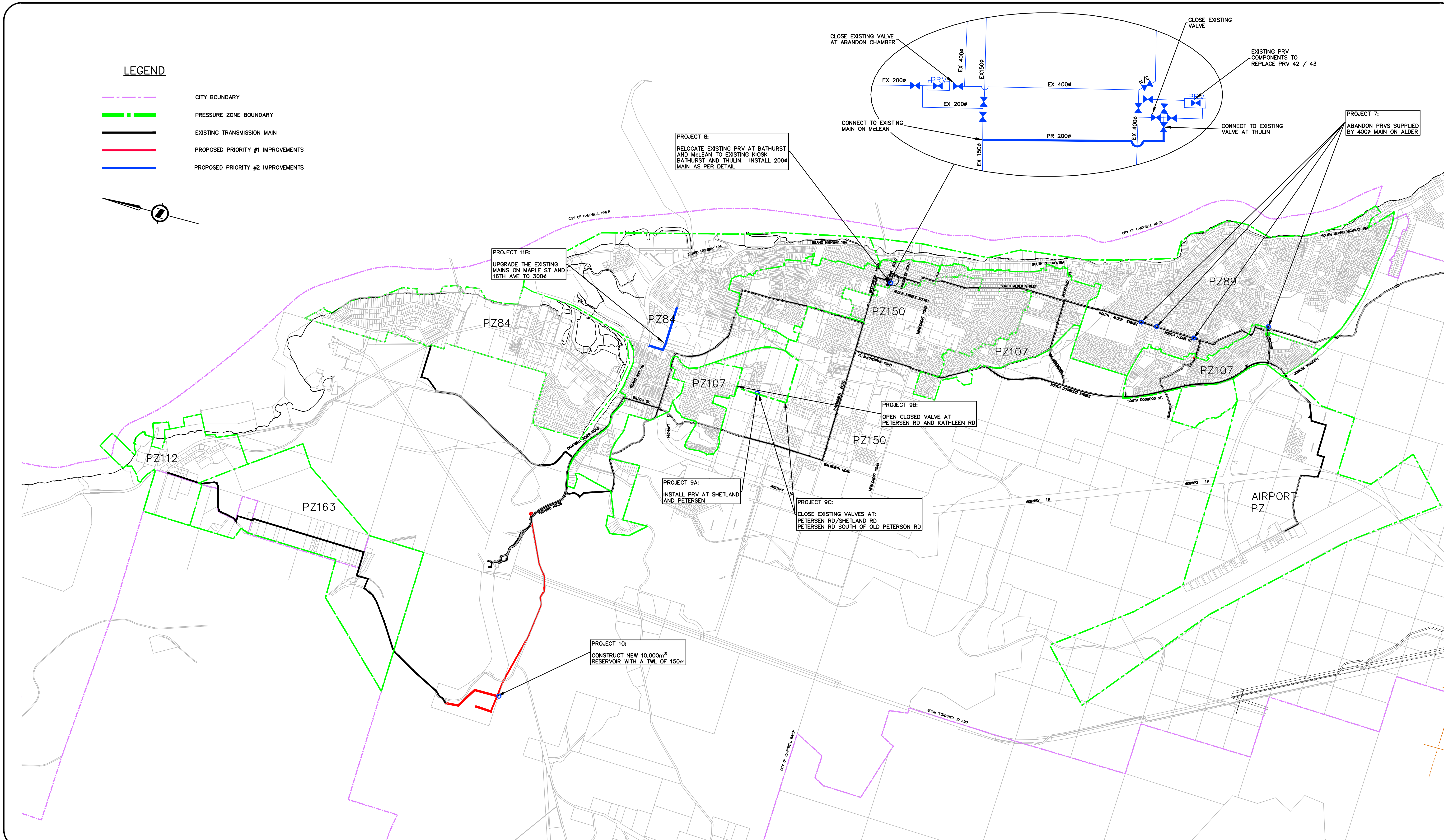
CLIENT: CITY OF CAMPBELL RIVER

PROJECT: WATER SYSTEM STRATEGIC ACTION PLAN 2016 UPDATE

TITLE: PRIORITY PROJECTS #1 SYSTEM FLOW = 50ML/d

APPROVED		SCALE	1:50,000
DATE	JUN 2016	DWG No.	FIGURE 2
JOB No.	1631		

File: H:\1002 Campbell River\1631 WSSAP Update\03 Drawings\1631-Figures REV1.dwg Plot Time: Feb 28, 2017 - 11:56am User: mbrook



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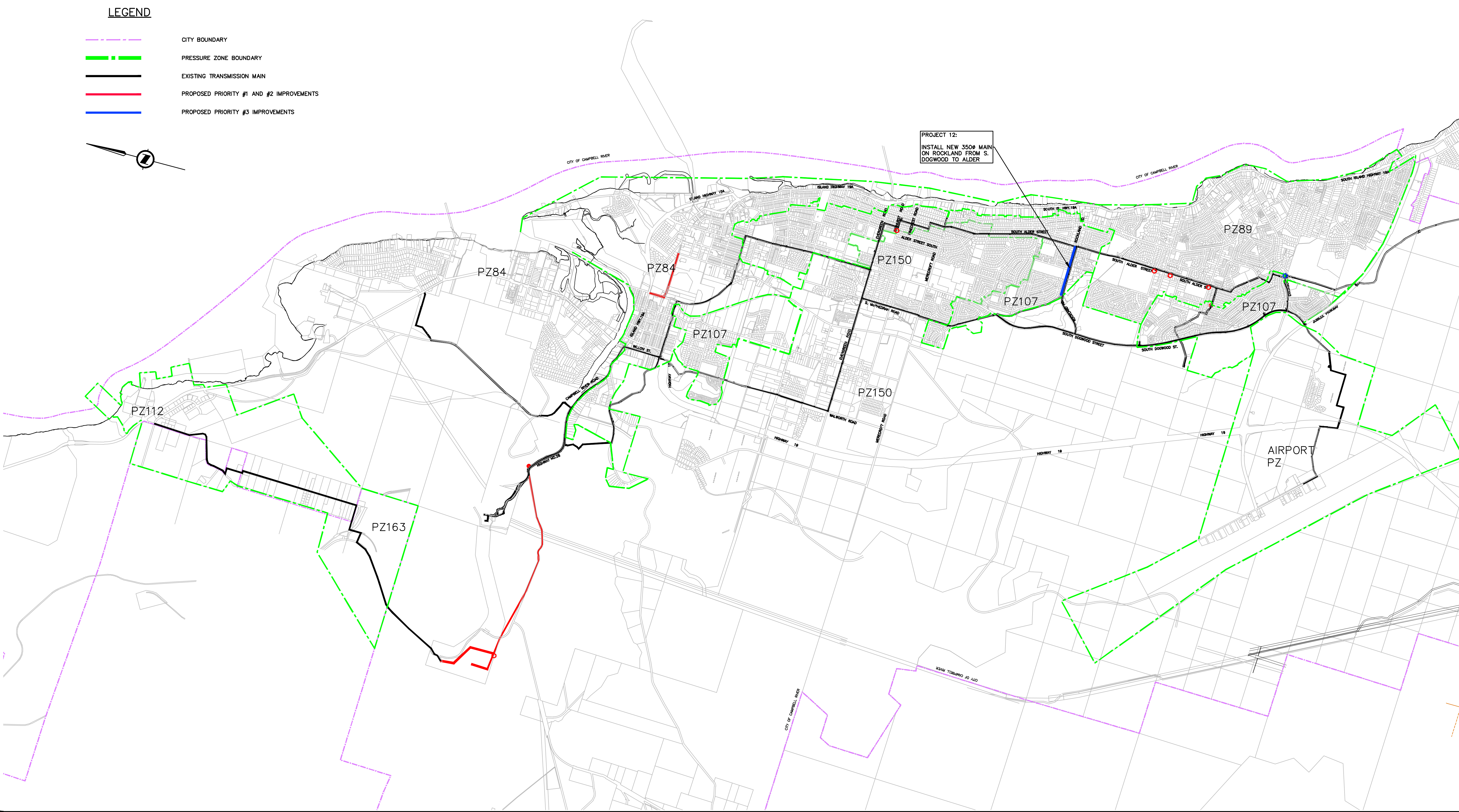
CLIENT: CITY OF CAMPBELL RIVER

PROJECT: WATER SYSTEM STRATEGIC ACTION PLAN 2016 UPDATE

TITLE: PRIORITY PROJECTS #2 SYSTEM FLOW = 55 ML/d

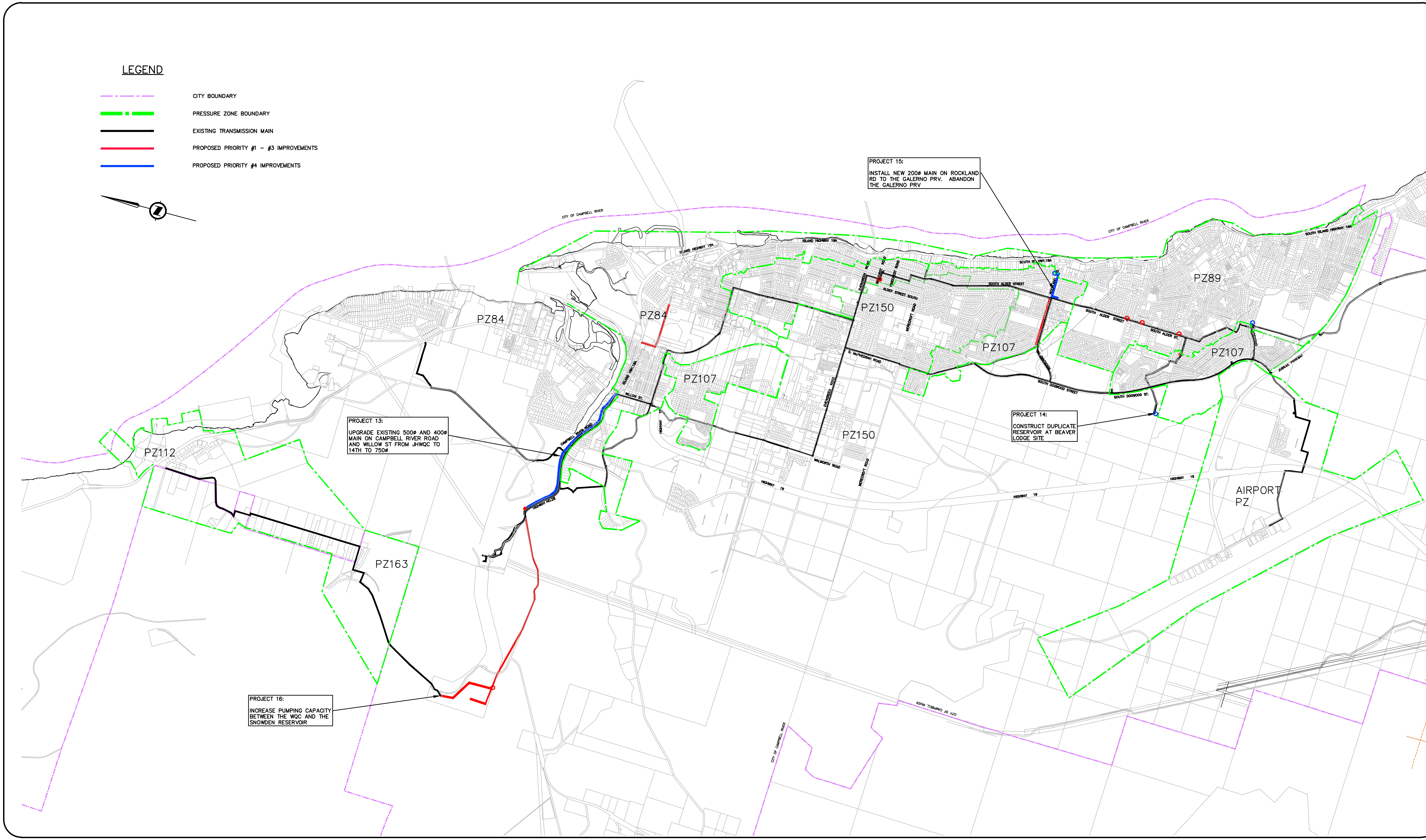
APPROVED		SCALE	1:50,000
DATE	JUN 2016	DWG No.	FIGURE 3
JOB No.	1631		



KOERS & ASSOCIATES ENGINEERING LTD.
Consulting Engineers

CLIENT	CITY OF CAMPBELL RIVER
PROJECT	WATER SYSTEM STRATEGIC ACTION PLAN 2016 UPDATE
TITLE	PRIORITY #3 PROJECTS (SYSTEM FLOW = 76.3 ML/d)
APPROVED	
DATE	JUN 2016
JOB No.	1631
SCALE	1:50,000
DWG No.	FIGURE 4

File: H:\1002 Campbell River\1631 WSSAP Update\03 Drawings\1631-Figures REV1.dwg Plot Time: Feb 28, 2017 - 11:56am User: mbrook



CLIENT CITY OF CAMPBELL RIVER

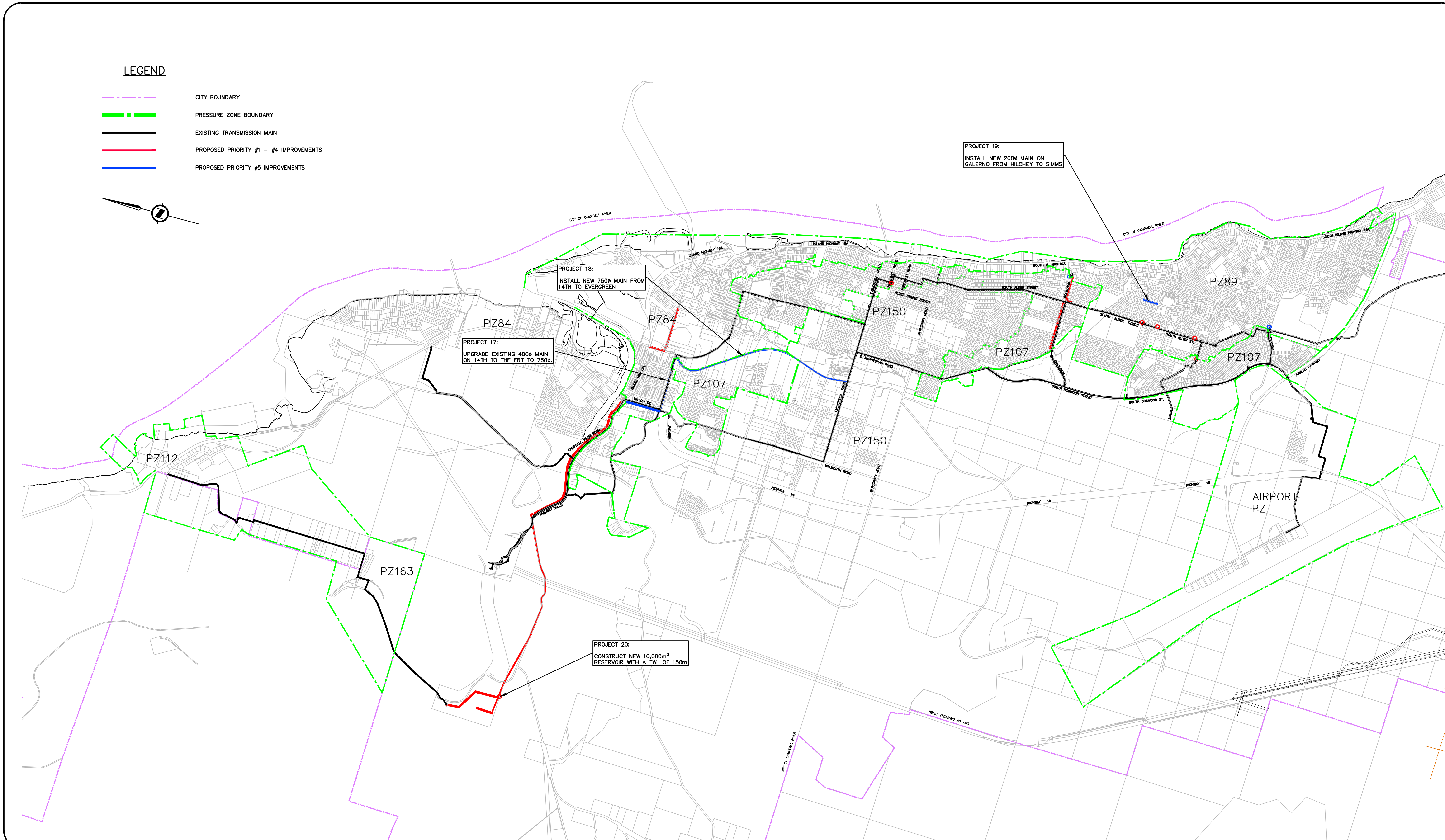
PROJECT WATER SYSTEM STRATEGIC ACTION PLAN 2016 UPDATE

KOERS & ASSOCIATES ENGINEERING LTD.
Consulting Engineers

TITLE PRIORITY #4 PROJECTS (SYSTEM DEMAND = 82.3 ML/d)

APPROVED		SCALE	1:50,000
DATE	JUN 2016	DWG No.	FIGURE 5
JOB No.	1631		

File: H:\1002 Campbell River\1631 WSSAP Update\03 Drawings\1631-Figures REV1.dwg Plot Time: Feb 28, 2017 – 11:56am User: mbrook



CLIENT

CITY OF CAMPBELL RIVER

PROJECT WATER SYSTEM STRATEGIC ACTION PLAN 2016 UPDATE

TITLE

PRIORITY #5 PROJECTS (SYSTEM DEMAND = 88.2 ML/d)

APPROVED		SCALE	1:50,000
DATE	JUN 2016	DWG No.	FIGURE 6
JOB No.	1631		

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File: H:\1002 Campbell River\1631 WSSAP Update\03 Drawings\1631–Figures REV1.dwg Plot Time: Feb 28, 2017 – 11:56am User: mbrook

LEGEND

- CITY BOUNDARY
- PRESSURE ZONE BOUNDARY
- EXISTING TRANSMISSION MAIN
- PROPOSED PRIORITY #1 – #5 IMPROVEMENTS
- PROPOSED PRIORITY #6 IMPROVEMENTS

PROJECT 22:
UPGRADE THE EXISTING 400ø MAIN ON EVERGREEN RD TO 600ø FROM S. DOGWOOD ST TO THE RESERVOIR

PROJECT 21:
INSTALL A NEW 500ø MAIN FROM EVERGREEN ROAD TO THE BEAVER LODGE RESERVOIR (FINAL ALIGNMENT TBD)

PROJECT 23:
CONSTRUCT NEW 10,000m³ RESERVOIR WITH A TWL OF 150m

PROJECT 23:
UPGRADE 200ø SUPPLY MAIN TO SNOWDEN RESERVOIR TO 300ø

PZ84
PZ84
PZ150
PZ107
PZ89
PZ107
PZ150
PZ112
PZ163
AIRPORT PZ

CITY OF CAMPBELL RIVER
ISLAND HIGHWAY 19A
SOUTH ISLAND HIGHWAY 19A
ALDER STREET SOUTH
SOUTH ALDER STREET
SOUTH DOGWOOD ST.
EVERGREEN ROAD
HERCHORT ROAD
S. HERCHORT ROAD
ROSELAND DR.
JUBILEE PARKWAY
MILLION ST.
CAMPBELL RIVER ROAD
HIGHWAY 19
ARGYLE ROAD
DOGWOOD ROAD
ALDERMONT ROAD
CITY OF CAMPBELL RIVER WATER

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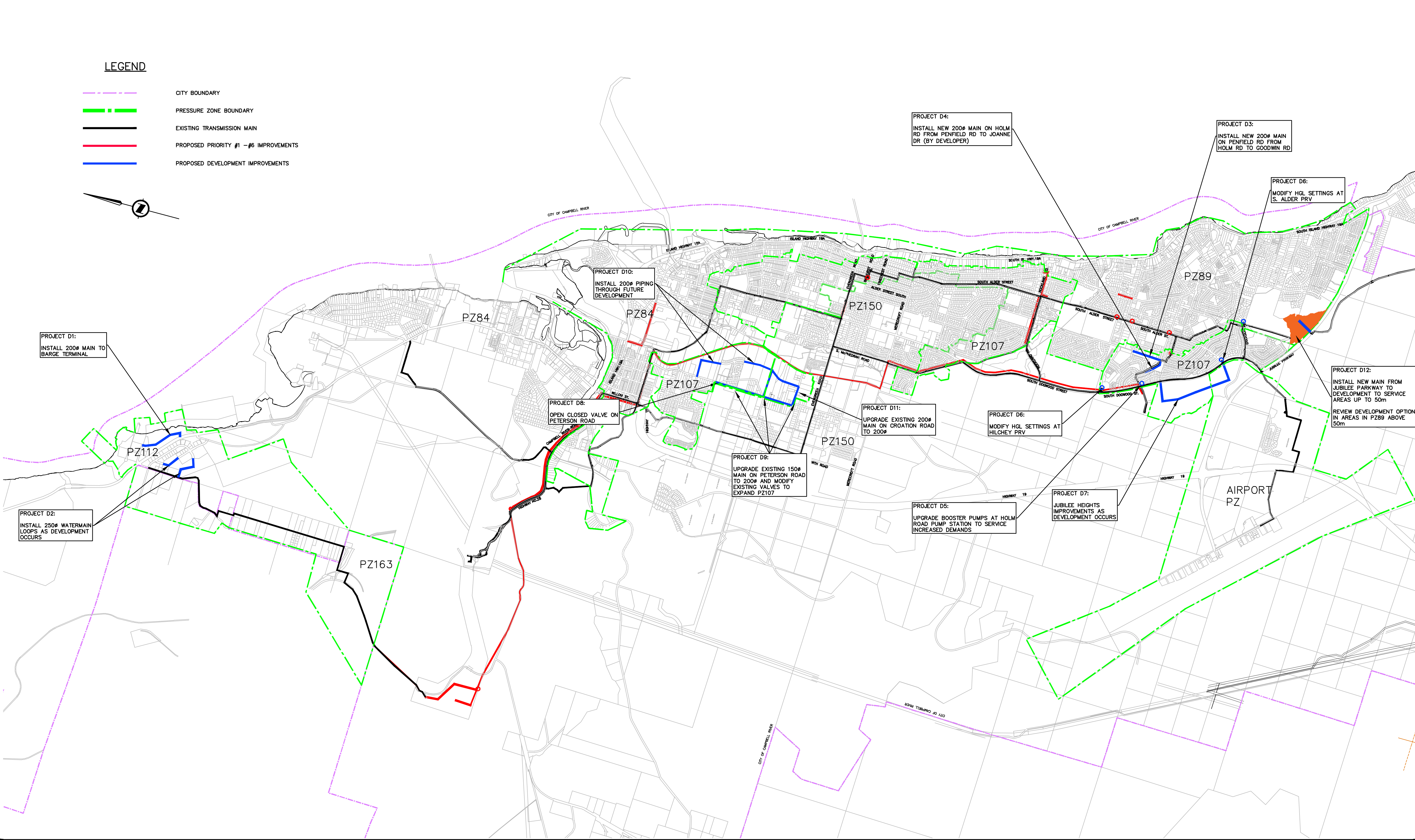
CLIENT: CITY OF CAMPBELL RIVER

PROJECT: WATER SYSTEM STRATEGIC ACTION PLAN 2016 UPDATE

TITLE: PRIORITY #6 PROJECTS (SYSTEM DEMAND = 135.7 ML/d)

APPROVED	
DATE	JUN 2016
JOB No.	1631
SCALE	1:50,000
DWG No.	FIGURE 7


LEGEND
CITY BOUNDARY
PRESSURE ZONE BOUNDARY
EXISTING TRANSMISSION MAIN
PROPOSED PRIORITY #1 - #6 IMPROVEMENTS
PROPOSED DEVELOPMENT IMPROVEMENTS
PROJECT D1:
INSTALL 200ø MAIN TO BARGE TERMINAL
PROJECT D2:
INSTALL 250ø WATERMAIN LOOPS AS DEVELOPMENT OCCURS
PROJECT D3:
INSTALL NEW 200ø MAIN ON PENFIELD RD FROM HOLM RD TO GOODWIN RD
PROJECT D4:
INSTALL NEW 200ø MAIN ON HOLM RD FROM PENFIELD RD TO JOANNE DR (BY DEVELOPER)
PROJECT D5:
UPGRADE BOOSTER PUMPS AT HOLM ROAD PUMP STATION TO SERVICE INCREASED DEMANDS
PROJECT D6:
MODIFY HGL SETTINGS AT S. ALDER PRV
PROJECT D6:
MODIFY HGL SETTINGS AT HILCHEY PRV
PROJECT D7:
JUBILEE HEIGHTS IMPROVEMENTS AS DEVELOPMENT OCCURS
PROJECT D8:
OPEN CLOSED VALVE ON PETERSON ROAD
PROJECT D9:
UPGRADE EXISTING 150ø MAIN ON PETERSON ROAD TO 200ø AND MODIFY EXISTING VALVES TO EXPAND PZ107
PROJECT D10:
INSTALL 200ø PIPING THROUGH FUTURE DEVELOPMENT
PROJECT D11:
UPGRADE EXISTING 200ø MAIN ON CROATION ROAD TO 200ø
PROJECT D12:
INSTALL NEW MAIN FROM JUBILEE PARKWAY TO DEVELOPMENT TO SERVICE AREAS UP TO 50m
REVIEW DEVELOPMENT OPTIONS IN AREAS IN PZ89 ABOVE 50m
PZ84
PZ84
PZ107
PZ107
PZ107
PZ150
PZ150
PZ89
PZ112
PZ163
AIRPORT PZ
CITY OF CAMPBELL RIVER

CLIENT CITY OF CAMPBELL RIVER

PROJECT WATER SYSTEM STRATEGIC ACTION PLAN 2016 UPDATE

KOERS & ASSOCIATES ENGINEERING LTD.
Consulting Engineers

TITLE	DEVELOPMENT PROJECTS
APPROVED	
SCALE	1:50,000
DATE	JUN 2016
JOB No.	1631
DWG No.	FIGURE 8

File: H:\1002 Campbell River\1631 WSSAP Update\03 Drawings\1631-Figures REV1.dwg Plot Time: Feb 28, 2017 - 11:57am User: mbrook

equipped with a pump station to draw water out of the lake and supply the City of Campbell River distribution system, including the north industrial area.

The supply main from the proposed WQC to the distribution system is partially constructed, with a new main installed along Highway 28 from the JHWQC to the proposed WQC site. The supply main consists of 1,000 mm and 1,200 mm dia. steel watermain.

The high point of the watermain is located on Brewster Lake Road near the intersection of Highway 28. The invert elevation of the watermain at this location is 145.08m, which is above the normal water level of 139 m at the John Hart Lake. In order to maintain a minimum pressure in the supply main, a pump station and surge tank with a top water level of 150 m will be required at the WQC site as detailed in Technical Memorandum 1631-161-REV 1 in **Appendix D**.

As a result of the planned temporary lowering John Hart Lake, the City has elected to install a new submerged supply main from the WQC to the John Hart Pump Station servicing the industrial park water system.

Listed below is a summary of the proposed improvements.

Improvements:

A) Complete the installation of the new supply main on Highway 28 and construction of the intake and WQC
B) Construct a new surge tank at the WQC site with a minimum top water level of 150 m.
C) Install a new 200 mm dia. submerged supply main to the John Hart Pump Station wet well.

Project #2: Upgrade Existing John Hart Pump Station

The John Hart Pump Station will require upgrades to suit the new submerged supply main from the WQC. This project will involve upgrading the existing wet well to suit the new 200 mm dia. supply main, modifications to the electrical and control system, and abandoning the existing lake intake.

Improvements:

A) Upgrade the existing John Hart Pump Station and wet well to suit the new supply main.

Project #3: Modify Evergreen Pump Station

As a result of the increase in the system HGL the existing pump station at Evergreen Reservoir should be modified such that the pump station only operates if the outlet pressure at the pump station drops below a specified pressure. This will limit the pump station operation to periods of heavy demand such as peak hour demands or fire flow conditions.

In addition the following existing closed valves should be opened to merge PZ 145 and PZ 150:

- S. Dogwood Street & Pinecrest Road
- S. Dogwood Street & Merecroft Road
- S. Dogwood Street & Cortez Road
- S. Alder Street and Robron Road
- S. Alder Street and Niluht Road
- 308 South Thulin Street

Improvements:

A) Modify the Evergreen Pump Station to turn on if the outlet pressure drops below 70 psi and open the existing closed valves noted above to merge pressure zone 145 and 150

Project #4: Complete the SCADA installation at the New Rockland and Alder PRV Station

The new PRV station at Rockland and Alder was installed in 2013, as per the recommendations of the 2012 WSSAP Study. At the time of construction the City's SCADA system was not able to accommodate any additional inputs and the station has been operating as a pressure reducing station only. In order to fully utilize the PRV station, SCADA is required to allow the station to operate as an altitude valve for the Beaver Lodge Reservoir.

Improvements:

A) Install SCADA at the Rockland and Alder PRV station.

Project #5: Upgrade the Willow PRV Station

The existing Willow PRV Station is aging and nearing the end of its design life and requires replacement due to the condition of the components and the increased upstream pressure at the station. It is recommended that this PRV station be replaced with a new above grade installation similar to the Rockland and Alder PRV Station. The new station should be designed such that the downstream pressure setting is controlled by the top water level in the Evergreen Reservoir. The PRV will have two pressure settings, one at 78 m, when the reservoir is full, and a second at 90 m when the reservoir reaches an adjustable user set point. This new control feature will provide a secondary supply to the Evergreen Reservoir and reduce the flows in the existing 400 mm dia. supply main on Evergreen Road between S. Dogwood and the Reservoir. Modifications will be required at the Evergreen Reservoir site to allow flow from the Willow PRV station to the fill the reservoir.

Improvements:

A) Upgrade the existing Willow PRV station to include controls to act as a second fill to the Evergreen Reservoir

B) Install modifications at the Evergreen Reservoir to allow flow into the reservoir from the Willow PRV.

Project #6: Install new Valve on 500 mm dia. Supply Main on Highway 28

In order to facilitate the commissioning of the new WQC an isolation valve is required on the 500 mm dia. supply main on Highway 28 near the logging bridge at Detweiler Road to isolate the supply main while maintaining supply to the distribution system through the existing 250 mm dia. main.

Improvements:

A) Install a new valve on the 500 mm dia. supply main on Highway 28.

4.5.2 Priority #2 Projects

The Priority #2 improvement projects are required to address existing system deficiencies that can be deferred until the new WQC is completed. These projects are listed below and shown in **Figure 3**:

Project #7: Abandon PRVs on South Alder Road south of PRV #60/61

Once the SCADA improvements at the new PRV station at Rockland and Alder are installed the existing PRV stations located on South Alder Road downstream of the PRV station can be abandoned. It is recommended that the following items be completed at each PRV station to complete the station abandonment:

- Remove the main PRV and install a spool piece.
- Remove bypass PRV and piping
- Remove air valves, pressure gauges, hose bids and other ancillary components and plug outlets.
- Fill chamber with pea gravel and remove the chamber access.

Improvements:

A) Abandon PRV stations Parkway/Alder (#15/16), Alder/Goodwin (#17/18), Erickson/Hudson (#25/26), Holm/Alder (#31/32), and Georgia (#33/34)

Project #8: Relocate the Existing PRV at Bathurst and McLean

The existing PRV at Bathurst Road and McLean Street (PRV Station 42/43) is aging and nearing the end of its service life. The functionality of PRV Station 56/57 can be relocated to the existing above ground kiosk at the intersection of Bathurst Road and Thulin Street. It is recommended that the existing below ground PRV Station 42/43 be abandoned and a new 200 mm dia. watermain be installed on Bathurst Road from Thulin Street to McLean Street to connect PRV Station 56/57 to the 107 m pressure zone.

Improvements:

A) Abandon the existing below ground PRV station at Bathurst Road and McLean Street.

B) Install a new 200 mm dia. watermain on Bathurst Road from PRV Station 56/57 to McLean Street to service the 107 m pressure zone.

Project #9: Install PRV at Petersen and Shetland Road.

The 107 m pressure zone located near Highway 19 is currently supplied by only one PRV station, the Cheviot PRV station (#27/28). For redundancy purposes another PRV station should be installed at the intersection of Petersen Road and Shetland Road to provide a secondary supply to the pressure zone in the event that the Cheviot PRV station is unable to supply the required flows, due to mechanical failure or scheduled maintenance. This PRV location will also allow the Petersen Road Area to be serviced by the 107 m pressure zone and will reduce the service pressures below 150 psi. In order to extend the 107 m pressure zone the existing closed valve on Petersen Road at Kathleen Road will be opened. The existing valves at the intersection of Shetland Road and Petersen Road and the line valve on Petersen Road south of Old Petersen Road will be closed.

Improvements:

A) Install a new PRV at Petersen/Shetland to service Pressure Zone 107 and provide a secondary supply to this pressure zone.
B) Open the existing valve on Petersen Road at Kathleen Road.
C) Close the existing valves on Shetland Road and the line valve south of Old Petersen Road.
D) Abandon the duplicate 100 mm dia. watermain on Shetland Road.

Project #10: Install a New Storage Reservoir and Associated Piping at the WQC Site to Provide the Required Emergency and Fire Flow Storage.

Storage is required to provide the service areas with balancing and fire storage. The improvement described below provides this storage in the 150 m and 107 m pressure zones. Sizing of the reservoir is discussed in Section 4.

Improvements:

A) Construct a reservoir at the WQC site with a volume of 10,000 m^3.

Project #11: Distribution Mains through Reserve Lands

There is a section of the distribution piping Pressure Zone 84 that is looped through the Campbell River First Nations Reserve (CRIB) in the downtown area. The City is in the process of reviewing options to separate the City's water system from the CRIB, to reduce the risk of water quality issues between the two systems. The final scope of this project has not been defined; however it should include the installation of a new 300 mm dia. watermain on Maple Road and 16th Avenue to Ironwood Street to replace the sections of the existing City piping through the CRIB lands.

Improvement:

A) Separation of City and CRIB water systems to be determined.
B) Install 300 mm dia. mains on Maple Road and 16th Avenue from Highway 19A to Ironwood Street.

4.5.3 Priority #3 Projects

The Priority #3 improvement projects required to service a system peak day flow of 76.3 ML/d are

listed below and shown in **Figure 4:**

Project #12: Duplicate 350 mm dia. Main on Rockland Rd

The velocities in the existing transmission main will create high pressure losses in the existing 250 mm dia. main on Rockland Road from S. Dogwood Street to S. Alder Street. In order to maintain the required inlet pressure at the Rockland PRV Station 11/12 (supply to PZone 107) a new duplicate main is required. When the inlet pressure at PRV Station 11/12 drops below 85 psi (approximately 107 m HGL) the following upgrade is require:

Improvements:

A) Install a duplicate 350 mm dia. watermain on Rockland Road from S. Dogwood Street to South Alder Street.

4.5.4 Priority #4 Projects

The Priority #4 improvement projects required to service a system peak day flow of 82.3 ML/d are listed below and shown in **Figure 5**:

Project #13: Duplicate 750 mm dia. Transmission Main.

The velocities in the existing transmission mains will create high pressure losses. In order to maintain the required pressures in the distribution network and along S. Dowgood Street, a secondary 750 mm dia. supply main is required as described below.

Improvements:

A) Replace the existing 400 mm and 500 mm dia. watermains on Campbell River Road and Willow Street from the JHWQC to 14th Avenue with a 750 mm dia. watermain.

Project #14: Improve Peaking and Fire Storage in the South End of Campbell River

The current storage at the Beaver Lodge reservoir site is not sufficient to meet the peaking and fire flow storage requirements in the South End of Campbell River. The improvements described below provides for this storage in the 89 m pressure zone. Sizing of the reservoirs is discussed in Section 4.

Improvements:

A) Construct a duplicate reservoir at the Beaver Lodge site with a volume of 5,500 m^3.

Project #15: Improve Fire Flows and Residual Pressures in Pressure Zone 89

Modeling identified fire flow deficiencies in pressure zone 89 on Highway 19A. The improvements described below will improve fire protection in this area, and eliminate a PRV Station.

Improvements:

A) Install a 200 mm dia. main on Rockland Road from the downstream side of the new Rockland/Alder PRV Station to the downstream side of the Galerno PRV station (13/14).

B) Abandon the Galerno PRV station (13/14).

