Technical Memorandum

Woodgrove Sewer Capacity Analysis

FINAL

project:	Woodgrove Sewer Capacity Analysis
GA project ID:	2024-074-NAM
date:	April 3, 2025
issued to:	City of Nanaimo, BC (City)
issued by:	GeoAdvice Engineering Inc. (GeoAdvice)

1. Introduction

The City of Nanaimo (City) is evaluating six (6) scenarios with different population growth projections for the Woodgrove mall area (Woodgrove). GeoAdvice modeled each scenario, identified City and Regional District of Nanaimo (RDN) sanitary sewer trunk gravity mains that are deficient with additional loads, and recommended upgrades for the deficient gravity trunk mains. Additionally, a capacity analysis of the Wellington pump station was performed.

This analysis was completed to assist with the City's OCP planning and to determine the City's capacity for future developments for Woodgrove within their existing system.

This memo describes the assumptions and results of the hydraulic modeling and capacity analysis using InfoSWMM software program (Innovyze Software). InfoSWMM is a sanitary sewer collection system modeling and management software application.

The City's InfoSWMM model, updated in July 2023, was used to complete the hydraulic modeling and capacity analysis.

2. Sewer Capacity Analysis

2.1. Assumptions

The following assumptions were made to complete the analysis:

- The Woodgrove allocation was based on GIS shapefiles of the study area provided by the City on June 28, 2024.
- Seven (7) scenarios were requested by the City:
    - No additional capita (Base)
    - 5,000 additional capita
    - 10,000 additional capita
    - 15,000 additional capita
    - 20,000 additional capita
    - 25,000 additional capita
    - 30,000 additional capita

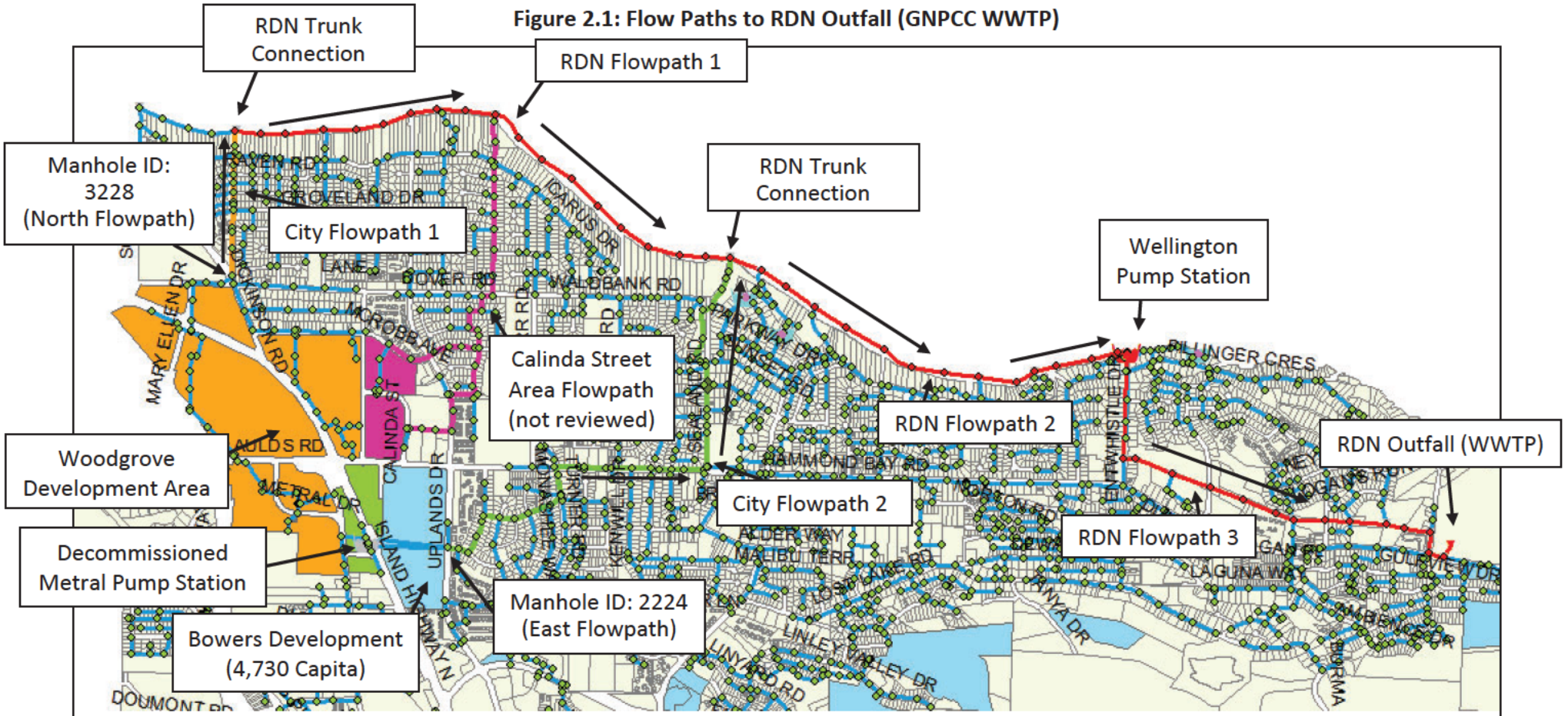
Note: Additional capita is the additional population added to the 2046 PWWF scenario in the model.

- The hydraulic analysis was performed using an extended period simulation (EPS) for each scenario using InfoSWMM.
- The per capita flow for Woodgrove was set as 230 L/cap/day and the infiltration rate was set as 25,000 L/ha/day based on 6.01A.4 and 6.01A.5 of the City of Nanaimo Manual of Engineering Standards and Specifications (July 4, 2022).
- Only gravity mains ≥ 250 mm in diameter were included in downstream flowpath analysis.
- Loads from previously evaluated developments were included in the analysis. A list of these developments is enclosed as **Appendix A**, including the Bowers development (4,730 capita) at 6261 Hammond Bay Road.
- The 2046 PWWF, 5-year I&I scenario with ideal pumps was used to determine the gravity main capacity. Gravity mains are considered deficient if the d/D is equal to one (1).
- Deficient gravity mains were sized to d/D = 0.7 under the 2076 PWWF, 25-year I&I scenario.
- The Wellington pump station, wet well, and force main owned by the RDN were also analyzed under the 2046 PWWF, 5-year I&I with climate change.
- The Wellington pump station was considered deficient when the 2046 PWWF wet well inflow exceeded the firm capacity of the pump station (both existing and future design firm capacity were used in the analysis as presented in **Section 2.5**).
- The Metral pump station is decommissioned in the 2046 PWWF scenario and all flows are conveyed by gravity through the Bowers development to the east (see **Figure 2.1**).

2.2. Gravity Main Capacity Analysis

A capacity analysis was done on the downstream flowpaths of Woodgroove under the seven (7) different scenarios. The downstream flowpaths are shown in **Figure 2.1** below.

Figure 2.1: Flow Paths to RDN Outfall (GNPCC WWTP)



North allocation of the Woodgrove development area shown in orange, east allocation shown in green, and the Calinda Street allocation shown in pink

The population loads for Woodgrove were calculated, and values were assigned to each flowpath proportionally to the catchment area of each flowpath. The population allocation was split between manhole ID 3228 (North) and manhole ID 2224 (East). The north flowpath was allocated 73.5% of the capita loads and the East flow path was allocated the remaining 26.5%. The population growth for Woodgrove in each scenario is summarized in **Table 2.1** below. Parcels in the Calinda Street area, with a population of about 676 people, are not captured by the north or east flowpaths. However, the Calinda Street area flows remain included in the model and are captured in the RDN interceptor analysis.

Table 2.1: Scenarios Population Growth Summary

Population Growth Scenario	Base (+0 Capita)*	+5,000 Capita**	+10,000 Capita**	+15,000 Capita**	+20,000 Capita**	+25,000 Capita**	+30,000 Capita**
North Flow Path Capita	3,186	+3,673	+7,345	+11,018	+14,690	+18,363	+22,035
East Flow Path Capita	5,045	+1,327	+2,655	+3,982	+5,310	+6,637	+7,965
North Flow Path BSF (L/s)***	12.39	+9.78	+19.55	+29.33	+39.11	+48.88	+58.66
East Flow Path BSF (L/s)***	14.39	+3.53	+7.07	+10.60	+14.13	+17.67	+21.20
North Flow Path PBSF (L/s)****	21.51	+32.96	+60.41	+85.35	+109.12	+131.49	+153.10
East Flow Path PBSF (L/s)****	27.54	+13.13	+24.67	+29.38	+45.50	+55.31	+64.66

***Based on loading calculations from the Brechin Sewer Master Plan and Model Conversion [GA Project ID: 2021-116-NAM], also includes the Bowers development (4,730 capita, as provided by the City on January 16, 2025) and peaked using diurnal pattern (largest peaking factor: 1.91). Does not capture the Calinda Street Area population of about 676 people.**
****Additional population added to the Base scenario.**
*****Includes ICI base sanitary loads**
******Harmon peaking factor assumed in EPS simulation to be conservative. PBSF for the Base Scenario was calculated using diurnal pattern peaking factors for residential and ICI base sanitary flows.**

2.3. Sewer Hydraulic Capacity Performance Criteria

Table 2.2 below summarizes the criteria that were used to assess the hydraulic impact of Woodgrove on the City and RDN sewer collection systems.

Table 2.2: Analysis Criteria

Facility	Criteria	Parameter Value
Gravity Main	Capacity Deficiency	d/D = 1.00
	Velocity Deficiency	v < 0.75 m/s
Manhole	HGL Deficiency	HGL ≥ Ground Elevation
Pump Station	Capacity Deficiency	PWWF > Firm Capacity
Forcemain (FM)	Velocity Deficiency	v < 1.0 m/s
		v > 3.5 m/s*

d/D = depth/Diameter
v = velocity
HGL = Hydraulic Grade Line
****Recommended Parameter***

2.4. Pipe Capacity Analysis

The extent of the analysis was limited to the downstream pipes from Woodgrove to the Greater Nanaimo Pollution Control Center (WWTP) including RDN owned trunk mains.

Table 2.3 below summarizes the total number of recommended upgrades and the corresponding lengths.

Table 2.3: Gravity Main Recommended Upgrades

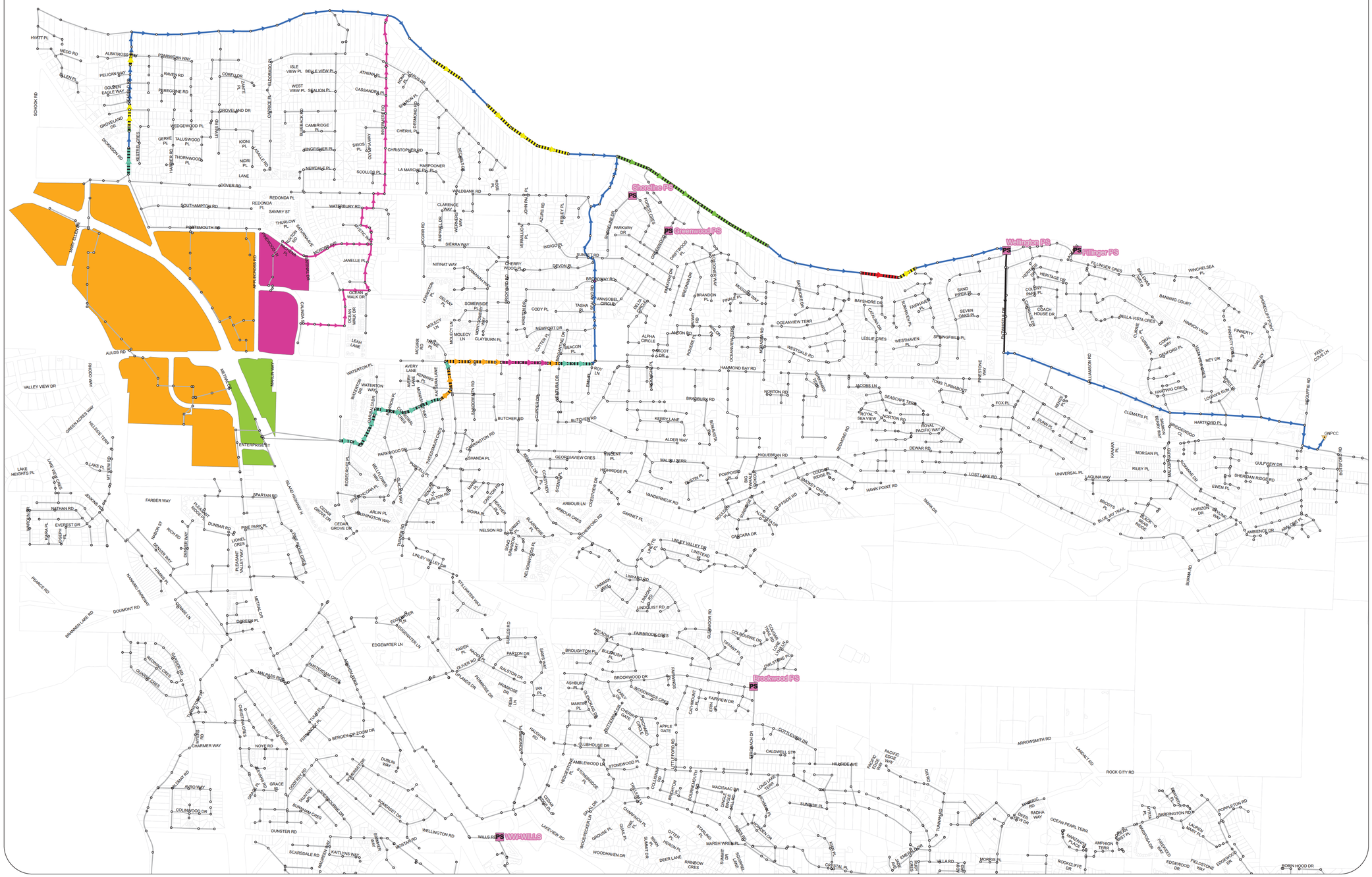
Parameter	+0 Capita	+5,000 Capita	+10,000 Capita	+15,000 Capita	+20,000 Capita	+25,000 Capita	+30,000 Capita
City Network Recommended Upgrades*	8	21 (+13)	24 (+16)	25 (+17)	28 (+20)	28 (+20)	31 (+23)
City Length (m)	485.6	1,421.4	1,642.0	1,664.7	1,790.2	1,790.2	1,958.6
RDN Network Recommended Upgrades*	0	0 (+0)	0 (+0)	5 (+5)	8 (+8)	9 (+9)	14 (+14)
RDN Length (m)	0.0	0.0	0.0	836.9	1,305.0	1,488.4	2,607.6

*Inclusive of new downstream deficiencies caused by relieving upstream bottlenecks.

Note that through an iterative process, all deficiencies are alleviated by completing the recommended upgrades summarized in Table 2.3 above.

Complete hydraulic modeling results can be found in **Appendix B** and **Appendix C**. Detailed recommended upgrades can be found in **Appendix D**. A map of recommended gravity main upgrades can be found in **Figure 2.2** on the following page.

RDN interceptor mains were also sized for upgrades. However, due to the complexity of installing upsized or twinned mains, any upgrades to the North Shore Interceptor may not be feasible (RDN Flowpaths 1 and 2 as shown in **Figure 2.1**). Alternative upgrades were thus considered, refer to **Section 2.6** for proposed diversion pump station and forcemain.



GeoAdvice Engineering Inc.

Legend

Woodgrove Development Area

- North Allocation
- East Allocation
- Calinda Street Allocation
- Parcel
- Greater Nanaimo Polution Control Center
- Pump Station
- Manhole
- Divider
- Forcemain
- Gravity Main
- Flow Path

Upgrade Capita (Refer to Table 2.3)

- Base Scenario
- 5,000 Capita
- 10,000 Capita
- 15,000 Capita
- 20,0000 Capita
- 25,000 Capita
- 30,000 Capita

Woodgrove Recommended Upgrades

CITY OF NANAIMO
THE HARBOUR CITY

Project: **Woodgrove OCP Sewer Capacity Analysis**
Project ID: **2024-074-NAM**
Client: **City of Nanaimo, BC**
Date: **February 2025**
Created by: **ZT**
Reviewed by: **WdS**

DISCLAIMER: GeoAdvice does not warrant in any way the accuracy and completeness of the information shown on this map. Field verification of the accuracy and completeness of the information shown on this map is the sole responsibility of the user.