Project #16: Improve Flows to Snowden Reservoir

The proposed 200 mm dia. submarine pipeline from the WQC to the John Hart Pump Station has a capacity of approximately 49 lps. As the flows in the industrial park water service increase as development occurs, improvements will be required to provide the required flows from the WQC to the Snowden Reservoir.

Improvements:

A) Increase the pumping capacity between the WQC and the Snowden Reservoir. New pumps will be required to deliver the ultimate build out flows to the industrial park. Based on the model results the pump station will require a discharge HGL of 246 m to deliver a maximum flow of 94 lps (3.0 m/s capacity of the 200 mm dia. watermain) from the surge tank to the Snowden Reservoir.

4.5.5 Priority #5 Projects

The Priority #5 improvement projects required to service a system peak day flow of 88.2 ML/d are listed below and shown in **Figure 6**:

Project #17 & 18: Duplicate 750 mm dia. Transmission Main

The velocities in the existing transmission mains will create high pressure losses and duplicate mains are required as described below.

Improvements:

Project #17

A) Upgrade the existing 400 mm on 14th Avenue from Willow Street to Elk River Timber Road to 750 mm dia.

Project #18

A) Install a new 750 mm dia. main on Elk River Timber Road from 14th Avenue to Evergreen Road.

Project #19: Improve Fire Flows in Pressure Zones 89

Further modelling identified high velocities and pressure losses in the distribution system, creating low pressures and fire flow concerns.

Improvements:

A) Install a 200 mm dia. main on Galerno Road from Hilchey Road to Simms Road.

Project #20: Additional Storage at the WQC Site

Additional storage is required to service the system flows of 88.2 ML/d, it is recommended that additional storage be installed at the WQC site.

Improvements:

A) Construct an additional reservoir at the WQC site with a volume of 10,000 m^3. The reservoir should be designed to allow for future expansion under build out conditions. For reservoir sizing criteria please refer to Section 5.

4.5.6 Priority #6 Projects

The required Priority #6 improvement projects required to service a system peak day flow of 135.7 ML/d (build out) are listed below and shown in **Figure 7**:

Project #21: Duplicate Transmission Main to Beaver Lodge Reservoir

In order to maintain the required HGL upstream of the Hilchey PRV Station the existing 600 mm dia. and 450 mm dia. main from Evergreen Road to the Beaver Lodge Reservoir will need to be duplicated.

Improvement:

A) Install a 500 mm dia. main from Evergreen Road/ERT to the Beaver Lodge Reservoir inlet.

Project #22: Upgrade 400 mm dia. Main on Evergreen Road

The velocities in the existing transmission main will create high pressure losses in the existing 400 mm dia. main on Evergreen Road from South Dogwood Street to the Evergreen Reservoir site and upgrading will be required.

Improvement:

A) Install a 600 mm dia. main on the Evergreen Road from South Dogwood Street to the Evergreen Reservoir site to replace the existing 400 mm dia. main.

Project #23: Upgrade 200 mm dia. supply main to Snowden Reservoir

The velocities in the existing transmission main will be creating high pressure losses in the existing 200 mm dia. main to the Snowden Reservoir site and upgrading the main will be required.

Improvement:

A) Install a 300 mm dia. main from the John Hart Pump Station to the Snowden Reservoir site.

Project #24: Additional Storage at the WQC Site

Additional storage is required to service the Build Out population, it is recommended that additional storage be installed at the WQC site.

Improvement:

A) Construct a 10,000 m^3 reservoir expansion at the proposed reservoir near the WQC. For reservoir sizing criteria please refer to Section 5.

4.5.7 Development Projects

The required development specific improvement projects required are listed below and shown in **Figure 8**:

Project #D1 & D2: Improve Fire Flows in Industrial Park

Modelling indicates limited ability to supply fire flows in areas of the Industrial Park north of Duncan Bay Road near the Barge Terminal. Listed below are the proposed improvements to address the fire flow concerns as development in the area continues.

Improvements:

D1: Install a new 200 mm dia. watermain loop to the Barge Terminal from Middle Point Drive

D2: Install new 250 mm dia. watermains on Menzies Way and Middle Point Drive and development occurs in the area.

Project #D3 to D7: Improvements for Jubilee Heights Development Area

In order to service the proposed Jubilee Height development, which is located adjacent to the Dogwood supply main between, the Jubilee Parkway and the Beaver Lodge Reservoir, a new supply main will need to be installed through the development. The proposed supply main will be connected to the 450 mm dia. supply main on South Dogwood Street. In order to service the proposed development and minimize the amount of pumped flow through the South Alder PRV Station the following improvements are required:

Improvements:

D3: Install a new 200 mm dia. main on Penfield Road from Holm Road to Goodwin Road.

D4: Install a new 200 mm dia. main on Holm Road from Penfield Road to Joanne Drive. This project is to be completed as development occurs. Project D3 and D4 are not required to service the Jubilee Heights development, however the additional watermain looping will delay the timing of project D5.

D5: Upgrade the existing Holm Road pump station to service the increased demands in the Jubliee Heights development.

D6: Decrease the HGL setting of the main at the existing South Alder PRV station to 100 m in order to maintain the required fire flows in the 107 m pressure zone. The HGL setting of the smaller PRV should be reduced to 105/104 m to maintain minimal domestic flows (+/- 1 lps) in order to maintain water quality in the 200 mm dia main. Increase the HGL setting of the small Hilchey PRV to 110 m and increase the HGL setting of the main PRV to 107 m.

D7: Install the required domestic piping through the proposed Jubilee Heights subdivision with connections to the existing main on South Dogwood. The proposed watermains should be sized to provide the required domestic and design fire flows.

Project #D8 to D11: Future Development in Petersen Road area

As future development in this area it is recommended that the pressure zone boundary be modified such that PZ107 is the supply to this area. In order to achieve the revised pressure zone boundary the following improvements are required:

Improvements:

- D8: Open closed valve on Petersen Road
- D9: Upgrade the existing 150 mm dia. watermain on Petersen Road from Kathleen Road to Croatian Road to 200 mm dia. and modify the existing valves at the following intersections:
  - Open the existing valve on Petersen Road south of Old Petersen Road.
  - Close the existing valve Petersen Road and Willis Road
  - Close the exiting valve Petersen Road and Croatian Road
- D10: Install new 200 mm dia. piping through the proposed development.
- D11: Upgrade the existing 100 mm dia. watermain on Croatian Road to 200 mm dia.

Project #D12: Future Development in South Campbell River

There is a localized high point in the undeveloped lands east of Willow Creek in the 89 m Pressure Zone. During 2041 conditions the water modelling, results indicate that the areas over the elevation of 46 m will experience peak hour pressures less than 300 kPa (44 psi). In order to increase the available pressure in this area, a new watermain connection to the existing 400 mm dia. watermain on the Jubilee Parkway is required. The proposed watermain loop will allow a maximum elevation of approximately 50 m to be serviced with the required 300 kPa peak hour pressure.

A strata development with a local private pump station may be required to provide the required residual pressure in areas above the 50 m contour. It is recommended that developments with elevations greater than 50 m be reviewed on a case by case basis.

4.5.8 Distribution System Improvements

It should be noted that this report does not include a comprehensive review of the City's distribution system. However, based on a high level review of the distribution network there are several locations where there are fire hydrants supplied by 100 mm dia. watermains. The 100 mm dia. piping does not indicate that the available fire flows are not available, however this type of installation is not ideal or as per industry standard due to the high velocities that are development in the 100 mm dia. piping under high flow conditions.

In order to improve the fire flows in these areas the existing 100 mm dia. watermains should be upgraded to 150 mm dia. at a minimum.

These locations are:

- Rainbow Road
- Chum Road
- Alpine Road
- Victoria Crescent
- Hopton Road
- Old Petersen Road
- Painter Road
- Garfield Road
- Perkins Road
- Colwyn Street from 5th Avenue to 7th Avenue
- Thulin Street from 2nd Avenue to 4th Avenue
- Thulin Street from Evergreen Road to Bathurst Road
- Westmore Road
- Northmore Road
- Kathleen Road
- Margueritte Road
- Effie Joy Road
- Holmstrom Road

The above noted projects should be included in the City's capital plan for distribution system improvements to be coordinated with end of service life replacement or part of a larger upgrade/renewal project in the area.

4.5.9 PRV Station Improvements

Based on further modeling and analysis of the available fire flows and the peak hour residual pressures with the various improvements, it has been determined that several PRVs can be removed from the water distribution system to reduce operation and maintenance costs, while maintaining the required fire flows and minimum pressure requirements.

The abandoned PRV stations fall into two categories. The first category is that the PRV is no longer required, as the pressure reduction across the valve has been eliminated. These PRV stations will be considered as a flow through site and the existing PRV can be removed and replaced with a spool piece or as an alternative a bypass pipe can be installed and the existing PRV chamber and components can be removed.

The second category is that the PRV is not required at the current location, due to the presence of other PRVs in the area or local piping improvements, but the pressure zone boundary is still required. Under this scenario the existing isolation valves at the PRV chamber would be closed and the PRV removed to maintain the pressure zone boundary. **Table 9** summarizes the PRV stations that will be bypassed, the stations that will be closed to form zone boundaries and the scheduled year that they could be removed.

Table 9: PRV Removal Summary

PRV to be Removed	Type of Abandonment	Earliest Year to be Removed
9th/Homewood (23/24)	Closed	2017
Parkway/Alder (15/16)	Bypassed	2017
Alder/Goodwin (17/18)	Bypassed	2017
Erickson/Hudson (25/26)	Bypassed	2017
Holm/Alder (31/32)	Bypassed	2017
Georgia (33/34)	Closed	2017
Carnegie/Merecroft (38/39)	Closed	2017
Galerno (13/14)	Closed	2031

4.6 Project Scheduling

The scheduling for the projects listed in this report assume that the per capita demands will remain constant throughout the population growth of the Campbell River water service area. A reduction of the residential per capita demands through conservation programs could greatly influence the scheduling of the proposed improvements. **Table 10** shows the peak day residential demands for the Campbell River water system at the current design standards (2100 lpcd), the per capita demands listed in Section 2 of this report (1685 lpcd), as well as per capita demands with a reduction of 5%, 10% and 25% through conservation programs.

Table 10: Peak Day Residential Demands with Conservation

		Peak Day Demands (ML/d)				
Year	Population	2100 (lpcd)	1685 (lpcd)	1600 (5%) (lpcd)	1515 (10%) (lpcd)	1265 (25%) (lpcd)
2017	36,585	76.8	61.6	58.5	55.4	46.3
2018	36,851	77.4	62.1	59.0	55.8	46.6
2019	37,120	78.0	62.5	59.4	56.2	47.0
2020	37,390	78.5	63.0	59.8	56.6	47.3
2021	37,669	79.1	63.5	60.3	57.1	47.7
2022	37,943	79.7	63.9	60.7	57.5	48.0
2023	38,219	80.3	64.4	61.2	57.9	48.3
2024	38,498	80.8	64.9	61.6	58.3	48.7
2025	38,778	81.4	65.3	62.0	58.7	49.1
2026	39,061	82.0	65.8	62.5	59.2	49.4
2027	39,345	82.6	66.3	63.0	59.6	49.8
2028	39,632	83.2	66.8	63.4	60.0	50.1
2029	39,921	83.8	67.3	63.9	60.5	50.5
2030	40,212	84.4	67.8	64.3	60.9	50.9
2031	40,516	85.1	68.3	64.8	61.4	51.3
2032	40,812	85.7	68.8	65.3	61.8	51.6
2033	41,109	86.3	69.3	65.8	62.3	52.0

		Peak Day Demands (ML/d)				
Year	Population	2100 (lpcd)	1685 (lpcd)	1600 (5%) (lpcd)	1515 (10%) (lpcd)	1265 (25%) (lpcd)
2034	41,378	86.9	69.7	66.2	62.7	52.3
2035	41,639	87.4	70.2	66.6	63.1	52.7
2036	41,902	88.0	70.6	67.0	63.5	53.0
2037	42,167	88.6	71.1	67.5	63.9	53.3
2038	42,435	89.1	71.5	67.9	64.3	53.7
2039	42,703	89.7	72.0	68.3	64.7	54.0
2040	42,974	90.2	72.4	68.8	65.1	54.4
2041	43,234	90.8	72.8	69.2	65.5	54.7

As shown in the above table if the existing per capita demands were at the levels listed in the City of Campbell River engineering standards and specifications, the existing transmission systems would not be able to service the current population. A reduction in the residential per capita demands from 1,685 lpcd to 1600 lpcd (5% reduction) would result in ability to delay the required projects by approximately seven years. By further reducing the residential per capita demand to 1265 lpcd (25% reduction) the required upgrading projects could be delayed beyond 2041.

5 RESERVOIRS

5.1 Sizing Design Standard

The projected volume for required system storage was calculated using the following formula as listed in the Master Municipal Construction Documents Design Guideline Manual:
Volume (V) = A + B + C

Where: A = Fire Storage
B = Equalization (Peaking) Storage (25% of Peak Day Demands)
C = Emergency Storage (25% of A + B)

Given the reliability of the source and the presence of other reservoirs in the system, the emergency volume component (C) can be eliminated. In order to determine the equalization (peaking) storage requirements for each reservoir the 2041 (system flow = 88.2 ML/d) and build-out maximum day outflows from each reservoir were modeled. The results are summarized in **Table 11 and 12:**

Table 11: 2041 Storage Requirements

Reservoir	Storage Volume				
	Required (m^3)			Existing + Proposed Storage (m^3)	Shortfall (m^3)
	Equalization	Fire Flow	Total		
Evergreen	1,361 (1)	2,880 (5)	4,241	5,000	-759
Beaver Lodge	5,292 (2)	4,320 (6)	9,612	10,700 (8)	-1,088
Snowden	1,534 (3)	1,080 (7)	2,614	1,000	1,614
Future Reservoir	16,092 (4)	4,320 (6)	20,412	10,000 (9)	10,412
Total	**22,745**	**11,520**	**36,879**	**25,700**	**10,179**

(1) Based on a 2041 Maximum Day outflow of 63 lps at the reservoir

(2) Based on a 2041 Maximum Day outflow of 245 lps at the reservoir

(3) Based on a 2041 Maximum Day outflow of 71 lps at the reservoir

(4) Based on a 2041 Maximum Day outflow of 745 lps at the reservoir

(5) Based on a 200 lps fire flow for 4 hours. This assumed that 2/3 of a 300 lps fire flow would be supplied by the Evergreen Reservoir with the remaining amount supplied by the future reservoir.

(6) Based on a 300 lps fire flow for 4 hours

(7) Based on a 150 lps fire flow for 2 hours

(8) Beaver Lodge duplication scheduled for system flow of 82.3 ML/d

(9) Future reservoir at WQC site scheduled under Priority No. 2 projects

Table 12: Build Out Storage Requirements

Reservoir	Storage Volume				
	Required (m^3)			Existing + Proposed 2041 Storage (m^3)	Shortfall (m^3)
	Equalization	Fire Flow	Total		
Evergreen	1,750 (1)	2,880 (5)	4,630	5,000	-370
Beaver Lodge	6,372 (2)	4,320 (6)	10,692	10,700	-8
Snowden	1,534 (3)	1,080 (7)	2,614	1,000	1,614
Future Reservoir	25,034 (4)	4,320 (6)	29,354	20,000	9,354
Total	**33,156**	**11,520**	**47,290**	**36,700**	**10,590**

(1) Based on a Maximum Day outflow of 81 lps at the reservoir

(2) Based on a Maximum Day outflow of 295 lps at the reservoir

(3) Based on a Maximum Day outflow of 71 lps at the reservoir

(4) Based on a Maximum Day outflow of 1,159 lps at the reservoir

(5) Based on a 200 lps fire flow for 4 hours. This assumed that 2/3 of a 300 lps fire flow would be supplied by the Evergreen Reservoir with the remaining amount supplied by the future reservoir.

(6) Based on a 300 lps fire flow for 4 hours

(7) Based on a 150 lps fire flow for 2 hours

For the purposes of this report it is recommended that a future reservoir with a storage volume of 10,000 m^3 is constructed at the WQC due to limitations of the site. The proposed reservoir location and top water level are detailed in TM 1631-161 (see Appendix C) and will supplement the volume of storage in the surge tank. Allowances for an additional 20,000 m^3 reservoir at the WQC has been made, with 10,000 m^3 to be constructed prior to 2041 (system flow = 88.2 ML/d) and the remaining 10,000 m^3 to be constructed prior to build out. In order to construct an additional reservoir at the WQC site additional land will be required.

Additional storage will be required at the Beaver Lodge Reservoir to provide peaking storage during a fire flow event. As there is a current shortfall in the available storage peaking flows under fire flow conditions will be supplied by the PRVs and check valve supplying the 89 m pressure zone until the additional storage is constructed.

As the Industrial Park system will be supplied by the proposed future reservoir at the WQC site the additional storage at the Snowden site is not required, provided the John Hart Pump Station and supply main has a capacity of 94 lps in order to transfer flow to the reservoir.

6 Cost Estimates

The estimates are Class 'D' (feasibility study) made without preliminary design input and include the following allowance in accordance with the City of Campbell River Capital Project Management Policy:

- 30% general contingency allowance
- 30% allowance for engineering, legal, construction, financial and administration costs
- 25% contingency allowance for inflation

The estimates are derived from our in-house construction cost data from similar watermain projects in the mid Vancouver Island Area and are in 2016 dollars and are exclusive of GST.

Table 13: Cost Estimates

Priority	PDD (ML/d)	#	Project Description	Length (m)	Cost
1	±50	1A	New Intake, Water Treatment Plant and Supply Main at John Hart Lake		TBD By Stantec
1	±50	1B	New Surge Tank at John Hart Lake Water Treatment Plant		TBD By Stantec
1	±50	1C	New 200 mm dia. supply main to Jonh Hart Pump Station intake		TBD By Stantec
1	±50	2	Upgrade the existing John Hart pump station to suit new supply from Water Treatment Plant		$215,000
1	±50	3	Modify Control Logic at Evergreen Pump Station		$30,000
1	±50	4	Install SCADA at Rockland/Alder PRV Station		$30,000
1	±50	5	Upgrade the Willow PRV station		$510,000
1	±50	6	Install a new valve on the 500 mm dia. main at Highway 28 and the logging bridge		$115,000
Sub Total Priority 1 Projects					**$900,000**
2	±55	7	Abandon PRVs supplied by the 400 mm dia. main on Alder (4 Locations)		$45,000
2	±55	8	Relocate PRV 42/43 to the above ground kiosk at Bathurst/Thulin and install 200 mm dia. interconnection main		$195,000
2	±55	9	Install PRV at Shetland and Petersen		$225,000
2	±55	10	Construct 10,000 m^3 reservoir at WQC site		$6,500,000
2	±55	11A	Separate City of Campbell River and CRIB water systems		TBD
2	±55	11B	Install a 300 mm dia. main on Maple Road and 16th Avenue from Highway 19A to Ironwood Street	830	$1,155,000
Sub Total Priority 2 Projects					**$8,120,000**

Table 13: Cost Estimates

Priority	PDD (ML/d)	#	Project Description	Length (m)	Cost
3	76.3	12	Install duplicate 350 mm dia main on Rockland from S. Dogwood to Alder	700	$975,000
				Sub Total Priority 3 Projects	**$975,000**
4	82.3	13	Upgrade existing 500 mm dia. and 400 mm dia. watermains to 750 mm dia. from the JHWQC to 14th Avenue.	2,650	$5,900,000
4	82.3	14	Install duplicate Beaver Lodge Reservoir		$3,600,000
4	82.3	15	Install a 200 mm dia. main on Rockland Road from the downstream side of the Rockland/South Alder PRV to the downstream side of the Galerno PRV station.	450	$460,000
4	82.3	16	Increase the pumping capacity between the WQC and Snowden Reservoir		$1,300,000
				Sub Total Priority 4 Projects	**$11,260,000**
5	88.2	17	Replace existing 400 mm dia. watermain on 14th Ave from Willow to ERT with 750 mm dia.	600	$1,335,000
5	88.2	18	Install new 750 mm dia. watermain on ERT from 14th to Evergreen Road	2,750	$6,105,000
5	88.2	19	Install a 200 mm dia. main on Galerno Road from Hilchey Road to Simms Road.	250	$255,000
5	88.2	20	Install a new 10,000 m^3 reservoir cell on at WQC		$6,500,000
				Sub Total Priority 5 Projects	**$14,195,000**
6	135.7	21	500 mm dia. supply main to Beaver Lodge	4,500	$7,910,000
6	135.7	22	Replace the existing 400 mm dia. main on Evergreen Rd to 600 mm dia from S. Dogwood St to the reservoir	275	$560,000
6	135.7	23	Replace the 200 mm dia supply main with 300 mm dia. main from pump station to Snowden Reservoir	850	$1,180,000
6	135.7	24	Install a new 10,000 m^3 reservoir cell on at WQC		$6,500,000
				Sub Total Priority 6 Projects	**$16,150,000**
TBD	N/A	D-1	Industrial Park Upgrades: 200 mm dia. main to Barge Terminal Road	540	TBD
TBD	N/A	D-2	Industrial Park Upgrades: 250 mm dia mains on Menzies Way and Middle Point Dr	600	TBD
TBD	N/A	D-3	Install 200 mm dia. main on Penfield from Holm to Goodwin	400	TBD
TBD	N/A	D-4	Install 200 mm dia. main on Holm through undeveloped property	180	TBD
TBD	N/A	D-5	Upgrade booster pumps at Holm Road Pump Station to meet airport demands, Homalco Demands and Jubilee Heights development demands		TBD

Table 13: Cost Estimates

Priority	PDD (ML/d)	#	Project Description	Length (m)	Cost
TBD	N/A	D-6	Modify PRV settings at Hilchey and South Alder PRV stations		TBD
TBD	N/A	D-7	Install piping through Jubilee Heights Development		TBD
TBD	N/A	D-8	Open Existing Closed Valve at Petersen and Kathleen		TBD
TBD	N/A	D-9	Upgrade 150 mm dia. main on Petersen Road from Kathleen Road to Croatian Road to 200 mm dia.	1,200	TBD
TBD	N/A	D-10	Install 200 mm piping through future development		TBD
TBD	N/A	D-11	Upgrade 100 mm dia. main on Croatian Road to 200 mm dia.	300	TBD
TBD	N/A	D-12	Pressure improvements in PZ89 east of Willow Creek		TBD
Sub Total Development Dependant Projects					**TBD** (1)

(1) Costs associated with development are to be determined outside of this study once the final subdivision layouts and phasing has been determined.

7 Conclusions

As a result of the findings of this study, it is concluded that:

1. Completion of the new water intake, WQC and associated works at John Hart Lake is scheduled for early 2018.

2. The construction of the new intake will result in an increase in the supply HGL to the City from 134 m to 150 m.

3. The existing JHWQC, EFWQC and UV component of the SFWQC will be abandoned following commissioning of the new WQC.

4. Under build-out conditions, with the improvements identified in this report, the City will be able to continue to provide water to Area D, based on a build out population of 4,024 for Area D. However any additional improvements to the Area D water system, including pumping and piping improvements, have not been reviewed as part of this study.

5. Based on the past ten years of records, the City of Campbell River peak day demands are 1,685 lpcd with a peak hour demand of 2,325 lpcd and an average day demand of 700 lpcd for residential consumption.

6. The 200 mm dia. supply main to the John Hart Pump Station has a capacity of approximately 49 lps. Once the system demands in the Industrial Park exceed this flow rate the John Hart Pump Station will need to be replaced with a new pump station at the WQC site or a duplicate submarine main and improvements at the JHPS.

7. The City requires an additional 15,500 m^3 of storage by 2021, with 5,500 m^3 at the Beaver Lodge Reservoir and a new 10,000 m^3 reservoir at the Water Treatment Plant site. The additional storage at the Beaver Lodge Reservoir is required as soon as possible as the existing storage does not meet the required storage volumes for the fire flow demands.

8. The City will require an additional 20,000 m^3 of storage at the Water Treatment Plant Site to supply the build-out service area population of 69,024.

9. There are several areas of the distribution system that have fire hydrants that are supplied by 100 mm dia. watermains.

10. As development continues in the Petersen Road area the existing PZ107 will need to be expanded to ensure that the service pressures in the new development are below 150 psi.

11. Development in PZ89 east of Willow Creek above the 46 m elevation will not have the required minimum pressure of 40 psi.

8 Recommendations

Based on the conclusions reached in this report, it is recommended that the following improvements be completed to service the Campbell River Water System to build out conditions:

Priority	PDD (ML/d)	#	Project Description
1	±50	1A	New Intake, Water Treatment Plant and Supply Main at John Hart Lake
1	±50	1B	New Surge Tank at John Hart Lake Water Treatment Plant
1	±50	1C	New 200 mm dia. supply main to Jonh Hart Pump Station intake
1	±50	2	Upgrade the existing John Hart pump station to suit new supply from Water Treatment Plant
1	±50	3	Modify Control Logic at Evergreen Pump Station
1	±50	4	Install SCADA at Rockland/Alder PRV Station
1	±50	5	Upgrade the Willow PRV station
1	±50	6	Install a new valve on the 500 mm dia. main at Highway 28 and the logging bridge
2	±55	7	Abandon PRVs supplied by the 400 mm dia. main on Alder (4 Locations)
2	±55	8	Relocate PRV 42/43 to the above ground kiosk at Bathurst/Thulin and install 200 mm dia. interconnection main
2	±55	9	Install PRV at Shetland and Petersen
2	±55	10	Construct 10,000 m3 reservoir at WQC site
2	±55	11A	Separate City of Campbell River and CRIB water systems
2	±55	11B	Install a 300 mm dia. main on Maple Road and 16th Avenue from Highway 19A to Ironwood Street
3	76.3	12	Install duplicate 350 mm dia main on Rockland from S. Dogwood to Alder
4	82.3	13	Upgrade existing 500 mm dia. and 400 mm dia. watermains to 750 mm dia. from the JHWQC to 14th Avenue.
4	82.3	14	Install duplicate Beaver Lodge Reservoir
4	82.3	15	Install a 200 mm dia. main on Rockland Road from the downstream side of the Rockland/South Alder PRV to the downstream side of the Galerno PRV station.
4	82.3	16	Increase the pumping capacity between the WQC and Snowden Reservoir
5	88.2	17	Replace existing 400 mm dia. watermain on 14th Ave from Willow to ERT with 750 mm dia.
5	88.2	18	Install new 750 mm dia. watermain on ERT from 14th to Evergreen Road
5	88.2	19	Install a 200 mm dia. main on Galerno Road from Hilchey Road to Simms Road.
5	88.2	20	Install a new 10,000 m^3 reservoir cell on at WQC
6	135.7	21	500 mm dia. supply main to Beaver Lodge
6	135.7	22	Replace the existing 400 mm dia. main on Evergreen Rd to 600 mm dia from S. Dogwood St to the reservoir
6	135.7	23	Replace the 200 mm dia supply main with 300 mm dia. main from pump station to Snowden Reservoir
6	135.7	24	Install a new 10,000 m^3 reservoir cell on at WQC

Priority	PDD (ML/d)	#	Project Description
TBD	N/A	D-1	Industrial Park Upgrades: 200 mm dia. main to Barge Terminal Road
TBD	N/A	D-2	Industrial Park Upgrades: 250 mm dia mains on Menzies Way and Middle Point Dr
TBD	N/A	D-3	Install 200 mm dia. main on Penfield from Holm to Goodwin
TBD	N/A	D-4	Install 200 mm dia. main on Holm through undeveloped property
TBD	N/A	D-5	Upgrade booster pumps at Holm Road Pump Station to meet airport demands, Hamlco Demands and Jubilee Heights development demands
TBD	N/A	D-6	Modify PRV settings at Hilchey and South Alder PRV stations
TBD	N/A	D-7	Install piping through Jubilee Heights Development
TBD	N/A	D-8	Open Existing Closed Valve at Petersen and Kathleen
TBD	N/A	D-9	Upgrade 150 mm dia. main on Petersen Road from Kathleen Road to Croatian Road to 200 mm dia.
TBD	N/A	D-10	Install 200 mm piping through future development
TBD	N/A	D-11	Upgrade 100 mm dia. main on Croatian Road to 200 mm dia.
TBD	N/A	D-12	Pressure improvements in PZ89 east of Willow Creek

Appendix A

Terms of Reference

CITY OF CAMPBELL RIVER
WATER SYSTEM STRATEGIC ACTION PLAN – UPDATE
TERMS OF REFERENCE

A. BACKGROUND

The City presently draws water from John Hart Lake which is delivered to the community via a gravity based system. The lake source water is provided by way of connection to each of the three existing BC Hydro penstocks serving the John Hart Generating Station, at the City's existing water UV facility.

BC Hydro is currently in the process upgrading its John Hart Generating Station which will include the removal of the existing penstocks. As a result of that project, the City will require a new independent water intake and supply infrastructure to deliver water to the City's water distribution system. Design and construction are currently underway for this new system with an anticipated in-service date of December 31, 2017.

The new system will include a pump station to transfer the water from John Hart Lake to the water supply main on Highway 28 which will result in an increase of system pressure for the existing water system. As such, the City needs to update its Water System Strategic Action Plan to reflect this higher system pressure so that capital and operational plans can be adjusted accordingly.

In addition, BC Hydro is also planning a dam safety upgrade project that will require lowering of the lake level below the existing intake of the City's John Hart Pump station located on the north side of John Hart Lake for an estimated two to three year period beginning in 2019. As a result, the City is required to make modifications to this water intake so that water can continue to be delivered to the Snowden / Industrial Park system. The City has decided to achieve this by utilizing the new pump station to withdraw water from the lake and deliver it to this system through a 200mm diameter pipe laid on the lake bed between the two pump stations. The City requires an assessment of the existing and proposed systems to determine the additional modifications required to allow this system to continue to operate. Also, this system was last assessed in 2001 and needs to be re-assessed with recommended improvements updated as required.

As both the main system and the Industrial Park system will receive water through the new pump station, the City would like the updated Water System Strategic Action Plan to include long term plans for both systems.

B. OBJECTIVES

The objective is to provide an updated water model and long term strategy to reflect the revised configuration and system pressures of the new water supply system. The updated model and strategy will also include the Industrial Park water system.

C. SCOPE OF WORK

To complete this project, the City of Campbell River requires the services of an engineering firm to:

1. Update the City's existing water model to:
    a. Reflect recent system improvements and modifications that have been completed.
    b. Reflect the new water supply infrastructure that is currently under construction.
    c. Include the Industrial Park water system which will be supplied by the new pump station.

2. Provide recommendations on:
    a. System modifications required to address the increased pressure that will result from the new pump station.
    b. Required modifications (concept level) to the Industrial Park water system as a result of the new intake supply, including pumping, storage, and disinfection systems.
    c. Long term capital plans for upgrades to allow for community growth within both systems.

3. Update the Water System Strategic Action Plan report to include the above items. Recommendations shall be provided for immediate, 5, 10, 20, 30-year, and build-out population projection. The report shall be similar in content to the 2012 Water System Strategic Action Plan, including design demands, system maps for each planning period, and cost estimates for all proposed improvements.

D. METHODOLOGY

In meeting the above, the consultant, at a minimum, should carry out the following tasks:

1. Review all relevant plans, reports, and records to date.
2. Facilitate and chair a project initiation meeting with appropriate City staff to confirm the scope of work, gather information, establish communication protocols, confirm roles, and timelines. Compile and distribute meeting minutes within three days of meeting.
3. Consult with other consultant working for the City on the design of the new water supply system.
4. Obtain input from and exchange information with the City staff as required throughout the project.

5. Apply all relevant standards including but not limited to the City of Campbell River Design Standards, MMCD, etc. – identify where standards conflict or cannot be reasonably met.
6. Facilitate and chair a meeting with City staff to present and discuss preliminary model results and recommendations. Compile and distribute meeting minutes within three days of meeting.
7. Update model based on feedback received from City.
8. Prepare and submit a draft report at least two weeks prior to a review meeting with City staff.
9. Arrange and chair a review meeting with City staff to receive feedback on draft report. Compile and distribute meeting minutes within three days of meeting.
10. Finalize report and submit to City in digital (PDF) format.

E. TIMING

The suggested Project Schedule is as follows:

- Project initiation meeting: April 2016
- Preliminary model review meeting:: June 2016
- Submit Draft Report: September 2016
- Submit Final Report: October 2016

Appendix B

Technical Memorandum 1140-TM-2 Rev 2

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TECHNICAL MEMORANDUM NO. 2 - 1140-TM-2 Rev2

City of Campbell River
Jubilee Heights Neighbourhood Water Review

Issued: March 28th, 2014
Previous Issue: March 26th, 2014

1. Objective

The objective of this technical memorandum is to review the impact of a potential alternative to the proposed servicing noted in the Koers & Associates Technical Memorandum 1348-TM1 issued on September 13, 2013 for the proposed Jubilee Heights Neighbourhood development and evaluate the impact on the City of Campbell River distribution system.

2. Background Information

The Jubilee Heights Neighbourhood is located on Lot 1 and Lot 7, Plan VIP 82145, Comox District, adjacent to South Dogwood Street.

The projected build-out population is 3,500 people in a mix of residential types, and will additionally include commercial space up to 5,000 m^2 with provision for a 90-unit hotel. The projected build out demand for this site using the per-capita demands from the 2006 Water System Report, are show in Table 1 as follows:

TABLE 1
Projected Build-Out Demands

Demand Type	Residential (3,500 pop)	Commercial (Equiv 65 pop)	Hotel (Equiv 135 pop)	Total Demand
Average Day (663 lpcd)	26.9 lps	0.5 lps	1.0 lps	28.4 lps
Peak Day (1,650 lpcd)	66.8 lps	1.2 lps	2.6 lps	70.6 lps
Peak Hour (2,380 lpcd)	96.4 lps	1.8 lps	3.7 lps	101.9 lps

Fire flows for the proposed development are assumed to range from 150 lps for commercial to 60 lps for residential.

The proposed development consists of properties identified as Lot 1 and Lot 7, Plan VIP 82145, Comox District with an estimated geodetic elevation range of 65 m to 85 m.

...2

3. Water Supply

The proposed development is adjacent to the Dogwood supply main between, the Jubilee Parkway and the Beaver Lodge Reservoir. The hydraulic grade line (HGL) in the Dogwood supply main ranges from 130 m during average day to 110 m during filling of the Beaver Lodge Reservoir, which produces residual pressures of 65 psi during average day and 35 psi during peak hour conditions at the 85 m elevation.

The Dogwood supply main, which is fed from the Elk Falls ultraviolet (UV) facility with a 134 m HGL, is a key main to the south end of Campbell River, as it supplies the Beaver Lodge Reservoir (89 m HGL pressure zone), South Alder & Dogwood pressure reducing valve (PRV) (107 m HGL), and the Erickson Road PRV (89 m HGL pressure zone).

4. Holm Road Pump Station

The Holm Road Pump Station currently contains two 75 lps fire pumps and two 15 lps duty pumps. The pump station currently monitors the HGL in the Dogwood main and when it drops below a set valve of 125 m (80 psi) the first duty booster pump (15 lps capacity) is turned on. The second duty pump (15 lps capacity) followed by the fire pumps (75 lps capacity each) are turned on based on the flow rate. Similarly, the shut down sequence for the pumps is based on flow except for the first booster pump, which shuts down once the HGL in the Dogwood main returns to 132 m (90 psi).

5. Beaver Lodge Reservoir

The Beaver Lodge Reservoir presently has one supply feed, which is from the Dogwood supply main. A new Altitude / PRV has recently been installed at South Alder and Rockland, which will supply a second feed of water to the Beaver Lodge Reservoir.

6. Existing Conditions

Analysis of the water system during peak day demands shows the HGL in the Dogwood supply main at the Beaver Lodge connection will range from 127 m to 110 m, causing the Holm Road booster pumps to run. This is based on a peak demand of 28 lps south of the Beaver Lodge Reservoir, with 17 lps going to the Airport / Homalco area and 11 lps to the South Alder and Dogwood PRV. Therefore, the existing booster pumps at the Holm Road Reservoir have reached their capacity. We also note that the downstream HGL at the Erickson Road PRV ranges from 81 m to 88 m. The PRV is set to open should the HGL drop below 80 m. The smaller diameter PRV should be modified to maintain minimal domestic flows in order to maintain water quality.

7. Distribution System Improvements

As identified in the City of Campbell River Water System Strategic Action Plan, improvements to the distribution system are required to service the proposed development. The original recommendations were to install a new 300 mm dia. watermain from the Holm Road pump station through the new development to the existing 450 mm dia. south of Erickson Road with a new check valve installed at the intersection of Dogwood Street and Erickson Road. The pump station was to be modified such that the fire pumps discharged directly into the 450 mm dia. main on Dogwood and the domestic pumps would pump into the new main through the development.