0 0.275 0.55 1.1
Kilometers

N W E S

Figure 2.2

Document Path: W:\2024-074-NAM\02\Mapping\2024-074-NAM_UpgradesMap_2025-01-27.mxd

2.5. Pump Station Capacity Review

The flowpath in this analysis contains the Wellington pump station. The firm capacity of this pump station was compared to the pump station inflow in the 2046 PWWF scenario for every stage of capita increase. The pump station capacity and forcemain velocity are summarized in **Table 2.4** and **Table 2.5** below.

The RDN is currently working on upgrades to Wellington pump station. Once the upgrades are complete the firm capacity will be 450 L/s.

Table 2.4: Wellington Pump Station Capacity Results

Firm Capacity (L/s)	Future Firm Capacity (L/s)*	Base Scenario Inflow (L/s)**	+5,000 Capita Inflow (L/s)	+10,000 Capita Inflow (L/s)	+15,000 Capita Inflow (L/s)	+20,000 Capita Inflow (L/s)	+25,000 Capita Inflow (L/s)	+30,000 Capita Inflow (L/s)
298.0	450.0	414.0	459.3	497.4	528.0	563.0	596.5	628.2

***Future firm capacity as provided by the City and RDN on December 17, 2024.**
****Includes updated Bowers Development population and all previously evaluated developments (Approximately +25.3 L/s PBSF since the 2023 Wellington pump station capacity analysis, GA Project: 2023-069-RDN)**

Based on the results in **Table 2.4**, Wellington pump station is deficient under all scenarios with the existing firm capacity. Once upgraded, the Wellington pump station will be deficient under all scenarios greater than the base 2046 PWWF (5-year I&I) + 0 capita scenario.

Table 2.5: Wellington Forcemain Velocity Results

Existing Capacity Velocity (m/s)*	Future Capacity Velocity (m/s)**	Base Scenario Velocity (m/s)	+5,000 Capita Velocity (m/s)	+10,000 Capita Velocity (m/s)	+15,000 Capita Velocity (m/s)	+20,000 Capita Velocity (m/s)	+25,000 Capita Velocity (m/s)	+30,000 Capita Velocity (m/s)
1.87	2.83	2.60	2.89	3.13	3.32	**3.54**	**3.75**	**3.95**

***Velocity calculated from existing pump station firm capacity (298.0 L/s).**
****Velocity calculated from future upgrade pump station firm capacity (450.0 L/s).**

It is recommended that forcemain velocities remain under 3.5 m/s. As shown in **Table 2.5** above the Wellington forcemain exceeds 3.5 m/s under the 20,000, 25,000, and 30,000 additional population.

Forcemain upgrade twinning diameters and pump total dynamic head (TDH) with proposed twinned forcemain are summarized in **Table 2.6** below.

Table 2.6: Wellington Recommended Upgrades

Criteria	Base Scenario	+5,000 Capita	+10,000 Capita	+15,000 Capita	+20,000 Capita	+25,000 Capita	+30,000 Capita
Proposed Firm Capacity (L/s)	414.0	459.3	497.4	528.0	563.0	596.5	628.2
Proposed Twin Diameter (mm)	525	525	600	600	600	675	675
Existing FM Velocity (m/s)*	1.04	1.16	1.00	1.06	1.13	0.96	1.01
Proposed FM Velocity (m/s)	1.15	1.27	1.20	1.27	1.35	1.24	1.31
Total Dynamic Head (TDH in m)	44.17	44.40	44.11	44.22	44.35	44.04	44.13

***Existing 450 mm forcemain velocity with proposed twin forcemain upgrade**

Note that the results shown in **Table 2.4**, **Table 2.5** and **Table 2.6** assume ideal pumps with no upstream bottlenecks.

2.6. Diversion Pump Stations and Forcemain Analysis

As requested by the City on January 9, 2025, a capacity analysis of the RDN trunk main was conducted to determine the population (in addition to the base 2046 scenario population) at which an RDN trunk main along the Woodgrove downstream flow path reaches a d/D ratio of 0.9 (90% full). **Table 2.7** summarizes the trigger population at which the first RDN trunk main reaches this threshold.

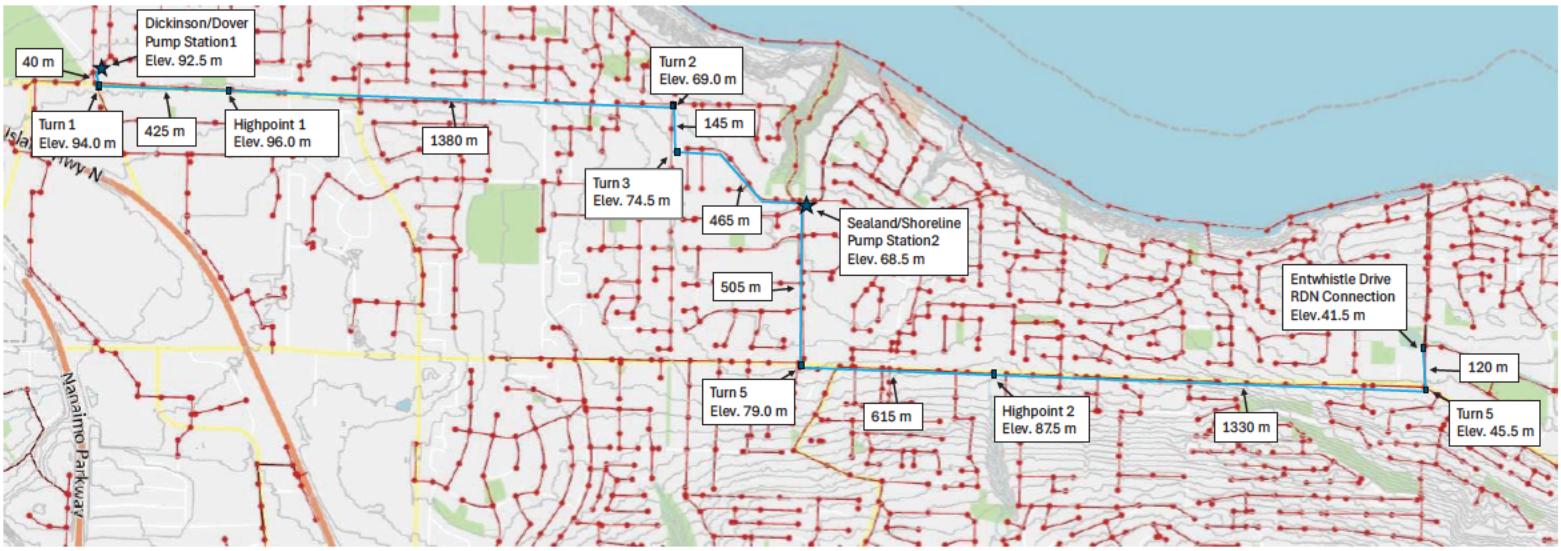
Table 2.7: Trigger Population Summary*

RDN Main	Location	2046 Base Scenario d/D	Trigger Population (d/D = 0.9)**
NSINT-PIPE6 (Nanaimo GIS ID: 503439)	North Shore Interceptor main immediately downstream of Sealand park RDN connection.	0.755	8,442***

***Trigger population for the entire Woodgrove development area.**
****Trigger population calculated when full flow is exceeded (q/Q ≥ 1) is 4,140 people, which occurs before d/D = 0.9.**
*****Additional population added to the based 2046 scenario population.**

The population summarized in the table above will serve as the trigger for a diversion pump station located near the intersection of Dickinson Road and Dover Road. Flows conveyed by 600 mm forcemain to the RDN trunk connection on Entwhistle Drive. The proposed diversion forcemain will function as a common forcemain, also carrying flow from the proposed Sealand/Shoreline diversion pump station. **Figure 2.3** below illustrates the recommended routing of the forcemain and location of the two (2) pump stations.

Figure 2.3: Proposed Diversion Pump Stations and Forcemain



The proposed Dickinson/Dover pump station will divert all flows from the northern section of the Woodgrove development area. Similarly, the proposed Sealand/Shoreline pump station will divert all flows from the southern section of the Woodgrove development area, along with the diverted flows from the Sealand/Shoreline upstream catchment (approximately 130.2 L/s) [refer to Urban System's *North End Sanitary Sewer Routing Study*, December 21, 2023].

The proposed pump stations were sized using the 2076 PWWF (25-year I&I) + 15,000 capita scenario for a high-level costing analysis as agreed with the City. The TDH calculations assumed a constant diameter forcemain of 600 mm. The estimated total length of the proposed forcemain is about 5,025 m.

Table 2.8 summarizes the pump sizing and TDH required to service the Woodgrove development area and upstream Sealand/Shoreline catchments.

Table 2.8: Proposed Pump Station Recommended Firm Capacity and TDH (Constant FM Diameter)

Pump Station	Proposed Firm Capacity (L/s)*	Proposed Forcemain Velocity (m/s)	Total Dynamic Head, TDH (m)**
Dickinson/Dover	155.6	0.55	3.8
Sealand/Shoreline	205.7	1.28	22.2

***Firm Capacity = 2076 PWWF (25-year I&I) + 15,000 capita.**
****Based on a 600 mm forcemain and elevations from NanaimoMap Contours Layer.**

Note that the proposed force main from the Dickinson/Dover pump station will not achieve the minimum design velocity of 1.0 m/s, as specified in the *City of Nanaimo Manual of Engineering Standards and Specifications (May 2020)*. To increase velocity, a smaller forcemain is recommended. During the detailed design of this diversion, forcemain diameter and pump sizing should be reviewed to find the most cost effective solution that satisfies the design criteria.

Table 2.9 below summarizes the pump sizing and TDH with a smaller diameter forcemain from the Dickinson/Dover pump station to the Sealand/Shoreline pump station.

Table 2.9: Proposed Pump Station Firm Capacity and TDH (Variable FM Diameter)

Pump Station	Proposed Firm Capacity (L/s)*	Proposed Forcemain diameter (mm)	Proposed Forcemain Velocity (m/s)	Estimated Length (m)	Total Dynamic Head, TDH (m)**
Dickinson/Dover	155.6	375	1.41	2,455	12.5
Sealand/Shoreline	205.7	600	1.28	2,570	22.2

***Firm Capacity = 2076 PWWF (25-year I&I) + 15,000 capita.**
****Based on elevations from NanaimoMap Contours Layer.**

The 375 mm Dickinson/Dover forcemain recommended in **Table 2.9** above has a velocity that meets the minimum design velocity mentioned above and does not exceed the recommended maximum velocity of 3.5 m/s under the 2076 PWWF (25-year I&I) + 30,000 capita.

3. Greater Nanaimo Pollution Control Center

It should be noted that the Greater Nanaimo Pollution Control Center (GNPCC) capacity and expansion costs cannot be looked at for the Woodgrove plan in isolation, and that major unknown costs will be incurred to expand population beyond city-wide baseline scenarios.

It should be noted that:

1. The GNPCC has an ultimate design treatment capacity of 2,720 L/s. If the predicted flows of the additional Woodgrove population in addition to predicted flows from the rest of the Nanaimo sewer infrastructure exceeds 2,720 L/s, major wastewater treatment facility expansion beyond the ultimate design capacity will be required.

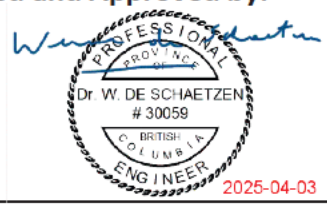
2. There is no existing study or cost estimate to expand the GNPCC beyond the current ultimate design capacity. It is anticipated that such an upgrade would have very significant cost and schedule requirements.

Submission

Prepared by:

Zach Thompson, E.I.T.
Hydraulic Modeler

Reviewed and Approved by:



Werner de Schaetzen, Ph.D., P.Eng.
Senior Modeling Review / Project Manager

Enclosed:

Appendix A – Development Review Project History
Appendix B – Gravity Main Hydraulic Results
Appendix C – Manhole Hydraulic Results
Appendix D – Detailed Recommended Upgrades and Results
Appendix E – Recommended Gravity Main Upgrade Maps

Document History and Version Control

Revision No.	Date	Document Description	Revised By	Reviewed By
R0	July 18, 2024	Draft	Zach Thompson	Werner de Schaetzen
R1	July 23, 2024	Updated Draft	Zach Thompson	Werner de Schaetzen
R2	July 31, 2024	Updated Draft	Zach Thompson	Werner de Schaetzen
R3	August 16, 2024	Updated Draft	Zach Thompson	Werner de Schaetzen
R4	October 31, 2024	Updated Draft	Zach Thompson	Werner de Schaetzen
R5	January 27, 2025	Updated Draft	Zach Thompson	Werner de Schaetzen
R6	February 11, 2025	Updated Draft	Zach Thompson	Werner de Schaetzen
R7	April 3, 2025	Final	Zach Thompson	Werner de Schaetzen

Appendix A Development Review Project History

Development Review Project History

City Project ID	Project Name/Address	Study Area	Submission Date	# People	Loading MH	PWWF (L/s)	PBSF (L/s)	Upgrades?	Overlapping Flowpath
2159-65	4455 Hammond Bay Road	From development to Shores and Piper Outlets	2023-04-17	203	4532 & 4538	4.69	2.28	No	
2159-66	13, 17 & 21 Haliburton Street	From development to RDN Connection	2023-04-17	75	7588	0.92	0.86	No	
2159-70	1347 Fielding Road (Steady State)	From development to Chase River Pump Station	2023-08-04	110	6963	2.21	1.23	Yes	Project 7
SUB01489 / DP001310 (Project 1)	2301 Extension Road	From development to Chase River Pump Station	2023-08-03	142	11353	3.09	1.60	Yes	2159-70
Project 2	6084/6088/6044/6048/6074/6124 Metral Drive	From development to Millstone Trunk Connection	2023-08-18	559	2261, 2262 & 2263	7.13	6.16	Yes	Project 9
RA000495 (Project 3)	250 Terminal Avenue N	From development to RDN Connection	2023-09-13	148	13434	1.72	1.63	No	
Project 4	103 Lotus Pinnatus Way	From development to Seventh Street Pump Station	2023-09-13	899	13801	23.27	9.15	Yes	
RA000496 (Project 5)	3469 Uplands Drive	From development to RDN Connection	2023-09-13	460	2487	6.31	4.99	Yes	
RA000491 (Project 6)	120 Needham Street	From development to RDN Connection	2023-09-11	216	6880	2.47	2.40	Yes	
Project 7	1347 Fielding Road (InfoSWMM) - 2026 scenario	From development to Chase River Pump Station	2024-01-19	110	6963	2.21	1.23	No	Project 1
Project 9	5360 Bergen-Op-Zoom Drive	From development to RDN Connection	2023-11-29	320	2209	3.88	3.46	No	Project 2
Project 10	101 South Street	From development to RDN Connection	2023-12-05	626	14291	8.27	6.62	No	
Project 11	3180 Island Highway	From development to RDN Connection	2024-01-12	N/A	2582	9.13	8.94	Yes	
Project 14	5190, 5196, and 5200 Rutherford Road	From development to RDN Connection	2024-02-05	116	13251	2.19	1.31	No	Project 17 & Project 21
Project 15	3425 Uplands Drive	From development to RDN Connection	2024-02-20	84	13625	1.16	0.94	Yes	Project 5
Project 18	5300 Tanya Drive	From development to RDN Connection	2024-05-02	224	1795	3.64	2.48	No	
Project 19	1740 Dufferin Crescent	From development to Millstone Trunk Connection	2024-05-22	147	6069	1.8	1.63	No	
Project 21	5420 Altavista Drive	From development to Millstone and RDN Trunk Connection	2024-06-06	242	10355, 12466 & 12071	6.06	2.79	Yes	Project 14 & Project 17
Project 20	2230 Boxwood Road	From development to RDN Connection	2024-06-06	734	5523 & 5525	8.42	7.79	Yes	Project 25
Project 17	6261 Hammond Bay Road	From development to RDN Connection	2024-08-16	4,730	2224	29.19	24.04**	Yes	Project 14 & Project 21
2024-067-NAM	3397 Tunnah Road	From development to RDN Connection	2024-08-16	65	236	0.92	0.73	Yes	Project 5, Project 15, 2024-066-NAM
Project 23	77 Chapel Road	From development to Millstone Trunk Connection	2024-09-20	276	12638	3.11	2.99	No	
2024-066-NAM	3344 Opal Road	From development to RDN Connection	2024-09-20	55	5343	1.26	0.65	Yes	Project 5, Project 15, 2024-067-NAM
Project 24	6330 and 6340 McRobb Avenue	From development to RDN Connection	2024-11-21	822	2089 & 2088	9.29	8.65	Yes	
Project 25	2080 and 2160 East Wellington Road	From development to RDN Connection	2024-12-04	437	1134 & 6176	11.9	4.77	No	Project 20
Project 28	5730 Turner Road	From development to RDN Connection	2024-12-26	163	1374	2.01	1.80	Yes	Project 14, Project 17 & Project 21
2021-025-NAM (Project 64)	505 Howard Avenue	From development to RDN Connection	2022-01-10	51	6421	0.95	0.81	No	Project 4 & Project 29
Project 29	502 Howard Avenue and 564 Fifth Street	From development to RDN Connection	2025-01-14	768	6404 & 4253	8.41	7.89	No	Project 4 & 2021-025-NAM (Project 64)