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As previously noted in the 1348 TM-1, dated September 13, 2013, the proposed servicing option for the Jubilee Heights development was updated to install a new 200 mm dia. watermain and PRV to service the 107m zone adjacent to the Holm Road pump station and reduce the South Alder PRV pressure setting such that it only supplied fire flows. This option was reviewed by the City and not accepted.

As an alternative to the servicing plan shown in 1348 TM-1, the following improvements are proposed:

1) A new 200 mm dia. watermain that connects Timberline Drive from Penfield Road, north through the undeveloped lot, to the existing dead end to provide additional looping in the 107 m pressure zone (approx. 450 m).

2) A new 200 mm dia. watermain that connects Holm Road from Penfield Road, north to Joanne Drive through the undeveloped lot, to the existing dead end to provide additional looping in the 107 m pressure zone (approx. 210 m).

3) A new 200 mm dia. watermain on Penfield Road from Goodwin Road to Holm Road to provide additional looping in the 107 m pressure zone (approx. 400 m).

4) Decrease the HGL setting of the main at the existing South Alder PRV station to 100 m in order to maintain the required fire flows in the 107 m pressure zone. The HGL setting of the smaller PRV should be reduced to 105/104 m to maintain minimal domestic flows (+/- 1 lps) in order to maintain water quality in the 200 mm dia main.

5) Install the required domestic piping through the proposed Jubilee Heights subdivision with connections to the existing main on South Dogwood. The proposed watermains should be sized to provide the required domestic and design fire flows.

8. Holm Road Booster Pump Station Improvements

With the proposed improvements listed above the peak hour flows through the Holm Road Pump Station would reduce from 28 lps to 19 lps. This will leave 11 lps available for the proposed development before the existing booster pumps reach capacity, which would service a population of 400 people.

Ultimately the booster pumps would need to service the build-out peak hour demand which is estimated at 175 lps and consists of 101.9 lps for the proposed development and 73.1 lps for the Homalco Band and airport Industrial Park. The timing for replacement of the booster pumps and the number of booster pumps required should be reviewed in more detail as the demand increases from 19 lps to 175 lps. The booster station control system should remain the same and only boost water in the Dogwood main, when the HGL drops below 125 m, which represents 55 psi at the highest elevation.

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9. Supply System Improvements

A review of the water model shows that the existing system can support the development until it reaches the equivalent demand of 725 people. It is at this point when the Dogwood main will experience a drop in the HGL below 110 m, which will prevent the Holm Road Reservoir from filling and a loss of pressure through the PRVs supplying the 107 m pressure zone.

As noted in the City of Campbell River Water System Strategic Action Plan, in order for the supply system to support the remainder of the development, a pump station is required on the existing 750 mm transmission main between the Elk Falls UV facility and Evergreen Road. The pump station would increase the HGL in the transmission main to 135 m on the discharge of the pump station. As the inlet HGL will vary with demand, the pumps will require a variable frequency drive (VFD) to regulate the speed of the pumps. This project has been identified in the report for construction by 2016.

10. Proposed Improvements

The following improvements to the City of Campbell River distribution system are recommended to maintain service pressures and fire flows for the existing distribution system and the proposed development.

1) A new 200 mm dia. watermain that connects Timberline Drive from Penfield Road north through the undeveloped lot to the existing dead end main (approx. 450 m).

2) A new 200 mm dia. watermain that connects Holm Road from Penfield Road north through the undeveloped lot to the existing dead end main (approx. 210 m).

3) A new 200 mm dia. watermain on Penfield Road from Goodwin Road to Holm Road (approx. 400 m).

4) Increase the HGL setting of the small Hilchey PRV to 110 m and increase the HGL setting of the main PRV to 107 m.

5) Reduce the HGL setting of the South Alder main PRV to 100 m and reduce the HGL setting of the smaller PRV to maintain minimal (1 lps) domestic flows for water quality purposes.

6) Reduce the HGL setting of the Erickson main PRV to 80 m and reduce the HGL setting of the smaller PRV to maintain minimal (1 lps) domestic flows for water quality purposes.

7) A new booster pump station on the 750 dia. transmission main between the Elk Falls UV facility and Evergreen Road (WSSAP Project #4).

8) Replace and upgrade the existing booster pumps at the Holm Road booster station to meet the build-out demands of the Homalco Band, the airport, the airport industrial park, and the proposed development (WSSAP Project #20G).

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The proposed improvements (No. 1 to 6) are an alternative to the recommendation listed in the Water System Strategic Action Plan for Project #8 Improvements for the Jubilee Heights Development.

11. Impact of Proposed 200 mm dia mains

We have reviewed the impact on the Holm Road Pump Station should the three 200 mm dia watermain loops on Timberline Road, Holm Road and Penfield Road not be installed. Projects 1, 2 and 3 listed in Item 10 above.

1) Should any one of the three watermain loops not be installed and the HGL of the small PRV at South Alder increased to 104 m the flow through the South Alder PRV will be approximately 0.84 lps.

2) Should any two of the three watermain loops not be installed and the HGL of the small PRV at South Alder increased to 104 m the flow through the South Alder PRV will be approximately 3.26 lps.

3) Should all three of the watermain loops not be installed and the HGL of the small PRV at South Alder increased to 104 m the flow through the South Alder PRV will be approximately 11.03 lps.

The net effect of flows increasing through the South Alder PRV will cause flow through the Holm Road Pump Station to increase which will reduce the amount of proposed development available before improvements are required at the pump station and the future pump station on the City's transmission main.

Under Scenario 1 above an additional 0.84 lps is required, which would reduce the proposed development from 400 to 370 people before improvements are required at the pump station and 725 to 695 people before the future pump station is required.

Under Scenario 2 above an additional 3.26 lps is required, which would reduce the proposed development from 400 to 280 people before improvements are required at the pump station and 725 to 605 people before the future pump station is required.

Under Scenario 3 above an additional 11.03 lps is required, which would require improvements at the pump station prior to the proposed development, and would reduce the proposed development from 725 to 325 before the future pump station is required.

Under all of these scenarios the 0.84, 3.26 lps and 11.03 lps would be pumped through Holm Road and the pressure reduced through the South Alder PRV.

12. Conclusions and Recommendations

The City of Campbell River water system will not be able to support the proposed Jubilee Neighbourhood development without improvements.

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The peak hour demand at the Holm Road booster station will increase from 17 to 175 lps. The existing booster pumps at the Holm Road pump station are at capacity (30 lps) and 11 lps of the flow through the station does not require pumping. Contour information for the proposed development shows the geodetic elevation ranges from 65 m to 85 m, which requires that the development be part of the booster zone to meet pressure and fire flow requirements.

The water demand from the South Alder PRV and Erickson Road PRV does not require additional pumping. The South Alder PRV station should be maintained at a lower PRV HGL setting (100 m) in order to provide the required fire flows in the distribution system and smaller PRV HGL should be reduced to maintain minimal domestic flows for water quality purposes.

Three new 200 mm dia loop mains are required to remove the demand from the South Alder PRV to supply domestic demand requirements for the 107 m pressure zone. These are on Timberline Drive, Holm Road, and Penfield Road, which will reduce the flow through the Holm Road pump station and only require the pump station to service domestic demands in the 125 m zone. Fire flows in the 107m and 89 m zones would still be serviced through the Holm Road Pump Station, should the fire flow event lower downstream HGL at the South Alder and Erickson PRVs.

When the development reaches an equivalent population of 400 people, the existing booster pumps at the Holm Road booster station would need to be replaced should all three watermain loops not be in place, the pumps will need to be replaced earlier. The replacement of the pumps and additional upgrading of the station should be reviewed and potentially phased due to the large demand increase.

The City water system, with the Rockland/South Alder altitude valve installed, can support an additional equivalent population of 725 people (beyond existing) with improvements to the Holm Road Pump Station. Further population and water demand would lower the HGL in the Dogwood main to a point were it would not be able to provide acceptable pressures or supply water to the Beaver Lodge Reservoir. A Booster Station is required on the existing 750 mm dia. transmission main between the Elk Falls UV facility and Evergreen Road, to increase the HGL. This proposed booster station has been identified in the City of Campbell River Water Supply Strategic Action Plan for construction by 2016.

Should one of the watermain loops not be installed, improvements at Holm Road booster station would be required once development reaches an equivalent population of 370 people and the Booster Station on the transmission at an equivalent population of 695 people.

Should two of the watermains loops not be installed, improvements at Holm Road booster station would be required once development reaches an equivalent population of 280 people and the Booster Station on the transmission at an equivalent population of 605 people.

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Should three of the watermains loops not be installed, improvements at Holm Road booster station would be required prior to development and the Booster Station on the transmission at an equivalent population of 325 people. A summary of the population thresholds for the pump station improvements are listed below:

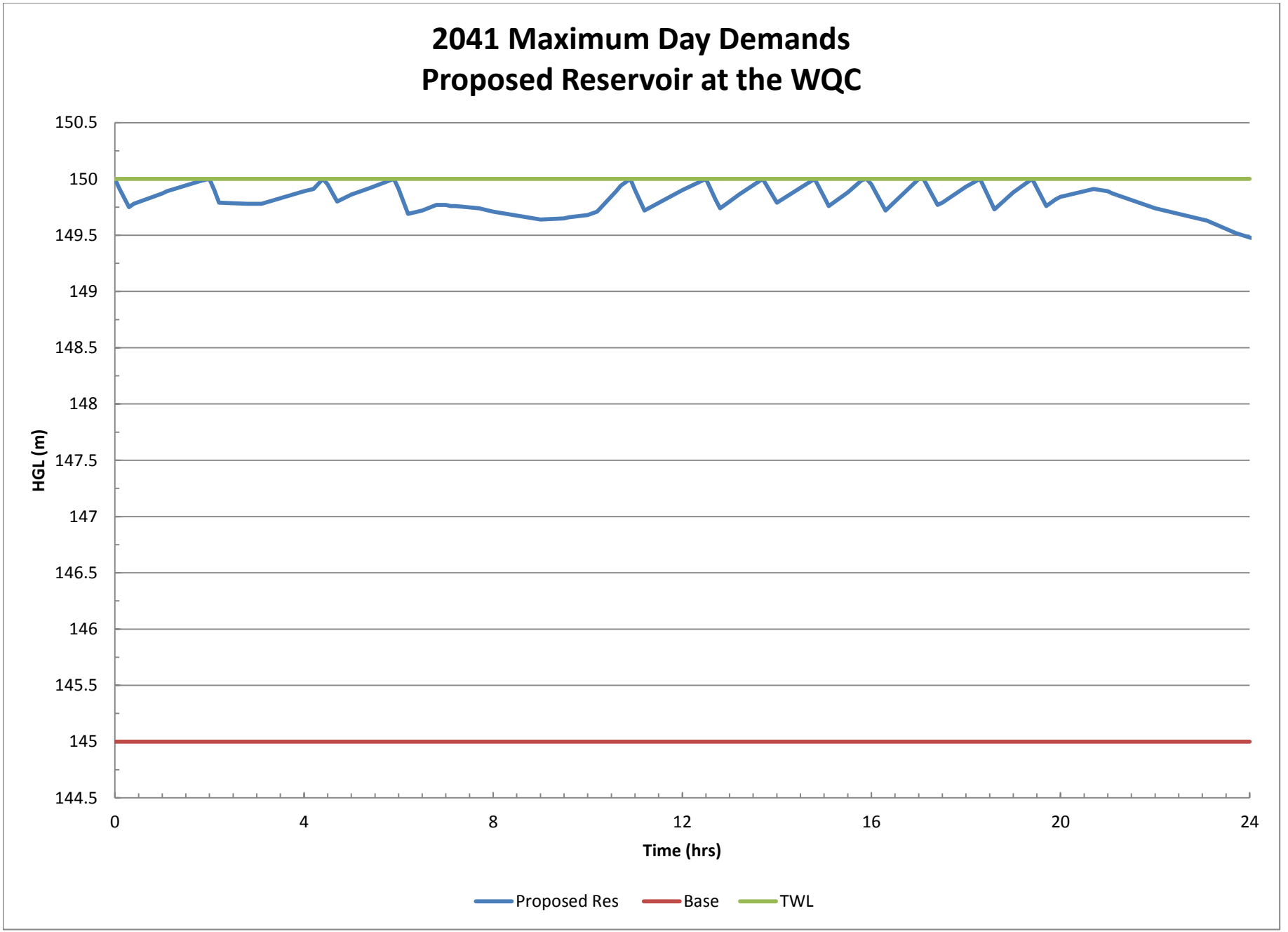
	Jubilee Heights Population Thresholds	
No. Of Watermain Loops	Holm Road Pump Station Upgrades Required	Booster Pump Station Installation Required
0	0	325
1	280	605
2	370	695
3	400	725

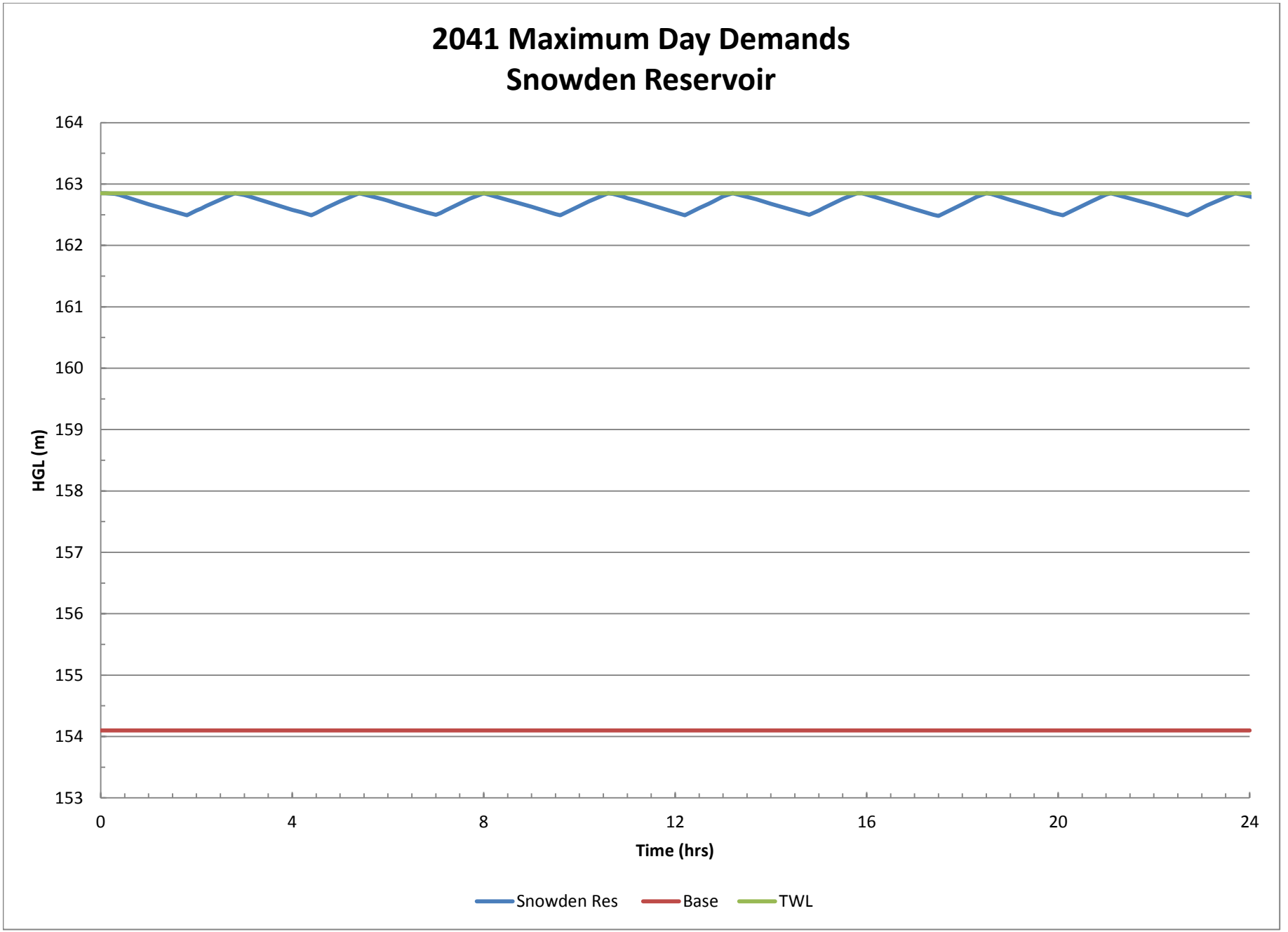
Prepared by:

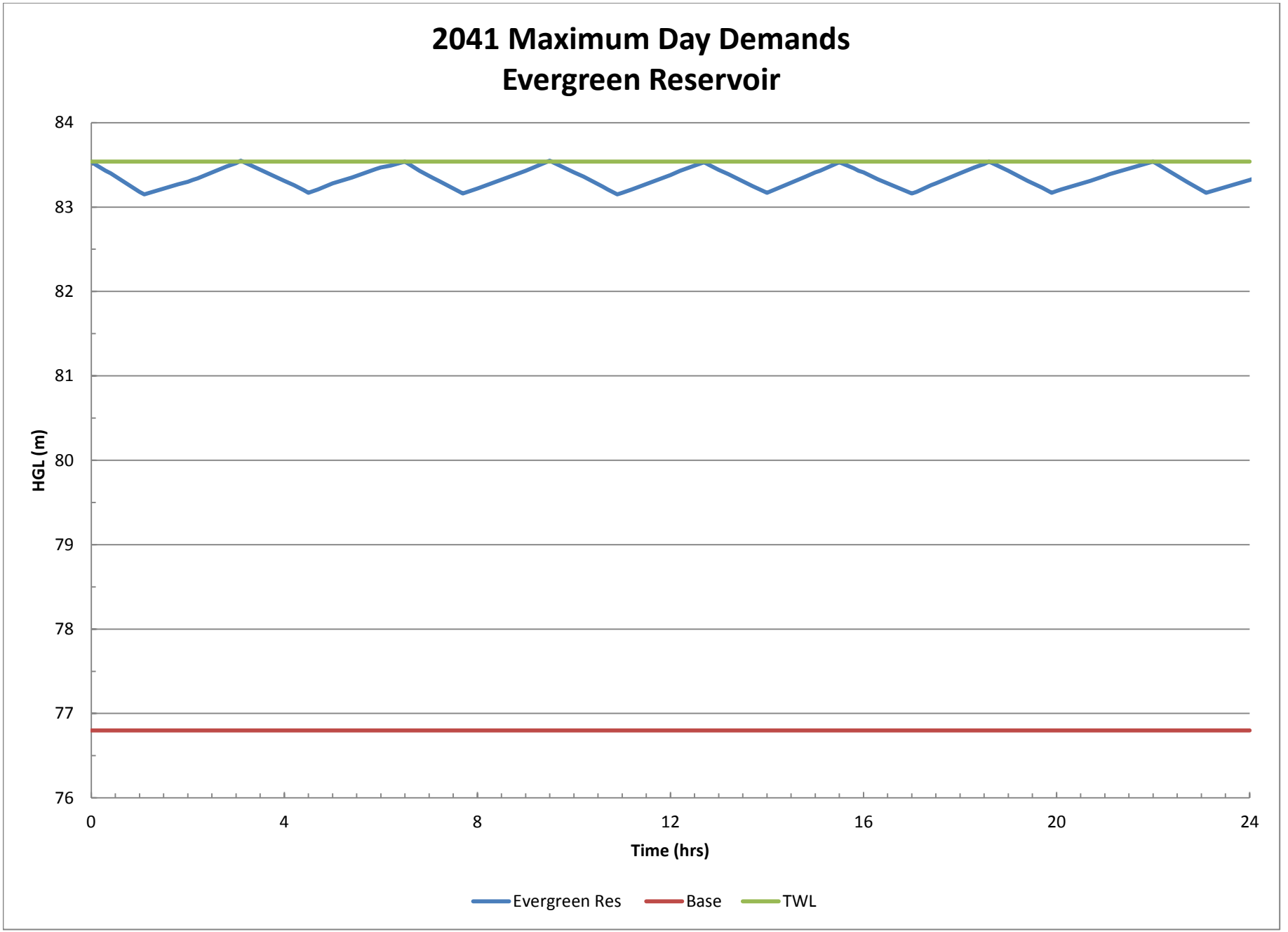
per Chris Downey, P.Eng.
Project Manager

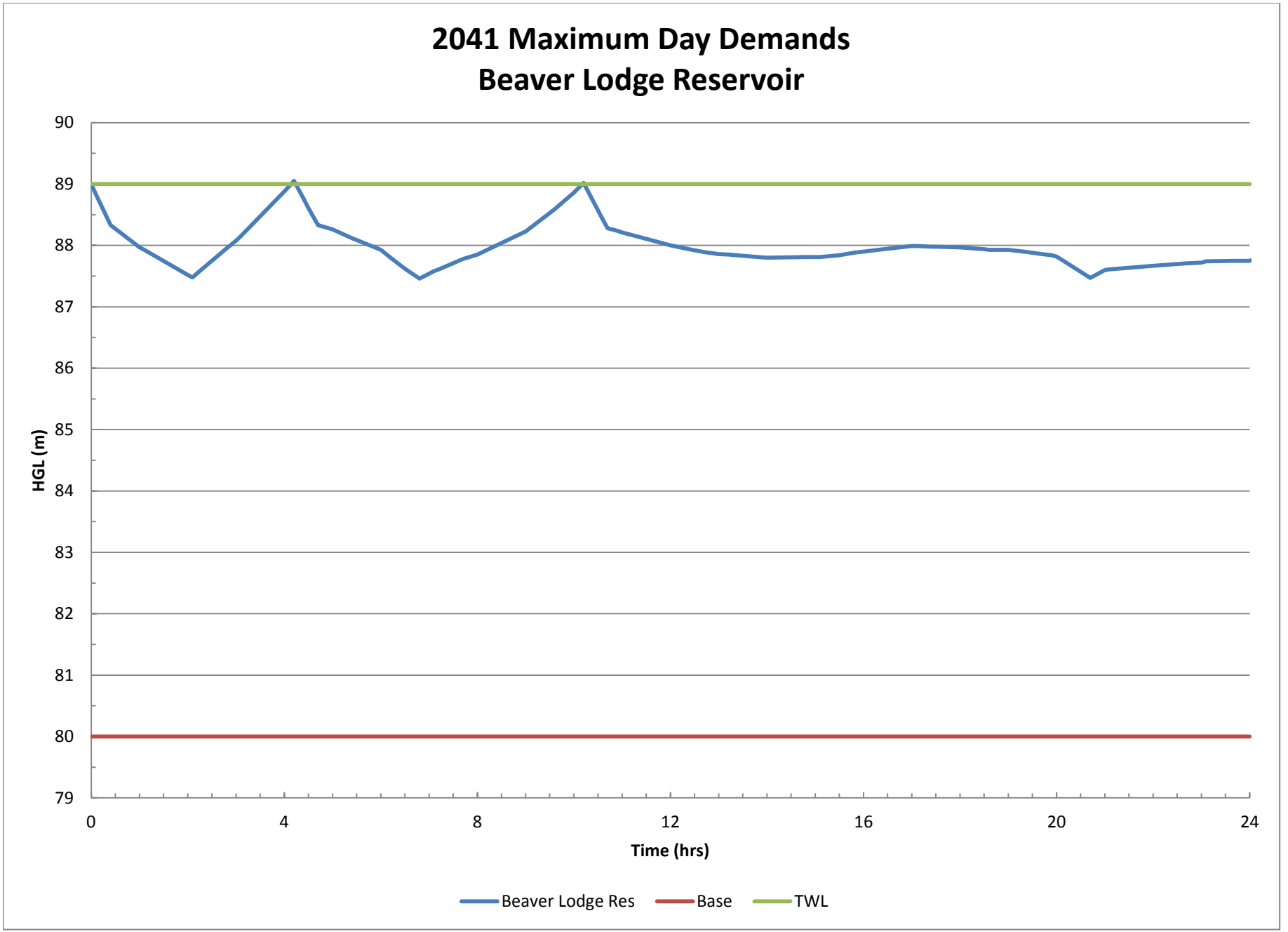
Appendix C

Model Results


2041 Maximum Day Demands
Proposed Reservoir at the WQC
150.5
150
149.5
149
148.5
148
147.5
147
146.5
146
145.5
145
144.5
HGL (m)
0
4
8
12
16
20
24
Time (hrs)
Proposed Res
Base
TWL


2041 Maximum Day Demands
Snowden Reservoir
164
163
162
161
160
159
158
157
156
155
154
153
HGL (m)
0
4
8
12
16
20
24
Time (hrs)
Snowden Res
Base
TWL


2041 Maximum Day Demands
Evergreen Reservoir
84
83
82
81
80
79
78
77
76
HGL (m)
0
4
8
12
16
20
24
Time (hrs)
Evergreen Res
Base
TWL


2041 Maximum Day Demands
Beaver Lodge Reservoir
90
89
88
87
86
85
84
83
82
81
80
79
HGL (m)
0
4
8
12
16
20
24
Time (hrs)
Beaver Lodge Res
Base
TWL

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-147	102	0	139.3	53	Airport
J-149	100.11	0	139.3	55.6	Airport
J-81	98.1	0	139.3	58.5	Airport
J-148	98.08	0	139.3	58.5	Airport
Airport System	97.15	1.13	139.3	59.8	Airport
J-85	96.93	0	139.3	60.1	Airport
J-83	94.88	0	139.31	63.1	Airport
J-146	89.94	0	139.31	70.1	Airport
Timberwest Ind Subdivision	87.61	0	139.31	73.4	Airport
J-537	74.88	18.46	138.27	90	Airport
Timberwest Jubilee Heights	74.89	0	139.94	92.3	Airport
J-86	74.24	0	139.31	92.4	Airport
1804	74.02	0	139.78	93.3	Airport
Holmaco Band	72.83	5.25	139.31	94.4	Airport
J-536	71.6	18.46	138.25	94.6	Airport
J-142	73.03	0	139.75	94.7	Airport
1806	70.34	0	139.62	98.3	Airport
1814	68.36	0	139.35	100.8	Airport
J-91	68.9	0	140.08	101	Airport
J-13	68.5	0	140.08	101.6	Airport
J-144	67.15	3.94	139.29	102.4	Airport
1808	67.2	0	139.49	102.6	Airport
J-55	66.77	0	139.49	103.2	Airport
J-58	66.48	0	139.49	103.6	Airport
J-145	65.41	0	139.32	104.9	Airport
1810	65	0	139.34	105.5	Airport
1812	64.63	0	139.34	106.1	Airport
J-124	64	0	139.34	106.9	Airport
J-561	63.02	0	139.35	108.3	Airport
1800	63	0	139.35	108.4	Airport
J-121	57.91	0	139.32	115.5	Airport
J-51	39.91	0	139.19	140.9	Airport
J-79	39.32	0	139.26	141.9	Airport
512	72.64	1.94	103.91	44.4	PZ107
J-112	74.33	0	105.95	44.9	PZ107
J-113	73.88	0	105.93	45.5	PZ107
J-203	71.07	0	103.39	45.9	PZ107
J-173	70.25	0	102.76	46.1	PZ107
J-117	71.58	0	105.93	48.8	PZ107
1120	69.01	0.31	103.56	49	PZ107
J-489	67.95	0	102.76	49.4	PZ107
1232	68.38	0	103.56	49.9	PZ107

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-461	68.63	0	103.93	50.1	PZ107
J-205	67.88	0	103.46	50.5	PZ107
J-114	70.04	0	105.93	50.9	PZ107
J-116	69.85	0	105.93	51.2	PZ107
1196	68.88	1.61	105.18	51.5	PZ107
J-372	69.62	0	105.97	51.6	PZ107
J-138	69.37	0	105.93	51.9	PZ107
644	65.9	2.46	102.8	52.4	PZ107
1234	66.49	1.28	103.56	52.6	PZ107
J-111	68.83	0	105.97	52.7	PZ107
J-380	65.29	0	102.81	53.3	PZ107
J-286	66.54	0	104.34	53.6	PZ107
J-288	65.98	0	103.77	53.6	PZ107
482	65.75	0.59	103.91	54.2	PZ107
626	64.5	4.88	102.77	54.3	PZ107
478	65.58	0	103.9	54.4	PZ107
J-115	67.6	0	105.93	54.4	PZ107
J-115	64.46	0	102.82	54.5	PZ107
1846	63.79	0.86	102.75	55.3	PZ107
1230	64.47	2.46	103.56	55.5	PZ107
J-56	66.54	0	105.92	55.9	PZ107
J-57	66.5	0	105.92	56	PZ107
1208	64.13	1.94	103.69	56.1	PZ107
480	64.37	4	103.97	56.2	PZ107
642	63.17	1.06	102.8	56.3	PZ107
J-204	62.94	0	102.82	56.6	PZ107
504	64	0.49	104.39	57.3	PZ107
506	64	0	104.41	57.4	PZ107
638	62.17	0.86	102.75	57.6	PZ107
J-371	65.3	0	105.98	57.7	PZ107
502	63.63	0.98	104.35	57.8	PZ107
744	62.58	0	103.39	57.9	PZ107
746	62.63	0.05	103.39	57.9	PZ107
J-118	65.15	0	105.92	57.9	PZ107
J-427	62.79	0	103.81	58.2	PZ107
454	62.83	0.14	103.96	58.4	PZ107
444	62.78	0	103.96	58.5	PZ107
J-116	61.49	0	102.84	58.7	PZ107
804	61.22	0.44	102.71	58.9	PZ107
1198	63.36	1.3	105.05	59.2	PZ107
736	61.59	1.89	103.46	59.4	PZ107
628	60.85	0.4	102.79	59.5	PZ107
J-323	61.14	0	103.09	59.6	PZ107

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-428	61.39	0	103.62	59.9	PZ107
452	61.65	1.05	103.91	60	PZ107
484	61.4	0.65	103.71	60	PZ107
734	61.17	1.45	103.48	60.1	PZ107
J-369	63.62	0	105.93	60.1	PZ107
J-429	61.53	0	103.97	60.2	PZ107
634	60.29	0.34	102.76	60.3	PZ107
450	61.38	3.14	103.91	60.4	PZ107
608	60.26	0.4	102.8	60.4	PZ107
1228	60.91	2.68	103.57	60.6	PZ107
J-528	61.1	0	103.92	60.8	PZ107
J-110	63.05	0	105.99	60.9	PZ107
448	60.89	2.51	103.92	61.1	PZ107
J-426	60.79	0	103.89	61.2	PZ107
J-473	60.08	0	103.22	61.2	PZ107
1194	62.08	1.3	105.25	61.3	PZ107
J-119	62.54	0	105.92	61.6	PZ107
J-125	62.55	0	105.92	61.6	PZ107
884	59.07	0.35	102.6	61.8	PZ107
1772	62.37	0.74	105.93	61.8	PZ107
J-363	62.34	0	105.92	61.9	PZ107
J-364	62.29	0	105.92	61.9	PZ107
442	60.19	0.76	103.93	62.1	PZ107
1190	60.58	0.7	104.34	62.1	PZ107
J-370	62.25	0	106	62.1	PZ107
J-472	59.22	0	103.18	62.4	PZ107
636	58.75	0.2	102.75	62.5	PZ107
J-294	59.34	0	103.56	62.8	PZ107
458	59.54	1.5	103.88	62.9	PZ107
620	58.44	0.86	102.75	62.9	PZ107
1258	59.09	0	103.38	62.9	PZ107
432	59.62	2.76	103.98	63	PZ107
606	58.4	0.34	102.81	63	PZ107
440	59.51	0.14	103.95	63.1	PZ107
J-365	61.45	0	105.92	63.1	PZ107
J-458	59.8	0	104.28	63.1	PZ107
J-490	58.19	0	102.76	63.3	PZ107
430	59.32	0	103.95	63.4	PZ107
J-212	59.31	0	103.98	63.4	PZ107
J-285	60.43	0	105.11	63.4	PZ107
1202	59.96	2.19	105.11	64.1	PZ107
J-379	57.71	0	102.85	64.1	PZ107
1046	57.91	1.29	103.24	64.4	PZ107

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-485	57.3	0	102.72	64.5	PZ107
1200	59.5	1.06	105.03	64.6	PZ107
456	58.05	1.88	103.89	65.1	PZ107
462	57.99	1.61	103.85	65.1	PZ107
424	57.91	1.39	104.05	65.5	PZ107
J-126	59.79	0	105.92	65.5	PZ107
960	56.68	0.96	102.9	65.6	PZ107
J-368	59.74	0	105.92	65.6	PZ107
416	57.65	1.04	103.92	65.7	PZ107
1222	57.37	0.08	103.65	65.7	PZ107
806	56.31	0	102.7	65.9	PZ107
J-557	56.22	6.58	102.71	66	PZ107
742	56.77	1.65	103.38	66.2	PZ107
J-226	59.26	0	105.92	66.2	PZ107
412	57.27	0.46	104	66.3	PZ107
808	56	0.79	102.71	66.3	PZ107
1858	58.59	0.98	105.38	66.4	PZ107
J-129	59.01	0	105.92	66.6	PZ107
J-331	55.76	0	102.65	66.6	PZ107
604	55.87	0.14	102.85	66.7	PZ107
J-287	56.47	0	103.77	67.1	PZ107
732	56.06	0.56	103.45	67.3	PZ107
498	56.5	6.18	104	67.4	PZ107
632	55.28	0.93	102.76	67.4	PZ107
J-120	58.42	0	105.92	67.4	PZ107
J-127	58.43	0	105.92	67.4	PZ107
1192	56.78	0.93	104.34	67.5	PZ107
J-213	56.41	0	104	67.5	PZ107
J-430	56.58	0	104.13	67.5	PZ107
1012	55.25	2.03	102.94	67.7	PZ107
1044	55.35	0.7	103.2	67.9	PZ107
J-33	58.07	0	105.92	67.9	PZ107
406	56.26	0	104.2	68	PZ107
426	56.25	0.71	104.14	68	PZ107
J-128	57.93	0	105.92	68.1	PZ107
J-293	55.28	0	103.57	68.5	PZ107
1170	58.23	0.4	106.63	68.7	PZ107
J-78	57.41	1.14	105.92	68.9	PZ107
414	55.36	1.56	103.96	69	PZ107
410	55.7	1.44	104.41	69.1	PZ107
640	54.09	1.54	102.78	69.1	PZ107
408	55.7	0	104.42	69.2	PZ107
1268	54.57	1.56	103.35	69.2	PZ107

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
486	54.7	1.55	103.59	69.4	PZ107
802	53.81	1.76	102.69	69.4	PZ107
J-229	56.91	0	105.92	69.6	PZ107
J-366	56.77	0	105.92	69.8	PZ107
762	53.52	0.96	102.75	69.9	PZ107
1172	56.12	0.65	105.66	70.3	PZ107
J-106	56.51	0	106.02	70.3	PZ107
J-478	53.18	0	102.92	70.6	PZ107
1752	56.15	1.43	105.93	70.7	PZ107
J-431	54.54	0	104.34	70.7	PZ107
J-153	56.09	0	105.95	70.8	PZ107
J-230	56.04	0	105.92	70.8	PZ107
1002	52.97	0.31	103.09	71.1	PZ107
1168	56.67	0.73	106.93	71.3	PZ107
J-459	53.98	0	104.26	71.4	PZ107
J-122	55.48	0	105.92	71.6	PZ107
1224	52.82	0	103.62	72.1	PZ107
1260	52.58	0.11	103.38	72.1	PZ107
500	52.97	0.56	104.22	72.7	PZ107
1032	51.8	0.48	103.08	72.8	PZ107
496	52.77	0.43	104.16	73	PZ107
J-469	55.46	0	106.93	73.1	PZ107
1204	53.05	1.3	104.98	73.7	PZ107
J-92	54.86	0	106.93	73.9	PZ107
J-95	54.5	0	106.93	74.4	PZ107
J-103	53.79	0	106.37	74.6	PZ107
1056	50.81	1.09	103.59	74.9	PZ107
624	49.89	1.13	102.75	75	PZ107
950	49.76	0.61	102.59	75	PZ107
J-419	54	0	106.93	75.1	PZ107
790	49.62	1.34	102.65	75.3	PZ107
1266	50.3	4.36	103.35	75.3	PZ107
1054	50.49	0.16	103.63	75.4	PZ107
J-362	52.6	0	105.92	75.7	PZ107
J-93	53.5	0	106.93	75.8	PZ107
J-94	53.5	0	106.93	75.8	PZ107
J-420	53.5	0	106.93	75.8	PZ107
788	49.13	1.23	102.66	76	PZ107
1036	49.46	0.2	103.07	76.1	PZ107
730	49.76	1.13	103.43	76.2	PZ107
J-105	52.24	0	106.02	76.3	PZ107
J-361	52.06	0	105.92	76.4	PZ107
404	50.36	1.45	104.28	76.5	PZ107