***Note that these are the developments that have been added to the updated City of Nanaimo sanitary sewer model (March 2023). Previously analyzed developments are included in the base load allocation.**

****Peaked using the residential diurnal pattern**

Appendix B Gravity Main Hydraulic Results

Gravity Main Hydraulic Modeling Results

							2046 PWWF 5-Year I&I No Additional Capita				2046 PWWF 5-Year I&I 5,000 Additional Capita				2046 PWWF 5-Year I&I 10,000 Additional Capita				2046 PWWF 5-Year I&I 15,000 Additional Capita				2046 PWWF 5-Year I&I 20,000 Additional Capita				2046 PWWF 5-Year I&I 25,000 Additional Capita				2046 PWWF 5-Year I&I 30,000 Additional Capita			
Gravity Main ID	Install Year	Length (m)	Diameter (mm)	Material	Slope (/)	Full Flow Capacity (L/s)	Flow (L/s)	d/D	q/Q	Flow Remaining to d/D = 1 (L/s)	Flow (L/s)	d/D	q/Q	Flow Remaining to d/D = 1 (L/s)	Flow (L/s)	d/D	q/Q	Flow Remaining to d/D = 1 (L/s)	Flow (L/s)	d/D	q/Q	Flow Remaining to d/D = 1 (L/s)	Flow (L/s)	d/D	q/Q	Flow Remaini	Flow (L/s)	d/D	q/Q	Flow Remaini	Flow (L/s)	d/D	q/Q	Flow Remaini
501062	1981	126.8	250	PVC	0.015	73.6	50.8	0.61	0.690	22.8	83.7		1.14	0.0	111.2		1.51	0.0	128.8		1.75	0.0	131.7		1.79	0.0	134.4		1.83	0.0	139.9		1.90	0.0
500802	1981	76.2	250	PVC	0.052	136.1	50.9	0.42	0.374	85.2	83.9	0.57	0.62	52.3	111.4	0.69	0.82	24.8	129.0	0.78	0.95	7.2	131.9	0.79	0.97	4.3	134.5	0.81	0.99	1.6	148.7		1.09	0.0
511039	1981	22.7	250	PVC	0.041	120.1	50.9	0.46	0.424	69.2	83.9	0.62	0.70	36.3	111.4	0.76	0.93	8.8	129.8		1.08	0.0	131.9		1.10	0.0	139.3		1.16	0.0	140.1		1.17	0.0
501061	1981	82.4	250	PVC	0.101	188.6	51.0	0.36	0.270	137.7	83.9	0.47	0.45	104.7	111.4	0.55	0.59	77.2	129.0	0.61	0.68	59.6	131.9	0.62	0.70	56.7	134.6	0.63	0.71	54.1	140.1	0.64	0.74	48.5
501059	1981	26.2	250	PVC	0.095	183.2	53.8	0.37	0.294	129.3	86.8	0.49	0.47	96.4	114.2	0.57	0.62	68.9	131.9	0.63	0.72	51.3	134.8	0.64	0.74	48.4	137.4	0.65	0.75	45.7	143.0	0.67	0.78	40.2
511040	1981	13.4	250	PVC	0.134	217.8	53.8	0.34	0.247	164.0	86.8	0.44	0.40	131.0	114.2	0.52	0.53	103.5	131.9	0.56	0.61	85.9	134.8	0.57	0.62	83.0	137.4	0.58	0.63	80.3	143.0	0.59	0.66	74.8
501058	1981	45.5	250	PVC	0.142	223.7	54.5	0.34	0.244	169.2	87.5	0.44	0.39	136.2	115.0	0.51	0.51	108.8	132.6	0.56	0.59	91.1	135.5	0.56	0.61	88.3	138.2	0.57	0.62	85.6	143.7	0.58	0.64	80.0
503056	1981	41.2	250	PVC	0.141	223.6	55.0	0.34	0.246	168.6	87.9	0.44	0.39	135.7	115.4	0.51	0.52	108.2	133.0	0.56	0.60	90.6	135.9	0.57	0.61	87.7	138.6	0.57	0.62	85.0	144.2	0.59	0.65	79.4
501056	1981	39.5	250	PVC	0.140	222.6	55.9	0.34	0.251	166.7	88.9	0.44	0.40	133.8	116.4	0.52	0.52	106.3	134.0	0.56	0.60	88.7	136.9	0.57	0.62	85.8	139.6	0.58	0.63	83.1	145.1	0.59	0.65	77.5
503057	1981	42.7	250	PVC	0.142	224.3	56.3	0.34	0.251	167.9	89.3	0.44	0.40	135.0	116.8	0.51	0.52	107.5	134.4	0.56	0.60	89.9	137.3	0.57	0.61	87.0	140.0	0.57	0.62	84.3	145.5	0.59	0.65	78.8
503335	1981	59.8	250	PVC	0.101	188.8	56.8	0.44	0.301	132.0	89.7	0.57	0.48	99.1	117.2	0.69	0.62	71.6	134.8	0.88	0.71	54.0	137.7	0.90	0.73	51.1	140.4	0.93	0.74	48.4	146.0	0.98	0.77	42.9
501001	1981	29.1	250	PVC	0.085	173.0	65.5	0.40	0.379	107.4	98.5	0.52	0.57	74.5	125.9	0.63	0.73	47.0	143.6	0.79	0.83	29.4	146.5	0.82	0.85	26.5	149.2	0.84	0.86	23.8	154.7	0.89	0.90	18.2
501200	1981	75.8	200	PVC	0.520	236.5	65.5	0.37	0.277	171.0	98.5	0.46	0.42	138.1	125.9	0.53	0.53	110.6	143.6	0.59	0.61	93.0	146.5	0.60	0.62	90.1	149.2	0.61	0.63	87.4	154.7	0.64	0.65	81.8
NSINT-PIPE31	1978	119.1	750	0	0.001	353.3	105.4	0.40	0.298	247.9	138.3	0.47	0.39	215.0	165.8	0.52	0.47	187.6	183.5	0.56	0.52	169.9	186.4	0.56	0.53	167.0	189.1	0.57	0.54	164.3	194.6	0.58	0.55	158.7
NSINT-PIPE30	1978	119.2	750	0	0.001	288.4	105.4	0.42	0.366	182.9	138.3	0.49	0.48	150.1	165.8	0.54	0.58	122.6	183.5	0.58	0.64	104.9	186.4	0.58	0.65	102.0	189.1	0.59	0.66	99.3	194.6	0.60	0.68	93.8
NSINT-PIPE29	1978	177.7	750	0	0.001	289.3	105.4	0.41	0.364	183.9	138.3	0.48	0.48	151.1	165.7	0.54	0.57	123.6	183.5	0.57	0.63	105.9	186.4	0.58	0.64	103.0	189.0	0.59	0.65	100.3	194.6	0.60	0.67	94.8
NSINT-PIPE28	1978	151.6	750	0	0.001	326.0	114.1	0.43	0.350	212.0	146.9	0.50	0.45	179.2	174.4	0.56	0.54	151.7	192.2	0.59	0.59	133.9	195.1	0.60	0.60	131.0	197.7	0.61	0.61	128.3	203.3	0.62	0.62	122.8
NSINT-PIPE27	1978	128.4	750	0	0.001	277.9	114.0	0.45	0.410	163.9	146.8	0.52	0.53	131.1	174.3	0.57	0.63	103.6	192.1	0.61	0.69	85.8	195.0	0.62	0.70	82.9	197.7	0.63	0.71	80.2	203.2	0.64	0.73	74.7
NSINT-PIPE26	1978	138.6	750	0	0.001	283.7	114.0	0.45	0.402	169.7	146.8	0.52	0.52	136.9	174.3	0.58	0.61	109.4	192.1	0.62	0.68	91.6	195.0	0.63	0.69	88.7	197.7	0.63	0.70	86.0	203.2	0.64	0.72	80.5
NSINT-PIPE25	1978	123.7	750	0	0.001	300.3	114.0	0.47	0.380	186.3	146.8	0.54	0.49	153.5	174.3	0.60	0.58	126.0	192.1	0.64	0.64	108.2	195.0	0.65	0.65	105.3	197.7	0.65	0.66	102.6	203.2	0.67	0.68	97.1
NSINT-PIPE24	1978	134.8	750	0	0.001	287.7	131.7	0.50	0.458	156.0	164.3	0.57	0.57	123.4	191.9	0.63	0.67	95.8	209.9	0.67	0.73	77.8	212.8	0.67	0.74	74.9	215.4	0.68	0.75	72.3	220.9	0.69	0.77	66.8
NSINT-PIPE23	1978	141.6	750	0	0.001	280.7	131.7	0.53	0.469	149.0	164.4	0.59	0.59	116.3	191.9	0.65	0.68	88.7	209.9	0.68	0.75	70.8	212.8	0.69	0.76	67.9	215.4	0.70	0.77	65.2	220.9	0.71	0.79	59.8
NSINT-PIPE22	1978	158.9	750	0	0.001	330.4	191.8	0.55	0.580	138.7	224.3	0.61	0.68	106.2	252.0	0.66	0.76	78.5	270.1	0.70	0.82	60.4	273.0	0.71	0.83	57.4	275.6	0.71	0.83	54.8	281.1	0.72	0.85	49.4
NSINT-PIPE21	1978	147.9	750	0	0.001	342.6	191.7	0.57	0.560	150.9	224.2	0.63	0.65	118.4	251.8	0.68	0.74	90.8	269.9	0.72	0.79	72.6	272.9	0.73	0.80	69.7	275.5	0.74	0.80	67.1	280.8	0.75	0.82	61.7
NSINT-PIPE20	1978	167.6	750	0	0.001	285.2	191.6	0.57	0.672	93.6	224.1	0.63	0.79	61.1	251.7	0.69	0.88	33.5	269.8	0.73	0.95	15.4	272.7	0.74	0.96	12.5	275.3	0.74	0.97	9.9	280.6	0.76	0.98	4.6
NSINT-PIPE19	1978	171.2	750	0	0.001	329.6	191.5	0.57	0.581	138.1	224.0	0.63	0.68	105.6	251.5	0.69	0.76	78.1	269.5	0.74	0.82	60.1	272.4	0.74	0.83	57.2	274.9	0.75	0.83	54.7	280.1	0.77	0.85	49.5
NSINT-PIPE18	1978	153.6	750	0	0.001	298.0	191.4	0.57	0.642	106.5	223.8	0.64	0.75	74.1	251.3	0.70	0.84	46.7	269.2	0.76	0.90	28.8	272.1	0.77	0.91	25.9	274.5	0.78	0.92	23.5	279.5	0.80	0.94	18.5
NSINT-PIPE17	1978	153.4	750	0	0.001	311.4	191.4	0.57	0.614	120.1	223.7	0.65	0.72	87.7	251.1	0.71	0.81	60.4	268.9	0.77	0.86	42.6	271.7	0.79	0.87	39.7	274.1	0.80	0.88	37.3	279.0	0.83	0.90	32.5
NSINT-PIPE16	1978	153.4	750	0	0.001	311.4	191.3	0.59	0.614	120.1	223.6	0.67	0.72	87.8	250.9	0.74	0.81	60.5	268.6	0.81	0.86	42.7	271.5	0.82	0.87	39.9	273.9	0.84	0.88	37.5	278.8	0.87	0.90	32.6
NSINT-PIPE15	1978	117.3	750	0	0.001	325.0	191.2	0.62	0.588	133.8	223.5	0.71	0.69	101.5	250.8	0.79	0.77	74.3	268.6	0.86	0.83	56.4	271.5	0.87	0.84	53.6	273.9	0.88	0.84	51.2	278.8	0.91	0.86	46.2
NSINT-PIPE14	1979	112.4	900	0	0.000	381.8	191.3	0.72	0.501	190.5	223.6	0.80	0.59	158.3	250.8	0.86	0.66	131.0	268.7	0.92	0.70	113.2	271.5	0.93	0.71	110.3	273.9	0.94	0.72	107.9	279.1	0.96	0.73	102.7
NSINT-PIPE13	1978	162.0	900	0	0.000	376.3	340.3	0.74	0.904	36.1	377.5		1.00	0.0	404.7		1.08	0.0	422.6		1.12	0.0	425.5		1.13	0.0	427.7		1.14	0.0	432.3		1.15	0.0
NSINT-PIPE12	1978	133.2	900	0	0.000	384.3	342.0	0.74	0.890	42.3	379.3	0.81	0.99	5.0	406.4		1.06	0.0	424.4		1.10	0.0	427.3		1.11	0.0	429.5		1.12	0.0	434.1		1.13	0.0
NSINT-PIPE11	1978	163.3	900	0	0.000	374.8	341.7	0.74	0.912	33.1	379.1		1.01	0.0	406.2		1.08	0.0	424.2		1.13	0.0	427.2		1.14	0.0	429.4		1.15	0.0	434.0		1.16	0.0
NSINT-PIPE10	1978	173.4	900	0	0.000	388.8	347.7	0.74	0.894	41.1	385.1	0.81	0.99	3.7	412.1		1.06	0.0	430.3		1.11	0.0	433.3		1.11	0.0	435.5		1.12	0.0	440.1		1.13	0.0
NSINT-PIPE9	1978	205.0	900	0	0.000	399.9	347.5	0.75	0.869	52.4	384.9	0.81	0.96	15.0	412.0		1.03	0.0	430.2		1.08	0.0	433.2		1.08	0.0	435.4		1.09	0.0	440.1		1.10	0.0
NSINT-PIPE8	1979	154.3	900	0	0.000	385.6	347.4	0.75	0.901	38.2	384.9	0.81	1.00	0.8	412.0		1.07	0.0	430.2		1.12	0.0	433.2		1.12	0.0	435.5		1.13	0.0	440.2		1.14	0.0
NSINT-PIPE7	1979	158.2	900	0	0.000	380.8	347.4	0.75	0.912	33.3	384.9		1.01	0.0	412.1		1.08	0.0	430.4		1.13	0.0	433.4		1.14	0.0	435.6		1.14	0.0	440.3		1.16	0.0
NSINT-PIPE6	1979	155.6	900	0	0.000	384.0	347.5	0.75	0.905	36.5	385.0		1.00	0.0	412.2		1.07	0.0	430.5		1.12	0.0	433.5		1.13	0.0	435.8		1.14	0.0	440.5		1.15	0.0
NSINT-PIPE5	1978	183.4	900	0	0.000	401.0	384.7	0.75	0.959	16.3	422.1		1.05	0.0	449.2		1.12	0.0	468.0		1.17	0.0	471.2		1.18	0.0	473.3		1.18	0.0	477.8		1.19	0.0
NSINT-PIPE4A	1978	91.2	900	0	0.000	379.2	384.7		1.014	0.0	422.0		1.11	0.0	449.1		1.18	0.0	468.0		1.23	0.0	471.1		1.24	0.0	473.2		1.25	0.0	477.8		1.26	0.0
NSINT-PIPE4	1978	105.6	900	0	0.000	393.9	389.8	0.72	0.990	4.1	427.1		1.08	0.0	454.2		1.15	0.0	473.1		1.20	0.0	476.3		1.21	0.0	478.4		1.22	0.0	483.0		1.23	0.0
NSINT-PIPE3	1978	168.8	900	0	0.000	368.7	389.8		1.057	0.0	427.1		1.16	0.0	454.2		1.23	0.0	473.1		1.28	0.0	476.3		1.29	0.0	478.4		1.30	0.0	482.9		1.31	0.0
NSINT-PIPE2	1978	122.6	900	0	0.000	400.5	389.7	0.60	0.973	10.7	427.1		1.07	0.0	454.2		1.13	0.0	473.1		1.18	0.0	476.3		1.19	0.0	478.4		1.19	0.0	482.9		1.21	0.0
NSINT-PIPE1	1978	48.7	900	0	0.000	367.1	389.7		1.062	0.0	427.1		1.16	0.0	454.2		1.24	0.0	473.1		1.29	0.0	476.3		1.30	0.0	478.4		1.30	0.0	482.9		1.32	0.0
CDT 15	1980	7.4	900	0	0.016	2,306.0	678.9	0.72	0.294	1,627.1	671.5	0.71	0.29	1,634.6	643.4	0.69	0.28	1,662.7	736.1	0.71	0.32	1,570.0	703.8	0.66	0.31	1,602.2	717.4	0.67	0.31	1,588.7	732.3	0.68	0.32	1,573.7
HBINT-PIPE40	1976	52.5	900	0	0.007	1,539.8	445.2	0.40	0.289	1,094.7	482.6	0.42	0.31	1,057.3	509.8	0.43	0.33	1,030.1	529.2	0.44	0.34	1,010.6	532.6	0.44	0.35	1,007.2	534.6	0.44	0.35	1,005.2	539.3	0.45	0.35	1,000.5
HBINT-PIPE41	1976	186.5	900	0	0.004	1,193.0	445.2	0.41	0.373	747.8	482.6	0.43	0.41	710.4	509.8	0.44	0.43	683.2	529.2	0.45	0.44	663.7	532.6	0.45	0.45	660.4	534.6	0.46	0.45	658.3	539.3	0.46	0.45	653.7
HBINT-PIPE42	1976	188.9	750	0	0.008	1,011.7	447.9	0.47	0.443	563.8	485.3	0.49	0.48	526.4	512.5	0.51	0.51	499.2	532.0	0.52	0.53	479.7	535.4	0.52	0.53	476.3	537.4	0.52	0.53	474.3	542.1	0.52	0.54	469.6
HBINT-PIPE43	1976	163.4	750	0	0.008	1,000.6	447.9	0.49	0.448	552.7	485.3	0.52	0.49	515.3	512.5	0.53	0.51	488.1	532.0	0.55	0.53	468.6	535.4	0.55	0.54	465.2	537.4	0.55	0.54	463.2	542.1	0.55	0.54	458.5
HBINT-PIPE44	1976	162.4	750	0	0.008	1,007.6	447.8	0.43	0.444	559.8	485.3	0.45	0.48	522.4	512.5	0.46	0.51	495.2	532.0	0.48	0.53	475.7	535.4	0.48	0.53	472.3	537.4	0.48	0.53	470.3	542.0	0.48	0.54	465.6
HBINT-PIPE45	1976	87.8	750	0	0.026	1,782.6	447.8	0.41	0.251	1,334.8	485.3	0.43	0.27	1,297.3	512.5	0.45	0.29	1,270.2	532.0	0.46	0.30	1,250.6	535.4	0.46	0.30	1,247.2	537.4	0.46	0.30	1,245.2	542.0	0.46	0.30	1,240.6
HBINT-PIPE46	1976	146.0	750	0	0.008	1,000.9	471.3	0.48	0.471	529.6	508.8	0.50	0.51	492.1	536.0	0.52	0.54	464.9	555.9	0.53	0.56	444.9	559.4	0.53	0.56	441.4	561.4	0.53	0.56	439.4	566.1	0.54	0.57	434.7
HBINT-PIPE47	1976	120.0	750	0	0.009	1,026.3	471.3	0.48	0.459	555.0	508.8	0.50	0.50	517.5	536.0	0.51	0.52	490.3	555.9	0.53	0.54	470.4	559.4	0.53	0.55	466.9	561.4	0.53	0.55	464.9	566.1	0.53	0.55	460.2
HBINT-PIPE48	1976	167.7	900	0	0.003	927.4	480.1	0.49	0.518	447.2	517.7	0.51	0.56	409.7	544.9	0.53	0.59	382.5	564.9	0.54	0.61	362.4	568.5	0.54	0.61	358.9	570.5	0.54	0.62	356.9	575.2	0.55	0.62	352.2
HBINT-PIPE49	1976	87.3	900	0	0.004	1,129.7	483.4	0.47	0.428	646.3	521.0	0.49	0.46	608.7	548.2	0.51	0.49	581.5	568.3	0.52	0.50	561.4	571.9	0.52	0.51	557.8	573.9	0.52	0.51	555.8	578.6	0.53	0.51	551.2
HBINT-PIPE50	1976	122.3	900	0	0.003	1,009.1	483.4	0.50	0.479	525.7	521.0	0.53	0.52	488.1	548.2	0.54	0.54	460.9	568.3	0.55	0.56	440.8	571.9	0.56	0.57	437.2	573.9	0.56	0.57	435.2	578.5	0.56	0.57	430.5
HBINT-PIPE51	1976	96.9	900	0	0.003	937.8	485.0	0.49	0.517	452.8	522.6	0.51	0.56	415.2	549.8	0.52	0.59	388.0	570.0	0.53	0.61	367.9	573.5	0.53	0.61	364.3	575.5	0.53	0.61	362.3	580.2	0.54	0.62	357.6
HBINT-PIPE52	1974	72.8	900	0	0.004	1,123.2	488.9	0.46	0.435	634.3	526.5	0.48	0.47	596.7	553.7	0.49	0.49	569.5	573.9	0.50	0.51	549.3	577.5	0.50	0.51	545.7	579.5	0.50	0.52	543.7	584.1	0.51	0.52	539.0
HBINT-PIPE5C	1999	64.2	1350	0	0.010	5,337.2	1666.0	0.38	0.312	3,671.2	1703.6	0.39	0.32	3,633.5	1730.9	0.39	0.32	3,606.3	1751.2	0.39	0.33	3,585.9	1754.8	0.40	0.33	3,582.3	1756.8	0.40	0.33	3,580.3	1761.5	0.40	0.33	3,575.7
500995	1992	55.4	250	PVC	0.007	48.7	28.7	0.56	0.590	20.0	41.8	1.00	0.86	6.8	53.3		1.10	0.0	64.3		1.32	0.0	74.4		1.53	0.0	84.2		1.73	0.0	93.5		1.92	0.0
501188	1992	47.8	250	PVC	0.007	49.4	30.5	0.57	0.618	18.9	43.3	1.00	0.88	6.1	55.2		1.12	0.0	61.7		1.25	0.0	66.6		1.35	0.0	65.7		1.33	0.0	68.4		1.38	0.0
501658	1992	84.2	250	PVC	0.008	51.9	30.9	0.60	0.596	21.0	43.5	1.00	0.84	8.4	55.6		1.07	0.0	61.7		1.19	0.0	66.3		1.28	0.0	65.5		1.26	0.0	68.2		1.32	0.0
501483	1992	74.6	250	PVC	0.005	44.1	31.1	0.60	0.706	13.0	43.6	1.00	0.99	0.5	54.8		1.24	0.0	61.6		1.40	0.0	65.8		1.49	0.0	65.2		1.48	0.0	68.0		1.54	0.0
501657	1992	30.4	250	PVC	0.008	51.7	31.2	0.60	0.603	20.5	43.7	1.00	0.84	8.1	54.8		1.06	0.0	61.6		1.19	0.0	65.5		1.27	0.0	65.1		1.26	0.0	67.8		1.31	0.0
503550	1992	75.6	250	PVC	0.005	42.2	33.3	0.78	0.790	8.9	45.4		1.08	0.0	56.5		1.34	0.0	62.4		1.48	0.0	66.1		1.57	0.0	65.7		1.56	0.0	65.6		1.56	0.0
501161	1992	70.4	250	PVC	0.004	37.5	40.3		1.073	0.0	50.8		1.36	0.0	61.8		1.65	0.0	63.2		1.68	0.0	65.2		1.74	0.0	64.7		1.72	0.0	65.5		1.75	0.0
500983	1992	66.6	250	PVC	0.006	44.3	40.4	0.73	0.912	3.9	51.0		1.15	0.0	61.9		1.40	0.0	63.2		1.43	0.0	65.2		1.47	0.0	64.7		1.46	0.0	65.6		1.48	0.0
503377	1992	109.3	250	PVC	0.009	56.3	42.7	0.58	0.758	13.6	52.8	1.00	0.94	3.5	64.5		1.15	0.0	64.5		1.15	0.0	64.5		1.15	0.0	64.5		1.15	0.0	65.0		1.15	0.0
502209	1991	69.5	250	PVC	0.031	105.1	43.8	1.00	0.417	61.3	54.1	1.00	0.51	51.0	65.8	1.00	0.63	39.3	65.9	1.00	0.63	39.2	65.9	1.00	0.63	39.2	65.9	1.00	0.63	39.2	65.9	1.00	0.63	39.2
511503	1979	4.1	200	PVC	0.007	28.1	65.2		2.318	0.0	76.8		2.73	0.0	88.8		3.16	0.0	89.0		3.16	0.0	89.0		3.16	0.0	89.0		3.16	0.0	89.0		3.16	0.0
503360	1979	91.0	200	PVC	0.014	38.4	66.6		1.731	0.0	79.0		2.06	0.0	79.7		2.07	0.0	79.7		2.07	0.0	79.7		2.07	0.0	79.7		2.07	0.0	79.7		2.07	0.0
501179	1991	40.9	250	PVC	0.016	74.4	66.6	0.74	0.895	7.8	79.0		1.06	0.0	79.6		1.07	0.0	79.6		1.07	0.0	79.6		1.07	0.0	79.6		1.07	0.0	79.6		1.07	0.0
503231	1975	115.6	250	CP	0.021	86.3	68.0	1.00	0.787	18.4	80.6	1.00	0.93	5.7	80.7	1.00	0.94	5.6	80.7	1.00	0.94	5.6	80.7	1.00	0.94	5.6	80.7	1.00	0.94	5.6	80.7	1.00	0.94	5.6
512906	1975	25.4	250	CP	0.001	23.0	68.4		2.974	0.0	74.0		3.22	0.0	74.4		3.24	0.0	74.4		3.24	0.0	74.4		3.24	0.0	74.4		3.24	0.0	74.4		3.24	0.0
512907	1975	96.7	250	CP	0.003	32.8	69.8		2.129	0.0	75.2		2.30	0.0	75.2		2.30	0.0	75.2		2.30	0.0	75.2		2.30	0.0	75.2		2.30	0.0	75.2		2.30	0.0
503230	1975	29.8	250	CP	0.003	30.8	69.9		2.269	0.0	75.3		2.45	0.0	75.3		2.45	0.0	75.3		2.45	0.0	75.3		2.45	0.0	75.3		2.45	0.0	75.3		2.45	0.0
500765	1975	91.7	250	CP	0.032	106.6	70.3	0.67	0.660	36.2	75.7	0.71	0.71	30.8	75.7	0.71	0.71	30.8	75.7	0.71	0.71	30.8	75.7	0.71	0.71	30.8	75.7	0.71	0.71	30.8	75.7	0.71	0.71	30.8
503547	1975	90.3	250	CP	0.031	104.9	100.4	0.78	0.957	4.5	120.3		1.15	0.0	120.3		1.15	0.0	120.3		1.15	0.0	120.3		1.15	0.0	120.3		1.15	0.0	120.3		1.15	0.0
502020	1975	38.6	250	CP	0.036	113.4	101.7	0.74	0.897	11.7	110.5	0.80	0.98	2.9	110.5	0.80	0.98	2.9	110.3	0.80	0.97	3.0	110.6	0.80	0.98	2.8	110.3	0.80	0.97	3.1	110.6	0.80	0.98	2.8
502021	1990	53.4	375	PVC	0.003	93.0	101.8		1.095	0.0	111.4		1.20	0.0	111.3		1.20	0.0	111.2		1.20	0.0	111.4		1.20	0.0	111.0		1.19	0.0	111.4		1.20	0.0
511037	1990	61.7	375	PVC	0.003	90.1	104.0		1.154	0.0	112.2		1.24	0.0	112.1		1.24	0.0	112.0		1.24	0.0	112.2		1.24	0.0	111.8		1.24	0.0	112.2		1.24	0.0
501012	1990	92.1	375	PVC	0.003	91.3	104.6		1.145	0.0	111.8		1.22	0.0	111.8		1.22	0.0	111.8		1.22	0.0	111.8		1.22	0.0	111.8		1.22	0.0	111.8		1.22	0.0
503259	1990	20.2	375	PVC	0.002	86.4	105.0		1.216	0.0	112.2		1.30	0.0	112.2		1.30	0.0	112.2		1.30	0.0	112.2		1.30	0.0	112.2		1.30	0.0	112.2		1.30	0.0
500894	1996	157.6	375	CP	0.032	311.5	105.1	0.40	0.338	206.3	111.7	0.41	0.36	199.8	111.7	0.41	0.36	199.8	111.7	0.41	0.36	199.8	111.7	0.41	0.36	199.8	111.7	0.41	0.36	199.8	111.7	0.41	0.36	199.8
503456	1996	35.7	375	CP	0.015	211.7	109.4	0.51	0.517	102.3	115.9	0.53	0.55	95.8	115.9	0.53	0.55	95.8	115.9	0.53	0.55	95.8	115.9	0.53	0.55	95.9	115.9	0.53	0.55	95.8	115.9	0.53	0.55	95.8
500702	1999	41.6	375	PVC	0.012	188.4	109.5	0.55	0.581	78.9	115.9	0.57	0.62	72.6	115.8	0.57	0.62	72.6	115.9	0.57	0.62	72.6	115.8	0.57	0.62	72.6	115.8	0.57	0.62	72.6	115.8	0.57	0.62	72.6
500703	1999	146.0	375	PVC	0.012	189.8	110.7	0.55	0.583	79.1	116.5	0.57	0.61	73.3	116.5	0.57	0.61	73.3	116.5	0.57	0.61	73.3	116.5	0.57	0.61	73.3	116.5	0.57	0.61	73.3	116.5	0.57	0.61	73.3
500701	1996	112.1	450	PVC	0.007	231.6	105.6	0.47	0.456	126.0	110.4	0.49	0.48	121.2	110.4	0.49	0.48	121.2	110.4	0.49	0.48	121.2	110.4	0.49	0.48	121.2	110.4	0.49	0.48	121.2	110.4	0.49	0.48	121.2
511029	1988	21.9	450	PVC	0.005	199.1	124.2	0.56	0.624	75.0	129.7	0.58	0.65	69.5	129.6	0.58	0.65	69.5	129.7	0.58	0.65	69.5	129.7	0.58	0.65	69.5	129.7	0.58	0.65	69.5	129.7	0.58	0.65	69.5
500694	1996	117.4	400	PE	0.186	898.1	126.7	0.25	0.141	771.3	132.2	0.26	0.15	765.8	132.2	0.26	0.15	765.9	132.2	0.26	0.15	765.8	132.2	0.26	0.15	765.8	132.2	0.26	0.15	765.8	132.2	0.26	0.15	765.8
500697	1996	140.0	400	PE	0.106	678.5	126.8	0.29	0.187	551.7	132.3	0.30	0.20	546.2	132.3	0.30	0.20	546.2	132.3	0.30	0.20	546.2	132.3	0.30	0.20	546.2	132.3	0.30	0.20	546.2	132.3	0.30	0.20	546.2
501965	1993	41.7	300	PVC	0.088	287.1	151.3	0.52	0.527	135.8	156.8	0.53	0.55	130.3	156.8	0.53	0.55	130.3	156.8	0.53	0.55	130.3	156.8	0.53	0.55	130.3	156.8	0.53	0.55	130.3	156.8	0.53	0.55	130.3
501964	1993	94.1	300	PVC	0.092	293.9	151.3	0.51	0.515	142.6	156.8	0.52	0.53	137.1	156.8	0.52	0.53	137.1	156.8	0.52	0.53	137.1	156.8	0.52	0.53	137.1	156.8	0.52	0.53	137.1	156.8	0.52	0.53	137.1
501962	1993	56.2	300	PVC	0.091	291.6	151.5	0.51	0.519	140.1	157.0	0.52	0.54	134.7	157.0	0.52	0.54	134.6	157.0	0.52	0.54	134.6	157.0	0.52	0.54	134.6	157.0	0.52	0.54	134.6	157.0	0.52	0.54	134.6
501953	1993	36.1	300	PVC	0.089	289.1	151.5	0.52	0.524	137.6	157.0	0.53	0.54	132.2	157.0	0.53	0.54	132.1	157.0	0.53	0.54	132.1	157.0	0.53	0.54	132.1	157.0	0.53	0.54	132.1	157.0	0.53	0.54	132.2
501952	1993	65.1	300	PE	0.150	373.9	151.5	0.44	0.405	222.4	157.0	0.45	0.42	216.9	157.0	0.45	0.42	216.9	157.0	0.45	0.42	216.9	157.0	0.45	0.42	216.9	157.0	0.45	0.42	216.9	157.0	0.45	0.42	216.9