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
740	49.41	0.96	103.36	76.6	PZ107
494	50.18	0.55	104.18	76.7	PZ107
1014	48.82	1.48	102.94	76.8	PZ107
1206	49.76	2.01	103.88	76.8	PZ107
1052	49.32	0.24	103.49	76.9	PZ107
1040	48.84	2.25	103.07	77	PZ107
J-102	51.92	0	106.37	77.3	PZ107
J-123	51.28	0	105.92	77.6	PZ107
630	47.98	1.59	102.76	77.7	PZ107
464	48.85	1.61	103.85	78.1	PZ107
1262	48.39	0	103.38	78.1	PZ107
1278	48.43	0.04	103.48	78.1	PZ107
488	48.43	0.51	103.55	78.2	PZ107
1226	48.51	0.54	103.62	78.2	PZ107
J-491	47.68	0	102.75	78.2	PZ107
1270	48.07	1.4	103.37	78.5	PZ107
J-186	47.47	0	102.76	78.5	PZ107
J-454	48.51	0	103.86	78.6	PZ107
422	48.74	1.16	104.2	78.7	PZ107
J-104	50.37	0	106.04	79	PZ107
J-108	50.29	0	106.03	79.1	PZ107
1018	46.89	2.01	103	79.6	PZ107
J-107	49.78	0	106.04	79.9	PZ107
1030	46.43	0.8	103.02	80.3	PZ107
1026	46.35	0.94	103	80.4	PZ107
J-433	47.51	0	104.29	80.6	PZ107
J-196	45.67	0	102.63	80.8	PZ107
418	46.91	2.89	103.92	80.9	PZ107
J-199	45.54	0	102.56	80.9	PZ107
1042	46.01	1.56	103.1	81	PZ107
1248	46.44	0.86	103.61	81.1	PZ107
1242	46.21	0.65	103.61	81.5	PZ107
J-54	49.56	0	107.01	81.6	PZ107
766	45.03	0.79	102.71	81.9	PZ107
1028	45.29	1.41	103.02	81.9	PZ107
764	44.98	1.13	102.72	82	PZ107
ShoppingCentre1	49.22	0	107	82	PZ107
J-522	45.11	0	103.04	82.2	PZ107
1774	47.87	1.23	105.92	82.4	PZ107
420	46.11	2.16	104.26	82.5	PZ107
1280	45.36	0.71	103.48	82.5	PZ107
1252	45.45	3.31	103.6	82.6	PZ107
J-135	48.8	0	106.99	82.6	PZ107

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-457	45.3	0	103.52	82.6	PZ107
J-488	45.57	0	103.96	82.9	PZ107
J-479	44.35	0	102.82	83	PZ107
1264	44.68	0	103.38	83.3	PZ107
1314	44.38	1.16	103.08	83.3	PZ107
J-477	44.25	0	102.97	83.3	PZ107
1034	43.87	1.88	103.06	84	PZ107
1058	44.05	1.64	103.21	84	PZ107
490	44.14	0.65	103.37	84.1	PZ107
1754	46	1.83	105.92	85.1	PZ107
J-295	43.33	0	103.35	85.2	PZ107
J-432	44.21	0	104.22	85.2	PZ107
J-239	42.85	0	102.99	85.4	PZ107
J-471	43.35	0	103.6	85.5	PZ107
786	42.35	1.23	102.63	85.6	PZ107
1722	45.65	0.41	106	85.7	PZ107
738	42.53	0.56	103.36	86.3	PZ107
1020	42.19	2.69	102.99	86.3	PZ107
392	42.89	0.6	104	86.7	PZ107
1750	44.76	0.8	105.93	86.8	PZ107
1236	42.6	1.48	103.79	86.9	PZ107
1728	44.74	1.33	106.06	87	PZ107
J-101	44.78	0	106.38	87.4	PZ107
396	42.73	0.04	104.35	87.5	PZ107
J-456	41.97	0	103.85	87.8	PZ107
386	42.5	0	104.43	87.9	PZ107
388	42.5	0.38	104.42	87.9	PZ107
618	40.8	0.4	102.75	87.9	PZ107
J-109	44	0	106.02	88	PZ107
390	42.25	1.96	104.35	88.2	PZ107
616	40.51	0.34	102.75	88.3	PZ107
1038	40.87	0	103.09	88.3	PZ107
758	40.78	0.65	103.36	88.8	PZ107
1272	40.84	2.25	103.42	88.8	PZ107
1246	40.75	3	103.61	89.2	PZ107
1024	40.15	0.68	103.1	89.3	PZ107
402	41.37	1.68	104.37	89.4	PZ107
1274	40.28	0	103.39	89.6	PZ107
J-523	39.9	0	103.04	89.6	PZ107
J-219	42.75	0	105.93	89.7	PZ107
J-376	40.8	0	104.11	89.9	PZ107
J-476	39.67	0	103.01	89.9	PZ107
902	38.77	3.36	102.56	90.6	PZ107

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
1250	39.7	3.31	103.6	90.7	PZ107
J-475	38.69	0	103.04	91.3	PZ107
1060	38.58	0	103.14	91.6	PZ107
1064	38.26	0	103.14	92.1	PZ107
1062	37.65	0	103.15	93	PZ107
J-521	37.31	0	103.02	93.3	PZ107
1758	39.85	1.09	105.92	93.8	PZ107
1776	39.75	1.08	105.92	93.9	PZ107
768	36.34	0.35	102.71	94.2	PZ107
J-474	36.69	0	103.07	94.2	PZ107
J-434	37.79	0	104.3	94.4	PZ107
J-227	39.26	0	105.92	94.6	PZ107
ShoppingCentre2	40.06	0.4	106.84	94.8	PZ107
954	35.8	0.38	102.72	95	PZ107
958	35.48	1.4	102.76	95.5	PZ107
J-480	35.19	0	102.75	95.9	PZ107
1244	35.95	3.95	103.62	96.1	PZ107
1726	38.39	0.99	106.1	96.1	PZ107
1748	38.18	1.36	105.93	96.2	PZ107
J-481	34.72	0	102.73	96.5	PZ107
794	34.52	2.04	102.56	96.6	PZ107
956	34.67	0.59	102.73	96.6	PZ107
J-482	34.67	0	102.7	96.6	PZ107
1316	34.27	0.55	103.01	97.6	PZ107
1652	37.23	2.03	106	97.6	PZ107
J-77	37.12	0	105.92	97.7	PZ107
J-435	35.32	0	104.32	97.9	PZ107
J-310	34.08	0	103.61	98.7	PZ107
1238	33.94	1.4	103.68	99	PZ107
614	32.71	3.58	102.67	99.3	PZ107
J-132	35.97	0	105.92	99.3	PZ107
1254	33.35	1.6	103.61	99.7	PZ107
J-241	32.44	0	103.01	100.2	PZ107
J-330	31.83	0	102.63	100.5	PZ107
1276	32.5	0.04	103.4	100.6	PZ107
792	31.68	1.05	102.6	100.7	PZ107
1332	31.98	4.91	102.99	100.8	PZ107
J-220	34.92	0	105.93	100.8	PZ107
1240	32.18	2.35	103.65	101.4	PZ107
1724	34.5	0.16	106.05	101.6	PZ107
J-243	31.91	0	103.85	102.1	PZ107
1330	31.13	1.86	103.6	102.9	PZ107
J-308	31.04	0	103.63	103	PZ107

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-311	31	0	103.61	103.1	PZ107
J-412	32.68	0	106	104.1	PZ107
J-559	17	14.21	73.33	104.1	PZ107
394	30.57	1.05	104.3	104.7	PZ107
1536	31.98	2.76	106	105.1	PZ107
952	28.16	0.75	102.56	105.6	PZ107
J-484	28.04	0	102.56	105.8	PZ107
1290	28.89	0	104.03	106.7	PZ107
1288	28.08	0.13	104.01	107.8	PZ107
J-98	27.67	0	103.99	108.3	PZ107
J-133	29.53	0	105.92	108.4	PZ107
J-313	25.52	0	103.65	110.9	PZ107
1286	24.79	0.65	103.91	112.3	PZ107
J-309	24.41	0	103.64	112.5	PZ107
J-312	22.37	0	103.65	115.4	PZ107
1256	21.5	4.59	103.65	116.6	PZ107
J-296	19.81	0	103.6	118.9	PZ107
1284	19.39	0.43	103.73	119.7	PZ107
1282	19.35	1.4	103.72	119.8	PZ107
1338	19.22	5.75	103.71	119.9	PZ107
1340	15.79	1.86	103.67	124.7	PZ107
J-279	12.38	0	102.67	128.2	PZ107
J-280	10.09	0	102.67	131.4	PZ107
612	5.06	0.7	102.66	138.5	PZ107
658	70.5	0	103	46.1	PZ134
660	70.5	0.55	103	46.1	PZ134
666	68	1.25	102.8	49.4	PZ134
S4-PS1	68	1.05	102.78	49.4	PZ134
656	67.61	0.48	102.86	50	PZ134
664	67.5	0.7	102.85	50.2	PZ134
662	67.41	0.9	102.86	50.3	PZ134
J-175	66.17	0	102.8	52	PZ134
1840	64.87	2.53	102.76	53.8	PZ134
J-174	64.84	0	102.77	53.8	PZ134
J-177	64.89	0	102.77	53.8	PZ134
J-176	64.7	0	102.78	54.1	PZ134
J-178	57.94	0	102.76	63.6	PZ134
J-181	57.88	0	102.76	63.7	PZ134
J-547	95.23	7.13	140.8	64.7	PZ134
J-201	95.73	0	141.84	65.4	PZ134
J-180	53.79	0	102.75	69.5	PZ134
528	92.6	0.43	142.28	70.5	PZ134
J-183	52.33	0	102.73	71.5	PZ134

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-179	51.95	0	102.75	72.1	PZ134
J-193	51.14	0	102.76	73.3	PZ134
J-467	90.14	0	141.86	73.4	PZ134
J-182	50.32	0	102.75	74.4	PZ134
J-425	89.75	0	142.14	74.4	PZ134
1128	85.75	0.08	141.88	79.7	PZ134
J-185	44.5	0	102.75	82.7	PZ134
526	83.29	1.86	142.42	83.9	PZ134
J-184	43.05	0	102.75	84.7	PZ134
J-423	81.73	0	141.96	85.5	PZ134
1124	81.07	4.81	141.91	86.4	PZ134
J-422	80.97	0	141.88	86.5	PZ134
1164	79.29	6.11	141.73	88.6	PZ134
J-284	79.2	0	141.74	88.8	PZ134
1176	77.39	0	141.72	91.3	PZ134
1126	76.48	0.91	141.89	92.8	PZ134
J-112	78.21	0	144.57	94.2	PZ134
J-111	77.67	0	144.57	95	PZ134
1178	74.46	0.58	141.61	95.3	PZ134
`	74.86	0.59	142.01	95.3	PZ134
J-118	76.93	0	144.12	95.4	PZ134
J-117	76.64	0	144.12	95.8	PZ134
722	77	0.14	144.57	95.9	PZ134
J-110	77	0	144.57	95.9	PZ134
J-119	76.44	0	144.12	96.1	PZ134
524	74.75	1.1	142.77	96.5	PZ134
720	76.61	0.14	144.62	96.5	PZ134
J-40	76.67	0	144.63	96.5	PZ134
J-187	76.5	0	144.63	96.7	PZ134
J-188	76.5	0	144.63	96.7	PZ134
J-190	76	0	144.12	96.7	PZ134
S4-PS3	76	0	144.12	96.7	PZ134
728	74.86	0.73	143.07	96.8	PZ134
J-383	75.94	0	144.12	96.8	PZ134
J-114	76.26	0	144.57	97	PZ134
J-113	76	0	144.57	97.3	PZ134
J-381	75.34	0	144.12	97.6	PZ134
J-382	75.36	0	144.12	97.6	PZ134
J-558	75.74	6.58	144.49	97.6	PZ134
J-399	75.68	0	144.52	97.7	PZ134
J-191	75	0	144.12	98.1	PZ134
J-120	74.54	0	144.12	98.8	PZ134
678	74.28	0.49	144.11	99.1	PZ134

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
680	74.09	0.41	144.12	99.4	PZ134
J-242	73.08	0	143.07	99.4	PZ134
J-121	74	0	144.12	99.5	PZ134
522	73.06	0	143.23	99.6	PZ134
520	72.89	0	143.23	99.8	PZ134
540	72.81	1.43	143.13	99.8	PZ134
718	74	1.11	144.6	100.2	PZ134
1152	71.24	3.09	141.88	100.3	PZ134
724	73.83	0.35	144.58	100.4	PZ134
J-192	73.42	0	144.12	100.4	PZ134
J-202	72.1	0	143.07	100.7	PZ134
682	73.32	0.14	144.74	101.4	PZ134
J-14	68.53	0	140.08	101.6	PZ134
S4-Q1	72.5	0.49	144.11	101.6	PZ134
726	73	0.21	144.62	101.7	PZ134
J-470	70.2	0	141.84	101.7	PZ134
650	72.82	0.14	144.63	101.9	PZ134
696	72.87	0	144.63	101.9	PZ134
S4-Q2	72.85	0	144.61	101.9	PZ134
694	72.53	0	144.63	102.3	PZ134
1122	72	0.9	144.1	102.3	PZ134
S4-PS2	72.5	1.05	144.62	102.4	PZ134
716	72.34	0.84	144.6	102.6	PZ134
S4-PR2	72.28	0	144.6	102.7	PZ134
J-25	72	0	144.61	103.1	PZ134
J-571	70.5	0	143.23	103.2	PZ134
J-466	71.02	0	144.12	103.8	PZ134
1188	67.65	1.63	141.21	104.4	PZ134
S4-PR1	70.5	0	144.1	104.5	PZ134
536	69.27	0.95	143.12	104.8	PZ134
692	70.77	0.76	144.6	104.8	PZ134
532	69.07	0.48	143.08	105	PZ134
514	68.88	0	143.08	105.3	PZ134
1162	67.53	2.48	141.81	105.4	PZ134
530	68.71	1.28	143.07	105.6	PZ134
648	70.09	0.55	144.74	106	PZ134
672	69	0.43	144.12	106.6	PZ134
674	69.06	0.49	144.12	106.6	PZ134
700	69	0.06	144.12	106.6	PZ134
688	69.43	0.29	144.62	106.7	PZ134
J-1	68.9	0	144.14	106.8	PZ134
S4-PR3	68.92	0.35	144.12	106.8	PZ134
690	69.3	0.21	144.61	106.9	PZ134

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
684	69.27	0.14	144.62	107	PZ134
714	68.5	0.76	144.13	107.4	PZ134
J-2	68.44	0	144.13	107.4	PZ134
654	68	1.66	144.1	108	PZ134
670	68	1.19	144.09	108	PZ134
698	68	0.06	144.1	108	PZ134
S4-Q3	67.91	0.29	144.13	108.2	PZ134
872	66.13	3.68	142.75	108.8	PZ134
706	67.36	0.29	144.12	109	PZ134
710	67.31	0.21	144.13	109	PZ134
J-465	67.29	0	144.1	109	PZ134
1154	64.85	1.7	141.9	109.4	PZ134
558	65.67	1.29	143.07	109.9	PZ134
564	65.46	1.41	143.11	110.2	PZ134
S4-PS4	66.39	0.63	144.1	110.3	PZ134
J-424	63.9	0	141.96	110.8	PZ134
1142	63.44	0.29	141.9	111.4	PZ134
1880	65.5	0.63	144.12	111.6	PZ134
508	64	0.59	142.7	111.7	PZ134
510	64.08	0	142.93	111.9	PZ134
446	64.02	0	142.92	112	PZ134
1140	62.77	0	141.9	112.3	PZ134
566	63.81	1.28	143.12	112.6	PZ134
1144	62.61	0.06	141.9	112.6	PZ134
882	62.41	0.43	142.02	113	PZ134
1838	63.43	0.38	143.06	113	PZ134
880	61.63	0.21	142.03	114.1	PZ134
1160	61.5	1.06	141.86	114.1	PZ134
1158	61.37	1.06	141.93	114.4	PZ134
1854	61.69	1.79	142.4	114.6	PZ134
J-421	61	0	141.92	114.9	PZ134
J-41	63.13	0	144.63	115.7	PZ134
560	61.42	0.85	143.05	115.9	PZ134
J-468	60.27	0	141.97	116	PZ134
1148	60.11	2.19	141.91	116.1	PZ134
876	59.97	0	142.07	116.5	PZ134
J-42	62.59	0	144.74	116.6	PZ134
1150	59.33	1.3	141.93	117.2	PZ134
428	59.37	0	142.89	118.6	PZ134
568	59.51	1.79	143.17	118.7	PZ134
1156	58.37	0.08	142.06	118.8	PZ134
J-460	59.22	0	142.93	118.8	PZ134
J-43	60.85	0	144.74	119.1	PZ134

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
1166	57.68	0.4	142.12	119.9	PZ134
J-464	58.4	0	143.86	121.3	PZ134
1146	55.45	0.06	141.9	122.7	PZ134
398	56.04	0	142.87	123.3	PZ134
J-462	56.75	0	143.61	123.3	PZ134
400	55.75	0.13	142.82	123.6	PZ134
J-374	55.32	0	143.06	124.5	PZ134
548	54.95	0.43	143	125	PZ134
874	54	0.14	142.41	125.5	PZ134
544	54.24	0	142.94	125.9	PZ134
546	54.24	1.26	142.94	125.9	PZ134
1856	53.19	0.29	141.9	125.9	PZ134
870	53.36	0.14	143	127.2	PZ134
J-283	52.97	0	142.94	127.7	PZ134
J-53	49.82	0	140.42	128.6	PZ134
J-463	51.35	0	143.36	130.6	PZ134
J-39	52.06	0	144.74	131.6	PZ134
550	50.22	1.79	143	131.7	PZ134
J-282	48.86	0	143.04	133.7	PZ134
552	48.76	1.66	143.01	133.8	PZ134
556	48.31	0	143.15	134.6	PZ134
572	48.33	0.35	143.15	134.6	PZ134
J-281	47.99	0	143.04	134.9	PZ134
554	47.7	0.63	143.06	135.4	PZ134
1874	47.5	0.29	143.13	135.7	PZ134
20	41.96	0	142.87	143.2	PZ134
22	41.84	0	142.88	143.4	PZ134
18	38	0	142.9	148.9	PZ134
384	37.34	0.19	142.79	149.7	PZ134
1876	36.55	0	142.01	149.7	PZ134
1296	31.77	0.11	141.56	155.8	PZ134
1328	31.53	0	141.62	156.3	PZ134
1326	27.81	0	141.63	161.6	PZ134
1324	24.78	0	141.64	165.9	PZ134
1320	19.36	0	141.66	173.6	PZ134
J-493	11.27	0	143.65	187.9	PZ134
J-545	103.17	7.13	141.42	54.3	PZ145
936	101.04	1.33	141.02	56.7	PZ145
922	100.95	0	141.44	57.5	PZ145
944	100.72	0	141.43	57.8	PZ145
J-97	100.67	1.68	141.51	58	PZ145
920	100.5	0.15	141.43	58.1	PZ145
1138	100.61	0.21	141.53	58.1	PZ145

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
942	98.89	0.74	140.88	59.6	PZ145
948	98.87	4.89	140.88	59.6	PZ145
938	98.47	2.4	141	60.4	PZ145
S5-PS1	97.51	0.6	141.39	62.3	PZ145
J-334	97.48	0	141.68	62.7	PZ145
1132	97.71	0	141.96	62.8	PZ145
1134	97.57	0	141.88	62.9	PZ145
940	96.5	0.76	141	63.2	PZ145
J-335	95.47	0	141	64.6	PZ145
1130	96.37	0	142.2	65	PZ145
864	96.02	1.28	141.9	65.1	PZ145
1136	95.89	1.8	141.84	65.2	PZ145
1098	94.16	0.59	141.08	66.6	PZ145
S5-Q1	93.85	0	141.22	67.3	PZ145
858	94.39	0	141.87	67.4	PZ145
1100	93.61	0.41	141.11	67.4	PZ145
S5-PS4	93.5	0	141.05	67.5	PZ145
946	93.5	0	141.2	67.7	PZ145
992	93.28	0.51	141.19	68	PZ145
S5-Q2	93.21	0.41	141.17	68.1	PZ145
J-546	93.76	7.13	141.91	68.3	PZ145
924	93.06	0.46	141.3	68.5	PZ145
J-327	93.05	0	141.54	68.8	PZ145
910	92.78	0.46	141.3	68.9	PZ145
S5-PR1	91.8	0	141.11	70	PZ145
542	92.6	0	142.6	71	PZ145
894	91.78	0	141.83	71	PZ145
866	92.53	0.59	142.58	71.1	PZ145
900	91.32	0.38	141.8	71.7	PZ145
898	90.83	0	141.81	72.4	PZ145
990	90.02	2.16	141.15	72.6	PZ145
J-486	90.77	0	142.12	72.9	PZ145
S5-PS2	89.34	1.21	141.17	73.6	PZ145
856	89.38	1.69	142	74.7	PZ145
934	88.01	0.68	141	75.2	PZ145
932	87.78	0.34	141	75.6	PZ145
908	87.28	0.38	141.28	76.6	PZ145
926	86.91	6.54	141.01	76.8	PZ145
916	86.8	0.31	141.27	77.3	PZ145
J-319	86.3	0	141.16	77.9	PZ145
890	86.72	1.91	141.69	78	PZ145
1108	86.12	1.55	141.14	78.1	PZ145
S5-PR2	85.99	0	141.12	78.2	PZ145

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
892	86.59	3.2	141.72	78.3	PZ145
J-333	85.96	0	141.89	79.4	PZ145
928	84.91	0.41	141.01	79.6	PZ145
J-328	85.07	0	141.53	80.1	PZ145
J-495	85.45	0	142.05	80.3	PZ145
854	85.24	1.69	142.05	80.6	PZ145
J-500	84.3	0	141.14	80.7	PZ145
J-487	84.67	0	142.23	81.7	PZ145
S5-Q3	83.13	2.09	141.13	82.3	PZ145
1182	82.7	0.78	141.24	83.1	PZ145
1110	82.43	1.31	141.14	83.3	PZ145
J-200	82.34	0	141.01	83.3	PZ145
862	83.09	0.76	141.97	83.6	PZ145
994	81.86	1.6	141.13	84.1	PZ145
J-25	83.26	0	142.54	84.1	PZ145
J-30	83.27	0	142.54	84.1	PZ145
J-22	83.25	0	142.54	84.2	PZ145
J-23	83.24	0	142.54	84.2	PZ145
850	82.57	1.86	142.16	84.6	PZ145
840	82.61	0	142.66	85.2	PZ145
842	82.56	0	142.64	85.3	PZ145
J-336	81.04	0	141.21	85.4	PZ145
844	82.07	0	142.54	85.8	PZ145
1106	80.07	2.01	141.08	86.6	PZ145
J-215	79.5	0	141.13	87.5	PZ145
S5-PR3	79.44	0	141.12	87.6	PZ145
822	80.98	0	142.76	87.7	PZ145
1114	79.22	0.39	141.07	87.8	PZ145
J-315	79.01	0	141.08	88.1	PZ145
996	78.59	1.1	141.12	88.8	PZ145
830	80.13	0.61	142.76	88.9	PZ145
1180	78.19	0	141.29	89.6	PZ145
S5-PS3	77.8	0	140.94	89.6	PZ145
852	78.91	2.04	142.37	90.1	PZ145
972	77.45	1.48	141.13	90.4	PZ145
1184	77.5	0.61	141.25	90.5	PZ145
1112	77.32	1.15	141.14	90.6	PZ145
834	78.69	0	142.82	91	PZ145
J-316	76.91	0	141.08	91.1	PZ145
J-314	75.18	0	140.85	93.2	PZ145
1210	75.09	0.48	140.9	93.4	PZ145
888	75.75	3.43	141.64	93.5	PZ145
824	76.96	0	142.88	93.6	PZ145

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
1212	74.71	0.61	140.89	93.9	PZ145
1214	74.72	2.64	140.85	93.9	PZ145
826	76.65	0.53	142.87	94	PZ145
848	75.5	0.19	142.16	94.6	PZ145
J-549	77.15	0	144.57	95.7	PZ145
828	75.09	3.13	142.8	96.1	PZ145
J-548	76.34	0	144.12	96.2	PZ145
J-329	73.56	0	141.47	96.4	PZ145
1186	72.88	1.31	141.22	97	PZ145
998	72.7	0.59	141.1	97.1	PZ145
J-45	72.46	0	141.2	97.6	PZ145
1216	71.77	3.03	140.83	98	PZ145
J-317	72.05	0	141.07	98	PZ145
886	72.75	0	141.9	98.2	PZ145
930	71.14	2.49	140.87	99	PZ145
914	71.26	3.43	141.27	99.4	PZ145
J-216	70.3	0	141.13	100.5	PZ145
1118	70.21	0.61	141.07	100.6	PZ145
846	71.14	0.95	142.25	100.9	PZ145
J-320	69.95	0	141.11	101	PZ145
J-1	69.82	0	141.07	101.1	PZ145
1004	69.7	0.59	141.09	101.3	PZ145
1116	69.6	0.61	141.07	101.5	PZ145
962	69.24	2.2	140.8	101.6	PZ145
J-292	69.38	0	141.07	101.8	PZ145
J-291	68.73	0	140.83	102.3	PZ145
J-496	68.59	0	140.82	102.5	PZ145
1218	67.89	0.96	140.85	103.6	PZ145
1006	68.06	1.26	141.08	103.7	PZ145
986	67.01	0.93	140.83	104.8	PZ145
J-321	66.78	0	140.8	105.1	PZ145
J-44	66.89	0	141.21	105.5	PZ145
J-318	65.75	0	141.08	106.9	PZ145
J-289	65.39	0	140.89	107.2	PZ145
1220	64.15	0.31	140.86	108.9	PZ145
J-332	64.41	0	141.79	109.8	PZ145
964	62.92	2.7	140.8	110.5	PZ145
J-238	63.18	0	141.08	110.6	PZ145
J-325	62.88	0	140.81	110.6	PZ145
J-322	62.36	0	140.8	111.3	PZ145
906	59.74	0	141.62	116.2	PZ145
J-217	58.91	0	140.8	116.2	PZ145
984	58.87	0.59	140.82	116.3	PZ145

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-326	57.99	0	140.82	117.6	PZ145
J-198	58.38	0	141.27	117.7	PZ145
J-290	57.83	0	140.86	117.9	PZ145
J-324	55.45	0	140.8	121.1	PZ145
1008	55.39	0.31	141.07	121.6	PZ145
982	54.34	0.71	140.82	122.7	PZ145
812	55.14	0	142.75	124.4	PZ145
976	33.97	0.38	142.4	153.9	PZ145
978	27.18	0.69	142.4	163.6	PZ145
1816	52.62	0.2	79.82	38.6	PZ84
S2-PR1	45.39	0	76.95	44.8	PZ84
S2-Q1	44.59	0	77.42	46.6	PZ84
136	42.77	4.41	76.66	48.1	PZ84
J-387	42.5	0	76.57	48.4	PZ84
138	42.5	1.81	76.67	48.5	PZ84
S2-PS1	43.58	0.6	78	48.9	PZ84
S2-PS2	42	7.54	76.48	48.9	PZ84
122	42.5	0	77.08	49.1	PZ84
J-248	41.16	0	76.67	50.4	PZ84
124	40.46	0	76.69	51.4	PZ84
760	39.86	0.73	77.17	53	PZ84
754	38.4	1.53	76.95	54.7	PZ84
1852	36.39	1.45	76.9	57.5	PZ84
Quinsam IR	33.63	16.25	74.27	57.7	PZ84
756	36.16	0.89	77.17	58.2	PZ84
116	35.9	1.94	77.11	58.5	PZ84
382	36.31	2.93	77.69	58.7	PZ84
S2-Q3	34.73	1.5	76.27	59	PZ84
J-206	33.85	0	75.48	59.1	PZ84
80	35.03	0	77.12	59.7	PZ84
S1-PR1	35.06	1.38	77.12	59.7	PZ84
770	35.16	0.7	78.12	61	PZ84
J-375	31.44	0	74.66	61.4	PZ84
344	30.56	2.5	75.22	63.4	PZ84
466	30.89	1.8	75.54	63.4	PZ84
J-307	30.41	0	75.24	63.6	PZ84
J-276	32.32	0	77.24	63.8	PZ84
S1-PR2	31.98	0.78	77.16	64.1	PZ84
S1-Q1	32	0	77.21	64.2	PZ84
114	31.5	0.71	77.16	64.8	PZ84
S2-PR3	30.36	0	76.24	65.1	PZ84
J-96	30.86	0	77.28	65.9	PZ84
84	30.5	0.61	77.27	66.4	PZ84

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
784	31.68	0.35	79.12	67.3	PZ84
578	29.96	0.4	77.46	67.4	PZ84
102	29.56	1.16	77.24	67.7	PZ84
772	30.12	0.18	78.17	68.2	PZ84
J-214	27	0	75.24	68.5	PZ84
474	24.66	8.78	74.53	70.8	PZ84
378	25.82	1.49	75.77	70.9	PZ84
492	25.14	0.48	75.24	71.1	PZ84
586	26.96	0	77.29	71.4	PZ84
594	26.94	0.1	77.29	71.5	PZ84
584	26.88	0	77.29	71.6	PZ84
112	26.68	0.71	77.18	71.7	PZ84
J-377	24.27	0	74.77	71.7	PZ84
580	26.78	1.01	77.4	71.9	PZ84
S1-Q2	26.51	0.65	77.18	71.9	PZ84
1868	26.29	0.1	77.29	72.4	PZ84
774	26.76	0.1	78.15	72.9	PZ84
98	25.72	0.71	77.3	73.2	PZ84
778	26.57	0.65	78.13	73.2	PZ84
S1-PS1	25.9	0	77.62	73.4	PZ84
782	26.39	0.35	78.48	73.9	PZ84
82	25.01	0.6	77.54	74.6	PZ84
596	24.58	0	77.29	74.8	PZ84
750	24.12	1.09	76.79	74.8	PZ84
752	24.47	1.65	77.29	75	PZ84
J-453	22.42	0	75.27	75	PZ84
S1-PR3	24.26	0	77.11	75	PZ84
776	24.91	0.48	78.15	75.6	PZ84
S1-PS4	24	0	77.49	75.9	PZ84
90	23.28	1.69	77.11	76.4	PZ84
780	24.19	0.08	78.07	76.5	PZ84
92	22.84	1.88	77.13	77.1	PZ84
376	21.17	2.13	75.48	77.1	PZ84
106	22.99	0.83	77.37	77.2	PZ84
472	20.47	1.93	75	77.4	PZ84
S2-PS4	21.41	0.75	76.15	77.7	PZ84
S1-PS2	21.98	0.78	77.11	78.3	PZ84
118	21.99	0	77.38	78.6	PZ84
108	22	2.2	77.48	78.8	PZ84
128	20.57	1.84	76.17	78.9	PZ84
748	20.42	0.06	76.15	79.1	PZ84
J-211	18.7	0	74.69	79.5	PZ84
374	19.13	1.41	75.29	79.7	PZ84

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-161	20.3	0	76.44	79.7	PZ84
372	19	0.84	75.28	79.9	PZ84
576	21.04	0.4	77.54	80.2	PZ84
470	17.53	9.35	74.53	80.9	PZ84
110	20.02	1.49	77.19	81.1	PZ84
J-391	20.02	0	77.28	81.3	PZ84
468	18.18	0.49	75.59	81.5	PZ84
338	16.82	0.54	74.56	82	PZ84
78	19.74	14.7	77.96	82.6	PZ84
96	18.44	1.04	77.14	83.3	PZ84
76	19.5	0	78.41	83.6	PZ84
J-392	18.14	0	77.11	83.7	PZ84
S1-PS3	18.2	0	77.14	83.7	PZ84
94	18.08	1.99	77.14	83.8	PZ84
1844	19.44	0.48	78.46	83.8	PZ84
178	17.73	0.39	77.13	84.3	PZ84
S2-PR2	16.63	0	76.11	84.4	PZ84
176	17.5	0	77.18	84.7	PZ84
J-163	16.26	0	76.26	85.2	PZ84
J-455	15.28	0	75.33	85.2	PZ84
J-499	17.07	0	77.13	85.2	PZ84
132	15.6	0.34	76.11	85.9	PZ84
S2-Q2	15.43	0	76.11	86.1	PZ84
S3-PR3	14.46	0	75.15	86.2	PZ84
74	19	0.41	80.03	86.6	PZ84
186	14.5	2.86	76.03	87.3	PZ84
J-160	15.5	0	77.18	87.6	PZ84
180	14.21	1.78	76.08	87.8	PZ84
J-168	13.66	0	76.09	88.6	PZ84
144	13.55	3.33	76.08	88.8	PZ84
476	12.49	4.71	75.08	88.8	PZ84
142	13.41	1.25	76.08	89	PZ84
1818	14.27	1.24	77.12	89.2	PZ84
166	13.31	7.23	76.26	89.4	PZ84
J-171	14.06	0	77.12	89.5	PZ84
J-388	12.9	0	76.08	89.7	PZ84
184	12.78	0.01	76.09	89.9	PZ84
J-172	13.6	0	77.12	90.2	PZ84
J-278	12.5	0	76.08	90.3	PZ84
340	11.49	0.83	75.24	90.5	PZ84
S3-PS4	11.31	1.55	75.14	90.6	PZ84
342	11.02	0.11	75.21	91.1	PZ84
J-156	11.81	0	76.1	91.3	PZ84

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-445	12.97	0	77.35	91.4	PZ84
582	13	1.41	77.55	91.6	PZ84
J-162	11.86	0	76.44	91.7	PZ84
J-162	11.5	0	76.26	91.9	PZ84
172	11.31	0	76.09	92	PZ84
J-154	11.14	0	76.12	92.2	PZ84
160	11	1.5	76.12	92.4	PZ84
162	11	2.7	76.12	92.4	PZ84
J-155	10.84	0	76.18	92.8	PZ84
574	11.9	0.5	77.59	93.2	PZ84
S3-Q3	9.5	1.23	75.17	93.2	PZ84
164	10.5	2.76	76.21	93.3	PZ84
1820	11.27	1.59	77.11	93.5	PZ84
J-389	10.58	0	76.44	93.5	PZ84
54	11.5	0	77.65	93.9	PZ84
J-166	9.44	0	76.12	94.6	PZ84
J-164	9.5	0	76.21	94.7	PZ84
250	10.52	0	77.34	94.8	PZ84
J-554	10.38	7.58	77.33	95	PZ84
336	7.66	0.83	74.69	95.1	PZ84
J-436	7.73	0	75.16	95.7	PZ84
J-167	8.5	0	76.12	96	PZ84
332	6.8	0.75	74.69	96.4	PZ84
1822	9.21	0.74	77.1	96.4	PZ84
J-247	9.53	0	77.48	96.5	PZ84
198	9.07	0.58	77.37	96.9	PZ84
J-165	7.67	0	76.21	97.3	PZ84
194	8.68	1.53	77.48	97.7	PZ84
J-14	8.55	0	77.35	97.7	PZ84
J-207	6.64	0	75.45	97.7	PZ84
248	8.42	0.15	77.34	97.8	PZ84
228	8.33	0.24	77.34	97.9	PZ84
58	8.39	3.05	77.86	98.6	PZ84
J-494	5.23	0	74.71	98.6	PZ84
200	7.5	1.06	77.39	99.2	PZ84
348	5.15	1.59	75.12	99.3	PZ84
J-556	5.35	7.58	75.3	99.3	PZ84
290	4.42	3.69	74.53	99.5	PZ84
192	7.34	0.46	77.58	99.7	PZ84
J-441	5	0	75.34	99.9	PZ84
196	7	1.06	77.44	100	PZ84
1824	6.62	1.81	77.08	100	PZ84
1836	4	3.05	74.45	100	PZ84