Appendix C Manhole Hydraulic Results

Manhole Hydraulic Modeling Results

ID (Char)	Depth (m)	Diameter (mm)	Invert Elevation (m)	Crown Elevation (m)	Rim Elevation (m)	2046 PWWF 5-Year I&I No Additional Capita	2046 PWWF 5-Year I&I 5,000 Additional Capita	2046 PWWF 5-Year I&I 10,000 Additional Capita	2046 PWWF 5-Year I&I 15,000 Additional Capita	2046 PWWF 5-Year I&I 20,000 Additional Capita	2046 PWWF 5-Year I&I 25,000 Additional Capita	2046 PWWF 5-Year I&I 30,000 Additional Capita
3228	4.98	1,050	87.33	87.58	92.31	87.48	88.09	89.64	90.74	90.92	91.09	91.47
3230	2.64	1,050	85.36	85.61	88.00	85.47	85.50	85.53	85.56	85.56	85.56	85.66
1423	3.24	1,050	81.14	81.39	84.38	81.25	81.29	81.33	81.35	81.52	81.56	81.67
3231	2.73	1,050	80.08	80.33	82.81	80.17	80.20	80.22	80.23	80.23	80.24	80.24
3192	2.32	1,050	71.67	71.92	73.99	71.76	71.79	71.81	71.83	71.83	71.83	71.84
3194	3.33	1,050	69.07	69.32	72.40	69.15	69.18	69.20	69.21	69.21	69.21	69.21
3210	3.27	1,050	67.24	67.49	70.51	67.32	67.35	67.37	67.38	67.38	67.38	67.39
3209	3.77	1,050	60.68	60.93	64.45	60.76	60.79	60.81	60.82	60.82	60.82	60.83
3195	3.24	1,050	54.91	55.16	58.15	55.00	55.02	55.04	55.05	55.05	55.05	55.06
3207	4.05	1,050	49.30	49.55	53.35	49.39	49.41	49.43	49.44	49.44	49.44	49.45
3196	4.12	1,050	43.21	43.46	47.33	43.30	43.33	43.35	43.37	43.37	43.37	43.38
3202	4.36	1,050	37.20	37.40	41.56	37.34	37.38	37.41	37.49	37.50	37.51	37.54
3197	4.09	1,050	34.76	34.96	38.85	34.84	34.85	34.87	34.88	34.88	34.88	34.88
NSINT-MH32	1.58	1,050	-0.48	0.27	1.10	-0.20	-0.15	-0.11	-0.08	-0.08	-0.07	-0.06
NSINT-MH31	1.58	1,050	-0.60	0.15	0.98	-0.29	-0.24	-0.19	-0.17	-0.16	-0.16	-0.15
NSINT-MH30	1.57	1,050	-0.68	0.07	0.89	-0.37	-0.32	-0.27	-0.25	-0.24	-0.24	-0.23
NSINT-MH29	2.49	1,050	-1.70	-1.50	0.79	-0.49	-0.44	-0.40	-0.37	-0.37	-0.36	-0.35
NSINT-MH28	1.88	1,050	-0.93	-0.18	0.95	-0.60	-0.54	-0.50	-0.47	-0.47	-0.46	-0.45
NSINT-MH27	1.89	1,050	-1.01	-0.26	0.88	-0.68	-0.62	-0.58	-0.55	-0.55	-0.54	-0.53
NSINT-MH26	1.87	1,050	-1.10	-0.35	0.77	-0.76	-0.71	-0.66	-0.63	-0.63	-0.62	-0.61
NSINT-MH25	1.88	1,050	-1.19	-0.65	0.69	-0.82	-0.77	-0.73	-0.70	-0.69	-0.69	-0.68
NSINT-MH24	2.19	1,050	-1.28	-0.53	0.91	-0.90	-0.85	-0.80	-0.78	-0.77	-0.77	-0.76
NSINT-MH23	2.19	1,050	-1.37	-0.70	0.82	-0.96	-0.92	-0.88	-0.85	-0.85	-0.84	-0.83
NSINT-MH22	2.08	1,050	-1.51	-0.76	0.57	-1.10	-1.05	-1.01	-0.98	-0.98	-0.97	-0.96
NSINT-MH21	1.87	1,050	-1.65	-0.90	0.22	-1.21	-1.17	-1.12	-1.09	-1.09	-1.08	-1.07
NSINT-MH20	2.16	1,050	-1.76	-1.01	0.40	-1.35	-1.30	-1.26	-1.22	-1.22	-1.21	-1.20
NSINT-MH19	2.18	1,050	-1.91	-1.16	0.27	-1.48	-1.43	-1.38	-1.35	-1.34	-1.33	-1.31
NSINT-MH18	1.87	1,050	-2.02	-1.27	-0.15	-1.59	-1.54	-1.49	-1.45	-1.44	-1.43	-1.41
NSINT-MH17	2.80	1,050	-2.14	-1.39	0.66	-1.71	-1.65	-1.60	-1.55	-1.54	-1.53	-1.51
NSINT-MH16	2.50	1,050	-2.26	-1.51	0.24	-1.81	-1.75	-1.69	-1.64	-1.63	-1.62	-1.59
NSINT-MH15	1.94	1,050	-2.51	-1.61	-0.57	-1.88	-1.81	-1.75	-1.70	-1.69	-1.68	-1.66
NSINT-MH14	3.25	1,050	-2.56	-1.66	0.69	-1.89	-1.83	-1.77	-1.72	-1.71	-1.70	-1.68
NSINT-MH13	2.34	1,050	-2.63	-2.07	-0.29	-1.96	-1.90	-1.84	-1.80	-1.79	-1.78	-1.76
NSINT-MH12	2.36	1,050	-2.69	-1.79	-0.33	-2.02	-1.96	-1.91	-1.86	-1.85	-1.84	-1.83
NSINT-MH11	2.65	1,050	-2.76	-2.11	-0.11	-2.09	-2.03	-1.98	-1.94	-1.93	-1.92	-1.91
NSINT-MH10	2.64	1,050	-2.84	-1.94	-0.20	-2.17	-2.11	-2.06	-2.02	-2.02	-2.01	-2.00
NSINT-MH9	2.35	1,050	-2.94	-2.04	-0.59	-2.27	-2.21	-2.16	-2.12	-2.12	-2.11	-2.10
NSINT-MH8	2.96	1,050	-3.01	-2.11	-0.05	-2.33	-2.28	-2.23	-2.20	-2.20	-2.19	-2.18
NSINT-MH7	3.29	1,050	-3.08	-2.18	0.21	-2.40	-2.35	-2.31	-2.28	-2.28	-2.27	-2.27
NSINT-MH6	3.26	1,050	-3.15	-2.41	0.11	-2.47	-2.42	-2.39	-2.36	-2.36	-2.35	-2.35
NSINT-MH5	3.26	1,050	-3.24	-2.34	0.02	-2.57	-2.53	-2.50	-2.48	-2.47	-2.47	-2.46
NSINT-MH4A	3.89	1,050	-3.28	-2.73	0.61	-2.62	-2.58	-2.56	-2.54	-2.53	-2.53	-2.52
NSINT-MH4	4.50	1,050	-3.33	-2.43	1.17	-2.69	-2.66	-2.63	-2.61	-2.61	-2.61	-2.60
NSINT-MH3	3.70	1,050	-3.40	-2.50	0.30	-2.82	-2.79	-2.77	-2.76	-2.75	-2.75	-2.75
NSINT-MH2	3.99	1,050	-3.46	-2.56	0.53	-2.89	-2.90	-2.92	-2.90	-2.92	-2.92	-2.92
NSINT-MH1	3.51	1,050	-3.51	-3.36	0.00	-2.88	-2.87	-2.88	-2.86	-2.90	-2.87	-2.87
WELLINGTON-PS	3.51	1,050	-3.51	-3.06	0.00	42.96	43.04	43.41	43.67	43.72	43.75	43.81
HBINT-MH40	2.04	1,050	39.32	39.47	41.36	39.95	39.97	39.98	39.98	39.99	39.99	39.99
HBINT-MH41	1.93	1,050	39.24	40.14	41.17	39.63	39.65	39.66	39.67	39.67	39.67	39.67
HBINT-MH42	2.56	1,050	38.43	39.18	40.99	38.78	38.80	38.81	38.82	38.82	38.82	38.82
HBINT-MH43	2.57	1,050	36.87	37.62	39.44	37.22	37.24	37.25	37.26	37.26	37.26	37.26
HBINT-MH44	2.75	1,050	35.55	36.30	38.30	35.94	35.96	35.97	35.98	35.98	35.98	35.99
HBINT-MH45	2.04	1,050	34.22	34.97	36.26	34.48	34.49	34.50	34.50	34.50	34.50	34.50
HBINT-MH46	2.44	1,050	31.97	32.45	34.41	32.33	32.35	32.36	32.37	32.37	32.37	32.38
HBINT-MH47	2.30	1,050	30.79	31.54	33.09	31.15	31.16	31.18	31.18	31.19	31.19	31.19
HBINT-MH48	3.29	1,050	29.61	30.51	32.90	30.08	30.10	30.12	30.13	30.13	30.13	30.14
HBINT-MH49	3.23	1,050	29.17	30.07	32.40	29.58	29.60	29.61	29.62	29.62	29.62	29.63
HBINT-MH50	3.23	1,050	28.83	29.73	32.06	29.27	29.29	29.30	29.31	29.32	29.32	29.32

Manhole Hydraulic Modeling Results

ID (Char)	Depth (m)	Diameter (mm)	Invert Elevation (m)	Crown Elevation (m)	Rim Elevation (m)	2046 PWWF 5-Year I&I No Additional Capita	2046 PWWF 5-Year I&I 5,000 Additional Capita	2046 PWWF 5-Year I&I 10,000 Additional Capita	2046 PWWF 5-Year I&I 15,000 Additional Capita	2046 PWWF 5-Year I&I 20,000 Additional Capita	2046 PWWF 5-Year I&I 25,000 Additional Capita	2046 PWWF 5-Year I&I 30,000 Additional Capita
HBINT-MH51	2.95	1,050	28.45	29.10	31.40	28.92	28.94	28.95	28.96	28.97	28.97	28.97
HBINT-MH52	3.33	1,050	28.07	28.97	31.40	28.49	28.51	28.52	28.53	28.53	28.53	28.53
GA-HBINT-MH-003	2.85	1,050	27.02	28.37	29.87	27.54	27.55	27.55	27.56	27.56	27.56	27.56
2224	3.12	1,050	96.77	96.97	99.90	96.91	97.06	99.12	99.33	99.50	99.69	99.89
2225	2.41	1,050	96.40	96.65	98.81	96.54	96.87	98.75	98.81	98.81	98.81	98.81
2223	2.43	1,050	96.05	96.30	98.48	96.19	96.68	98.42	98.46	98.46	98.46	98.46
2105	2.41	1,050	95.41	95.66	97.82	95.57	96.36	97.82	97.82	97.82	97.82	97.82
7999	2.41	1,050	95.00	95.25	97.41	95.14	96.08	97.37	97.37	97.37	97.37	97.37
2034	2.58	1,050	94.76	95.01	97.34	94.93	95.96	97.19	97.19	97.19	97.19	97.19
2036	2.32	1,050	94.37	94.62	96.69	94.60	95.64	96.69	96.69	96.69	96.69	96.69
2035	3.59	1,050	94.08	94.33	97.67	94.27	95.20	96.06	96.06	96.06	96.06	96.06
2030	3.55	1,050	93.70	93.95	97.25	93.88	94.77	95.45	95.45	95.45	95.45	95.45
2029	2.53	1,050	92.72	92.94	95.25	92.83	94.00	94.33	94.33	94.33	94.33	94.33
2028	3.78	1,050	90.12	90.32	93.90	92.45	93.52	93.64	93.64	93.64	93.64	93.64
7823	3.40	1,050	90.03	90.23	93.43	92.33	93.37	93.43	93.43	93.43	93.43	93.43
7998	2.25	1,050	88.78	88.98	91.03	88.97	89.00	89.09	89.09	89.09	89.09	89.09
2026	4.04	1,050	86.58	86.83	90.63	87.24	88.01	88.01	88.01	88.01	88.01	88.01
2014	2.03	1,050	84.14	84.39	86.17	85.87	86.17	86.17	86.17	86.17	86.17	86.17
9296	2.26	1,050	84.10	84.35	86.36	85.58	85.84	85.84	85.84	85.84	85.84	85.84
2013	2.50	1,050	83.81	84.06	86.31	84.34	84.43	84.43	84.43	84.43	84.43	84.43
1429	1.94	1,050	83.73	83.93	85.67	83.88	83.89	83.89	83.89	83.89	83.89	83.89
2003	1.98	1,050	80.78	80.99	82.76	80.98	80.99	80.99	80.99	80.99	80.99	80.99
2004	1.63	1,050	77.93	78.13	79.56	78.13	78.14	78.14	78.14	78.14	78.14	78.14
1776	2.53	1,050	75.94	76.32	78.47	76.34	76.49	76.49	76.49	76.49	76.49	76.49
1779	1.74	1,050	75.79	75.99	77.54	76.16	76.30	76.30	76.30	76.30	76.30	76.30
1775	1.92	1,050	75.60	75.98	77.52	75.97	76.06	76.06	76.06	76.06	76.06	76.06
1772	3.06	1,050	75.35	75.60	78.41	75.68	75.69	75.69	75.69	75.69	75.69	75.69
1405	2.80	1,050	75.30	75.67	78.10	75.60	75.60	75.60	75.60	75.60	75.60	75.60
1745	1.75	1,050	70.30	70.68	72.05	70.49	70.50	70.50	70.50	70.50	70.50	70.50
1743	1.89	1,050	69.76	70.14	71.65	69.97	69.97	69.97	69.97	69.97	69.97	69.97
1752	1.64	1,050	69.23	69.48	70.87	69.44	69.44	69.44	69.44	69.44	69.44	69.44
1674	1.82	1,050	66.56	66.76	68.38	66.82	66.83	66.83	66.83	66.83	66.83	66.83
1391	1.74	1,050	66.40	66.76	68.14	66.50	66.50	66.50	66.50	66.50	66.50	66.50
1390	1.93	1,050	44.25	44.65	46.18	44.37	44.37	44.37	44.37	44.37	44.37	44.37
1676	3.54	1,050	29.30	29.50	32.84	29.48	29.48	29.48	29.48	29.48	29.48	29.48
1675	2.16	1,050	25.60	25.90	27.76	25.75	25.76	25.76	25.76	25.76	25.76	25.76
1658	2.32	1,050	16.82	17.12	19.14	16.97	16.98	16.98	16.98	16.98	16.98	16.98
1662	2.57	1,050	11.59	11.89	14.16	11.75	11.75	11.75	11.75	11.75	11.75	11.75
1661	2.92	1,050	8.33	8.63	11.25	8.46	8.47	8.47	8.47	8.47	8.47	8.47