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-452	4.5	0	74.95	100	PZ84
282	4.08	3.65	74.59	100.1	PZ84
302	4.07	0.69	74.58	100.1	PZ84
380	4.92	0.75	75.45	100.1	PZ84
1864	7.15	1.6	77.65	100.1	PZ84
324	4.09	1.68	74.73	100.3	PZ84
J-442	4.98	0	75.72	100.4	PZ84
J-194	7.56	0	78.37	100.5	PZ84
56	6.78	0.1	77.65	100.6	PZ84
292	3.64	1.99	74.49	100.6	PZ84
J-378	4.25	0	75.11	100.6	PZ84
364	4.08	0.33	75.04	100.7	PZ84
368	4.12	0.4	75.04	100.7	PZ84
S3-PR1	4.11	0.9	75.08	100.7	PZ84
1860	3.43	0.65	74.44	100.8	PZ84
146	4.98	1.36	76.06	100.9	PZ84
326	3.62	1.43	74.7	100.9	PZ84
J-451	3.7	0	74.8	100.9	PZ84
S3-Q1	3.99	2.15	75.08	100.9	PZ84
J-497	3.5	0	74.7	101.1	PZ84
J-498	3.5	0	74.7	101.1	PZ84
152	4.73	0	76.05	101.2	PZ84
300	3.18	12.53	74.48	101.2	PZ84
1850	3.18	0	74.48	101.2	PZ84
216	6.29	0.94	77.64	101.3	PZ84
294	3.11	4.38	74.48	101.3	PZ84
1872	3.22	5	74.58	101.3	PZ84
156	4.61	2.45	76.05	101.4	PZ84
298	3	0.2	74.44	101.4	PZ84
J-438	3.27	0	74.71	101.4	PZ84
296	3	1.69	74.48	101.5	PZ84
1862	4.57	0	76.05	101.5	PZ84
J-195	6.82	0	78.36	101.5	PZ84
J-209	3.48	0	75.01	101.5	PZ84
J-443	4.5	0	75.99	101.5	PZ84
J-448	3.5	0	75.01	101.5	PZ84
S2-PS3	4.56	3.51	76.04	101.5	PZ84
60	6.81	0.16	78.38	101.6	PZ84
140	4.5	2.13	76.11	101.6	PZ84
352	3.5	1.51	75.08	101.6	PZ84
J-169	4.5	0	76.04	101.6	PZ84
J-550	3.5	12.91	75.1	101.6	PZ84
334	3.06	1.21	74.73	101.7	PZ84

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
354	3.5	1.96	75.12	101.7	PZ84
J-132	3.45	0	75.08	101.7	PZ84
J-450	3.02	0	74.66	101.7	PZ84
318	3.2	0.19	74.94	101.8	PZ84
202	5.58	1.64	77.34	101.9	PZ84
286	2.93	0.89	74.71	101.9	PZ84
312	2.99	0.25	74.81	101.9	PZ84
J-449	3.34	0	75.15	101.9	PZ84
280	2.86	0.5	74.68	102	PZ84
1866	7	0.06	78.85	102	PZ84
J-133	3.19	0	75.08	102	PZ84
J-440	3.25	0	75.08	102	PZ84
J-551	2.94	12.08	74.81	102	PZ84
266	3.5	0.76	75.45	102.1	PZ84
272	3.5	1.61	75.42	102.1	PZ84
276	2.79	0.94	74.7	102.1	PZ84
370	3.01	0.9	74.98	102.1	PZ84
J-552	2.72	12.08	74.64	102.1	PZ84
S3-PS2	2.99	0	74.88	102.1	PZ84
284	2.73	0.66	74.7	102.2	PZ84
306	2.81	0.26	74.77	102.2	PZ84
308	2.85	0.1	74.86	102.2	PZ84
330	2.7	1.89	74.72	102.2	PZ84
356	3	0.98	74.97	102.2	PZ84
358	3	0.8	74.96	102.2	PZ84
S3-PS1	2.71	0.91	74.71	102.2	PZ84
J-129	3.11	0	75.19	102.3	PZ84
J-134	3	0	75.08	102.3	PZ84
J-141	3	0	75.04	102.3	PZ84
J-277	4.01	0	76.09	102.3	PZ84
J-553	4	7.58	76.09	102.3	PZ84
254	4	0.06	76.17	102.4	PZ84
270	3.22	1.14	75.37	102.4	PZ84
328	2.6	1.56	74.71	102.4	PZ84
J-130	3.08	0	75.19	102.4	PZ84
J-157	3.91	0	76.06	102.4	PZ84
S3-PR2	2.61	0.93	74.75	102.4	PZ84
188	3.85	0	76.05	102.5	PZ84
258	3.97	0.08	76.17	102.5	PZ84
304	2.66	0.94	74.86	102.5	PZ84
J-131	3	0	75.19	102.5	PZ84
158	3.78	1.06	76.06	102.6	PZ84
310	2.5	0.5	74.8	102.6	PZ84

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
1870	4.72	0.2	77.01	102.6	PZ84
J-208	2.74	0	75.01	102.6	PZ84
J-386	6.05	0	78.36	102.6	PZ84
J-444	4.88	0	77.2	102.6	PZ84
S3-PS3	2.5	0	74.81	102.6	PZ84
204	5	1.29	77.38	102.7	PZ84
366	2.56	0.36	74.92	102.7	PZ84
J-210	2.5	0	74.84	102.7	PZ84
J-437	2.5	0	74.83	102.7	PZ84
S3-Q2	2.5	0.73	74.85	102.7	PZ84
150	3.64	0	76.05	102.8	PZ84
208	5.63	1.11	78.05	102.8	PZ84
274	2.33	1.44	74.75	102.8	PZ84
278	2.35	0.21	74.77	102.8	PZ84
314	2.31	0.44	74.75	102.8	PZ84
J-158	3.54	0	76.05	102.9	PZ84
J-555	3.5	0	76.05	103	PZ84
244	3.5	0.01	76.11	103.1	PZ84
256	3.57	0.55	76.17	103.1	PZ84
J-244	4.11	0	76.81	103.2	PZ84
J-384	4	0	76.7	103.2	PZ84
J-439	2	0	74.74	103.2	PZ84
214	4.75	0.75	77.52	103.3	PZ84
J-245	5.92	0	78.74	103.4	PZ84
212	4.72	1.36	77.63	103.5	PZ84
226	4.07	0.48	76.99	103.5	PZ84
44	6	0.66	79.02	103.6	PZ84
46	6	0	78.98	103.6	PZ84
48	6	0.2	78.98	103.6	PZ84
206	5.26	0.49	78.25	103.6	PZ84
218	4.53	0.4	77.49	103.6	PZ84
242	3.1	0.04	76.11	103.6	PZ84
J-246	6	0	78.97	103.6	PZ84
246	3	0.69	76.14	103.8	PZ84
260	3.06	0.49	76.17	103.8	PZ84
1832	3.33	0.78	76.47	103.8	PZ84
222	4	1.58	77.25	104	PZ84
1830	3.19	1.29	76.47	104	PZ84
1834	3.19	0.61	76.47	104	PZ84
264	2.5	0.84	75.86	104.1	PZ84
J-447	3	0	76.3	104.1	PZ84
268	2.57	0.19	76.01	104.2	PZ84
234	2.94	0.59	76.44	104.3	PZ84

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
236	2.83	0.48	76.42	104.5	PZ84
220	3.65	0.68	77.32	104.6	PZ84
J-138	3.28	0	77.03	104.7	PZ84
224	3.2	0.66	76.99	104.8	PZ84
J-139	3.06	0	76.99	104.9	PZ84
230	3	1.73	76.96	105	PZ84
262	2	0.35	76.17	105.3	PZ84
J-249	2.78	0	76.97	105.3	PZ84
232	2.65	0.7	76.97	105.5	PZ84
J-446	2.5	0	76.98	105.7	PZ84
210	2.67	1.06	77.32	106	PZ84
J-385	3	0	77.71	106	PZ84
J-529	2.7	0	77.49	106.2	PZ84
J-533	47.65	0	74.83	38.6	PZ89
CONN to AREA D 1	46.93	0	78.84	45.3	PZ89
J-221	45.5	0	78.24	46.5	PZ89
1642	45.11	0	78.86	47.9	PZ89
J-534	40.95	0	74.81	48.1	PZ89
1762	50.44	0.08	86.4	51	PZ89
J-231	38.78	0	74.8	51.1	PZ89
J-535	36.95	0	74.81	53.7	PZ89
1378	39.66	0.99	77.8	54.1	PZ89
J-223	39.3	0	77.42	54.1	PZ89
J-519	38.98	0	77.72	55	PZ89
J-222	38.91	0	77.69	55.1	PZ89
1370	38.71	0.84	77.62	55.2	PZ89
1318	37.41	0	76.49	55.5	PZ89
1368	38.5	1.25	77.58	55.5	PZ89
1760	44.75	0.84	83.93	55.6	PZ89
1336	37.27	2.35	76.49	55.7	PZ89
1372	38.34	1.49	77.66	55.8	PZ89
J-373	38.19	0	77.56	55.9	PZ89
1066	37.06	0	76.51	56	PZ89
J-86	35.33	0	74.88	56.1	PZ89
J-87	35.37	0	74.88	56.1	PZ89
J-233	38	0	77.58	56.2	PZ89
1068	36.59	0.6	76.51	56.7	PZ89
J-147	34.71	3.84	74.8	56.9	PZ89
1374	37.49	2.09	77.67	57	PZ89
J-52	39.35	0	79.78	57.4	PZ89
J-224	36.84	0	77.34	57.5	PZ89
J-518	36.84	0	77.66	58	PZ89
J-135	38.82	0	79.73	58.1	PZ89

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-140	38.56	0	79.73	58.4	PZ89
1878	36.1	1.66	77.54	58.8	PZ89
J-218	36.8	0	78.53	59.2	PZ89
1376	35.67	2	77.74	59.7	PZ89
J-516	35.88	0	78.24	60.1	PZ89
J-150	37.06	0	79.7	60.5	PZ89
1638	36.76	0	79.53	60.7	PZ89
1640	36.84	0	79.59	60.7	PZ89
J-148	32.02	0	74.78	60.7	PZ89
J-515	34.95	0	77.69	60.7	PZ89
1636	35.95	0	79.18	61.4	PZ89
1634	35.79	0.13	79.17	61.6	PZ89
J-145	31.33	0	74.81	61.7	PZ89
J-85	31.3	0	74.89	61.9	PZ89
1366	34.32	0.25	78.04	62.1	PZ89
1364	34	0.68	77.84	62.2	PZ89
1746	34.41	1.36	78.24	62.2	PZ89
1334	32.58	2.74	76.48	62.3	PZ89
1460	34.15	0.93	78.02	62.3	PZ89
J-89	30.27	0	74.84	63.3	PZ89
1756	32.96	1.96	77.69	63.5	PZ89
J-501	29.92	0	74.77	63.7	PZ89
J-359	28.82	0	74.94	65.5	PZ89
J-75	30.32	0	77.34	66.7	PZ89
J-76	30.37	0	77.42	66.8	PZ89
J-149	27.71	0	74.76	66.8	PZ89
J-232	31.65	0	78.77	66.9	PZ89
J-337	30.32	0	77.5	67	PZ89
J-542	31.37	3.71	78.76	67.3	PZ89
1362	29.92	2.66	77.5	67.5	PZ89
J-84	27.45	0	75.01	67.5	PZ89
1786	29.82	0.33	77.51	67.7	PZ89
J-88	27.17	0	74.87	67.7	PZ89
J-503	27.11	0	74.78	67.7	PZ89
J-413	30.69	0	78.47	67.8	PZ89
1796	31.1	0.38	78.95	67.9	PZ89
J-339	30.62	0	78.56	68.1	PZ89
J-358	26.5	0	74.96	68.8	PZ89
1794	30.32	2.46	78.83	68.9	PZ89
J-83	25.87	0	75.06	69.8	PZ89
J-338	28.31	0	77.52	69.8	PZ89
S6-Q2	26.06	0	75.31	69.9	PZ89
1630	26.03	0.75	75.35	70	PZ89

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
1790	28.19	0.85	77.47	70	PZ89
J-225	29.12	0	78.45	70	PZ89
1626	26.04	0.13	75.42	70.1	PZ89
J-134	29	0	78.45	70.2	PZ89
1604	27.8	0.86	77.32	70.3	PZ89
1792	27.74	0.38	77.44	70.5	PZ89
J-151	25.05	0	74.77	70.6	PZ89
1744	28.06	1.01	78.24	71.2	PZ89
J-360	28.79	0	78.95	71.2	PZ89
J-90	24.5	0	74.83	71.4	PZ89
J-109	26.91	0	77.18	71.4	PZ89
J-304	28.5	0	78.95	71.6	PZ89
J-131	26.72	0	77.31	71.8	PZ89
1614	24.49	0.75	75.31	72.1	PZ89
J-150	23.93	0	74.74	72.1	PZ89
1606	26.4	1.2	77.38	72.4	PZ89
1784	26.3	0.56	77.45	72.6	PZ89
1608	26.19	0.38	77.38	72.7	PZ89
1388	25.23	0.2	76.5	72.8	PZ89
J-SouthEnd Adjust	23.54	0	74.83	72.8	PZ89
J-128	26.05	0	77.66	73.3	PZ89
1434	27.42	1.15	79.11	73.4	PZ89
1390	24.71	2.05	76.5	73.5	PZ89
1402	24.72	0.14	76.51	73.5	PZ89
J-355	22.94	0	74.81	73.6	PZ89
J-82	22.8	0	74.75	73.7	PZ89
J-98	22.82	0	74.81	73.8	PZ89
J-152	22.75	0	74.77	73.8	PZ89
1436	27.06	0.34	79.25	74.1	PZ89
J-517	26.36	0	78.85	74.5	PZ89
1632	24.44	0	77.07	74.7	PZ89
1428	25.66	0.68	78.49	75	PZ89
1432	25.93	0	78.8	75	PZ89
J-32	24.09	0	76.93	75	PZ89
1444	25.77	0.4	78.85	75.3	PZ89
J-77	21.45	0	74.72	75.6	PZ89
J-99	21.5	0	74.81	75.7	PZ89
1442	25.36	0.48	78.79	75.8	PZ89
1676	23.8	0.36	77.18	75.8	PZ89
1694	21.42	0.24	74.8	75.8	PZ89
J-504	21.25	0	74.75	75.9	PZ89
1542	24.85	0.14	78.53	76.2	PZ89
1674	23.4	1.38	77.18	76.3	PZ89

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
1430	26.51	0	80.42	76.5	PZ89
J-297	23.52	0	77.39	76.5	PZ89
J-2	24.6	0	78.55	76.6	PZ89
J-130	23.29	0	77.29	76.6	PZ89
1412	23.62	0.48	77.89	77	PZ89
1540	24	0.41	78.23	77	PZ89
1538	23.8	0.55	78.17	77.2	PZ89
J-76	20.25	0	74.72	77.3	PZ89
1782	22.86	1.08	77.38	77.4	PZ89
1468	24.28	0.48	78.87	77.5	PZ89
1680	22.5	0.86	77.1	77.5	PZ89
1352	22.84	1.83	77.52	77.6	PZ89
J-97	20.08	0	74.79	77.7	PZ89
1360	22.42	1.91	77.5	78.2	PZ89
1778	21.92	0.38	77.25	78.5	PZ89
1464	24.93	0.68	80.4	78.7	PZ89
J-510	20.97	0	77.06	79.6	PZ89
1550	23.65	0.36	79.82	79.7	PZ89
J-75	18.49	0	74.72	79.8	PZ89
1552	22.96	1.23	79.39	80.1	PZ89
1350	20.94	1.41	77.47	80.2	PZ89
1684	20.37	1.6	76.88	80.2	PZ89
1548	23.99	0.2	80.73	80.5	PZ89
1482	20.77	1.51	77.55	80.6	PZ89
1462	20.76	2.81	77.59	80.7	PZ89
1480	20.5	1.08	77.66	81.1	PZ89
1358	20.3	1.41	77.5	81.2	PZ89
S6-Q1	18.06	1.26	75.26	81.2	PZ89
1356	19.83	1.41	77.48	81.8	PZ89
J-74	17.06	0	74.71	81.8	PZ89
1446	20.03	1.38	77.72	81.9	PZ89
1484	19.19	1.51	77.46	82.7	PZ89
J-48	16.43	0	74.79	82.8	PZ89
1668	18.9	2.53	77.32	82.9	PZ89
J-64	16.22	0	74.61	82.9	PZ89
J-340	19.91	0	78.29	82.9	PZ89
1354	18.98	0.68	77.47	83	PZ89
1672	18.65	3.45	77.19	83.1	PZ89
J-520	18.82	0	77.46	83.2	PZ89
J-78	15.86	0	74.71	83.5	PZ89
1780	18.28	0.83	77.25	83.7	PZ89
J-96	15.73	0	74.79	83.8	PZ89
1348	18.3	1.25	77.46	84	PZ89

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
1410	18.12	1.23	77.39	84.1	PZ89
J-140	15.32	0	74.61	84.2	PZ89
1554	18.04	1.74	77.43	84.3	PZ89
S6-PS1	15.59	0	75.26	84.7	PZ89
1346	17.71	1.66	77.46	84.8	PZ89
J-356	14.44	0	74.77	85.6	PZ89
J-73	14.09	0	74.62	85.9	PZ89
J-79	14.19	0	74.71	85.9	PZ89
J-418	16.9	0	77.58	86.1	PZ89
1476	16.5	2.45	77.39	86.4	PZ89
1342	16.53	1.49	77.44	86.5	PZ89
S6-PR2	14.22	2.28	75.23	86.6	PZ89
1478	16.28	2.66	77.34	86.7	PZ89
1406	16.11	2.56	77.27	86.8	PZ89
1710	13.52	0.13	74.66	86.8	PZ89
1344	16.19	0.5	77.44	86.9	PZ89
J-541	15.21	0	76.51	87	PZ89
1706	13.35	0.71	74.71	87.1	PZ89
1302	15.92	0.34	77.44	87.3	PZ89
1398	14.96	0.96	76.55	87.4	PZ89
J-63	12.9	0	74.59	87.6	PZ89
J-511	15.17	0	76.94	87.7	PZ89
1394	14.64	1.3	76.51	87.8	PZ89
1682	15	1.51	76.88	87.8	PZ89
1798	15.02	3	76.88	87.8	PZ89
1414	14.98	0	77.12	88.2	PZ89
1416	14.87	0.49	77.1	88.3	PZ89
1704	12.5	0.71	74.7	88.3	PZ89
J-411	15.07	0	77.26	88.3	PZ89
1602	14.8	0.75	77.18	88.5	PZ89
1624	12.82	1.39	75.24	88.6	PZ89
1666	14.83	2.38	77.22	88.6	PZ89
J-298	14.65	0	77.08	88.6	PZ89
1692	12.27	0.24	74.79	88.7	PZ89
J-100	12.32	0	74.79	88.7	PZ89
S6-PR1	12.71	1.31	75.25	88.8	PZ89
J-512	14.39	0	77.05	88.9	PZ89
1448	14.36	0.29	77.16	89.1	PZ89
1392	13.69	1.16	76.5	89.2	PZ89
1440	14.34	0	77.16	89.2	PZ89
J-506	12.4	0	75.27	89.2	PZ89
1470	14.18	0.61	77.08	89.3	PZ89
1408	14.34	1.63	77.33	89.4	PZ89

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-341	13.8	0	76.8	89.4	PZ89
1472	14	0.08	77.03	89.5	PZ89
J-65	11.5	0	74.57	89.5	PZ89
1396	13.37	2.23	76.5	89.6	PZ89
J-505	11.91	0	75.19	89.8	PZ89
J-66	11.12	0	74.57	90.1	PZ89
J-513	13.48	0	76.94	90.1	PZ89
S6-PS4	11.8	0	75.25	90.1	PZ89
1438	14.57	0.89	78.09	90.2	PZ89
J-62	11.06	0	74.6	90.2	PZ89
J-508	11.68	0	75.23	90.2	PZ89
J-507	11.65	0	75.24	90.3	PZ89
J-303	13.14	0	76.88	90.5	PZ89
1712	10.78	0.41	74.6	90.6	PZ89
1450	12.53	1.1	76.51	90.8	PZ89
1474	13.08	0.39	77.01	90.8	PZ89
1690	10.83	0.18	74.79	90.8	PZ89
J-108	12.92	0	76.88	90.8	PZ89
1702	10.66	1.25	74.67	90.9	PZ89
J-72	10.5	0	74.58	91	PZ89
1600	12.34	1.2	76.64	91.3	PZ89
1404	12.92	1.76	77.29	91.4	PZ89
J-Southend Adjust 2	10.35	0	74.75	91.4	PZ89
1400	12.15	0.26	76.58	91.5	PZ89
1486	12.71	1.01	77.14	91.5	PZ89
J-103	10.73	0	75.19	91.5	PZ89
1520	11.98	1.16	76.55	91.7	PZ89
1530	12.5	0.86	77.11	91.7	PZ89
1534	12.43	1.08	77.06	91.7	PZ89
J-67	10	0	74.57	91.7	PZ89
J-70	9.95	0	74.57	91.7	PZ89
J-345	11.63	0	76.4	91.9	PZ89
1532	12.25	1.24	77.09	92	PZ89
1598	11.69	0.25	76.49	92	PZ89
J-68	9.75	0	74.57	92	PZ89
J-106	10.76	0	75.59	92	PZ89
1306	12.52	0	77.39	92.1	PZ89
1506	11.57	1.39	76.44	92.1	PZ89
1612	10.33	2.01	75.23	92.1	PZ89
1678	12	1.65	76.88	92.1	PZ89
1488	11.51	1.95	76.47	92.2	PZ89
1560	11.89	0.86	76.85	92.2	PZ89
1622	10.29	2.14	75.21	92.2	PZ89

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
1304	12.33	0.26	77.39	92.3	PZ89
J-234	11.39	0	76.38	92.3	PZ89
1308	12.31	0.34	77.38	92.4	PZ89
J-240	11.82	0	76.89	92.4	PZ89
J-415	11.9	0	77.01	92.4	PZ89
1492	11.23	0.65	76.4	92.5	PZ89
1698	9.55	1.66	74.72	92.5	PZ89
1500	11	1.81	76.27	92.6	PZ89
1522	11.29	1.56	76.54	92.6	PZ89
1514	11.57	0.61	76.87	92.7	PZ89
1516	11.27	1.09	76.56	92.7	PZ89
J-346	11.02	0	76.35	92.7	PZ89
J-414	12	0	77.28	92.7	PZ89
S6-PS2	9.87	1.64	75.21	92.7	PZ89
1504	11.06	2.41	76.47	92.8	PZ89
J-71	9.21	0	74.57	92.8	PZ89
J-352	11.5	0	76.88	92.8	PZ89
J-342	11	0	76.47	92.9	PZ89
J-416	11.33	0	76.75	92.9	PZ89
J-509	11.42	0	76.88	92.9	PZ89
1312	11.42	0.55	76.93	93	PZ89
1418	11.4	0.69	76.89	93	PZ89
1670	11.33	1.15	76.87	93	PZ89
J-80	9.13	0	74.67	93	PZ89
1498	10.7	0.43	76.31	93.1	PZ89
1424	11	0.41	76.69	93.2	PZ89
1496	10.66	2.05	76.32	93.2	PZ89
1716	8.88	0.36	74.51	93.2	PZ89
1422	11	0.61	76.72	93.3	PZ89
1508	11.19	0.54	76.9	93.3	PZ89
J-69	8.82	0	74.57	93.3	PZ89
J-104	9.5	0	75.21	93.3	PZ89
1310	11.5	1.09	77.3	93.4	PZ89
1688	9	1.13	74.78	93.4	PZ89
J-343	10.6	0	76.4	93.4	PZ89
1096	8.54	0.24	74.47	93.6	PZ89
1420	10.89	1.04	76.8	93.6	PZ89
1714	8.63	0.54	74.55	93.6	PZ89
1510	10.77	0.61	76.86	93.8	PZ89
1686	8.7	0.25	74.79	93.8	PZ89
1700	8.5	1.13	74.66	93.9	PZ89
J-417	11	0	77.12	93.9	PZ89
1452	10.19	0.48	76.41	94	PZ89

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
1610	9	1.64	75.22	94	PZ89
1512	10.5	1.01	76.8	94.1	PZ89
J-301	10	0	76.28	94.1	PZ89
1426	10.17	1.5	76.57	94.2	PZ89
1562	10.5	1.08	76.86	94.2	PZ89
J-354	8.74	0	75.14	94.2	PZ89
1490	10	1.44	76.41	94.3	PZ89
J-539	10	3.71	76.41	94.3	PZ89
J-344	9.89	0	76.41	94.4	PZ89
J-353	8.61	0	75.22	94.5	PZ89
J-357	8	0	74.65	94.6	PZ89
1524	10	1.16	76.71	94.7	PZ89
J-81	7.95	0	74.66	94.7	PZ89
J-235	9.92	0	76.67	94.7	PZ89
1526	9.81	1.56	76.67	94.9	PZ89
J-543	9.5	0	76.52	95.1	PZ89
1594	9.24	1.44	76.34	95.3	PZ89
1696	7.47	1.55	74.65	95.4	PZ89
1576	9	0	76.29	95.5	PZ89
1580	9	0.43	76.29	95.5	PZ89
J-102	7.76	0	75.19	95.7	PZ89
1578	8.81	1.16	76.28	95.8	PZ89
1558	9	0	76.65	96	PZ89
1568	8.9	1.49	76.52	96	PZ89
J-302	9.18	0	76.8	96	PZ89
1596	8.72	1.81	76.4	96.1	PZ89
1574	8.76	0.75	76.52	96.2	PZ89
S6-PS3	7.12	0.19	74.88	96.2	PZ89
CONN TO AREA D 2	6.44	0	74.29	96.3	PZ89
1564	8.73	2.35	76.81	96.6	PZ89
1570	8.5	0.11	76.52	96.6	PZ89
1572	8.5	0.21	76.52	96.6	PZ89
1718	6.38	0.36	74.43	96.6	PZ89
1566	8.69	2.24	76.8	96.7	PZ89
J-410	8.25	0	76.35	96.7	PZ89
J-514	8.46	0	76.63	96.8	PZ89
1628	6.53	1.01	75.11	97.3	PZ89
J-105	6.96	0	75.59	97.4	PZ89
1094	5.89	0.48	74.64	97.6	PZ89
J-538	5.73	0	74.47	97.6	PZ89
J-305	5.5	0	74.67	98.2	PZ89
J-351	6.78	0	76.25	98.6	PZ89
1588	6.69	2.18	76.23	98.7	PZ89

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
S6-PR3	5.5	0	75.05	98.7	PZ89
1090	5.47	0.19	75.1	98.8	PZ89
1592	6.65	1.15	76.23	98.8	PZ89
J-306	5.02	0	74.67	98.9	PZ89
J-347	6.5	0	76.31	99.1	PZ89
S6-Q3	5.35	0	75.16	99.1	PZ89
J-349	6.33	0	76.2	99.2	PZ89
J-101	4.99	0	75.19	99.6	PZ89
1590	5.87	3.61	76.2	99.8	PZ89
J-107	5.21	0	75.59	99.9	PZ89
J-350	5.83	0	76.21	99.9	PZ89
1082	5.74	1.5	76.27	100.1	PZ89
1586	5.5	3.49	76.18	100.3	PZ89
J-300	5.53	0	76.34	100.5	PZ89
1080	5.49	1.98	76.34	100.6	PZ89
1088	4.34	1.13	75.23	100.6	PZ89
1584	5.25	0.1	76.17	100.7	PZ89
1086	4.61	3.2	75.59	100.8	PZ89
J-299	5.29	0	76.34	100.9	PZ89
J-348	5	0	76.2	101.1	PZ89
1078	5	0.3	76.35	101.3	PZ89
J-540	5	0	76.34	101.3	PZ89
1084	4.6	0.48	76.12	101.5	PZ89
J-236	4.48	0	76.02	101.5	PZ89
820	4.85	5.71	76.52	101.7	PZ89
1582	4.45	0.36	76.13	101.7	PZ89
J-405	4.89	0	76.63	101.8	PZ89
J-137	4.57	0	76.39	101.9	PZ89
1076	4.5	1.61	76.37	102	PZ89
1070	4.58	0.66	76.5	102.1	PZ89
1072	4.55	1.3	76.48	102.1	PZ89
J-408	4.56	0	76.49	102.1	PZ89
J-407	4.52	0	76.51	102.2	PZ89
J-406	4.41	0	76.51	102.3	PZ89
J-524	4.35	0	76.51	102.4	PZ89
J-404	4.5	0	76.75	102.6	PZ89
J-409	4.03	0	76.45	102.8	PZ89
J-237	4.01	0	76.51	102.9	PZ89
1074	3.71	1.05	76.41	103.2	PZ89
J-526	4	0	76.85	103.4	PZ89
J-525	4	0	76.94	103.5	PZ89
J-136	4	0	77	103.6	PZ89
J-544	5	0	78.08	103.7	PZ89

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-403	4.29	0	77.38	103.8	PZ89
980	4.54	1.14	77.83	104	PZ89
818	3.77	3.8	77.12	104.1	PZ89
J-402	4	0	77.59	104.5	PZ89
816	4	5.11	77.83	104.8	PZ89
J-527	4	0	77.93	104.9	PZ89
J-401	4	0	77.97	105	PZ89
814	4	2.16	78.08	105.2	PZ89
J-400	3.5	0	78.23	106.1	PZ89
J-126	85.52	0	89	4.9	Reservoir
J-125	85.29	0	88.87	5.1	Reservoir
J-569	146	0	149.97	5.6	Reservoir
J-17	78	0	83.52	7.8	Reservoir
J-18	78	0	83.52	7.8	Reservoir
J-20	78	0	83.52	7.8	Reservoir
J-21	78	0	83.51	7.8	Reservoir
J-26	78	0	83.52	7.8	Reservoir
J-563	78	0	83.54	7.9	Reservoir
J-251	156	0	162.76	9.6	Reservoir
J-568	146	0	153	9.9	Reservoir
J-398	145.08	1.62	160.93	22.5	Snowdon
J-253	132.25	1.62	158.76	37.6	Snowdon
J-252	131.92	58.01	158.78	38.1	Snowdon
J-270	20.31	1.62	53.05	46.5	Snowdon
J-254	115.78	1.62	158.42	60.5	Snowdon
J-258	65.18	1.62	112.47	67.1	Snowdon
J-271	4.01	1.62	53.04	69.6	Snowdon
J-250	143.2	0	195.04	73.6	Snowdon
J-264	51.22	1.62	112.31	86.7	Snowdon
J-263	49.74	1.62	112.3	88.8	Snowdon
J-259	49.61	1.62	112.35	89.1	Snowdon
J-256	94.05	0	157.75	90.4	Snowdon
J-492	94.06	1.62	158.09	90.9	Snowdon
J-260	48.11	1.62	112.31	91.1	Snowdon
J-255	91.83	1.62	157.92	93.8	Snowdon
J-397	42.44	1.62	112.3	99.2	Snowdon
J-262	41.72	1.62	112.3	100.2	Snowdon
J-265	41.12	1.62	112.29	101	Snowdon
J-396	40.12	1.62	112.3	102.5	Snowdon
J-261	36	1.62	112.29	108.3	Snowdon
J-267	29.13	1.62	112.18	117.9	Snowdon
J-266	28.74	1.62	112.29	118.6	Snowdon
J-269	27.95	1.62	112.18	119.6	Snowdon

2041 Peak Hour Results

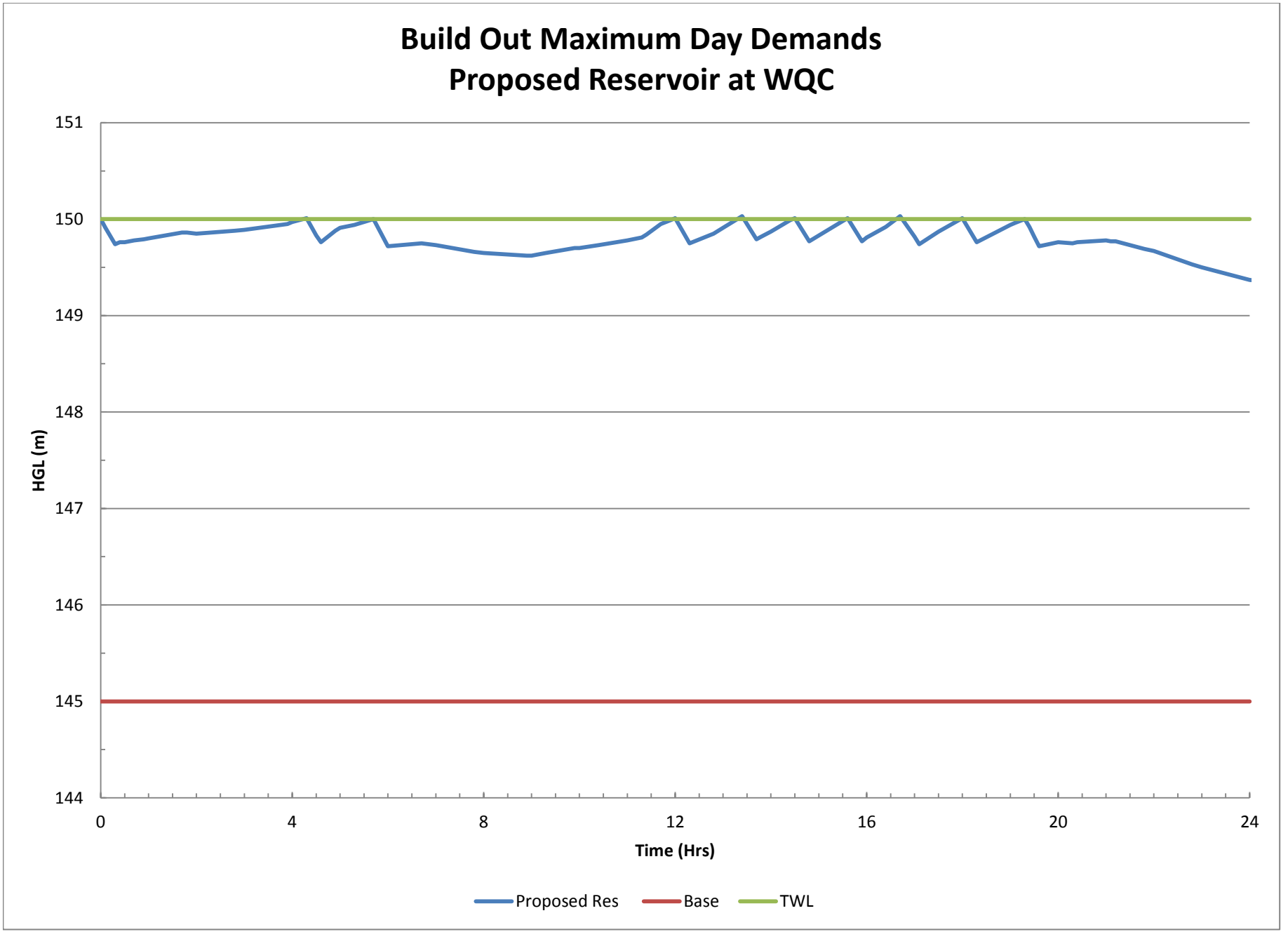
Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-268	21.15	1.62	112.18	129.2	Snowdon
J-257	65.62	1.62	157.53	130.5	Snowdon
J-142	147.9	0	149.54	2.3	Supply
J-570	142.5	0	145.5	4.3	Supply
J-562	144	0	149.54	7.9	Supply
798	76.66	0.13	83.33	9.5	Supply
J-3	69.03	0	87.11	25.7	Supply
1648	60	0	78.44	26.2	Supply
1646	60	0	78.51	26.3	Supply
J-127	40.59	0	80.97	57.3	Supply
J-50	40.4	0	80.97	57.6	Supply
1658	32.83	0	82.14	70	Supply
J-137	29.25	0	80.34	72.5	Supply
1662	29.61	0	81.89	74.2	Supply
J-136	27.89	0	81.15	75.6	Supply
1656	28.74	0	82.56	76.4	Supply
1768	85.41	0	140.08	77.6	Supply
1300	25.75	0	80.97	78.4	Supply
1454	24.71	0	81.12	80.1	Supply
1456	24.61	0	81.14	80.2	Supply
J-43	25.04	0	82.23	81.2	Supply
1546	24.35	0	81.7	81.4	Supply
1544	24.66	0	82.15	81.6	Supply
J-27	83.12	0	142.54	84.3	Supply
1882	82.25	0	143.09	86.4	Supply
J-15	78	0	143.09	92.4	Supply
J-16	78	0	143.09	92.4	Supply
70	20	87	86.31	94.1	Supply
836	76.68	0	143.03	94.2	Supply
J-6	75.35	0	144.36	98	Supply
68	18.89	0	87.99	98.1	Supply
518	72.85	0	143.23	99.9	Supply
538	72.85	1.26	143.22	99.9	Supply
J-36	72.83	0	143.22	99.9	Supply
516	72.77	0	143.21	100	Supply
1766	68.87	0	140.08	101.1	Supply
J-8	68.5	0	140.08	101.6	Supply
J-9	68.5	0	140.08	101.6	Supply
J-10	68.5	0	140.08	101.6	Supply
J-11	68.5	0	140.08	101.6	Supply
J-7	68.33	0	140.08	101.9	Supply
J-23	72.84	0	144.63	101.9	Supply
J-12	68.07	0	140.08	102.2	Supply

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-189	72.54	0	144.63	102.3	Supply
J-6	67.78	0	140.08	102.6	Supply
970	69.56	0	142.14	103	Supply
J-5	66.97	0	140.08	103.8	Supply
J-31	66.83	0	140.08	104	Supply
J-4	65.99	0	140.08	105.2	Supply
646	70.21	0	144.8	105.9	Supply
702	69	0	144.14	106.7	Supply
J-393	59.99	0	137.38	109.8	Supply
1734	63.47	0	142.74	112.5	Supply
J-394	47.42	0	130.47	117.9	Supply
1736	58.35	0	142.37	119.3	Supply
904	57.97	0	142.53	120	Supply
652	57.04	0	144	123.4	Supply
968	55.29	0	142.4	123.6	Supply
1732	55.69	0	143.12	124.1	Supply
1010	54.37	0	141.85	124.2	Supply
810	54.4	0	142.75	125.4	Supply
796	54.52	0	142.9	125.5	Supply
1000	53.33	0	141.89	125.7	Supply
600	55.7	0.14	145.13	127	Supply
602	55.53	0	145.12	127.2	Supply
J-565	54.31	0	143.94	127.2	Supply
1380	50.05	0	140.53	128.4	Supply
1050	50.04	0	141.53	129.9	Supply
J-88	49.56	0	141.63	130.7	Supply
J-170	47.97	0	140.11	130.8	Supply
1048	49.11	0	141.63	131.3	Supply
J-24	48.3	0	143.4	135	Supply
570	48	0	143.41	135.4	Supply
J-37	46.76	0	142.7	136.2	Supply
800	46.46	0	142.71	136.6	Supply
966	46.16	0	142.49	136.7	Supply
1738	45.14	0	142.11	137.6	Supply
1740	43.2	0	142.09	140.4	Supply
1298	41.46	0	141.63	142.2	Supply
J-49	41.22	0	141.63	142.5	Supply
J-395	25.53	0	127	144	Supply
66	18.75	0	121.41	145.7	Supply
64	18.73	0	121.61	146	Supply
1742	35.93	0	141.56	149.9	Supply
974	35.57	0	142.4	151.6	Supply
592	26.65	0.66	146.61	170.3	Supply

2041 Peak Hour Results

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-32	28	0	148.35	170.8	Supply
J-33	28	0	148.33	170.8	Supply
J-35	28	0	148.39	170.9	Supply
J-34	27.5	0	148.39	171.6	Supply
J-30	26.89	0	148.39	172.5	Supply
J-31	26.84	0	148.36	172.5	Supply
J-272	26.21	0	148.41	173.4	Supply
J-273	26	0	148.32	173.6	Supply
J-274	26	0	148.39	173.7	Supply
J-275	26	0	148.37	173.7	Supply
J-27	25.89	0	148.39	173.9	Supply
J-29	25.69	0	148.36	174.1	Supply
J-28	25.33	0	148.33	174.6	Supply
1322	18.59	0	141.67	174.7	Supply
J-144	25.13	0	148.45	175.1	Supply
62	15.1	0	145.03	184.4	Supply
14	12	0	145.48	189.5	Supply
16	11.29	0	145.47	190.5	Supply
J-159	4.57	0	139.82	192	Supply
12	10.19	0	147.8	195.3	Supply
1826	5.39	0	143.52	196.1	Supply
1828	5.96	0	144.46	196.6	Supply
52	8	0	146.65	196.8	Supply
36	7	0	145.8	197	Supply
34	7.81	0	146.68	197.1	Supply
J-5	6	0	145.32	197.8	Supply
42	6	0	145.58	198.1	Supply
38	5.99	0	145.64	198.2	Supply
40	5.99	0	145.64	198.2	Supply
J-532	5.87	0	145.64	198.4	Supply
J-531	5.86	0	145.69	198.5	Supply
640	4.85	1.65	145	198.9	Supply


Build Out Maximum Day Demands
Proposed Reservoir at WQC
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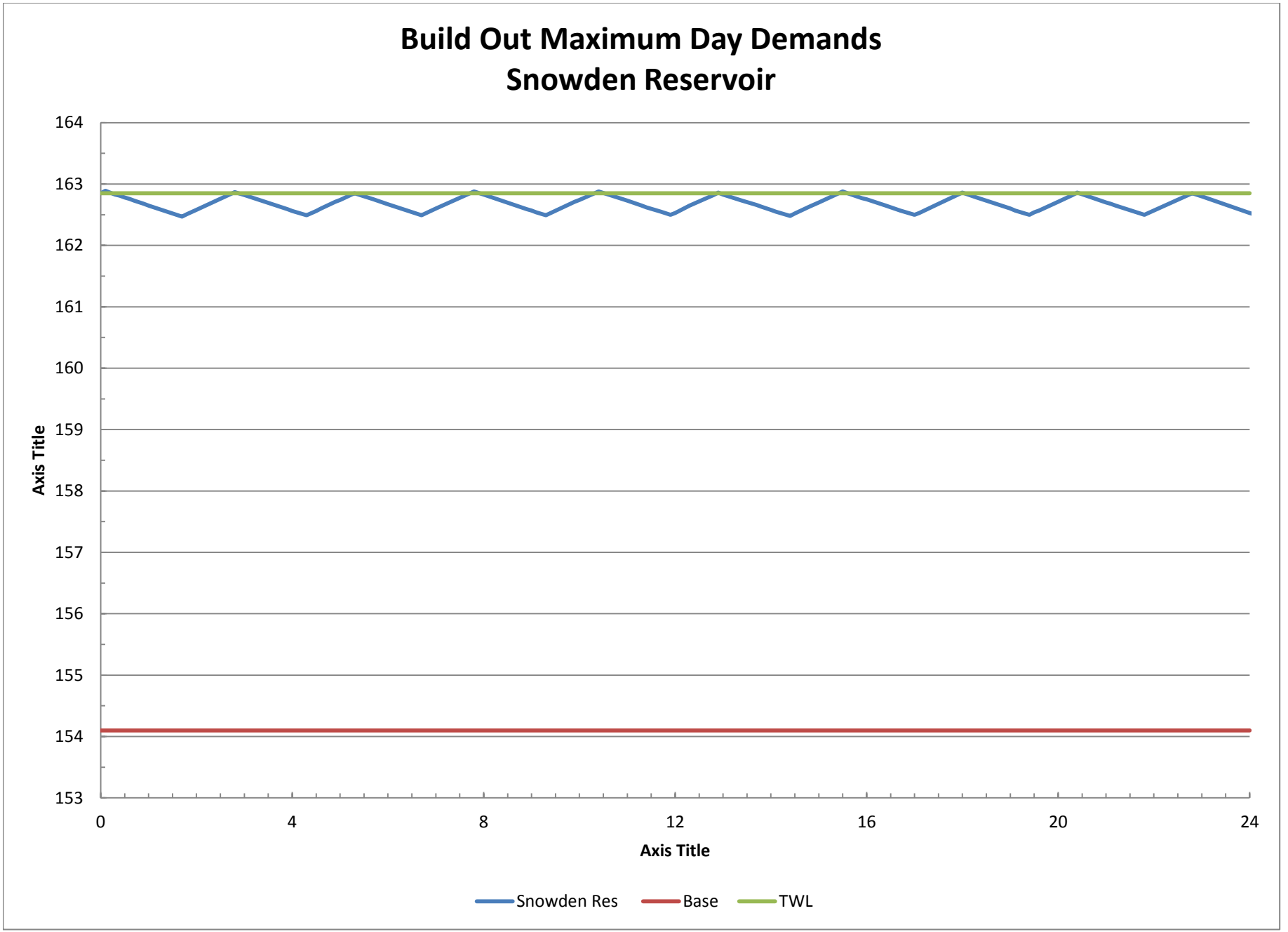
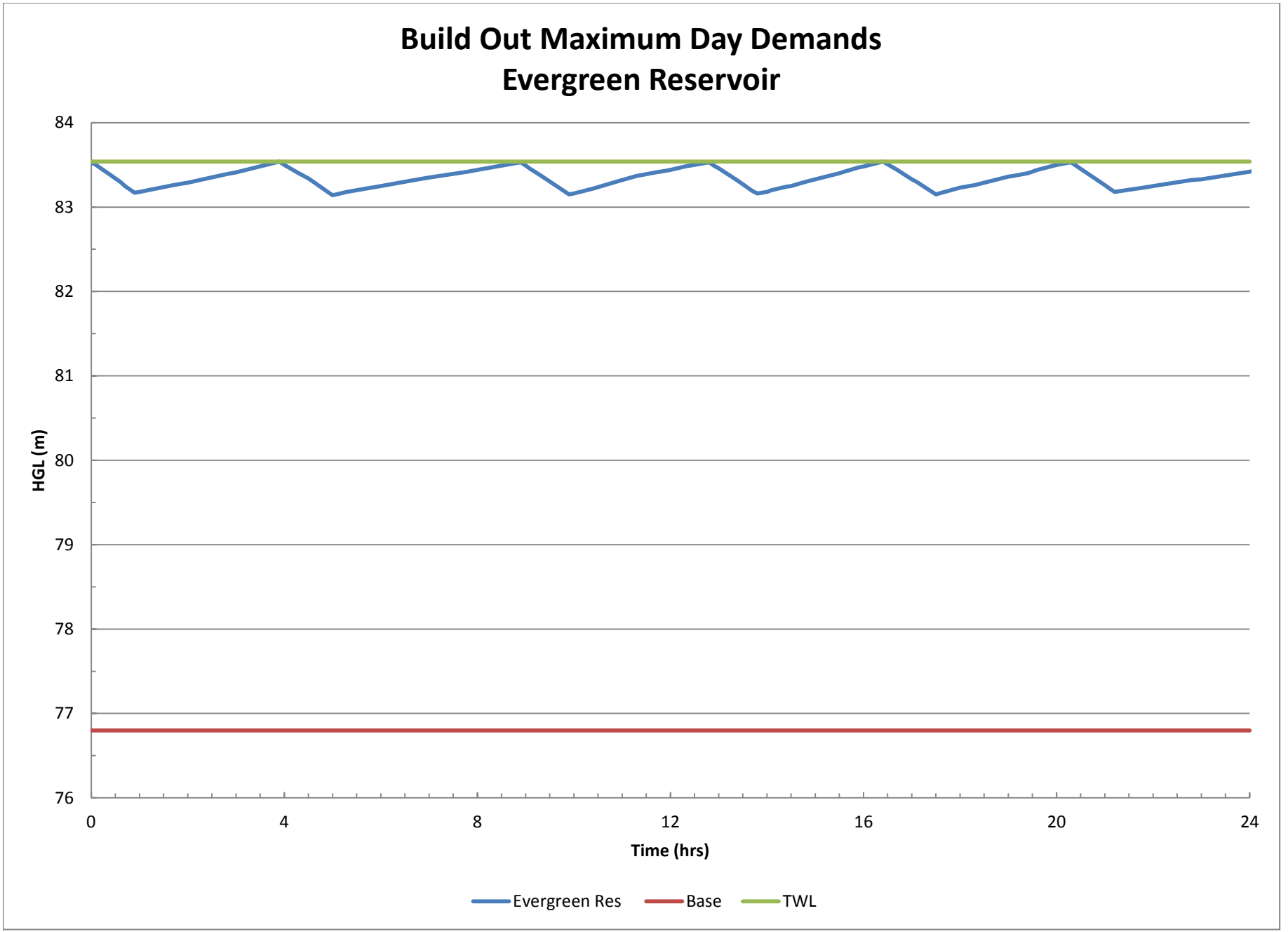
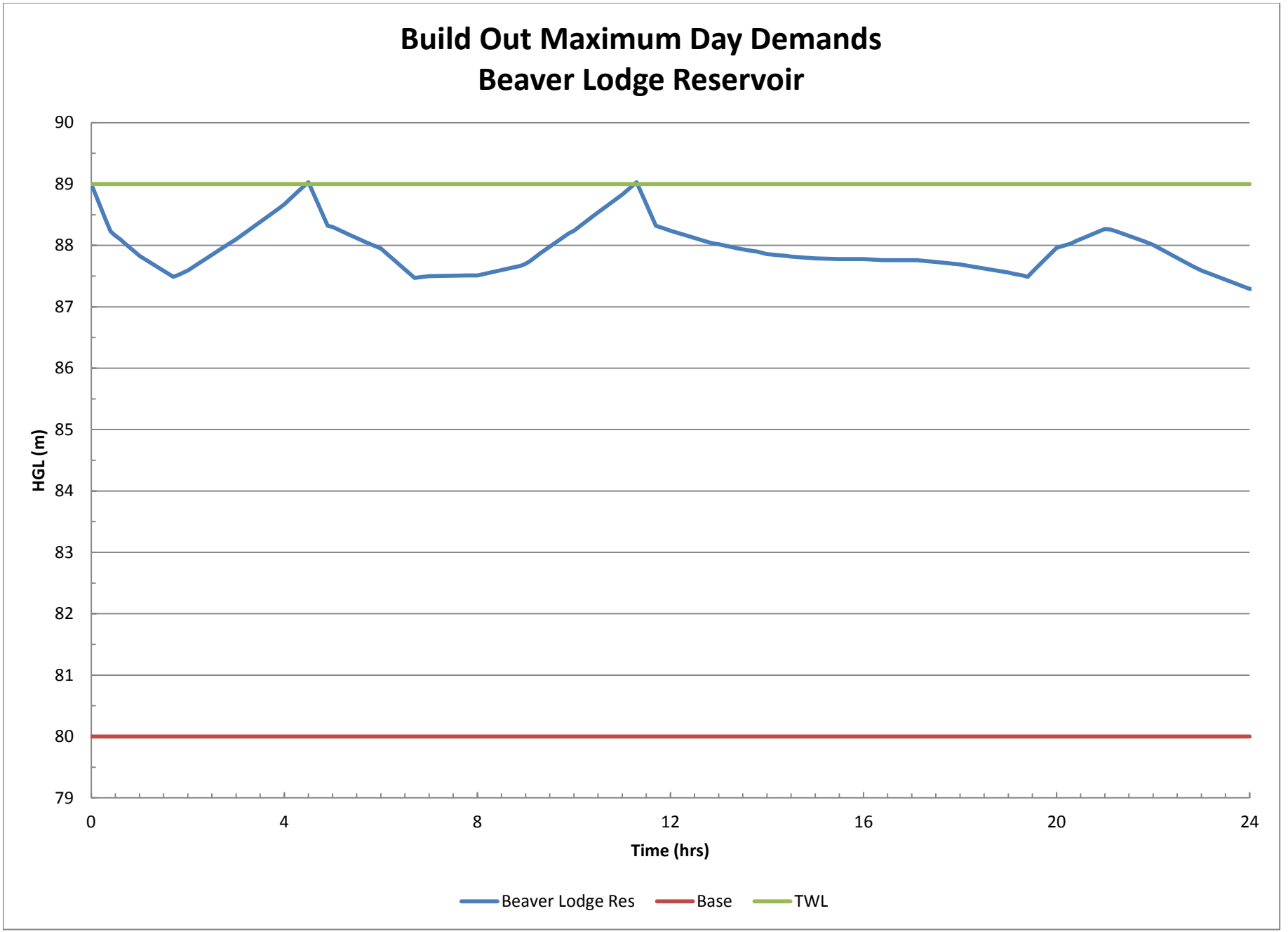
150
149
148
147
146
145
144
HGL (m)
0
4
8
12
16
20
24
Time (Hrs)
Proposed Res
Base
TWL


Build Out Maximum Day Demands
Snowden Reservoir
164
163
162
161
160
159
158
157
156
155
154
153
Axis Title
0
4
8
12
16
20
24
Axis Title
Snowden Res
Base
TWL


Build Out Maximum Day Demands
Evergreen Reservoir
84
83
82
81
80
79
78
77
76
HGL (m)
0
4
8
12
16
20
24
Time (hrs)
Evergreen Res
Base
TWL


Build Out Maximum Day Demands
Beaver Lodge Reservoir
90
89
88
87
86
85
84
83
82
81
80
79
HGL (m)
0
4
8
12
16
20
24
Time (hrs)
Beaver Lodge Res
Base
TWL

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-147	102	0	131.04	41.2	Airport
J-149	100.11	0	131.04	43.9	Airport
J-81	98.1	0	131.04	46.8	Airport
J-148	98.08	0	131.04	46.8	Airport
Airport System	97.15	1.68	131.04	48.1	Airport
J-85	96.93	0	131.04	48.4	Airport
J-83	94.88	0	131.05	51.3	Airport
J-146	89.94	0	131.05	58.4	Airport
Timberwest Ind Subdivision	87.61	0	131.05	61.7	Airport
J-537	74.88	27.51	129.84	78	Airport
J-86	74.24	0	131.05	80.6	Airport
J-536	71.6	27.51	129.63	82.4	Airport
Holmaco Band	72.83	7.82	131.05	82.6	Airport
1804	74.02	0	133.3	84.1	Airport
Timberwest Jubilee Heights	74.89	0	134.11	84.1	Airport
J-142	73.03	0	133.13	85.3	Airport
1806	70.34	0	132.51	88.3	Airport
1814	68.36	0	131.13	89.1	Airport
J-144	67.15	5.87	131.02	90.7	Airport
1808	67.2	0	131.86	91.8	Airport
J-55	66.77	0	131.86	92.4	Airport
J-58	66.48	0	131.86	92.8	Airport
J-145	65.41	0	131.08	93.2	Airport
J-91	68.9	0	134.8	93.5	Airport
1810	65	0	131.12	93.9	Airport
1812	64.63	0	131.12	94.4	Airport
J-13	68.5	0	134.97	94.4	Airport
J-124	64	0	131.13	95.3	Airport
1800	63	0	131.13	96.7	Airport
J-561	63.02	0	131.13	96.7	Airport
J-121	57.91	0	130.89	103.6	Airport
J-51	39.91	0	129.88	127.7	Airport
J-79	39.32	0	130.41	129.3	Airport
512	72.64	2.89	103.05	43.2	PZ107
J-112	74.33	0	104.79	43.2	PZ107
J-203	71.07	0	101.5	43.2	PZ107
J-113	73.88	0	104.75	43.8	PZ107
J-173	70.25	0	102.54	45.8	PZ107
1120	69.01	0.47	101.97	46.8	PZ107
J-117	71.58	0	104.73	47.1	PZ107
1232	68.38	0	101.97	47.7	PZ107
J-205	67.88	0	101.71	48	PZ107

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-461	68.63	0	103.11	48.9	PZ107
J-489	67.95	0	102.53	49.1	PZ107
J-114	70.04	0	104.74	49.3	PZ107
J-116	69.85	0	104.73	49.5	PZ107
J-372	69.62	0	104.82	50	PZ107
1196	68.88	2.4	104.17	50.1	PZ107
J-138	69.37	0	104.74	50.2	PZ107
1234	66.49	1.9	101.97	50.4	PZ107
J-111	68.83	0	104.83	51.1	PZ107
J-288	65.98	0	102.3	51.6	PZ107
J-286	66.54	0	103.03	51.8	PZ107
644	65.9	3.67	102.66	52.2	PZ107
J-115	67.6	0	104.74	52.7	PZ107
482	65.75	0.88	103.05	52.9	PZ107
478	65.58	0	103.02	53.1	PZ107
J-380	65.29	0	102.68	53.1	PZ107
1230	64.47	3.67	101.98	53.2	PZ107
626	64.5	7.26	102.55	54	PZ107
1208	64.13	2.89	102.19	54	PZ107
J-56	66.54	0	104.72	54.2	PZ107
J-57	66.5	0	104.72	54.3	PZ107
J-115	64.46	0	102.7	54.3	PZ107
J-204	62.94	0	101.57	54.8	PZ107
1846	63.79	1.29	102.52	55	PZ107
480	64.37	5.96	103.2	55.1	PZ107
744	62.58	0	101.5	55.2	PZ107
746	62.63	0.07	101.5	55.2	PZ107
J-323	61.14	0	100.33	55.6	PZ107
642	63.17	1.58	102.65	56	PZ107
J-371	65.3	0	104.85	56.1	PZ107
J-118	65.15	0	104.72	56.2	PZ107
J-427	62.79	0	102.76	56.7	PZ107
736	61.59	2.81	101.71	57	PZ107
504	64	0.73	104.21	57.1	PZ107
506	64	0	104.28	57.2	PZ107
444	62.78	0	103.18	57.3	PZ107
454	62.83	0.2	103.18	57.3	PZ107
638	62.17	1.29	102.53	57.3	PZ107
502	63.63	1.45	104.12	57.5	PZ107
734	61.17	2.16	101.75	57.6	PZ107
1198	63.36	1.94	103.99	57.7	PZ107
J-428	61.39	0	102.18	57.9	PZ107
J-473	60.08	0	100.86	57.9	PZ107

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
484	61.4	0.97	102.44	58.2	PZ107
1228	60.91	3.99	102	58.3	PZ107
J-369	63.62	0	104.73	58.4	PZ107
804	61.22	0.65	102.44	58.5	PZ107
J-116	61.49	0	102.73	58.5	PZ107
452	61.65	1.56	103.05	58.8	PZ107
J-472	59.22	0	100.67	58.8	PZ107
450	61.38	4.68	103.05	59.2	PZ107
J-429	61.53	0	103.2	59.2	PZ107
628	60.85	0.6	102.62	59.3	PZ107
J-110	63.05	0	104.86	59.3	PZ107
J-528	61.1	0	103.09	59.6	PZ107
448	60.89	3.74	103.08	59.9	PZ107
1194	62.08	1.94	104.27	59.9	PZ107
J-119	62.54	0	104.72	59.9	PZ107
J-125	62.55	0	104.72	59.9	PZ107
J-426	60.79	0	103	59.9	PZ107
634	60.29	0.5	102.56	60	PZ107
1772	62.37	1.1	104.74	60.1	PZ107
608	60.26	0.6	102.65	60.2	PZ107
J-363	62.34	0	104.72	60.2	PZ107
J-364	62.29	0	104.72	60.2	PZ107
1190	60.58	1.04	103.03	60.3	PZ107
884	59.07	0.52	101.63	60.4	PZ107
J-294	59.34	0	101.98	60.5	PZ107
J-370	62.25	0	104.88	60.5	PZ107
1258	59.09	0	101.93	60.8	PZ107
442	60.19	1.14	103.11	60.9	PZ107
1046	57.91	1.92	100.97	61.1	PZ107
960	56.68	1.43	99.82	61.2	PZ107
J-365	61.45	0	104.72	61.4	PZ107
458	59.54	2.24	102.97	61.7	PZ107
432	59.62	4.12	103.23	61.9	PZ107
J-285	60.43	0	104.06	61.9	PZ107
440	59.51	0.2	103.15	62	PZ107
636	58.75	0.3	102.52	62.1	PZ107
430	59.32	0	103.17	62.2	PZ107
J-212	59.31	0	103.24	62.3	PZ107
620	58.44	1.29	102.52	62.6	PZ107
1202	59.96	3.26	104.06	62.6	PZ107
J-458	59.8	0	103.96	62.7	PZ107
606	58.4	0.5	102.68	62.9	PZ107
J-490	58.19	0	102.54	62.9	PZ107

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
1200	59.5	1.58	103.96	63.1	PZ107
742	56.77	2.46	101.38	63.3	PZ107
1012	55.25	3.02	99.82	63.3	PZ107
1222	57.37	0.11	102.14	63.5	PZ107
462	57.99	2.4	102.87	63.7	PZ107
456	58.05	2.79	103	63.8	PZ107
J-126	59.79	0	104.72	63.8	PZ107
J-485	57.3	0	102.22	63.8	PZ107
J-368	59.74	0	104.72	63.9	PZ107
J-379	57.71	0	102.76	63.9	PZ107
1044	55.35	1.04	100.71	64.4	PZ107
416	57.65	1.55	103.09	64.5	PZ107
J-226	59.26	0	104.72	64.5	PZ107
424	57.91	2.07	103.4	64.6	PZ107
732	56.06	0.84	101.64	64.7	PZ107
J-129	59.01	0	104.72	64.9	PZ107
J-287	56.47	0	102.3	65	PZ107
1858	58.59	1.45	104.47	65.1	PZ107
412	57.27	0.69	103.28	65.3	PZ107
806	56.31	0	102.47	65.5	PZ107
1192	56.78	1.38	103.03	65.6	PZ107
J-557	56.22	9.8	102.42	65.6	PZ107
J-120	58.42	0	104.72	65.7	PZ107
J-127	58.43	0	104.72	65.7	PZ107
J-331	55.76	0	102.05	65.7	PZ107
808	56	1.17	102.49	66	PZ107
J-33	58.07	0	104.72	66.2	PZ107
J-478	53.18	0	99.82	66.2	PZ107
J-293	55.28	0	102	66.3	PZ107
498	56.5	9.2	103.29	66.4	PZ107
J-128	57.93	0	104.72	66.4	PZ107
604	55.87	0.2	102.78	66.6	PZ107
J-213	56.41	0	103.29	66.6	PZ107
J-430	56.58	0	103.6	66.7	PZ107
J-559	17	21.18	64.1	66.9	PZ107
632	55.28	1.38	102.56	67.1	PZ107
1268	54.57	2.33	101.86	67.1	PZ107
486	54.7	2.31	102.08	67.2	PZ107
1002	52.97	0.47	100.33	67.2	PZ107
J-78	57.41	1.7	104.73	67.2	PZ107
426	56.25	1.06	103.63	67.3	PZ107
406	56.26	0	103.75	67.4	PZ107
414	55.36	2.33	103.18	67.9	PZ107

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-229	56.91	0	104.72	67.9	PZ107
J-366	56.77	0	104.72	68.1	PZ107
762	53.52	1.43	101.57	68.2	PZ107
1170	58.23	0.6	106.42	68.4	PZ107
1032	51.8	0.71	100.07	68.5	PZ107
J-106	56.51	0	104.94	68.7	PZ107
802	53.81	2.63	102.29	68.8	PZ107
640	54.09	2.29	102.6	68.9	PZ107
408	55.7	0	104.29	69	PZ107
410	55.7	2.14	104.28	69	PZ107
1752	56.15	2.12	104.74	69	PZ107
J-153	56.09	0	104.79	69.1	PZ107
J-230	56.04	0	104.72	69.1	PZ107
1172	56.12	0.97	104.92	69.3	PZ107
J-122	55.48	0	104.72	69.9	PZ107
1224	52.82	0	102.11	70	PZ107
1260	52.58	0.17	101.93	70	PZ107
J-431	54.54	0	104.1	70.4	PZ107
J-459	53.98	0	103.92	70.9	PZ107
1168	56.67	1.08	106.88	71.3	PZ107
1036	49.46	0.3	100.03	71.8	PZ107
500	52.97	0.84	103.82	72.2	PZ107
1204	53.05	1.94	103.91	72.2	PZ107
496	52.77	0.63	103.69	72.3	PZ107
1014	48.82	2.2	99.82	72.4	PZ107
1040	48.84	3.35	100.03	72.7	PZ107
J-469	55.46	0	106.88	73	PZ107
1266	50.3	6.5	101.86	73.2	PZ107
1056	50.81	1.62	102.5	73.4	PZ107
730	49.76	1.68	101.53	73.5	PZ107
950	49.76	0.91	101.55	73.5	PZ107
740	49.41	1.43	101.25	73.6	PZ107
J-103	53.79	0	105.66	73.6	PZ107
790	49.62	1.99	101.58	73.8	PZ107
J-92	54.86	0	106.88	73.8	PZ107
J-362	52.6	0	104.72	74	PZ107
1054	50.49	0.24	102.67	74.1	PZ107
788	49.13	1.83	101.56	74.4	PZ107
J-95	54.5	0	106.88	74.4	PZ107
624	49.89	1.68	102.53	74.7	PZ107
J-361	52.06	0	104.72	74.7	PZ107
1206	49.76	3	102.44	74.8	PZ107
J-105	52.24	0	104.94	74.8	PZ107

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
1052	49.32	0.35	102.13	75	PZ107
J-419	54	0	106.88	75.1	PZ107
1018	46.89	3	99.91	75.3	PZ107
J-93	53.5	0	106.88	75.8	PZ107
J-94	53.5	0	106.88	75.8	PZ107
J-420	53.5	0	106.88	75.8	PZ107
1030	46.43	1.19	99.91	75.9	PZ107
J-123	51.28	0	104.72	75.9	PZ107
488	48.43	0.76	101.94	76	PZ107
494	50.18	0.82	103.74	76	PZ107
1026	46.35	1.4	99.91	76	PZ107
1262	48.39	0	101.93	76	PZ107
404	50.36	2.16	103.97	76.1	PZ107
1226	48.51	0.8	102.11	76.1	PZ107
1278	48.43	0.06	102.13	76.2	PZ107
J-102	51.92	0	105.66	76.3	PZ107
1270	48.07	2.09	101.9	76.4	PZ107
464	48.85	2.4	102.88	76.7	PZ107
1042	46.01	2.33	100.08	76.7	PZ107
J-454	48.51	0	102.92	77.2	PZ107
630	47.98	2.37	102.55	77.4	PZ107
1028	45.29	2.1	99.91	77.5	PZ107
J-104	50.37	0	104.96	77.5	PZ107
J-108	50.29	0	104.94	77.6	PZ107
J-491	47.68	0	102.54	77.9	PZ107
422	48.74	1.73	103.78	78.1	PZ107
J-522	45.11	0	100.11	78.1	PZ107
J-186	47.47	0	102.55	78.2	PZ107
J-107	49.78	0	104.96	78.3	PZ107
J-479	44.35	0	99.82	78.7	PZ107
J-477	44.25	0	99.83	78.9	PZ107
1248	46.44	1.29	102.1	79	PZ107
1314	44.38	1.73	100.19	79.2	PZ107
J-196	45.67	0	101.48	79.2	PZ107
J-199	45.54	0	101.33	79.2	PZ107
1242	46.21	0.97	102.11	79.3	PZ107
1034	43.87	2.79	99.93	79.6	PZ107
418	46.91	4.3	103.08	79.7	PZ107
1058	44.05	2.44	100.46	80.1	PZ107
766	45.03	1.17	101.52	80.2	PZ107
J-433	47.51	0	103.99	80.2	PZ107
J-457	45.3	0	101.8	80.2	PZ107
764	44.98	1.68	101.52	80.3	PZ107

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
1252	45.45	4.94	102.1	80.4	PZ107
1280	45.36	1.06	102.12	80.6	PZ107
1774	47.87	1.83	104.72	80.7	PZ107
490	44.14	0.97	101.14	80.9	PZ107
J-239	42.85	0	99.98	81.1	PZ107
1264	44.68	0	101.93	81.3	PZ107
J-54	49.56	0	107	81.5	PZ107
1020	42.19	4.01	99.83	81.8	PZ107
J-488	45.57	0	103.19	81.8	PZ107
ShoppingCentre1	49.22	0	106.97	82	PZ107
420	46.11	3.22	103.93	82.1	PZ107
J-135	48.8	0	106.95	82.5	PZ107
738	42.53	0.84	101.05	83.1	PZ107
J-295	43.33	0	101.86	83.1	PZ107
1754	46	2.72	104.72	83.4	PZ107
J-471	43.35	0	102.1	83.4	PZ107
1038	40.87	0	99.9	83.8	PZ107
786	42.35	1.83	101.48	83.9	PZ107
1722	45.65	0.61	104.89	84.1	PZ107
J-432	44.21	0	103.83	84.6	PZ107
1024	40.15	1.01	99.83	84.7	PZ107
1236	42.6	2.2	102.33	84.8	PZ107
1750	44.76	1.19	104.74	85.1	PZ107
758	40.78	0.97	100.92	85.4	PZ107
J-476	39.67	0	99.83	85.4	PZ107
J-523	39.9	0	100.09	85.4	PZ107
1728	44.74	1.97	105.01	85.6	PZ107
392	42.89	0.89	103.28	85.7	PZ107
J-101	44.78	0	105.67	86.4	PZ107
J-109	44	0	104.92	86.5	PZ107
J-456	41.97	0	102.88	86.5	PZ107
1060	38.58	0	99.74	86.8	PZ107
1272	40.84	3.35	102.01	86.8	PZ107
J-475	38.69	0	99.83	86.8	PZ107
1246	40.75	4.47	102.11	87.1	PZ107
396	42.73	0.06	104.13	87.2	PZ107
1064	38.26	0	99.68	87.2	PZ107
1274	40.28	0	101.94	87.5	PZ107
618	40.8	0.6	102.53	87.6	PZ107
386	42.5	0	104.31	87.7	PZ107
388	42.5	0.56	104.29	87.7	PZ107
390	42.25	2.92	104.12	87.8	PZ107
616	40.51	0.5	102.52	88	PZ107

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-219	42.75	0	104.73	88	PZ107
1062	37.65	0	99.91	88.4	PZ107
1250	39.7	4.94	102.1	88.6	PZ107
902	38.77	5.01	101.33	88.8	PZ107
J-376	40.8	0	103.55	89.1	PZ107
J-521	37.31	0	100.05	89.1	PZ107
402	41.37	2.5	104.18	89.2	PZ107
J-474	36.69	0	99.83	89.6	PZ107
954	35.8	0.56	99.9	91	PZ107
958	35.48	2.09	99.82	91.3	PZ107
J-480	35.19	0	99.83	91.8	PZ107
1758	39.85	1.62	104.72	92.1	PZ107
1776	39.75	1.6	104.72	92.2	PZ107
768	36.34	0.52	101.52	92.5	PZ107
956	34.67	0.88	99.86	92.5	PZ107
J-481	34.72	0	99.86	92.5	PZ107
J-482	34.67	0	100.07	92.8	PZ107
J-227	39.26	0	104.72	92.9	PZ107
1316	34.27	0.82	100.03	93.4	PZ107
1244	35.95	5.89	102.13	94	PZ107
J-434	37.79	0	104.01	94	PZ107
1748	38.18	2.03	104.73	94.5	PZ107
ShoppingCentre2	40.06	0.6	106.64	94.5	PZ107
1726	38.39	1.47	105.09	94.7	PZ107
794	34.52	3.04	101.33	94.8	PZ107
J-241	32.44	0	100.03	95.9	PZ107
1652	37.23	3.02	104.87	96	PZ107
J-77	37.12	0	104.72	96	PZ107
1332	31.98	7.32	99.98	96.5	PZ107
J-310	34.08	0	102.12	96.6	PZ107
1238	33.94	2.09	102.21	96.9	PZ107
1254	33.35	2.38	102.13	97.6	PZ107
J-132	35.97	0	104.72	97.6	PZ107
J-435	35.32	0	104.06	97.6	PZ107
J-330	31.83	0	100.68	97.7	PZ107
1276	32.5	0.06	101.97	98.6	PZ107
614	32.71	5.33	102.37	98.9	PZ107
792	31.68	1.56	101.42	99	PZ107
J-220	34.92	0	104.73	99.1	PZ107
1240	32.18	3.5	102.18	99.4	PZ107
1724	34.5	0.24	104.98	100	PZ107
J-243	31.91	0	102.88	100.7	PZ107
J-308	31.04	0	102.17	101	PZ107