Appendix D Detailed Recommended Upgrades and Results

Manhole Hydraulic Modeling Results

ID (Char)	Depth (m)	Diameter (mm)	Invert Elevation (m)	Crown Elevation (m)	Rim Elevation (m)	2046 PWWF 5-Year I&I No Additional Capita	2046 PWWF 5-Year I&I 5,000 Additional Capita	2046 PWWF 5-Year I&I 10,000 Additional Capita	2046 PWWF 5-Year I&I 15,000 Additional Capita	2046 PWWF 5-Year I&I 20,000 Additional Capita	2046 PWWF 5-Year I&I 25,000 Additional Capita	2046 PWWF 5-Year I&I 30,000 Additional Capita
3228	4.98	1,050	87.33	87.58	92.31	87.48	88.09	89.64	90.74	90.92	91.09	91.47
3230	2.64	1,050	85.36	85.61	88.00	85.47	85.50	85.53	85.56	85.56	85.56	85.66
1423	3.24	1,050	81.14	81.39	84.38	81.25	81.29	81.33	81.35	81.52	81.56	81.67
3231	2.73	1,050	80.08	80.33	82.81	80.17	80.20	80.22	80.23	80.23	80.24	80.24
3192	2.32	1,050	71.67	71.92	73.99	71.76	71.79	71.81	71.83	71.83	71.83	71.84
3194	3.33	1,050	69.07	69.32	72.40	69.15	69.18	69.20	69.21	69.21	69.21	69.21
3210	3.27	1,050	67.24	67.49	70.51	67.32	67.35	67.37	67.38	67.38	67.38	67.39
3209	3.77	1,050	60.68	60.93	64.45	60.76	60.79	60.81	60.82	60.82	60.82	60.83
3195	3.24	1,050	54.91	55.16	58.15	55.00	55.02	55.04	55.05	55.05	55.05	55.06
3207	4.05	1,050	49.30	49.55	53.35	49.39	49.41	49.43	49.44	49.44	49.44	49.45
3196	4.12	1,050	43.21	43.46	47.33	43.30	43.33	43.35	43.37	43.37	43.37	43.38
3202	4.36	1,050	37.20	37.40	41.56	37.34	37.38	37.41	37.49	37.50	37.51	37.54
3197	4.09	1,050	34.76	34.96	38.85	34.84	34.85	34.87	34.88	34.88	34.88	34.88
NSINT-MH32	1.58	1,050	-0.48	0.27	1.10	-0.20	-0.15	-0.11	-0.08	-0.08	-0.07	-0.06
NSINT-MH31	1.58	1,050	-0.60	0.15	0.98	-0.29	-0.24	-0.19	-0.17	-0.16	-0.16	-0.15
NSINT-MH30	1.57	1,050	-0.68	0.07	0.89	-0.37	-0.32	-0.27	-0.25	-0.24	-0.24	-0.23
NSINT-MH29	2.49	1,050	-1.70	-1.50	0.79	-0.49	-0.44	-0.40	-0.37	-0.37	-0.36	-0.35
NSINT-MH28	1.88	1,050	-0.93	-0.18	0.95	-0.60	-0.54	-0.50	-0.47	-0.47	-0.46	-0.45
NSINT-MH27	1.89	1,050	-1.01	-0.26	0.88	-0.68	-0.62	-0.58	-0.55	-0.55	-0.54	-0.53
NSINT-MH26	1.87	1,050	-1.10	-0.35	0.77	-0.76	-0.71	-0.66	-0.63	-0.63	-0.62	-0.61
NSINT-MH25	1.88	1,050	-1.19	-0.65	0.69	-0.82	-0.77	-0.73	-0.70	-0.69	-0.69	-0.68
NSINT-MH24	2.19	1,050	-1.28	-0.53	0.91	-0.90	-0.85	-0.80	-0.78	-0.77	-0.77	-0.76
NSINT-MH23	2.19	1,050	-1.37	-0.70	0.82	-0.96	-0.92	-0.88	-0.85	-0.85	-0.84	-0.83
NSINT-MH22	2.08	1,050	-1.51	-0.76	0.57	-1.10	-1.05	-1.01	-0.98	-0.98	-0.97	-0.96
NSINT-MH21	1.87	1,050	-1.65	-0.90	0.22	-1.21	-1.17	-1.12	-1.09	-1.09	-1.08	-1.07
NSINT-MH20	2.16	1,050	-1.76	-1.01	0.40	-1.35	-1.30	-1.26	-1.22	-1.22	-1.21	-1.20
NSINT-MH19	2.18	1,050	-1.91	-1.16	0.27	-1.48	-1.43	-1.38	-1.35	-1.34	-1.33	-1.31
NSINT-MH18	1.87	1,050	-2.02	-1.27	-0.15	-1.59	-1.54	-1.49	-1.45	-1.44	-1.43	-1.41
NSINT-MH17	2.80	1,050	-2.14	-1.39	0.66	-1.71	-1.65	-1.60	-1.55	-1.54	-1.53	-1.51
NSINT-MH16	2.50	1,050	-2.26	-1.51	0.24	-1.81	-1.75	-1.69	-1.64	-1.63	-1.62	-1.59
NSINT-MH15	1.94	1,050	-2.51	-1.61	-0.57	-1.88	-1.81	-1.75	-1.70	-1.69	-1.68	-1.66
NSINT-MH14	3.25	1,050	-2.56	-1.66	0.69	-1.89	-1.83	-1.77	-1.72	-1.71	-1.70	-1.68
NSINT-MH13	2.34	1,050	-2.63	-2.07	-0.29	-1.96	-1.90	-1.84	-1.80	-1.79	-1.78	-1.76
NSINT-MH12	2.36	1,050	-2.69	-1.79	-0.33	-2.02	-1.96	-1.91	-1.86	-1.85	-1.84	-1.83
NSINT-MH11	2.65	1,050	-2.76	-2.11	-0.11	-2.09	-2.03	-1.98	-1.94	-1.93	-1.92	-1.91
NSINT-MH10	2.64	1,050	-2.84	-1.94	-0.20	-2.17	-2.11	-2.06	-2.02	-2.02	-2.01	-2.00
NSINT-MH9	2.35	1,050	-2.94	-2.04	-0.59	-2.27	-2.21	-2.16	-2.12	-2.12	-2.11	-2.10
NSINT-MH8	2.96	1,050	-3.01	-2.11	-0.05	-2.33	-2.28	-2.23	-2.20	-2.20	-2.19	-2.18
NSINT-MH7	3.29	1,050	-3.08	-2.18	0.21	-2.40	-2.35	-2.31	-2.28	-2.28	-2.27	-2.27
NSINT-MH6	3.26	1,050	-3.15	-2.41	0.11	-2.47	-2.42	-2.39	-2.36	-2.36	-2.35	-2.35
NSINT-MH5	3.26	1,050	-3.24	-2.34	0.02	-2.57	-2.53	-2.50	-2.48	-2.47	-2.47	-2.46
NSINT-MH4A	3.89	1,050	-3.28	-2.73	0.61	-2.62	-2.58	-2.56	-2.54	-2.53	-2.53	-2.52
NSINT-MH4	4.50	1,050	-3.33	-2.43	1.17	-2.69	-2.66	-2.63	-2.61	-2.61	-2.61	-2.60
NSINT-MH3	3.70	1,050	-3.40	-2.50	0.30	-2.82	-2.79	-2.77	-2.76	-2.75	-2.75	-2.75
NSINT-MH2	3.99	1,050	-3.46	-2.56	0.53	-2.89	-2.90	-2.92	-2.90	-2.92	-2.92	-2.92
NSINT-MH1	3.51	1,050	-3.51	-3.36	0.00	-2.88	-2.87	-2.88	-2.86	-2.90	-2.87	-2.87
WELLINGTON-PS	3.51	1,050	-3.51	-3.06	0.00	42.96	43.04	43.41	43.67	43.72	43.75	43.81
HBINT-MH40	2.04	1,050	39.32	39.47	41.36	39.95	39.97	39.98	39.98	39.99	39.99	39.99
HBINT-MH41	1.93	1,050	39.24	40.14	41.17	39.63	39.65	39.66	39.67	39.67	39.67	39.67
HBINT-MH42	2.56	1,050	38.43	39.18	40.99	38.78	38.80	38.81	38.82	38.82	38.82	38.82
HBINT-MH43	2.57	1,050	36.87	37.62	39.44	37.22	37.24	37.25	37.26	37.26	37.26	37.26
HBINT-MH44	2.75	1,050	35.55	36.30	38.30	35.94	35.96	35.97	35.98	35.98	35.98	35.99
HBINT-MH45	2.04	1,050	34.22	34.97	36.26	34.48	34.49	34.50	34.50	34.50	34.50	34.50
HBINT-MH46	2.44	1,050	31.97	32.45	34.41	32.33	32.35	32.36	32.37	32.37	32.37	32.38
HBINT-MH47	2.30	1,050	30.79	31.54	33.09	31.15	31.16	31.18	31.18	31.19	31.19	31.19
HBINT-MH48	3.29	1,050	29.61	30.51	32.90	30.08	30.10	30.12	30.13	30.13	30.13	30.14
HBINT-MH49	3.23	1,050	29.17	30.07	32.40	29.58	29.60	29.61	29.62	29.62	29.62	29.63
HBINT-MH50	3.23	1,050	28.83	29.73	32.06	29.27	29.29	29.30	29.31	29.32	29.32	29.32

Manhole Hydraulic Modeling Results

ID (Char)	Depth (m)	Diameter (mm)	Invert Elevation (m)	Crown Elevation (m)	Rim Elevation (m)	2046 PWWF 5-Year I&I No Additional Capita	2046 PWWF 5-Year I&I 5,000 Additional Capita	2046 PWWF 5-Year I&I 10,000 Additional Capita	2046 PWWF 5-Year I&I 15,000 Additional Capita	2046 PWWF 5-Year I&I 20,000 Additional Capita	2046 PWWF 5-Year I&I 25,000 Additional Capita	2046 PWWF 5-Year I&I 30,000 Additional Capita
HBINT-MH51	2.95	1,050	28.45	29.10	31.40	28.92	28.94	28.95	28.96	28.97	28.97	28.97
HBINT-MH52	3.33	1,050	28.07	28.97	31.40	28.49	28.51	28.52	28.53	28.53	28.53	28.53
GA-HBINT-MH-003	2.85	1,050	27.02	28.37	29.87	27.54	27.55	27.55	27.56	27.56	27.56	27.56
2224	3.12	1,050	96.77	96.97	99.90	96.91	97.06	99.12	99.33	99.50	99.69	99.89
2225	2.41	1,050	96.40	96.65	98.81	96.54	96.87	98.75	98.81	98.81	98.81	98.81
2223	2.43	1,050	96.05	96.30	98.48	96.19	96.68	98.42	98.46	98.46	98.46	98.46
2105	2.41	1,050	95.41	95.66	97.82	95.57	96.36	97.82	97.82	97.82	97.82	97.82
7999	2.41	1,050	95.00	95.25	97.41	95.14	96.08	97.37	97.37	97.37	97.37	97.37
2034	2.58	1,050	94.76	95.01	97.34	94.93	95.96	97.19	97.19	97.19	97.19	97.19
2036	2.32	1,050	94.37	94.62	96.69	94.60	95.64	96.69	96.69	96.69	96.69	96.69
2035	3.59	1,050	94.08	94.33	97.67	94.27	95.20	96.06	96.06	96.06	96.06	96.06
2030	3.55	1,050	93.70	93.95	97.25	93.88	94.77	95.45	95.45	95.45	95.45	95.45
2029	2.53	1,050	92.72	92.94	95.25	92.83	94.00	94.33	94.33	94.33	94.33	94.33
2028	3.78	1,050	90.12	90.32	93.90	92.45	93.52	93.64	93.64	93.64	93.64	93.64
7823	3.40	1,050	90.03	90.23	93.43	92.33	93.37	93.43	93.43	93.43	93.43	93.43
7998	2.25	1,050	88.78	88.98	91.03	88.97	89.00	89.09	89.09	89.09	89.09	89.09
2026	4.04	1,050	86.58	86.83	90.63	87.24	88.01	88.01	88.01	88.01	88.01	88.01
2014	2.03	1,050	84.14	84.39	86.17	85.87	86.17	86.17	86.17	86.17	86.17	86.17
9296	2.26	1,050	84.10	84.35	86.36	85.58	85.84	85.84	85.84	85.84	85.84	85.84
2013	2.50	1,050	83.81	84.06	86.31	84.34	84.43	84.43	84.43	84.43	84.43	84.43
1429	1.94	1,050	83.73	83.93	85.67	83.88	83.89	83.89	83.89	83.89	83.89	83.89
2003	1.98	1,050	80.78	80.99	82.76	80.98	80.99	80.99	80.99	80.99	80.99	80.99
2004	1.63	1,050	77.93	78.13	79.56	78.13	78.14	78.14	78.14	78.14	78.14	78.14
1776	2.53	1,050	75.94	76.32	78.47	76.34	76.49	76.49	76.49	76.49	76.49	76.49
1779	1.74	1,050	75.79	75.99	77.54	76.16	76.30	76.30	76.30	76.30	76.30	76.30
1775	1.92	1,050	75.60	75.98	77.52	75.97	76.06	76.06	76.06	76.06	76.06	76.06
1772	3.06	1,050	75.35	75.60	78.41	75.68	75.69	75.69	75.69	75.69	75.69	75.69
1405	2.80	1,050	75.30	75.67	78.10	75.60	75.60	75.60	75.60	75.60	75.60	75.60
1745	1.75	1,050	70.30	70.68	72.05	70.49	70.50	70.50	70.50	70.50	70.50	70.50
1743	1.89	1,050	69.76	70.14	71.65	69.97	69.97	69.97	69.97	69.97	69.97	69.97
1752	1.64	1,050	69.23	69.48	70.87	69.44	69.44	69.44	69.44	69.44	69.44	69.44
1674	1.82	1,050	66.56	66.76	68.38	66.82	66.83	66.83	66.83	66.83	66.83	66.83
1391	1.74	1,050	66.40	66.76	68.14	66.50	66.50	66.50	66.50	66.50	66.50	66.50
1390	1.93	1,050	44.25	44.65	46.18	44.37	44.37	44.37	44.37	44.37	44.37	44.37
1676	3.54	1,050	29.30	29.50	32.84	29.48	29.48	29.48	29.48	29.48	29.48	29.48
1675	2.16	1,050	25.60	25.90	27.76	25.75	25.76	25.76	25.76	25.76	25.76	25.76
1658	2.32	1,050	16.82	17.12	19.14	16.97	16.98	16.98	16.98	16.98	16.98	16.98
1662	2.57	1,050	11.59	11.89	14.16	11.75	11.75	11.75	11.75	11.75	11.75	11.75
1661	2.92	1,050	8.33	8.63	11.25	8.46	8.47	8.47	8.47	8.47	8.47	8.47

City of Nanaimo Gravity Main Recommended Upgrades

						2046 PWWF 5-Year I&I No Additional Capita			2046 PWWF 5-Year I&I 5,000 Additional Capita			2046 PWWF 5-Year I&I 10,000 Additional Capita			2046 PWWF 5-Year I&I 15,000 Additional Capita			2046 PWWF 5-Year I&I 20,000 Additional Capita			2046 PWWF 5-Year I&I 25,000 Additional Capita			2046 PWWF 5-Year I&I 30,000 Additional Capita		
Gravity Main ID	Length (m)	Location	Flowpath	Existing Diameter (mm)	Average Depth (m)	Proposed Diameter (mm)	2076 PWWF Design Flow (L/s)	d/D w/ Upgrade (2076)	Proposed Diameter (mm)	2076 PWWF Design Flow (L/s)	d/D w/ Upgrade (2076)	Proposed Diameter (mm)	2076 PWWF Design Flow (L/s)	d/D w/ Upgrade (2076)	Proposed Diameter (mm)	2076 PWWF Design Flow (L/s)	d/D w/ Upgrade (2076)	Proposed Diameter (mm)	2076 PWWF Design Flow (L/s)	d/D w/ Upgrade (2076)	Proposed Diameter (mm)	2076 PWWF Design Flow (L/s)	d/D w/ Upgrade (2076)	Proposed Diameter (mm)	2076 PWWF Design Flow (L/s)	d/D w/ Upgrade (2076)
501062	126.8	Seabold Road	City 1	250	3.55	-	-	-	375	103.2	0.49	450	130.6	0.42	450	155.6	1.00*	450	179.4	0.51	450	201.7	0 54	525	223.3	0.45
500802	76 2	Seabold Road	City 1	250	2.57	-	-	-	-	-	-	-	-	-	-	-	-	375	179.6	0.47	375	201 9	0.58	375	223.5	0.53
511039	22.7	Seabold Road	City 1	250	2.67	-	-	-	-	-	-	-	-	-	375	155.8	0.46	375	179.6	0.50	375	201.7	1.00*	450	223.5	0.43
500995	55.4	Parkwood Drive	City 2	250	2.52	-	-	-	300	43 5	0.54	375	55.1	0.43	375	65.8	0.48	375	75 9	0.52	450	85.7	0.42	450	95.1	0.45
501188	47 8	Parkwood Drive	City 2	250	2.16	-	-	-	300	46.4	0.55	375	57.9	0.44	375	68.7	0.48	375	78 8	0.52	450	88.6	0.42	450	97 9	0.45
501658	84 2	Garibaldi Drive	City 2	250	2.17	-	-	-	300	46 9	0.53	375	58.5	0.46	375	69.2	0.50	375	79 3	0.51	375	89.1	0 55	450	98 5	0.46
501483	74.6	Garibaldi Drive	City 2	250	2.16	-	-	-	375	47 2	0.42	375	58.8	0.46	375	69.5	0.50	450	79.6	0.43	450	89.4	0.44	450	98.7	0.47
501657	30.4	Garibaldi Drive	City 2	250	2.24	-	-	-	300	47 3	0.54	375	58.9	0.45	375	69.6	0.50	375	79.7	0.51	450	89.5	0.43	450	98 9	0.46
503550	75.6	Tweedsmuir Crescent	City 2	250	2.20	-	-	-	375	50 2	0.48	375	61.8	0.50	375	72.5	0.55	450	82.6	0.47	450	92.4	0 50	450	101.8	0.51
501161	70.4	Tweedsmuir Crescent	City 2	250	2.70	-	-	-	375	61 0	0.51	450	72.6	0.44	450	83.3	0.47	450	93.4	0.50	450	103.2	0 53	525	112.6	0.44
500983	66.6	Tweedsmuir Crescent	City 2	250	3.32	-	-	-	375	61 3	0.48	375	72.8	0.53	450	83.5	0.44	450	93.6	0.47	450	103.4	0.49	450	112.8	0.52
503377	109.3	Tweedsmuir Crescent	City 2	250	2.79	-	-	-	375	65 5	0.41	375	76.0	0.44	375	88.8	0.49	375	96 8	0.51	450	106.6	0.41	450	116.0	0.42
502209	69 5	Tweedsmuir Crescent Path to Turner Road	City 2	250	2.69	300	53.2	0.38	300	70.1	0.33	300	77.9	0.47	300	88.9	0.52	300	98 8	0.56	300	108 5	0 38	300	117.9	1.00*
511503	4.1	Turner Road	City 2	200	3.36	375	83.4	0.53	450	100.8	0.47	450	107 9	0.47	450	119.1	0.50	450	129.1	0.59	450	139 8	0 57	450	147.8	0.56
503360	91 0	Turner Road	City 2	200	2.63	375	86.4	0.45	450	151.3	0.46	450	157 5	0.63	450	134.3	0.45	450	137.1	0.45	525	223 2	0.60	450	151.1	0.47
501179	40 9	Turner Road	City 2	250	2.12	-	-	-	375	119.3	0.53	375	125 5	0.54	375	124.2	0.54	450	131.9	0.42	450	166 2	0.48	450	151.1	0.45
503231	115.6	Hammond Bay Road	City 2	250	2.78	375	88.7	0.54	375	115.8	0.59	375	120 2	0.60	375	126.0	0.63	375	134.1	0.66	450	158 9	0.70	450	153.3	0.56
512906	25.4	Hammond Bay Road	City 2	250	1.89	525	89.3	0.49	600	113.5	0.44	600	116 5	0.45	600	126.4	0.48	600	134.8	0.50	600	155 5	0 50	600	153.9	0.51
512907	96.7	Hammond Bay Road	City 2	250	2.13	450	91.3	0.54	525	110.9	0.50	525	115 9	0.51	525	127.8	0.54	525	136.7	0.54	600	150 2	0.48	600	155.9	0.49
503230	29 8	Hammond Bay Road	City 2	250	1.97	525	91.4	0.38	525	109.0	0.40	525	116 0	0.42	525	127.7	0.44	600	136.8	0.38	600	148.1	0.40	600	156.0	0.41
502021	53.4	Hammond Bay Road	City 2	375	1.76	600	134.8	0.46	600	147.9	0.48	600	159.4	0.50	600	170.9	0.53	600	180.3	0.54	675	191 3	0 54	675	199.4	0.48
511037	61.7	Hammond Bay Road	City 2	375	1.44	-	-	-	600	151.1	0.47	600	162.6	0.49	600	174.0	0.51	600	183.5	0.53	675	194.4	0.45	675	202.6	0.45
501012	92.1	Hammond Bay Road	City 2	375	2.11	-	-	-	600	151.8	0.50	600	163.4	0.52	600	174.7	0.54	600	184.2	0.55	675	195 0	0.49	900	203.3	0.35
501061	82.4	Seabold Road	City 1	250	2.19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	375	223.6	0.44
501059	26 2	Seabold Road	City 1	250	2.51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	375	227.7	1.00*
503335	59 8	Seabold Road	City 1	250	3.98	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	375	239.7	0.50
501001	29.1	Seabold Road	City 1	250	3.97	-	-	-	-	-	-	-	-	-	-	-	-	375	213.2	0.45	375	222.4	0.46	375	272.8	1.00*
500765	91.7	Hammond Bay Road	City 2	250	1.70	-	-	-	-	-	-	375	116.7	0.45	375	128.3	0.48	375	137.5	0.49	375	148.7	0.49	375	156.7	0.50
503547	90 3	Hammond Bay Road	City 2	250	1.53	-	-	-	-	-	-	375	157.4	0.51	375	168.8	0.53	375	178.2	0.55	450	189 2	0.43	450	197.4	0.44
502020	38.6	Hammond Bay Road	City 2	250	1.52	-	-	-	-	-	-	375	159 3	0.49	375	170.7	0.51	375	180.1	0.52	375	191.1	0 54	450	199.3	0.42
503259	20 2	Hammond Bay Road	City 2	375	2.56	-	-	-	-	-	-	-	-	-	-	-	-	675	184.9	0.52	675	195.6	0.53	675	204.0	0.54

***d/D = 1 due to backwater conditions.**

RDN Gravity Main Recommended Upgrades

						2046 PWWF 5-Year I&I No Additional Capita			2046 PWWF 5-Year I&I 5,000 Additional Capita			2046 PWWF 5-Year I&I 10,000 Additional Capita		
Gravity Main ID	Length (m)	Location	Flowpath	Existing Diameter (mm)	Average Depth (m)	Proposed Diameter (mm)	2076 PWWF Design Flow (L/s)	d/D w/ Upgrade (2076)	Proposed Diameter (mm)	2076 PWWF Design Flow (L/s)	d/D w/ Upgrade (2076)	Proposed Diameter (mm)	2076 PWWF Design Flow (L/s)	d/D w/ Upgrade (2076)
NSINT-PIPE20	167.6	North Shore RDN Trunk	RDN 1	750	1.27	-	-	-	-	-	-	-	-	-
NSINT-PIPE18	153.6	North Shore RDN Trunk	RDN 1	750	1.28	-	-	-	-	-	-	-	-	-
NSINT-PIPE17	153.4	North Shore RDN Trunk	RDN 1	750	1.59	-	-	-	-	-	-	-	-	-
NSINT-PIPE16	153.4	North Shore RDN Trunk	RDN 1	750	1.90	-	-	-	-	-	-	-	-	-
NSINT-PIPE13	162.0	North Shore RDN Trunk	RDN 2	900	1.90	-	-	-	-	-	-	-	-	-
NSINT-PIPE12	133.2	North Shore RDN Trunk	RDN 2	900	1.45	-	-	-	-	-	-	-	-	-
NSINT-PIPE11	163.3	North Shore RDN Trunk	RDN 2	900	1.61	-	-	-	-	-	-	-	-	-
NSINT-PIPE10	173.4	North Shore RDN Trunk	RDN 2	900	1.75	-	-	-	-	-	-	-	-	-
NSINT-PIPE9	205.0	North Shore RDN Trunk	RDN 2	900	1.60	-	-	-	-	-	-	-	-	-
NSINT-PIPE8	154.3	North Shore RDN Trunk	RDN 2	900	1.76	-	-	-	-	-	-	-	-	-
NSINT-PIPE7	158.2	North Shore RDN Trunk	RDN 2	900	2.23	-	-	-	-	-	-	-	-	-
NSINT-PIPE6	155.6	North Shore RDN Trunk	RDN 2	900	2.38	-	-	-	-	-	-	-	-	-
NSINT-PIPE5	183.4	North Shore RDN Trunk	RDN 2	900	2.36	-	-	-	-	-	-	-	-	-
NSINT-PIPE4A	91 2	North Shore RDN Trunk	RDN 2	900	2.68	-	-	-	-	-	-	-	-	-

	2046 PWWF 5-Year I&I 15,000 Additional Capita			2046 PWWF 5-Year I&I 20,000 Additional Capita			2046 PWWF 5-Year I&I 25,000 Additional Capita			2046 PWWF 5-Year I&I 30,000 Additional Capita		
Gravity Main ID	Proposed Diameter (mm)	2076 PWWF Design Flow (L/s)	d/D w/ Upgrade (2076)	Proposed Diameter (mm)	2076 PWWF Design Flow (L/s)	d/D w/ Upgrade (2076)	Proposed Diameter (mm)	2076 PWWF Design Flow (L/s)	d/D w/ Upgrade (2076)	Proposed Diameter (mm)	2076 PWWF Design Flow (L/s)	d/D w/ Upgrade (2076)
NSINT-PIPE20	-	-	-	-	-	-	-	-	-	1050	397.6	0.60
NSINT-PIPE18	-	-	-	-	-	-	-	-	-	1050	397.5	0.53
NSINT-PIPE17	-	-	-	-	-	-	-	-	-	1050	397.4	0.55
NSINT-PIPE16	-	-	-	-	-	-	-	-	-	1050	397.6	0.59
NSINT-PIPE13	1200	569.5	0.60	1350	600.0	0.51	1350	618.7	0 52	1350	661.0	0.54
NSINT-PIPE12	1200	572.0	0.60	1350	602.7	0.51	1350	621.4	0 51	1350	663.7	0.53
NSINT-PIPE11	1200	571.7	0.59	1350	602.5	0.50	1350	621 3	0 50	1350	663.6	0.52
NSINT-PIPE10	1200	580.3	0.57	1500	611.3	0.44	1500	630.1	0.45	1500	672.4	0.46
NSINT-PIPE9	1350	580.0	0.50	1500	611.1	0.44	1500	630 0	0.45	1500	672.2	0.46
NSINT-PIPE8	-	-	-	1500	611.0	0.45	1500	629 9	0.45	1500	672.1	0.45
NSINT-PIPE7	-	-	-	1500	611.0	0.45	1500	629 9	0.45	1500	672.1	0.45
NSINT-PIPE6	-	-	-	1500	611.2	0.45	1500	630.1	0.44	1650	672.3	0.40
NSINT-PIPE5	-	-	-	-	-	-	1650	683 9	0.40	1800	725.2	0.36
NSINT-PIPE4A	-	-	-	-	-	-	-	-	-	1800	725.1	0.35