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-311	31	0	102.13	101	PZ107
1330	31.13	2.78	102.57	101.4	PZ107
J-412	32.68	0	104.88	102.5	PZ107
1536	31.98	4.12	104.89	103.5	PZ107
952	28.16	1.12	101.24	103.7	PZ107
J-484	28.04	0	101.33	104	PZ107
394	30.57	1.56	104.02	104.3	PZ107
1290	28.89	0	103.76	106.3	PZ107
J-133	29.53	0	104.72	106.7	PZ107
1288	28.08	0.19	103.68	107.3	PZ107
J-98	27.67	0	103.66	107.9	PZ107
J-313	25.52	0	102.22	108.9	PZ107
J-309	24.41	0	102.23	110.5	PZ107
1286	24.79	0.97	103.31	111.5	PZ107
J-312	22.37	0	102.25	113.4	PZ107
1256	21.5	6.84	102.27	114.7	PZ107
J-296	19.81	0	102.57	117.5	PZ107
1282	19.35	2.09	102.58	118.1	PZ107
1284	19.39	0.63	102.6	118.1	PZ107
1338	19.22	8.57	102.93	118.8	PZ107
1340	15.79	2.78	102.79	123.5	PZ107
J-279	12.38	0	102.35	127.7	PZ107
J-280	10.09	0	102.35	131	PZ107
612	5.06	1.04	102.35	138.1	PZ107
658	70.5	0	102.99	46.1	PZ134
660	70.5	0.82	102.98	46.1	PZ134
J-547	95.23	10.63	129.02	48	PZ134
S4-PS1	68	1.56	102.55	49	PZ134
666	68	1.86	102.6	49.1	PZ134
J-201	95.73	0	130.69	49.6	PZ134
656	67.61	0.71	102.72	49.8	PZ134
664	67.5	1.04	102.69	49.9	PZ134
662	67.41	1.34	102.71	50.1	PZ134
J-175	66.17	0	102.6	51.7	PZ134
1840	64.87	3.76	102.54	53.5	PZ134
J-174	64.84	0	102.56	53.5	PZ134
J-177	64.89	0	102.54	53.5	PZ134
J-176	64.7	0	102.57	53.8	PZ134
528	92.6	0.63	131.85	55.7	PZ134
J-467	90.14	0	130.73	57.6	PZ134
J-425	89.75	0	131.44	59.2	PZ134
J-178	57.94	0	102.53	63.3	PZ134
J-181	57.88	0	102.53	63.4	PZ134

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
1128	85.75	0.11	130.76	63.9	PZ134
526	83.29	2.78	131.93	69	PZ134
J-180	53.79	0	102.51	69.2	PZ134
J-423	81.73	0	130.97	69.9	PZ134
1124	81.07	7.17	130.83	70.6	PZ134
J-422	80.97	0	130.75	70.7	PZ134
J-183	52.33	0	102.47	71.2	PZ134
J-179	51.95	0	102.51	71.8	PZ134
1164	79.29	9.11	130.53	72.7	PZ134
J-193	51.14	0	102.52	72.9	PZ134
J-284	79.2	0	130.54	72.9	PZ134
J-182	50.32	0	102.51	74.1	PZ134
1176	77.39	0	130.51	75.4	PZ134
1126	76.48	1.36	130.79	77.1	PZ134
1178	74.46	0.86	130.37	79.4	PZ134
524	74.75	1.64	132.33	81.7	PZ134
728	74.86	1.08	132.68	82.1	PZ134
J-185	44.5	0	102.51	82.3	PZ134
J-112	78.21	0	136.34	82.5	PZ134
J-118	76.93	0	135.02	82.5	PZ134
J-117	76.64	0	135.02	82.9	PZ134
J-119	76.44	0	135.02	83.2	PZ134
J-111	77.67	0	136.34	83.3	PZ134
J-190	76	0	135.02	83.8	PZ134
S4-PS3	76	0	135.01	83.8	PZ134
J-383	75.94	0	135.02	83.9	PZ134
722	77	0.2	136.34	84.2	PZ134
J-110	77	0	136.34	84.2	PZ134
J-184	43.05	0	102.51	84.4	PZ134
1152	71.24	4.6	130.75	84.5	PZ134
J-242	73.08	0	132.68	84.6	PZ134
J-381	75.34	0	135.02	84.7	PZ134
J-382	75.36	0	135.02	84.7	PZ134
720	76.61	0.2	136.45	84.9	PZ134
J-40	76.67	0	136.45	84.9	PZ134
522	73.06	0	133	85.1	PZ134
J-187	76.5	0	136.46	85.1	PZ134
J-188	76.5	0	136.46	85.1	PZ134
540	72.81	2.12	132.82	85.2	PZ134
J-191	75	0	135.02	85.2	PZ134
520	72.89	0	133	85.3	PZ134
J-114	76.26	0	136.34	85.3	PZ134
J-14	68.53	0	128.84	85.6	PZ134

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-113	76	0	136.34	85.6	PZ134
J-558	75.74	9.8	136.16	85.8	PZ134
J-120	74.54	0	135.02	85.9	PZ134
J-399	75.68	0	136.23	85.9	PZ134
J-470	70.2	0	130.68	85.9	PZ134
J-202	72.1	0	132.68	86	PZ134
678	74.28	0.73	135	86.2	PZ134
680	74.09	0.61	135.02	86.5	PZ134
J-121	74	0	135.02	86.6	PZ134
J-192	73.42	0	135.03	87.5	PZ134
1188	67.65	2.42	129.83	88.3	PZ134
718	74	1.66	136.4	88.6	PZ134
724	73.83	0.52	136.35	88.7	PZ134
S4-Q1	72.5	0.73	134.99	88.7	PZ134
1122	72	1.34	134.98	89.4	PZ134
1162	67.53	3.69	130.64	89.6	PZ134
J-571	70.5	0	133.89	90	PZ134
536	69.27	1.42	132.77	90.1	PZ134
682	73.32	0.2	136.8	90.1	PZ134
726	73	0.32	136.45	90.1	PZ134
S4-Q2	72.85	0	136.42	90.2	PZ134
532	69.07	0.71	132.68	90.3	PZ134
650	72.82	0.2	136.46	90.3	PZ134
696	72.87	0	136.46	90.3	PZ134
514	68.88	0	132.68	90.6	PZ134
530	68.71	1.9	132.68	90.8	PZ134
694	72.53	0	136.46	90.8	PZ134
S4-PS2	72.5	1.56	136.44	90.8	PZ134
716	72.34	1.25	136.39	90.9	PZ134
J-466	71.02	0	135.03	90.9	PZ134
S4-PR2	72.28	0	136.4	91	PZ134
J-25	72	0	136.43	91.5	PZ134
S4-PR1	70.5	0	134.97	91.5	PZ134
692	70.77	1.14	136.4	93.2	PZ134
674	69.06	0.73	135.02	93.6	PZ134
1154	64.85	2.53	130.78	93.6	PZ134
672	69	0.63	135.02	93.7	PZ134
700	69	0.09	135.03	93.7	PZ134
S4-PR3	68.92	0.52	135.03	93.8	PZ134
872	66.13	5.48	132.29	93.9	PZ134
J-1	68.9	0	135.06	93.9	PZ134
714	68.5	1.14	135.05	94.5	PZ134
J-2	68.44	0	135.05	94.5	PZ134

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
648	70.09	0.82	136.8	94.7	PZ134
670	68	1.77	134.96	95	PZ134
558	65.67	1.92	132.67	95.1	PZ134
654	68	2.48	134.97	95.1	PZ134
688	69.43	0.43	136.43	95.1	PZ134
698	68	0.09	134.99	95.1	PZ134
J-424	63.9	0	130.95	95.2	PZ134
684	69.27	0.2	136.43	95.3	PZ134
690	69.3	0.32	136.43	95.3	PZ134
S4-Q3	67.91	0.43	135.04	95.3	PZ134
564	65.46	2.1	132.75	95.5	PZ134
1142	63.44	0.43	130.8	95.6	PZ134
706	67.36	0.43	135.03	96.1	PZ134
710	67.31	0.32	135.04	96.1	PZ134
J-465	67.29	0	134.99	96.1	PZ134
508	64	0.88	131.84	96.3	PZ134
1140	62.77	0	130.8	96.6	PZ134
1144	62.61	0.09	130.8	96.8	PZ134
510	64.08	0	132.37	96.9	PZ134
446	64.02	0	132.36	97	PZ134
S4-PS4	66.39	0.93	134.99	97.4	PZ134
882	62.41	0.63	131.11	97.5	PZ134
566	63.81	1.9	132.78	97.9	PZ134
1160	61.5	1.58	130.72	98.2	PZ134
1838	63.43	0.56	132.66	98.3	PZ134
880	61.63	0.32	131.11	98.6	PZ134
1158	61.37	1.58	130.83	98.6	PZ134
1880	65.5	0.93	135.02	98.7	PZ134
J-421	61	0	130.81	99.1	PZ134
1854	61.69	2.66	131.84	99.6	PZ134
1148	60.11	3.26	130.81	100.3	PZ134
J-468	60.27	0	130.9	100.3	PZ134
560	61.42	1.27	132.63	101.1	PZ134
876	59.97	0	131.2	101.1	PZ134
1150	59.33	1.94	130.83	101.5	PZ134
1156	58.37	0.11	131.03	103.1	PZ134
428	59.37	0	132.31	103.5	PZ134
J-460	59.22	0	132.38	103.9	PZ134
J-41	63.13	0	136.45	104.1	PZ134
568	59.51	2.66	132.89	104.2	PZ134
1166	57.68	0.6	131.13	104.3	PZ134
J-42	62.59	0	136.8	105.3	PZ134
1146	55.45	0.09	130.8	107	PZ134

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-43	60.85	0	136.8	107.8	PZ134
J-464	58.4	0	134.44	107.9	PZ134
398	56.04	0	132.28	108.2	PZ134
400	55.75	0.19	132.15	108.4	PZ134
J-462	56.75	0	133.89	109.5	PZ134
J-374	55.32	0	132.65	109.8	PZ134
548	54.95	0.63	132.53	110.1	PZ134
1856	53.19	0.43	130.8	110.2	PZ134
874	54	0.2	131.84	110.5	PZ134
544	54.24	0	132.4	110.9	PZ134
546	54.24	1.88	132.4	110.9	PZ134
870	53.36	0.2	132.65	112.5	PZ134
J-53	49.82	0	129.05	112.5	PZ134
J-283	52.97	0	132.4	112.8	PZ134
J-463	51.35	0	133.34	116.4	PZ134
550	50.22	2.66	132.53	116.8	PZ134
J-282	48.86	0	132.61	118.9	PZ134
552	48.76	2.48	132.56	119	PZ134
556	48.31	0	132.86	120	PZ134
572	48.33	0.52	132.86	120	PZ134
J-281	47.99	0	132.61	120.1	PZ134
J-39	52.06	0	136.8	120.3	PZ134
554	47.7	0.93	132.67	120.6	PZ134
1874	47.5	0.43	132.83	121.1	PZ134
20	41.96	0	132.29	128.2	PZ134
22	41.84	0	132.29	128.4	PZ134
18	38	0	132.35	133.9	PZ134
1876	36.55	0	130.85	133.9	PZ134
384	37.34	0.28	132.12	134.5	PZ134
1296	31.77	0.17	129.31	138.5	PZ134
1328	31.53	0	129.5	139.1	PZ134
1326	27.81	0	129.61	144.5	PZ134
1324	24.78	0	129.72	148.9	PZ134
1320	19.36	0	129.98	157	PZ134
J-493	11.27	0	134.19	174.5	PZ134
936	101.04	1.97	129.47	40.3	PZ145
922	100.95	0	130.23	41.6	PZ145
944	100.72	0	130.21	41.9	PZ145
J-97	100.67	2.5	130.31	42.1	PZ145
920	100.5	0.22	130.22	42.2	PZ145
1138	100.61	0.32	130.34	42.2	PZ145
J-545	100	10.63	130.14	42.8	PZ145
942	98.89	1.1	129.18	43	PZ145

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
948	98.87	7.28	129.19	43	PZ145
938	98.47	3.58	129.45	44	PZ145
S5-PS1	97.51	0.89	130.19	46.4	PZ145
940	96.5	1.14	129.44	46.8	PZ145
J-334	97.48	0	130.56	47	PZ145
1132	97.71	0	130.86	47.1	PZ145
1134	97.57	0	130.75	47.1	PZ145
J-335	95.47	0	129.45	48.2	PZ145
1136	95.89	2.68	130.69	49.4	PZ145
864	96.02	1.9	130.87	49.5	PZ145
1130	96.37	0	131.23	49.5	PZ145
1098	94.16	0.88	129.63	50.3	PZ145
1100	93.61	0.61	129.69	51.2	PZ145
S5-PS4	93.5	0	129.56	51.2	PZ145
S5-Q1	93.85	0	129.93	51.2	PZ145
858	94.39	0	130.83	51.7	PZ145
946	93.5	0	129.96	51.8	PZ145
S5-Q2	93.21	0.61	129.83	52	PZ145
992	93.28	0.76	129.96	52.1	PZ145
J-546	93.76	10.63	130.75	52.5	PZ145
924	93.06	0.69	130.1	52.6	PZ145
910	92.78	0.69	130.1	53	PZ145
J-327	93.05	0	130.38	53	PZ145
S5-PR1	91.8	0	129.69	53.8	PZ145
894	91.78	0	130.77	55.3	PZ145
542	92.6	0	131.85	55.7	PZ145
866	92.53	0.88	131.82	55.8	PZ145
900	91.32	0.56	130.74	56	PZ145
898	90.83	0	130.75	56.7	PZ145
990	90.02	3.22	129.95	56.7	PZ145
J-486	90.77	0	131.21	57.4	PZ145
S5-PS2	89.34	1.81	129.81	57.4	PZ145
934	88.01	1.01	129.45	58.8	PZ145
856	89.38	2.51	131.02	59.1	PZ145
932	87.78	0.5	129.45	59.2	PZ145
926	86.91	9.74	129.48	60.4	PZ145
908	87.28	0.56	130.1	60.8	PZ145
916	86.8	0.47	130.1	61.5	PZ145
1108	86.12	2.31	129.75	61.9	PZ145
J-319	86.3	0	129.93	61.9	PZ145
S5-PR2	85.99	0	129.75	62.1	PZ145
890	86.72	2.85	130.57	62.2	PZ145
892	86.59	4.77	130.62	62.5	PZ145

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
928	84.91	0.61	129.47	63.2	PZ145
J-333	85.96	0	130.87	63.7	PZ145
J-328	85.07	0	130.38	64.3	PZ145
J-495	85.45	0	131.1	64.8	PZ145
J-500	84.3	0	129.92	64.8	PZ145
854	85.24	2.51	131.1	65.1	PZ145
J-487	84.67	0	131.38	66.3	PZ145
S5-Q3	83.13	3.11	129.96	66.5	PZ145
J-200	82.34	0	129.48	66.9	PZ145
1182	82.7	1.15	129.89	67	PZ145
1110	82.43	1.96	129.74	67.2	PZ145
862	83.09	1.14	130.99	68	PZ145
994	81.86	2.38	129.91	68.2	PZ145
J-22	83.25	0	131.87	69	PZ145
J-23	83.24	0	131.87	69	PZ145
J-25	83.26	0	131.87	69	PZ145
J-30	83.27	0	131.87	69	PZ145
850	82.57	2.78	131.27	69.1	PZ145
J-336	81.04	0	129.83	69.2	PZ145
840	82.61	0	132.06	70.2	PZ145
842	82.56	0	132.03	70.2	PZ145
1106	80.07	3	129.68	70.4	PZ145
844	82.07	0	131.87	70.7	PZ145
1114	79.22	0.58	129.64	71.6	PZ145
J-215	79.5	0	130	71.7	PZ145
S5-PR3	79.44	0	129.92	71.7	PZ145
J-315	79.01	0	129.69	71.9	PZ145
822	80.98	0	132.23	72.7	PZ145
996	78.59	1.64	129.9	72.8	PZ145
S5-PS3	77.8	0	129.33	73.1	PZ145
1180	78.19	0	129.94	73.5	PZ145
830	80.13	0.91	132.23	74	PZ145
1112	77.32	1.71	129.73	74.4	PZ145
1184	77.5	0.91	129.88	74.4	PZ145
972	77.45	2.2	130	74.6	PZ145
852	78.91	3.04	131.6	74.8	PZ145
J-316	76.91	0	129.7	74.9	PZ145
834	78.69	0	132.32	76.1	PZ145
J-314	75.18	0	129.18	76.6	PZ145
1210	75.09	0.71	129.29	76.9	PZ145
1214	74.72	3.93	129.19	77.3	PZ145
1212	74.71	0.91	129.27	77.4	PZ145
888	75.75	5.1	130.51	77.7	PZ145

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
824	76.96	0	132.42	78.7	PZ145
826	76.65	0.78	132.4	79.1	PZ145
848	75.5	0.28	131.28	79.2	PZ145
J-329	73.56	0	130.32	80.6	PZ145
1186	72.88	1.96	129.84	80.8	PZ145
828	75.09	4.66	132.26	81.2	PZ145
998	72.7	0.88	129.87	81.2	PZ145
1216	71.77	4.51	129.15	81.4	PZ145
J-45	72.46	0	129.81	81.4	PZ145
J-317	72.05	0	129.71	81.9	PZ145
930	71.14	3.71	129.19	82.4	PZ145
886	72.75	0	130.89	82.5	PZ145
J-548	76.34	0	135.01	83.3	PZ145
914	71.26	5.1	130.13	83.6	PZ145
J-549	77.15	0	136.34	84	PZ145
1118	70.21	0.91	129.71	84.5	PZ145
962	69.24	3.28	129.04	84.9	PZ145
J-216	70.3	0	130.1	84.9	PZ145
J-1	69.82	0	129.71	85	PZ145
J-320	69.95	0	129.92	85.1	PZ145
1004	69.7	0.88	129.81	85.3	PZ145
1116	69.6	0.91	129.71	85.3	PZ145
846	71.14	1.42	131.42	85.6	PZ145
J-292	69.38	0	129.71	85.6	PZ145
J-291	68.73	0	129.15	85.8	PZ145
J-496	68.59	0	129.07	85.9	PZ145
1218	67.89	1.43	129.19	87	PZ145
1006	68.06	1.88	129.79	87.6	PZ145
986	67.01	1.38	129.1	88.1	PZ145
J-321	66.78	0	129.04	88.4	PZ145
J-44	66.89	0	129.82	89.3	PZ145
J-289	65.39	0	129.27	90.7	PZ145
J-318	65.75	0	129.77	90.9	PZ145
1220	64.15	0.47	129.21	92.4	PZ145
964	62.92	4.02	129.03	93.8	PZ145
J-325	62.88	0	129.05	93.9	PZ145
J-332	64.41	0	130.72	94.1	PZ145
J-238	63.18	0	129.8	94.6	PZ145
J-322	62.36	0	129.04	94.6	PZ145
J-217	58.91	0	129.03	99.5	PZ145
984	58.87	0.88	129.07	99.6	PZ145
906	59.74	0	130.49	100.4	PZ145
J-326	57.99	0	129.07	100.9	PZ145

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-290	57.83	0	129.21	101.3	PZ145
J-198	58.38	0	130.9	102.9	PZ145
J-324	55.45	0	129.03	104.4	PZ145
1008	55.39	0.47	129.73	105.5	PZ145
982	54.34	1.06	129.07	106.1	PZ145
812	55.14	0	131.44	108.3	PZ145
976	33.97	0.56	130.64	137.2	PZ145
978	27.18	1.02	130.64	146.9	PZ145
1816	52.62	0.3	79.6	38.3	PZ84
S2-PR1	45.39	0	73.21	39.5	PZ84
S2-Q1	44.59	0	74.26	42.1	PZ84
136	42.77	6.58	72.57	42.3	PZ84
J-387	42.5	0	72.37	42.4	PZ84
138	42.5	2.7	72.58	42.7	PZ84
S2-PS2	42	11.23	72.16	42.8	PZ84
122	42.5	0	73.5	44	PZ84
J-248	41.16	0	72.58	44.6	PZ84
S2-PS1	43.58	0.89	75.54	45.4	PZ84
124	40.46	0	72.63	45.7	PZ84
Quinsam IR	33.63	24.22	68.99	50.2	PZ84
760	39.86	1.08	76.67	52.2	PZ84
S2-Q3	34.73	2.24	71.65	52.4	PZ84
116	35.9	2.89	73.05	52.7	PZ84
754	38.4	2.27	75.83	53.1	PZ84
S1-PR1	35.06	2.05	73.06	53.9	PZ84
80	35.03	0	73.06	54	PZ84
J-206	33.85	0	72.23	54.5	PZ84
J-375	31.44	0	70.56	55.5	PZ84
1852	36.39	2.16	75.73	55.8	PZ84
756	36.16	1.32	76.43	57.2	PZ84
382	36.31	4.36	77.16	58	PZ84
344	30.56	3.73	71.59	58.2	PZ84
J-276	32.32	0	73.32	58.2	PZ84
J-307	30.41	0	71.61	58.5	PZ84
S1-PR2	31.98	1.15	73.16	58.5	PZ84
S1-Q1	32	0	73.24	58.5	PZ84
S2-PR3	30.36	0	71.59	58.5	PZ84
114	31.5	1.06	73.14	59.1	PZ84
466	30.89	2.68	72.52	59.1	PZ84
770	35.16	1.04	77.25	59.7	PZ84
J-96	30.86	0	73.41	60.4	PZ84
84	30.5	0.91	73.38	60.9	PZ84
102	29.56	1.73	73.32	62.1	PZ84

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-214	27	0	71.61	63.3	PZ84
474	24.66	13.08	70.27	64.7	PZ84
578	29.96	0.6	75.66	64.9	PZ84
112	26.68	1.06	73.19	66	PZ84
492	25.14	0.71	71.61	66	PZ84
J-377	24.27	0	70.8	66	PZ84
784	31.68	0.52	78.37	66.3	PZ84
S1-Q2	26.51	0.97	73.2	66.3	PZ84
378	25.82	2.22	72.88	66.8	PZ84
772	30.12	0.26	77.3	67	PZ84
98	25.72	1.06	73.45	67.7	PZ84
S1-PS1	25.9	0	74.1	68.4	PZ84
586	26.96	0	75.3	68.6	PZ84
594	26.94	0.15	75.3	68.6	PZ84
584	26.88	0	75.3	68.7	PZ84
580	26.78	1.51	75.53	69.2	PZ84
S1-PR3	24.26	0	73.06	69.3	PZ84
82	25.01	0.89	73.94	69.5	PZ84
1868	26.29	0.15	75.3	69.6	PZ84
J-453	22.42	0	71.91	70.2	PZ84
90	23.28	2.51	73.05	70.7	PZ84
S1-PS4	24	0	73.83	70.7	PZ84
S2-PS4	21.41	1.12	71.37	70.9	PZ84
92	22.84	2.79	73.09	71.3	PZ84
774	26.76	0.15	77.27	71.7	PZ84
106	22.99	1.23	73.59	71.8	PZ84
778	26.57	0.97	77.25	71.9	PZ84
596	24.58	0	75.3	72	PZ84
128	20.57	2.74	71.41	72.2	PZ84
472	20.47	2.87	71.3	72.2	PZ84
376	21.17	3.17	72.23	72.5	PZ84
S1-PS2	21.98	1.15	73.05	72.5	PZ84
750	24.12	1.62	75.33	72.7	PZ84
782	26.39	0.52	77.63	72.7	PZ84
J-161	20.3	0	71.84	73.2	PZ84
118	21.99	0	73.65	73.3	PZ84
108	22	3.28	73.84	73.6	PZ84
J-211	18.7	0	70.57	73.6	PZ84
752	24.47	2.46	76.38	73.7	PZ84
776	24.91	0.71	77.27	74.3	PZ84
374	19.13	2.1	71.79	74.8	PZ84
372	19	1.25	71.77	74.9	PZ84
470	17.53	13.93	70.27	74.9	PZ84

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
780	24.19	0.11	77.19	75.2	PZ84
110	20.02	2.22	73.21	75.5	PZ84
J-391	20.02	0	73.41	75.8	PZ84
748	20.42	0.09	73.9	75.9	PZ84
338	16.82	0.8	70.33	76	PZ84
468	18.18	0.73	72.64	77.3	PZ84
96	18.44	1.55	73.11	77.6	PZ84
S2-PR2	16.63	0	71.27	77.6	PZ84
576	21.04	0.6	75.83	77.8	PZ84
J-392	18.14	0	73.05	77.9	PZ84
S1-PS3	18.2	0	73.11	77.9	PZ84
94	18.08	2.96	73.11	78.1	PZ84
78	19.74	21.91	74.81	78.2	PZ84
J-163	16.26	0	71.49	78.4	PZ84
178	17.73	0.58	73.1	78.6	PZ84
132	15.6	0.5	71.27	79	PZ84
176	17.5	0	73.26	79.1	PZ84
S2-Q2	15.43	0	71.27	79.3	PZ84
J-499	17.07	0	73.09	79.5	PZ84
76	19.5	0	75.72	79.8	PZ84
186	14.5	4.27	71.05	80.3	PZ84
J-455	15.28	0	72.04	80.6	PZ84
180	14.21	2.65	71.18	80.9	PZ84
S3-PR3	14.46	0	71.46	80.9	PZ84
J-168	13.66	0	71.18	81.7	PZ84
144	13.55	4.96	71.2	81.8	PZ84
142	13.41	1.86	71.18	82	PZ84
J-160	15.5	0	73.26	82	PZ84
166	13.31	10.77	71.49	82.6	PZ84
1844	19.44	0.71	77.6	82.6	PZ84
J-388	12.9	0	71.18	82.7	PZ84
184	12.78	0.02	71.18	82.9	PZ84
J-278	12.5	0	71.17	83.3	PZ84
1818	14.27	1.84	73.08	83.5	PZ84
476	12.49	7.02	71.48	83.7	PZ84
J-171	14.06	0	73.08	83.8	PZ84
J-156	11.81	0	71.21	84.3	PZ84
J-172	13.6	0	73.08	84.4	PZ84
172	11.31	0	71.19	85	PZ84
J-162	11.86	0	71.84	85.1	PZ84
74	19	0.61	79.01	85.2	PZ84
J-162	11.5	0	71.49	85.2	PZ84
J-154	11.14	0	71.24	85.3	PZ84

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
S3-PS4	11.31	2.31	71.43	85.3	PZ84
340	11.49	1.23	71.61	85.4	PZ84
160	11	2.24	71.24	85.5	PZ84
162	11	4.02	71.24	85.5	PZ84
342	11.02	0.17	71.57	85.9	PZ84
J-155	10.84	0	71.35	85.9	PZ84
164	10.5	4.12	71.4	86.4	PZ84
J-389	10.58	0	71.84	87	PZ84
1820	11.27	2.37	73.06	87.7	PZ84
J-166	9.44	0	71.24	87.7	PZ84
J-164	9.5	0	71.4	87.9	PZ84
S3-Q3	9.5	1.83	71.49	88	PZ84
J-445	12.97	0	75.61	88.9	PZ84
J-167	8.5	0	71.24	89.1	PZ84
582	13	2.1	75.84	89.2	PZ84
336	7.66	1.23	70.57	89.3	PZ84
332	6.8	1.12	70.59	90.5	PZ84
J-165	7.67	0	71.4	90.5	PZ84
J-436	7.73	0	71.46	90.5	PZ84
1822	9.21	1.1	73.04	90.6	PZ84
574	11.9	0.75	75.91	90.9	PZ84
54	11.5	0	76.05	91.6	PZ84
250	10.52	0	75.6	92.4	PZ84
J-554	10.38	11.29	75.57	92.5	PZ84
J-494	5.23	0	70.62	92.8	PZ84
J-207	6.64	0	72.19	93	PZ84
290	4.42	5.5	70.23	93.4	PZ84
1836	4	4.55	70.05	93.8	PZ84
146	4.98	2.03	71.16	93.9	PZ84
302	4.07	1.02	70.33	94	PZ84
348	5.15	2.37	71.4	94	PZ84
282	4.08	5.44	70.34	94.1	PZ84
152	4.73	0	71.13	94.2	PZ84
1824	6.62	2.7	72.98	94.2	PZ84
J-247	9.53	0	75.87	94.2	PZ84
J-556	5.35	11.29	71.69	94.2	PZ84
156	4.61	3.65	71.13	94.4	PZ84
292	3.64	2.96	70.14	94.4	PZ84
198	9.07	0.86	75.64	94.5	PZ84
324	4.09	2.5	70.65	94.5	PZ84
1860	3.43	0.97	70.03	94.5	PZ84
1862	4.57	0	71.12	94.5	PZ84
S2-PS3	4.56	5.23	71.11	94.5	PZ84

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-169	4.5	0	71.11	94.6	PZ84
J-452	4.5	0	71.18	94.6	PZ84
140	4.5	3.17	71.27	94.8	PZ84
J-441	5	0	71.79	94.8	PZ84
300	3.18	18.67	70.12	95	PZ84
1850	3.18	0	70.11	95	PZ84
294	3.11	6.52	70.11	95.1	PZ84
298	3	0.3	70.03	95.1	PZ84
326	3.62	2.12	70.6	95.1	PZ84
J-14	8.55	0	75.61	95.2	PZ84
J-497	3.5	0	70.59	95.2	PZ84
J-498	3.5	0	70.59	95.2	PZ84
248	8.42	0.22	75.59	95.3	PZ84
296	3	2.51	70.11	95.3	PZ84
364	4.08	0.48	71.24	95.3	PZ84
368	4.12	0.6	71.24	95.3	PZ84
1872	3.22	7.45	70.34	95.3	PZ84
J-378	4.25	0	71.36	95.3	PZ84
J-451	3.7	0	70.83	95.3	PZ84
194	8.68	2.27	75.87	95.4	PZ84
J-157	3.91	0	71.14	95.4	PZ84
J-277	4.01	0	71.19	95.4	PZ84
S3-PR1	4.11	1.34	71.3	95.4	PZ84
188	3.85	0	71.12	95.5	PZ84
228	8.33	0.35	75.59	95.5	PZ84
380	4.92	1.12	72.19	95.5	PZ84
158	3.78	1.58	71.14	95.6	PZ84
J-438	3.27	0	70.61	95.6	PZ84
S3-Q1	3.99	3.2	71.31	95.6	PZ84
150	3.64	0	71.12	95.8	PZ84
J-442	4.98	0	72.5	95.8	PZ84
J-450	3.02	0	70.5	95.8	PZ84
J-158	3.54	0	71.12	95.9	PZ84
334	3.06	1.81	70.67	96	PZ84
J-448	3.5	0	71.16	96	PZ84
J-555	3.5	0	71.12	96	PZ84
280	2.86	0.75	70.55	96.1	PZ84
286	2.93	1.32	70.61	96.1	PZ84
J-209	3.48	0	71.16	96.1	PZ84
276	2.79	1.4	70.58	96.2	PZ84
312	2.99	0.37	70.79	96.2	PZ84
352	3.5	2.25	71.29	96.2	PZ84
J-552	2.72	18	70.46	96.2	PZ84

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
284	2.73	0.99	70.57	96.3	PZ84
354	3.5	2.92	71.36	96.3	PZ84
J-132	3.45	0	71.29	96.3	PZ84
J-550	3.5	19.24	71.31	96.3	PZ84
J-551	2.94	18	70.77	96.3	PZ84
306	2.81	0.39	70.72	96.4	PZ84
318	3.2	0.28	71.08	96.4	PZ84
330	2.7	2.81	70.65	96.4	PZ84
S3-PS1	2.71	1.36	70.61	96.4	PZ84
S3-PS2	2.99	0	70.93	96.4	PZ84
328	2.6	2.33	70.62	96.5	PZ84
308	2.85	0.15	70.89	96.6	PZ84
358	3	1.19	71.08	96.6	PZ84
J-440	3.25	0	71.29	96.6	PZ84
J-449	3.34	0	71.43	96.6	PZ84
S3-PR2	2.61	1.38	70.69	96.6	PZ84
58	8.39	4.55	76.5	96.7	PZ84
356	3	1.45	71.09	96.7	PZ84
370	3.01	1.34	71.13	96.7	PZ84
J-133	3.19	0	71.29	96.7	PZ84
200	7.5	1.58	75.69	96.8	PZ84
304	2.66	1.4	70.89	96.8	PZ84
J-141	3	0	71.23	96.8	PZ84
310	2.5	0.75	70.79	96.9	PZ84
J-134	3	0	71.29	96.9	PZ84
274	2.33	2.14	70.67	97	PZ84
278	2.35	0.32	70.72	97	PZ84
314	2.31	0.65	70.68	97	PZ84
J-210	2.5	0	70.86	97	PZ84
J-437	2.5	0	70.85	97	PZ84
S3-PS3	2.5	0	70.8	97	PZ84
272	3.5	2.4	71.94	97.1	PZ84
J-129	3.11	0	71.49	97.1	PZ84
J-130	3.08	0	71.49	97.1	PZ84
J-208	2.74	0	71.16	97.1	PZ84
S3-Q2	2.5	1.08	70.89	97.1	PZ84
266	3.5	1.14	71.99	97.2	PZ84
366	2.56	0.54	71.03	97.2	PZ84
J-131	3	0	71.49	97.2	PZ84
J-443	4.5	0	73	97.2	PZ84
270	3.22	1.7	71.83	97.4	PZ84
J-439	2	0	70.65	97.5	PZ84
192	7.34	0.69	76.07	97.6	PZ84

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
196	7	1.58	75.8	97.7	PZ84
1864	7.15	2.38	76.05	97.8	PZ84
J-553	4	11.29	73.18	98.2	PZ84
56	6.78	0.15	76.05	98.3	PZ84
254	4	0.09	73.35	98.4	PZ84
258	3.97	0.11	73.35	98.5	PZ84
244	3.5	0.02	73.23	99	PZ84
256	3.57	0.82	73.35	99.1	PZ84
216	6.29	1.4	76.18	99.2	PZ84
J-194	7.56	0	77.47	99.2	PZ84
202	5.58	2.44	75.6	99.4	PZ84
242	3.1	0.06	73.23	99.5	PZ84
264	2.5	1.25	72.77	99.7	PZ84
1870	4.72	0.3	74.96	99.7	PZ84
246	3	1.02	73.28	99.8	PZ84
260	3.06	0.73	73.35	99.8	PZ84
J-384	4	0	74.37	99.9	PZ84
268	2.57	0.28	73.05	100	PZ84
J-244	4.11	0	74.58	100	PZ84
J-444	4.88	0	75.32	100	PZ84
1832	3.33	1.15	73.92	100.2	PZ84
J-447	3	0	73.6	100.2	PZ84
204	5	1.92	75.69	100.3	PZ84
J-195	6.82	0	77.45	100.3	PZ84
60	6.81	0.24	77.57	100.4	PZ84
1830	3.19	1.92	73.93	100.4	PZ84
1834	3.19	0.91	73.91	100.4	PZ84
226	4.07	0.71	74.93	100.6	PZ84
234	2.94	0.88	73.87	100.7	PZ84
236	2.83	0.71	73.83	100.8	PZ84
214	4.75	1.12	75.95	101.1	PZ84
208	5.63	1.66	77	101.3	PZ84
218	4.53	0.6	75.9	101.3	PZ84
262	2	0.52	73.35	101.3	PZ84
212	4.72	2.03	76.18	101.4	PZ84
222	4	2.35	75.43	101.4	PZ84
1866	7	0.09	78.55	101.6	PZ84
J-386	6.05	0	77.61	101.6	PZ84
224	3.2	0.99	74.94	101.8	PZ84
J-138	3.28	0	75.01	101.8	PZ84
230	3	2.57	74.87	102	PZ84
J-139	3.06	0	74.93	102	PZ84
220	3.65	1.01	75.57	102.1	PZ84

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
206	5.26	0.73	77.39	102.4	PZ84
J-249	2.78	0	74.89	102.4	PZ84
232	2.65	1.04	74.89	102.5	PZ84
J-245	5.92	0	78.36	102.8	PZ84
J-446	2.5	0	74.9	102.8	PZ84
J-246	6	0	78.81	103.3	PZ84
46	6	0	78.84	103.4	PZ84
48	6	0.3	78.83	103.4	PZ84
44	6	0.99	78.91	103.5	PZ84
210	2.67	1.58	75.56	103.5	PZ84
J-529	2.7	0	75.91	103.9	PZ84
J-385	3	0	76.33	104.1	PZ84
J-533	47.65	0	71.85	34.4	PZ89
CONN to AREA D 1	46.93	0	74.82	39.6	PZ89
J-221	45.5	0	74.2	40.7	PZ89
1642	45.11	0	74.86	42.2	PZ89
J-534	40.95	0	71.58	43.5	PZ89
J-231	38.78	0	71.46	46.4	PZ89
J-223	39.3	0	73.06	47.9	PZ89
1378	39.66	1.47	73.83	48.5	PZ89
J-222	38.91	0	73.43	49	PZ89
J-535	36.95	0	71.58	49.1	PZ89
J-519	38.98	0	73.72	49.3	PZ89
1370	38.71	1.25	73.59	49.5	PZ89
1368	38.5	1.86	73.55	49.8	PZ89
1762	50.44	0.11	85.61	49.9	PZ89
1372	38.34	2.22	73.64	50.1	PZ89
J-373	38.19	0	73.53	50.2	PZ89
J-233	38	0	73.55	50.5	PZ89
1374	37.49	3.11	73.64	51.3	PZ89
J-224	36.84	0	72.97	51.3	PZ89
J-86	35.33	0	71.62	51.5	PZ89
J-87	35.37	0	71.62	51.5	PZ89
J-147	34.71	5.72	71.38	52.1	PZ89
J-518	36.84	0	73.64	52.2	PZ89
1878	36.1	2.48	73.51	53.1	PZ89
1760	44.75	1.25	82.38	53.4	PZ89
J-218	36.8	0	74.62	53.7	PZ89
1376	35.67	2.98	73.75	54	PZ89
1318	37.41	0	75.64	54.3	PZ89
1336	37.27	3.5	75.59	54.4	PZ89
J-516	35.88	0	74.2	54.4	PZ89
J-515	34.95	0	73.43	54.6	PZ89

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-52	39.35	0	77.88	54.7	PZ89
J-135	38.82	0	77.48	54.9	PZ89
J-140	38.56	0	77.47	55.2	PZ89
1066	37.06	0	76.29	55.7	PZ89
J-148	32.02	0	71.27	55.7	PZ89
1068	36.59	0.89	76.23	56.3	PZ89
1746	34.41	2.03	74.2	56.5	PZ89
1364	34	1.01	73.91	56.6	PZ89
1366	34.32	0.37	74.18	56.6	PZ89
1460	34.15	1.38	74.15	56.8	PZ89
J-145	31.33	0	71.35	56.8	PZ89
J-85	31.3	0	71.56	57.2	PZ89
1638	36.76	0	77.14	57.3	PZ89
1640	36.84	0	77.23	57.3	PZ89
J-150	37.06	0	77.41	57.3	PZ89
1756	32.96	2.92	73.43	57.4	PZ89
1636	35.95	0	76.6	57.7	PZ89
1634	35.79	0.19	76.57	57.9	PZ89
J-89	30.27	0	71.37	58.3	PZ89
1334	32.58	4.08	73.88	58.6	PZ89
J-501	29.92	0	71.25	58.7	PZ89
J-75	30.32	0	72.97	60.5	PZ89
J-76	30.37	0	73.06	60.6	PZ89
J-359	28.82	0	71.57	60.7	PZ89
J-337	30.32	0	73.48	61.3	PZ89
J-232	31.65	0	74.88	61.4	PZ89
1786	29.82	0.48	73.17	61.5	PZ89
J-149	27.71	0	71.18	61.7	PZ89
J-542	31.37	5.53	74.84	61.7	PZ89
1362	29.92	3.97	73.48	61.8	PZ89
J-84	27.45	0	71.57	62.6	PZ89
J-413	30.69	0	74.78	62.6	PZ89
J-503	27.11	0	71.21	62.6	PZ89
J-88	27.17	0	71.39	62.8	PZ89
J-339	30.62	0	74.92	62.9	PZ89
1790	28.19	1.27	73.13	63.8	PZ89
J-358	26.5	0	71.48	63.8	PZ89
1796	31.1	0.56	76.16	64	PZ89
J-338	28.31	0	73.49	64.1	PZ89
1604	27.8	1.29	73.18	64.4	PZ89
1792	27.74	0.56	73.09	64.4	PZ89
S6-Q2	26.06	0	71.49	64.5	PZ89
1630	26.03	1.12	71.57	64.6	PZ89

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
1626	26.04	0.19	71.71	64.8	PZ89
1794	30.32	3.67	75.95	64.8	PZ89
J-83	25.87	0	71.57	64.9	PZ89
J-109	26.91	0	72.83	65.2	PZ89
1744	28.06	1.51	74.2	65.5	PZ89
J-151	25.05	0	71.21	65.5	PZ89
J-225	29.12	0	75.25	65.5	PZ89
J-131	26.72	0	72.93	65.6	PZ89
J-134	29	0	75.25	65.6	PZ89
J-90	24.5	0	71.19	66.3	PZ89
1784	26.3	0.84	73.09	66.4	PZ89
1614	24.49	1.12	71.4	66.6	PZ89
J-150	23.93	0	71.08	66.9	PZ89
J-360	28.79	0	76.16	67.2	PZ89
1606	26.4	1.79	74	67.6	PZ89
J-128	26.05	0	73.69	67.6	PZ89
J-SouthEnd Adjust	23.54	0	71.19	67.6	PZ89
J-304	28.5	0	76.16	67.7	PZ89
1608	26.19	0.56	74	67.9	PZ89
J-355	22.94	0	71.12	68.4	PZ89
1388	25.23	0.3	73.51	68.5	PZ89
1434	27.42	1.71	75.69	68.5	PZ89
J-98	22.82	0	71.09	68.5	PZ89
J-82	22.8	0	71.1	68.6	PZ89
J-152	22.75	0	71.21	68.8	PZ89
J-517	26.36	0	75.03	69.1	PZ89
1390	24.71	3.05	73.49	69.2	PZ89
1402	24.72	0.2	73.51	69.3	PZ89
1436	27.06	0.5	75.89	69.3	PZ89
1676	23.8	0.54	72.83	69.6	PZ89
1632	24.44	0	73.64	69.8	PZ89
1428	25.66	1.01	74.89	69.9	PZ89
1432	25.93	0	75.27	70	PZ89
J-32	24.09	0	73.48	70.1	PZ89
1674	23.4	2.05	72.82	70.2	PZ89
1444	25.77	0.6	75.31	70.3	PZ89
J-77	21.45	0	70.96	70.3	PZ89
1694	21.42	0.35	71.04	70.4	PZ89
J-99	21.5	0	71.09	70.4	PZ89
J-130	23.29	0	72.9	70.4	PZ89
1542	24.85	0.2	74.62	70.6	PZ89
J-504	21.25	0	71.07	70.7	PZ89
1442	25.36	0.71	75.22	70.8	PZ89

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-2	24.6	0	74.65	71	PZ89
J-297	23.52	0	73.52	71	PZ89
1540	24	0.61	74.17	71.2	PZ89
1782	22.86	1.6	73.01	71.2	PZ89
1680	22.5	1.29	72.72	71.3	PZ89
1538	23.8	0.82	74.07	71.4	PZ89
1412	23.62	0.71	74.17	71.8	PZ89
1352	22.84	2.72	73.52	71.9	PZ89
J-76	20.25	0	70.96	72	PZ89
1468	24.28	0.71	75.09	72.1	PZ89
1778	21.92	0.56	72.85	72.3	PZ89
J-97	20.08	0	70.99	72.3	PZ89
1430	26.51	0	77.54	72.4	PZ89
1360	22.42	2.85	73.48	72.5	PZ89
J-510	20.97	0	72.65	73.4	PZ89
1684	20.37	2.38	72.39	73.8	PZ89
1482	20.77	2.25	73.18	74.4	PZ89
1462	20.76	4.19	73.25	74.5	PZ89
J-75	18.49	0	70.96	74.5	PZ89
1350	20.94	2.1	73.49	74.6	PZ89
1464	24.93	1.01	77.46	74.6	PZ89
1480	20.5	1.6	73.33	75	PZ89
1550	23.65	0.54	76.53	75.1	PZ89
1552	22.96	1.83	75.91	75.1	PZ89
1358	20.3	2.1	73.48	75.5	PZ89
S6-Q1	18.06	1.88	71.28	75.5	PZ89
1446	20.03	2.05	73.51	75.9	PZ89
1356	19.83	2.1	73.47	76.1	PZ89
J-74	17.06	0	70.91	76.4	PZ89
1484	19.19	2.25	73.05	76.5	PZ89
1548	23.99	0.3	77.88	76.5	PZ89
1668	18.9	3.76	72.92	76.7	PZ89
1672	18.65	5.14	72.8	76.9	PZ89
J-64	16.22	0	70.54	77.1	PZ89
1354	18.98	1.01	73.47	77.3	PZ89
J-48	16.43	0	70.99	77.4	PZ89
1780	18.28	1.23	72.85	77.5	PZ89
J-520	18.82	0	73.47	77.6	PZ89
J-340	19.91	0	74.62	77.7	PZ89
1554	18.04	2.59	73.08	78.1	PZ89
J-78	15.86	0	70.91	78.2	PZ89
1348	18.3	1.86	73.48	78.3	PZ89
J-96	15.73	0	70.99	78.4	PZ89

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-140	15.32	0	70.56	78.4	PZ89
1410	18.12	1.83	73.61	78.8	PZ89
S6-PS1	15.59	0	71.26	79	PZ89
1346	17.71	2.48	73.47	79.1	PZ89
1476	16.5	3.65	72.95	80.1	PZ89
J-73	14.09	0	70.56	80.2	PZ89
J-356	14.44	0	70.93	80.2	PZ89
1478	16.28	3.97	72.89	80.3	PZ89
J-79	14.19	0	70.9	80.5	PZ89
J-418	16.9	0	73.77	80.7	PZ89
1342	16.53	2.22	73.47	80.8	PZ89
S6-PR2	14.22	3.39	71.34	81.1	PZ89
1710	13.52	0.19	70.7	81.2	PZ89
1344	16.19	0.75	73.48	81.3	PZ89
J-511	15.17	0	72.46	81.3	PZ89
1682	15	2.25	72.37	81.4	PZ89
1798	15.02	4.47	72.38	81.4	PZ89
1406	16.11	3.82	73.5	81.5	PZ89
1302	15.92	0.5	73.48	81.7	PZ89
1706	13.35	1.06	70.88	81.7	PZ89
J-63	12.9	0	70.49	81.7	PZ89
J-411	15.07	0	72.84	82	PZ89
1666	14.83	3.54	72.8	82.3	PZ89
J-298	14.65	0	72.62	82.3	PZ89
J-512	14.39	0	72.59	82.6	PZ89
1704	12.5	1.06	70.79	82.7	PZ89
1602	14.8	1.12	73.11	82.8	PZ89
J-541	15.21	0	73.51	82.8	PZ89
1440	14.34	0	72.77	82.9	PZ89
1448	14.36	0.43	72.77	82.9	PZ89
1624	12.82	2.07	71.22	82.9	PZ89
1414	14.98	0	73.47	83	PZ89
1470	14.18	0.91	72.62	83	PZ89
1398	14.96	1.43	73.48	83.1	PZ89
1472	14	0.11	72.54	83.1	PZ89
J-341	13.8	0	72.33	83.1	PZ89
S6-PR1	12.71	1.96	71.25	83.1	PZ89
1416	14.87	0.73	73.46	83.2	PZ89
J-100	12.32	0	70.94	83.2	PZ89
1692	12.27	0.35	70.99	83.3	PZ89
1394	14.64	1.94	73.48	83.5	PZ89
J-65	11.5	0	70.42	83.6	PZ89
J-506	12.4	0	71.27	83.6	PZ89

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-513	13.48	0	72.45	83.7	PZ89
1408	14.34	2.42	73.53	84	PZ89
J-303	13.14	0	72.38	84.1	PZ89
J-66	11.12	0	70.41	84.2	PZ89
J-505	11.91	0	71.24	84.2	PZ89
S6-PS4	11.8	0	71.22	84.3	PZ89
1450	12.53	1.64	71.96	84.4	PZ89
1474	13.08	0.58	72.5	84.4	PZ89
J-62	11.06	0	70.49	84.4	PZ89
J-108	12.92	0	72.44	84.5	PZ89
J-507	11.65	0	71.21	84.5	PZ89
J-508	11.68	0	71.18	84.5	PZ89
1600	12.34	1.79	72.1	84.8	PZ89
1712	10.78	0.61	70.5	84.8	PZ89
1392	13.69	1.73	73.49	84.9	PZ89
1438	14.57	1.32	74.36	84.9	PZ89
1486	12.71	1.51	72.64	85.1	PZ89
1520	11.98	1.73	71.96	85.1	PZ89
J-72	10.5	0	70.46	85.1	PZ89
1702	10.66	1.86	70.68	85.2	PZ89
1396	13.37	3.32	73.48	85.3	PZ89
1530	12.5	1.29	72.6	85.3	PZ89
1534	12.43	1.6	72.55	85.3	PZ89
1690	10.83	0.26	70.94	85.3	PZ89
J-345	11.63	0	71.81	85.4	PZ89
1598	11.69	0.37	71.9	85.5	PZ89
1506	11.57	2.07	71.87	85.6	PZ89
1532	12.25	1.84	72.58	85.6	PZ89
1488	11.51	2.91	71.9	85.7	PZ89
1678	12	2.46	72.36	85.7	PZ89
J-67	10	0	70.41	85.7	PZ89
J-103	10.73	0	71.09	85.7	PZ89
1560	11.89	1.29	72.3	85.8	PZ89
J-70	9.95	0	70.41	85.8	PZ89
J-106	10.76	0	71.22	85.8	PZ89
J-234	11.39	0	71.81	85.8	PZ89
J-Southend Adjust 2	10.35	0	70.87	85.9	PZ89
1404	12.92	2.63	73.5	86	PZ89
1492	11.23	0.97	71.85	86	PZ89
1500	11	2.7	71.57	86	PZ89
1522	11.29	2.33	71.96	86.1	PZ89
J-68	9.75	0	70.41	86.1	PZ89
1514	11.57	0.91	72.32	86.2	PZ89

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
1516	11.27	1.62	71.97	86.2	PZ89
J-346	11.02	0	71.75	86.2	PZ89
1622	10.29	3.19	71.1	86.3	PZ89
1504	11.06	3.6	71.9	86.4	PZ89
1612	10.33	3	71.17	86.4	PZ89
1498	10.7	0.63	71.67	86.5	PZ89
J-342	11	0	71.93	86.5	PZ89
J-352	11.5	0	72.42	86.5	PZ89
1306	12.52	0	73.52	86.6	PZ89
1496	10.66	3.05	71.67	86.6	PZ89
1670	11.33	1.71	72.35	86.6	PZ89
J-509	11.42	0	72.4	86.6	PZ89
1304	12.33	0.39	73.52	86.8	PZ89
1508	11.19	0.8	72.37	86.8	PZ89
1308	12.31	0.5	73.52	86.9	PZ89
1698	9.55	2.48	70.79	86.9	PZ89
J-71	9.21	0	70.4	86.9	PZ89
S6-PS2	9.87	2.44	71.1	86.9	PZ89
1716	8.88	0.54	70.19	87	PZ89
J-343	10.6	0	71.86	87	PZ89
1400	12.15	0.39	73.48	87.1	PZ89
J-240	11.82	0	73.17	87.1	PZ89
1096	8.54	0.35	70.01	87.3	PZ89
1510	10.77	0.91	72.3	87.3	PZ89
J-414	12	0	73.5	87.3	PZ89
J-69	8.82	0	70.4	87.4	PZ89
J-80	9.13	0	70.68	87.4	PZ89
J-104	9.5	0	71.1	87.4	PZ89
J-415	11.9	0	73.47	87.4	PZ89
J-301	10	0	71.66	87.5	PZ89
J-416	11.33	0	72.99	87.5	PZ89
1452	10.19	0.71	71.88	87.6	PZ89
1512	10.5	1.51	72.23	87.6	PZ89
1714	8.63	0.8	70.35	87.6	PZ89
1418	11.4	1.02	73.17	87.7	PZ89
1562	10.5	1.6	72.31	87.7	PZ89
1490	10	2.14	71.88	87.8	PZ89
J-539	10	5.53	71.87	87.8	PZ89
1422	11	0.91	72.96	87.9	PZ89
1424	11	0.61	72.92	87.9	PZ89
1688	9	1.68	70.9	87.9	PZ89
1310	11.5	1.62	73.5	88	PZ89
J-344	9.89	0	71.87	88	PZ89

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
1312	11.42	0.82	73.48	88.1	PZ89
1420	10.89	1.55	73.06	88.2	PZ89
1524	10	1.73	72.12	88.2	PZ89
1610	9	2.44	71.11	88.2	PZ89
1700	8.5	1.68	70.62	88.2	PZ89
J-235	9.92	0	72.07	88.2	PZ89
1686	8.7	0.37	70.9	88.3	PZ89
1526	9.81	2.33	72.07	88.4	PZ89
J-354	8.74	0	71.14	88.6	PZ89
1594	9.24	2.14	71.71	88.7	PZ89
J-353	8.61	0	71.11	88.7	PZ89
J-417	11	0	73.49	88.7	PZ89
J-357	8	0	70.58	88.8	PZ89
1426	10.17	2.24	72.79	88.9	PZ89
1576	9	0	71.67	89	PZ89
1580	9	0.63	71.67	89	PZ89
J-81	7.95	0	70.62	89	PZ89
1578	8.81	1.73	71.66	89.2	PZ89
1568	8.9	2.22	71.9	89.4	PZ89
1558	9	0	72.07	89.5	PZ89
1596	8.72	2.7	71.77	89.5	PZ89
1696	7.47	2.31	70.54	89.5	PZ89
CONN TO AREA D 2	6.44	0	69.49	89.5	PZ89
J-302	9.18	0	72.23	89.5	PZ89
1574	8.76	1.12	71.89	89.6	PZ89
J-102	7.76	0	71.09	89.9	PZ89
1570	8.5	0.17	71.89	90	PZ89
1572	8.5	0.32	71.89	90	PZ89
J-410	8.25	0	71.72	90.1	PZ89
1564	8.73	3.5	72.24	90.2	PZ89
1566	8.69	3.33	72.23	90.2	PZ89
1718	6.38	0.54	69.92	90.2	PZ89
J-514	8.46	0	72.03	90.2	PZ89
S6-PS3	7.12	0.28	70.89	90.5	PZ89
J-105	6.96	0	71.22	91.2	PZ89
J-538	5.73	0	70.01	91.3	PZ89
1094	5.89	0.71	70.45	91.6	PZ89
1628	6.53	1.51	71.08	91.6	PZ89
J-351	6.78	0	71.61	92	PZ89
1588	6.69	3.24	71.59	92.1	PZ89
1592	6.65	1.71	71.59	92.2	PZ89
J-305	5.5	0	70.51	92.3	PZ89
J-347	6.5	0	71.74	92.6	PZ89

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-349	6.33	0	71.57	92.6	PZ89
J-306	5.02	0	70.51	93	PZ89
S6-PR3	5.5	0	71.02	93	PZ89
1090	5.47	0.28	71.06	93.1	PZ89
1590	5.87	5.38	71.56	93.2	PZ89
J-350	5.83	0	71.57	93.3	PZ89
S6-Q3	5.35	0	71.08	93.3	PZ89
1082	5.74	2.24	71.66	93.6	PZ89
1586	5.5	5.2	71.54	93.7	PZ89
J-107	5.21	0	71.22	93.7	PZ89
J-101	4.99	0	71.09	93.8	PZ89
J-543	9.5	0	75.61	93.8	PZ89
1080	5.49	2.94	71.79	94.1	PZ89
1584	5.25	0.15	71.54	94.1	PZ89
J-300	5.53	0	71.79	94.1	PZ89
J-299	5.29	0	71.79	94.4	PZ89
1086	4.61	4.77	71.22	94.5	PZ89
J-348	5	0	71.59	94.5	PZ89
1078	5	0.45	71.81	94.8	PZ89
1088	4.34	1.68	71.11	94.8	PZ89
J-540	5	0	71.79	94.8	PZ89
1084	4.6	0.71	71.52	95	PZ89
J-236	4.48	0	71.46	95.1	PZ89
1582	4.45	0.54	71.52	95.2	PZ89
1076	4.5	2.4	71.84	95.6	PZ89
J-137	4.57	0	71.98	95.7	PZ89
1072	4.55	1.94	72.71	96.8	PZ89
1074	3.71	1.56	72.08	97	PZ89
J-409	4.03	0	72.45	97.1	PZ89
J-408	4.56	0	73.04	97.2	PZ89
1070	4.58	0.99	73.5	97.8	PZ89
J-407	4.52	0	74.27	99	PZ89
J-524	4.35	0	74.48	99.5	PZ89
J-406	4.41	0	75.08	100.3	PZ89
820	4.85	8.51	75.61	100.4	PZ89
J-405	4.89	0	75.69	100.5	PZ89
J-237	4.01	0	74.95	100.7	PZ89
J-404	4.5	0	75.77	101.2	PZ89
J-526	4	0	75.84	102	PZ89
J-136	4	0	75.93	102.1	PZ89
J-525	4	0	75.89	102.1	PZ89
J-403	4.29	0	76.28	102.2	PZ89
J-544	5	0	77.07	102.3	PZ89

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
980	4.54	1.7	76.73	102.5	PZ89
818	3.77	5.66	76.01	102.6	PZ89
J-402	4	0	76.49	102.9	PZ89
816	4	7.62	76.73	103.2	PZ89
J-527	4	0	76.87	103.4	PZ89
J-401	4	0	76.91	103.5	PZ89
814	4	3.22	77.07	103.7	PZ89
J-400	3.5	0	77.27	104.7	PZ89
J-126	85.52	0	89	4.9	Reservoir
J-125	85.29	0	88.83	5	Reservoir
J-569	146	0	149.94	5.6	Reservoir
J-17	78	0	83.51	7.8	Reservoir
J-18	78	0	83.51	7.8	Reservoir
J-20	78	0	83.51	7.8	Reservoir
J-21	78	0	83.51	7.8	Reservoir
J-26	78	0	83.51	7.8	Reservoir
J-563	78	0	83.54	7.9	Reservoir
J-251	156	0	162.76	9.6	Reservoir
J-568	146	0	153	9.9	Reservoir
J-398	145.08	1.63	160.89	22.4	Snowdon
J-253	132.25	1.63	158.69	37.5	Snowdon
J-252	131.92	58.53	158.71	38	Snowdon
J-270	20.31	1.63	53.05	46.5	Snowdon
J-254	115.78	1.63	158.35	60.4	Snowdon
J-258	65.18	1.63	112.47	67.1	Snowdon
J-271	4.01	1.63	53.04	69.6	Snowdon
J-250	143.2	0	195.02	73.6	Snowdon
J-264	51.22	1.63	112.31	86.7	Snowdon
J-263	49.74	1.63	112.3	88.8	Snowdon
J-259	49.61	1.63	112.35	89.1	Snowdon
J-256	94.05	0	157.66	90.3	Snowdon
J-492	94.06	1.63	158.01	90.8	Snowdon
J-260	48.11	1.63	112.31	91.1	Snowdon
J-255	91.83	1.63	157.83	93.7	Snowdon
J-397	42.44	1.63	112.3	99.2	Snowdon
J-262	41.72	1.63	112.29	100.2	Snowdon
J-265	41.12	1.63	112.29	101	Snowdon
J-396	40.12	1.63	112.29	102.4	Snowdon
J-261	36	1.63	112.29	108.3	Snowdon
J-267	29.13	1.63	112.18	117.9	Snowdon
J-266	28.74	1.63	112.29	118.6	Snowdon
J-269	27.95	1.63	112.17	119.6	Snowdon
J-268	21.15	1.63	112.18	129.2	Snowdon

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-257	65.62	1.63	157.44	130.3	Snowdon
J-142	147.9	0	148.88	1.4	Supply
J-570	142.5	0	145.47	4.2	Supply
J-562	144	0	148.86	6.9	Supply
798	76.66	0.19	83.29	9.4	Supply
1648	60	0	73.69	19.4	Supply
1646	60	0	73.82	19.6	Supply
J-3	69.03	0	86.54	24.9	Supply
J-127	40.59	0	78.3	53.5	Supply
J-50	40.4	0	78.3	53.8	Supply
1768	85.41	0	129.01	61.9	Supply
1658	32.83	0	80.13	67.1	Supply
J-27	83.12	0	131.87	69.2	Supply
J-137	29.25	0	78.14	69.4	Supply
1662	29.61	0	79.86	71.3	Supply
1882	82.25	0	132.9	71.9	Supply
J-136	27.89	0	79.03	72.6	Supply
1656	28.74	0	80.6	73.6	Supply
1300	25.75	0	78.3	74.6	Supply
1454	24.71	0	78.52	76.4	Supply
1456	24.61	0	78.54	76.6	Supply
J-15	78	0	132.9	77.9	Supply
J-16	78	0	132.9	77.9	Supply
1546	24.35	0	79.33	78	Supply
J-43	25.04	0	80.11	78.2	Supply
1544	24.66	0	80	78.6	Supply
836	76.68	0	132.67	79.5	Supply
70	20	129.63	76.8	80.6	Supply
J-8	68.5	0	128.55	85.2	Supply
538	72.85	1.88	132.97	85.3	Supply
516	72.77	0	132.96	85.4	Supply
518	72.85	0	133	85.4	Supply
1766	68.87	0	129.01	85.4	Supply
J-36	72.83	0	132.98	85.4	Supply
J-7	68.33	0	128.56	85.5	Supply
J-6	75.35	0	135.68	85.6	Supply
970	69.56	0	130.12	86	Supply
J-394	47.42	0	108.15	86.2	Supply
J-6	67.78	0	128.56	86.3	Supply
68	18.89	0	80.32	87.2	Supply
J-5	66.97	0	128.57	87.4	Supply
J-31	66.83	0	128.69	87.8	Supply
J-393	59.99	0	122.47	88.7	Supply

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-4	65.99	0	128.57	88.8	Supply
J-23	72.84	0	136.46	90.3	Supply
J-189	72.54	0	136.47	90.7	Supply
702	69	0	135.07	93.8	Supply
J-9	68.5	0	135.1	94.5	Supply
J-10	68.5	0	135.09	94.5	Supply
J-11	68.5	0	135.11	94.6	Supply
646	70.21	0	136.94	94.7	Supply
J-12	68.07	0	135.11	95.2	Supply
1734	63.47	0	132.18	97.5	Supply
66	18.75	0	89.38	100.3	Supply
64	18.73	0	89.8	100.9	Supply
904	57.97	0	130.9	103.5	Supply
1736	58.35	0	131.53	103.9	Supply
968	55.29	0	130.64	107	Supply
1010	54.37	0	129.73	107	Supply
J-395	25.53	0	100.97	107.1	Supply
1000	53.33	0	129.77	108.5	Supply
810	54.4	0	131.51	109.4	Supply
1732	55.69	0	132.88	109.6	Supply
652	57.04	0	134.67	110.2	Supply
796	54.52	0	132.14	110.2	Supply
1050	50.04	0	129	112.1	Supply
1380	50.05	0	129.27	112.5	Supply
J-88	49.56	0	129.42	113.4	Supply
J-170	47.97	0	128.13	113.8	Supply
J-565	54.31	0	134.49	113.8	Supply
1048	49.11	0	129.43	114	Supply
600	55.7	0.2	137.85	116.6	Supply
602	55.53	0	137.81	116.8	Supply
J-37	46.76	0	131.37	120.1	Supply
966	46.16	0	130.83	120.2	Supply
800	46.46	0	131.39	120.5	Supply
J-24	48.3	0	133.38	120.8	Supply
570	48	0	133.39	121.2	Supply
1738	45.14	0	131.03	121.9	Supply
1740	43.2	0	131	124.6	Supply
1298	41.46	0	129.43	124.9	Supply
J-49	41.22	0	129.43	125.2	Supply
1742	35.93	0	130.08	133.6	Supply
974	35.57	0	130.64	135	Supply
1322	18.59	0	130.08	158.3	Supply
592	26.65	0.99	141.61	163.2	Supply

Build Out Peak Hour Pressures

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (psi)	Zone
J-32	28	0	146.03	167.5	Supply
J-33	28	0	146.03	167.5	Supply
J-35	28	0	146.04	167.5	Supply
J-34	27.5	0	146.04	168.3	Supply
J-30	26.89	0	146.04	169.1	Supply
J-31	26.84	0	146.02	169.2	Supply
J-272	26.21	0	146.07	170.1	Supply
J-273	26	0	146.03	170.4	Supply
J-274	26	0	146.04	170.4	Supply
J-275	26	0	146.02	170.4	Supply
J-27	25.89	0	146.04	170.5	Supply
J-29	25.69	0	146.03	170.8	Supply
J-28	25.33	0	146.03	171.3	Supply
J-144	25.13	0	146.18	171.8	Supply
J-159	4.57	0	127.35	174.3	Supply
62	15.1	0	138.51	175.2	Supply
14	12	0	138.78	180	Supply
16	11.29	0	138.77	181	Supply
1826	5.39	0	134.97	183.9	Supply
1828	5.96	0	136.91	185.9	Supply
640	4.85	2.46	137.5	188.3	Supply
36	7	0	139.73	188.4	Supply
J-5	6	0	138.7	188.4	Supply
42	6	0	139.18	189.1	Supply
38	5.99	0	139.3	189.2	Supply
40	5.99	0	139.3	189.2	Supply
J-532	5.87	0	139.34	189.5	Supply
J-531	5.86	0	139.44	189.6	Supply
52	8	0	141.91	190.1	Supply
34	7.81	0	141.98	190.4	Supply
12	10.19	0	144.56	190.7	Supply

Appendix D

Technical Memorandum 1631-TM1-Rev1

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TECHNICAL MEMORANDUM NO. 1631-161-1 REV 1

City of Campbell River
John Hart Lake Intake – System Pressure Implications Technical Memorandum

Issued: September 8, 2016
Previous Issue Date: July 5, 2016

1. Objective

The objective of this technical memorandum is to review the pressure impacts on the distribution system with the new intake and pump station at John Hart Lake.

This technical memorandum has been updated to reflect the comments on the draft submission received from City staff on August 18, 2016

2. Background

The City is currently in the detailed design phase of a new intake and water treatment plant at John Hart Lake. The proposed intake and water treatment plant (WTP) will be located adjacent to Brewster Lake Road south of the existing BC Hydro Penstocks and will be equipped with a pump station to draw water out of the lake and supply the City of Campbell River distribution system, including the north industrial area.

The supply main from the proposed WTP to the distribution system is partially constructed, with a new main installed along Highway 28 from the John Hart Water Quality Center (JHWQC) to the proposed WTP site. The supply main consists of 1,000 mm and 1,200 mm dia. steel watermain.

The high point of the watermain is located on Brewster Lake Road near the intersection of Highway 28. The invert elevation of the watermain at this location is 145.08m, which is above the normal water level of 139 m at the John Hart Lake. The City has confirmed a minimum pressure of 10 psi shall be maintained in the supply main at the high point, which will result in an HGL at the high point of approximately 153 m.

3. Impacts on Service Pressure

A system HGL of 153 m would increase the current system HGL by 19 m (presently the HGL is 134 m at the JHWQC), and would result in an increase of approximately 27 psi to the areas serviced directly from the transmission mains. The service areas located below the 48 m contour will have static pressures greater than 150 psi. This includes sections of the distribution system between Park Forest Drive and Elk River Road and a small area near Evergreen Road as shown on Figure 1.

4. Options

In order to address the system service pressure, several options were reviewed. Considerations for each option are listed below, including a description and summary of the advantages and disadvantages.

1) Maintain System HGL of 153m

Option 1 considered maintaining the current design HGL of 153 m at the water treatment plant.

Listed below is a summary of the advantages and disadvantages of this improvement option:

Advantages	Disadvantages
a. Provide a higher pressure at the south end of the system at the inlet of the Beaver Lodge Reservoir and Pump Station. b. Delay the need for duplication of the transmission mains, from a hydraulic stand point, as there is more pressure to overcome friction headloss in the piping. c. Provide increased fire flows in the areas serviced by the transmission mains. d. No additional construction costs.	a. Does not address the areas of the distribution system that will have pressures over 150 psi b. The operating conditions will result in a more complicated control philosophy for the pump station and treatment plant, which will be required to treat and supply a varying range of flows while maintaining a minimum pressure in the supply main. c. Supply main would be subject to loss of water during a power failure

2) Install PRVs at JHWQC

Option 2 reviewed the installation of a PRV station at the JHWQC location. The PRV station would be comprised of large and small diameter PRVs to supply the range of system flows from peak hour to night time low flows. The PRV station would also be designed for redundancy, to allow for the station to remain online during the maintenance or replacement of the valves. This PRV station could be housed in the existing JHWQC building and would maintain the existing HGL in the distribution system, with the ability to increase the pressure if required.

Listed below is a summary of the advantages and disadvantages of this improvement option:

Advantages	Disadvantages
a. Maintain current system pressures.	a. The operating conditions will result in a more complicated control philosophy for the pump station and treatment plant, which will be required to treat and supply a varying range of flows while maintaining a minimum pressure in the supply main. b. Additional construction costs associated with the PRV station. c. The installation of the PRV station would require the sequenced shutdown of the transmission mains during construction. d. Ongoing maintenance would be required for the PRV station. e. Supply main would be subject to loss of water during a power failure

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3) Install PRVs on Transmission Mains at Connections to Distribution System

Option 3 considered the installation of separate PRV stations at the connection points to the transmission mains in the distribution system. This option would require the installation of three additional PRV stations at the following locations:

1) Walworth Road and Shetland Road
2) Walworth Road and Willis Road
3) Evergreen Road and Greta Road

The PRV stations would be similar to the recent PRV stations that have been installed in the City and would consist of a large diameter PRV for fire flows and peak hour demands and a smaller PRV for the average day and low flow demands. The PRV stations would be located in above ground kiosks, which would allow the HGL in transmission main to remain at 153 m to the south end of the system. The new PRVs would reduce the HGL in the distribution system to current conditions.

Listed below is a summary of the advantages and disadvantages of this improvement option:

Advantages	Disadvantages
a. Provide a higher pressure at the south end of the system at the inlet of the Beaver Lodge Reservoir and Pump Station. b. Delay the need for duplication of the transmission mains, from a hydraulic stand point, as there is more pressure to overcome friction headloss in the piping. c. Maintain current system pressures in the distribution system.	a. Additional construction costs associated with the PRV station. b. Ongoing maintenance would be required for the three additional PRV stations. c. The operating conditions will result in a more complicated control philosophy for the pump station and treatment plant, which will be required to treat and supply a varying range of flows while maintaining a minimum pressure in the supply main. d. Supply main would be subject to loss of water during a power failure

4) Install Storage Tank at Treatment Plant Site

Option 4 reviewed a proposed storage tank with a top water level of 150 m. This would simplify the operation of the pump station as the pumps would be required to maintain a top water level in the storage tank rather than a pressure in the supply main. In addition the storage tank would prevent a loss of water within the supply main during a power failure as the reservoir would provide a gravity supply while the back-up generator completes its start-up sequence.

The storage volume should, at a minimum, be the volume of water required under peak hour conditions for the period of time that the back-up generator takes to start. Based on a generator start time of 30 seconds this results in a minimum volume of 125 m^3 to supply the build out peak hour demands with a factor of safety of 2. A proposed storage tank location and site piping layout is shown on the enclosed Figure 2.

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The proposed storage facility would provide an alternative location for the supply main to the Snowden Reservoir. New pumps would be required at the Snowden Pump Station to pump the water to the Snowden Reservoir (TWL of 162.85 m). Using the proposed storage tank to supply the Snowden Pump Station would provide a lower total dynamic head (TDH), which would result in lower power consumption.

We recommend that the proposed right of way for the intake and treatment plant be expanded to include the area south of the access to the property line of Elk Falls Provincial Park. This would allow for the construction of a future reservoir with a storage capacity of approximately 10,000m^3 as shown on Figure 2. This storage reservoir would replace the proposed reservoir and supply main on Merecroft Road scheduled for 2021.

The proposed top water level of the surge tank and future reservoir is 150m. The resulting HGL in the supply main at the high point is shown on Figure 3 under 2041 and Build Out peak hour demands. The resulting pressure in the main at these demand conditions ranges between 2.5 and 4.5 psi with a top water level of 150 m.

In order to accommodate the surge tank and future reservoir expansion, two tees and three valves, as shown on Figure 2 will be required as part of the treatment plant supply main construction.

A system HGL of 150 m would result in the areas supplied directly from the transmission mains, which are below the 45 m contour, to have residual pressures greater than 150 psi. This area includes sections of the distribution system between Park Forest Drive and Elk River Road.

Listed below is a summary of the advantages and disadvantages of this improvement option:

Advantages	Disadvantages
a. Provide a higher pressure at the south end of the system at the inlet of the Beaver Lodge Reservoir and Pump Station. b. Delay the need for duplication of the transmission mains, from a hydraulic stand point, as there is more pressure to overcome friction headloss in the piping. c. Provide increased fire flows in the areas serviced by the transmission mains. d. Reduces the areas in the distribution system with pressures above 150 psi. e. Simplifies pump station and treatment plant control philosophy. f. Allows for future reservoir storage expansion.	a. Areas of the distribution system will have a pressure over 150 psi b. Increased construction costs.

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