***d/D = 1 due to backwater conditions.**

Upgrade Gravity Main Hydraulic Modeling Results

					2046 PWWF 5-Year I&I No Additional Capita				2046 PWWF 5-Year I&I 5,000 Additional Capita				2046 PWWF 5-Year I&I 10,000 Additional Capita				2046 PWWF 5-Year I&I 15,000 Additional Capita				2046 PWWF 5-Year I&I 20,000 Additional Capita				2046 PWWF 5-Year I&I 25,000 Additional Capita				2046 PWWF 5-Year I&I 30,000 Additional Capita			
Gravity Main ID	Install Year	Length (m)	Material	Slope (/)	Diameter (mm)	Flow (L/s)	d/D	q/Q	Diameter (mm)	Flow (L/s)	d/D	q/Q	Diameter (mm)	Flow (L/s)	d/D	q/Q	Diameter (mm)	Flow (L/s)	d/D	q/Q	Diameter (mm)	Flow (L/s)	d/D	q/Q	Diameter (mm)	Flow (L/s)	d/D	q/Q	Diameter (mm)	Flow (L/s)	d/D	q/Q
501062	1981	126.8	PVC	0.015	250	50.8	0.61	0.690	375	83.7	0.43	0.39	450	111.2	0.39	0.32	450	136.1	0.43	0.39	450	159.9	0.47	0.45	450	182.2	0.51	0.52	525	203.9	0.43	0.38
500802	1981	76.2	PVC	0.052	250	50.9	0.42	0.374	250	83.9	0.57	0.62	250	111.3	0.69	0.82	250	146.9	0.91	1.08	375	160.1	0.44	0.40	375	182.4	0.47	0.45	375	204.0	0.51	0.51
511039	1981	22.7	PVC	0.041	250	50.9	0.46	0.424	250	83.9	0.62	0.70	250	111.3	0.76	0.93	375	142.1	0.44	0.40	375	160.1	0.47	0.45	375	182.4	0.51	0.52	450	204.0	0.41	0.35
501061	1981	82.4	PVC	0.101	250	51.0	0.36	0.270	250	83.9	0.47	0.45	250	111.4	0.55	0.59	250	140.1	0.64	0.74	250	160.1	0.71	0.85	250	182.5	0.79	0.97	375	204.1	0.42	0.37
501059	1981	26.2	PVC	0.095	250	53.8	0.37	0.294	250	86.8	0.49	0.47	250	114.2	0.57	0.62	250	142.9	0.67	0.78	250	162.9	0.74	0.89	250	198.0	0.91	1.08	375	206.9	0.43	0.38
511040	1981	13.4	PVC	0.134	250	53.8	0.34	0.247	250	86.8	0.44	0.40	250	114.2	0.52	0.53	250	142.8	0.59	0.66	250	162.9	0.65	0.75	250	194.7	0.74	0.89	250	206.9	0.79	0.95
501058	1981	45.5	PVC	0.142	250	54.5	0.34	0.244	250	87.5	0.44	0.39	250	115.0	0.51	0.51	250	143.0	0.58	0.64	250	163.7	0.64	0.73	250	188.9	0.71	0.84	250	207.6	0.77	0.93
503056	1981	41.2	PVC	0.141	250	55.0	0.34	0.246	250	88.0	0.44	0.39	250	115.4	0.51	0.52	250	143.5	0.59	0.64	250	164.1	0.64	0.73	250	189.2	0.71	0.85	250	208.1	0.77	0.93
501056	1981	39.5	PVC	0.140	250	55.9	0.34	0.251	250	88.9	0.44	0.40	250	116.4	0.52	0.52	250	144.2	0.59	0.65	250	165.1	0.64	0.74	250	189.1	0.71	0.85	250	209.0	0.77	0.94
503057	1981	42.7	PVC	0.142	250	56.3	0.34	0.251	250	89.3	0.44	0.40	250	116.8	0.51	0.52	250	144.4	0.59	0.64	250	165.5	0.64	0.74	250	188.9	0.71	0.84	250	209.4	0.77	0.93
503335	1981	59.8	PVC	0.101	250	56.8	0.44	0.301	250	89.8	0.58	0.48	250	117.2	0.69	0.62	250	144.9	0.96	0.77	250	165.9	0.73	0.88	250	188.8	0.82	1.00	375	209.9	0.47	0.38
501001	1981	29.1	PVC	0.085	250	65.5	0.40	0.379	250	98.5	0.52	0.57	250	125.9	0.63	0.73	250	153.1	0.87	0.89	375	174.6	0.40	0.34	375	197.4	0.43	0.39	375	218.6	0.46	0.43
501200	1981	75.8	PVC	0.520	200	65.5	0.37	0.277	200	98.5	0.46	0.42	200	125.9	0.53	0.53	200	153.1	0.62	0.65	200	174.6	0.73	0.74	200	197.3	0.85	0.83	200	218.6	0.97	0.92
NSINT-PIPE31	1978	119.1	0	0.001	750	105.4	0.40	0.298	750	138.4	0.47	0.39	750	165.8	0.52	0.47	750	191.3	0.57	0.54	750	214.4	0.62	0.61	750	236.7	0.67	0.67	750	258.2	0.71	0.73
NSINT-PIPE30	1978	119.2	0	0.001	750	105.4	0.42	0.366	750	138.3	0.49	0.48	750	165.8	0.54	0.58	750	190.9	0.59	0.66	750	214.4	0.64	0.74	750	236.6	0.69	0.82	750	258.2	0.74	0.90
NSINT-PIPE29	1978	177.7	0	0.001	750	105.4	0.41	0.364	750	138.3	0.48	0.48	750	165.7	0.54	0.57	750	190.7	0.59	0.66	750	214.3	0.64	0.74	750	236.6	0.69	0.82	750	258.1	0.74	0.89
NSINT-PIPE28	1978	151.6	0	0.001	750	114.1	0.43	0.350	750	147.0	0.50	0.45	750	174.4	0.56	0.54	750	199.3	0.61	0.61	750	222.9	0.66	0.68	750	245.1	0.71	0.75	750	266.6	0.76	0.82
NSINT-PIPE27	1978	128.4	0	0.001	750	114.0	0.45	0.410	750	146.9	0.52	0.53	750	174.3	0.57	0.63	750	199.3	0.63	0.72	750	222.8	0.68	0.80	750	245.0	0.74	0.88	750	266.5	0.78	0.96
NSINT-PIPE26	1978	138.6	0	0.001	750	114.0	0.45	0.402	750	146.9	0.52	0.52	750	174.3	0.58	0.61	750	199.2	0.63	0.70	750	222.8	0.69	0.79	750	244.9	0.75	0.86	750	266.5	0.79	0.94
NSINT-PIPE25	1978	123.7	0	0.001	750	114.0	0.47	0.380	750	146.9	0.54	0.49	750	174.3	0.60	0.58	750	199.2	0.66	0.66	750	222.8	0.71	0.74	750	244.9	0.77	0.82	750	266.6	0.80	0.89
NSINT-PIPE24	1978	134.8	0	0.001	750	131.7	0.50	0.458	750	164.5	0.57	0.57	750	191.9	0.63	0.67	750	216.8	0.68	0.75	750	240.3	0.73	0.84	750	262.3	0.79	0.91	750	284.1	0.82	0.99
NSINT-PIPE23	1978	141.6	0	0.001	750	131.7	0.53	0.469	750	164.6	0.59	0.59	750	191.9	0.65	0.68	750	216.9	0.70	0.77	750	240.4	0.75	0.86	750	262.4	0.81	0.94	750	284.1	0.81	1.01
NSINT-PIPE22	1978	158.9	0	0.001	750	191.8	0.55	0.580	750	224.6	0.61	0.68	750	252.0	0.66	0.76	750	276.8	0.71	0.84	750	300.2	0.76	0.91	750	322.0	0.82	0.98	750	344.0	0.79	1.04
NSINT-PIPE21	1978	147.9	0	0.001	750	191.7	0.57	0.560	750	224.5	0.63	0.66	750	251.8	0.68	0.74	750	276.7	0.73	0.81	750	300.1	0.78	0.88	750	321.9	0.84	0.94	750	344.0	0.76	1.00
NSINT-PIPE20	1978	167.6	0	0.001	750	191.6	0.57	0.672	750	224.4	0.63	0.79	750	251.6	0.69	0.88	750	276.6	0.74	0.97	750	299.9	0.78	1.05	750	321.7	0.84	1.13	1050	343.9	0.54	0.49
NSINT-PIPE19	1978	171.2	0	0.001	750	191.5	0.57	0.581	750	224.3	0.63	0.68	750	251.3	0.70	0.76	750	276.4	0.73	0.84	750	299.8	0.78	0.91	750	321.6	0.83	0.98	750	343.8	0.73	1.04
NSINT-PIPE18	1978	153.6	0	0.001	750	191.4	0.57	0.642	750	224.2	0.64	0.75	750	250.9	0.72	0.84	750	276.3	0.73	0.93	750	299.7	0.77	1.01	750	321.5	0.82	1.08	1050	343.8	0.48	0.47
NSINT-PIPE17	1978	153.4	0	0.001	750	191.3	0.57	0.614	750	224.0	0.65	0.72	750	250.6	0.75	0.81	750	276.1	0.72	0.89	750	299.7	0.75	0.96	750	321.5	0.79	1.03	1050	343.7	0.49	0.45
NSINT-PIPE16	1978	153.4	0	0.001	750	191.3	0.59	0.614	750	223.9	0.68	0.72	750	250.8	0.79	0.81	750	276.0	0.72	0.89	750	299.7	0.72	0.96	750	321.5	0.76	1.03	1050	343.6	0.53	0.45
NSINT-PIPE15	1978	117.3	0	0.001	750	191.3	0.62	0.589	750	224.1	0.72	0.69	750	251.2	0.85	0.77	750	275.9	0.71	0.85	750	299.7	0.67	0.92	750	321.5	0.70	0.99	750	343.7	0.73	1.06
NSINT-PIPE14	1979	112.4	0	0.000	900	191.7	0.72	0.502	900	224.5	0.81	0.59	900	251.6	0.92	0.66	900	275.9	0.77	0.72	900	299.8	0.71	0.79	900	321.7	0.72	0.84	900	343.9	0.74	0.90
NSINT-PIPE13	1978	162.0	0	0.000	900	340.4	0.74	0.905	900	385.7	0.83	1.03	900	424.4	0.93	1.13	1200	459.8	0.60	0.57	1350	494.6	0.48	0.45	1350	526.8	0.48	0.48	1350	557.9	0.50	0.50
NSINT-PIPE12	1978	133.2	0	0.000	900	342.1	0.74	0.890	900	387.3	0.83	1.01	900	425.8	0.93	1.11	1200	460.6	0.62	0.56	1350	496.1	0.48	0.44	1350	528.4	0.48	0.47	1350	559.7	0.49	0.49
NSINT-PIPE11	1978	163.3	0	0.000	900	341.8	0.74	0.912	900	387.0	0.83	1.03	900	425.3	0.92	1.14	1200	459.3	0.64	0.57	1350	495.4	0.49	0.45	1350	528.0	0.48	0.48	1350	559.4	0.49	0.51
NSINT-PIPE10	1978	173.4	0	0.000	900	347.8	0.74	0.894	900	392.8	0.82	1.01	900	431.1	0.91	1.11	1200	464.0	0.67	0.55	1500	500.6	0.45	0.33	1500	533.6	0.44	0.35	1500	565.2	0.44	0.37
NSINT-PIPE9	1978	205.0	0	0.000	900	347.5	0.75	0.869	900	392.5	0.83	0.98	900	430.6	0.91	1.08	1350	462.0	0.64	0.39	1500	499.2	0.49	0.32	1500	532.6	0.46	0.34	1500	564.5	0.46	0.36
NSINT-PIPE8	1979	154.3	0	0.000	900	347.4	0.75	0.901	900	392.4	0.83	1.02	900	430.4	0.90	1.12	900	461.9	0.98	1.20	1500	498.0	0.52	0.33	1500	531.7	0.49	0.35	1500	563.7	0.48	0.37
NSINT-PIPE7	1979	158.2	0	0.000	900	347.4	0.75	0.912	900	392.3	0.83	1.03	900	430.4	0.89	1.13	900	462.0	0.96	1.21	1500	497.2	0.55	0.33	1500	531.1	0.51	0.36	1500	563.1	0.50	0.38
NSINT-PIPE6	1979	155.6	0	0.000	900	347.4	0.76	0.905	900	392.4	0.82	1.02	900	430.4	0.88	1.12	900	462.1	0.94	1.20	1500	497.2	0.59	0.33	1500	530.6	0.54	0.35	1650	562.5	0.48	0.29
NSINT-PIPE5	1978	183.4	0	0.000	900	384.9	0.75	0.960	900	430.0	0.81	1.07	900	468.1	0.86	1.17	900	498.7	0.91	1.24	900	533.9	0.97	1.33	1650	567.6	0.53	0.28	1800	599.7	0.47	0.24
NSINT-PIPE4A	1978	91.2	0	0.000	900	384.8	0.74	1.015	900	430.0	0.79	1.13	900	468.1	0.84	1.23	900	498.7	0.88	1.32	900	533.9	0.93	1.41	900	567.4	0.98	1.50	1800	599.1	0.50	0.25
NSINT-PIPE4	1978	105.6	0	0.000	900	389.9	0.72	0.990	900	435.1	0.77	1.11	900	473.2	0.81	1.20	900	503.8	0.85	1.28	900	539.0	0.89	1.37	900	572.4	0.93	1.45	900	604.1	0.98	1.53
NSINT-PIPE3	1978	168.8	0	0.000	900	389.9	0.68	1.057	900	435.1	0.72	1.18	900	473.1	0.76	1.28	900	503.8	0.79	1.37	900	539.0	0.82	1.46	900	572.4	0.85	1.55	900	604.1	0.89	1.64
NSINT-PIPE2	1978	122.6	0	0.000	900	389.8	0.60	0.973	900	435.0	0.63	1.09	900	473.1	0.66	1.18	900	503.8	0.68	1.26	900	539.0	0.71	1.35	900	572.4	0.73	1.43	900	604.1	0.75	1.51
NSINT-PIPE1	1978	48.7	0	0.000	900	389.8	0.65	1.062	900	435.0	0.64	1.19	900	473.1	0.65	1.29	900	503.8	0.65	1.37	900	539.0	0.59	1.47	900	572.4	0.61	1.56	900	604.1	0.63	1.65
CDT_15	1980	7.4	0	0.016	900	675.7	0.72	0.293	900	681.0	0.71	0.30	900	691.5	0.71	0.30	900	702.0	0.70	0.30	900	698.6	0.65	0.30	900	728.4	0.67	0.32	900	768.2	0.69	0.33
HBINT-PIPE40	1976	52.5	0	0.007	900	445.3	0.40	0.289	900	490.6	0.42	0.32	900	528.7	0.44	0.34	900	559.3	0.45	0.36	900	594.1	0.47	0.39	900	627.8	0.49	0.41	900	659.4	0.50	0.43
HBINT-PIPE41	1976	186.5	0	0.004	900	445.3	0.41	0.373	900	490.6	0.43	0.41	900	528.7	0.45	0.44	900	559.3	0.47	0.47	900	594.1	0.49	0.50	900	627.8	0.50	0.53	900	659.4	0.52	0.55
HBINT-PIPE42	1976	188.9	0	0.008	750	448.0	0.47	0.443	750	493.3	0.49	0.49	750	531.4	0.52	0.53	750	562.0	0.53	0.56	750	596.8	0.55	0.59	750	630.5	0.57	0.62	750	662.1	0.59	0.65
HBINT-PIPE43	1976	163.4	0	0.008	750	448.0	0.49	0.448	750	493.3	0.52	0.49	750	531.4	0.55	0.53	750	562.0	0.57	0.56	750	596.8	0.59	0.60	750	630.5	0.61	0.63	750	662.1	0.63	0.66
HBINT-PIPE44	1976	162.4	0	0.008	750	448.0	0.43	0.445	750	493.3	0.45	0.49	750	531.4	0.47	0.53	750	562.0	0.49	0.56	750	596.8	0.51	0.59	750	630.4	0.53	0.63	750	662.1	0.54	0.66
HBINT-PIPE45	1976	87.8	0	0.026	750	448.0	0.41	0.251	750	493.3	0.44	0.28	750	531.4	0.45	0.30	750	562.0	0.47	0.32	750	596.8	0.49	0.34	750	630.4	0.50	0.35	750	662.1	0.52	0.37
HBINT-PIPE46	1976	146.0	0	0.008	750	471.4	0.48	0.471	750	516.8	0.51	0.52	750	554.8	0.53	0.55	750	585.4	0.55	0.59	750	620.1	0.57	0.62	750	653.9	0.59	0.65	750	685.4	0.61	0.69
HBINT-PIPE47	1976	120.0	0	0.009	750	471.4	0.48	0.459	750	516.8	0.50	0.50	750	554.8	0.52	0.54	750	585.4	0.54	0.57	750	620.1	0.56	0.60	750	653.9	0.58	0.64	750	685.4	0.60	0.67
HBINT-PIPE48	1976	167.7	0	0.003	900	480.2	0.49	0.518	900	525.6	0.52	0.57	900	563.7	0.54	0.61	900	594.3	0.56	0.64	900	628.9	0.58	0.68	900	662.7	0.60	0.72	900	694.2	0.61	0.75
HBINT-PIPE49	1976	87.3	0	0.004	900	483.5	0.47	0.428	900	528.9	0.50	0.47	900	567.0	0.52	0.50	900	597.6	0.54	0.53	900	632.2	0.55	0.56	900	666.0	0.57	0.59	900	697.5	0.59	0.62
HBINT-PIPE50	1976	122.3	0	0.003	900	483.5	0.50	0.479	900	528.9	0.53	0.52	900	567.0	0.55	0.56	900	597.6	0.57	0.59	900	632.2	0.59	0.63	900	666.0	0.61	0.66	900	697.5	0.63	0.69
HBINT-PIPE51	1976	96.9	0	0.003	900	485.2	0.49	0.517	900	530.6	0.51	0.57	900	568.6	0.53	0.61	900	599.2	0.55	0.64	900	633.8	0.56	0.68	900	667.6	0.58	0.71	900	699.1	0.60	0.75
HBINT-PIPE52	1974	72.8	0	0.004	900	489.0	0.46	0.435	900	534.4	0.48	0.48	900	572.5	0.50	0.51	900	603.1	0.52	0.54	900	637.7	0.53	0.57	900	671.4	0.55	0.60	900	703.0	0.56	0.63
HBINT-PIPE5C	1999	64.2	0	0.010	1350	1666.1	0.38	0.312	1350	1711.5	0.39	0.32	1350	1749.7	0.39	0.33	1350	1780.2	0.40	0.33	1350	1814.7	0.40	0.34	1350	1848.5	0.41	0.35	1350	1880.1	0.41	0.35
500995	1992	55.4	PVC	0.007	250	28.7	0.56	0.590	300	41.9	0.52	0.53	375	53.4	0.42	0.37	375	64.2	0.47	0.45	375	74.3	0.51	0.52	450	84.1	0.42	0.36	450	93.5	0.44	0.40
501188	1992	47.8	PVC	0.007	250	30.5	0.57	0.618	300	43.7	0.53	0.54	375	55.2	0.43	0.38	375	65.9	0.47	0.45	375	76.0	0.51	0.52	450	85.8	0.42	0.36	450	95.2	0.44	0.40
501658	1992	84.2	PVC	0.008	250	30.9	0.60	0.596	300	44.0	0.51	0.52	375	55.6	0.44	0.36	375	66.3	0.49	0.43	375	76.4	0.50	0.50	375	86.2	0.54	0.56	450	95.6	0.46	0.38
501483	1992	74.6	PVC	0.005	250	31.1	0.60	0.706	375	44.2	0.41	0.34	375	55.8	0.44	0.43	375	66.5	0.49	0.51	450	76.6	0.42	0.36	450	86.4	0.43	0.41	450	95.8	0.46	0.45
501657	1992	30.4	PVC	0.008	250	31.2	0.60	0.603	300	44.3	0.52	0.53	375	55.9	0.44	0.37	375	66.6	0.48	0.44	375	76.7	0.50	0.50	450	86.5	0.42	0.35	450	95.9	0.45	0.39
503550	1992	75.6	PVC	0.005	250	33.3	0.78	0.790	375	46.5	0.45	0.37	375	58.0	0.48	0.47	375	68.7	0.53	0.55	450	78.8	0.45	0.39	450	88.7	0.49	0.44	450	98.0	0.49	0.49
501161	1992	70.4	PVC	0.004	250	40.3	0.83	1.073	375	53.4	0.47	0.48	450	65.0	0.41	0.36	450	75.7	0.44	0.42	450	85.8	0.47	0.48	450	95.6	0.50	0.53	525	105.0	0.42	0.39
500983	1992	66.6	PVC	0.006	250	40.4	0.73	0.912	375	53.6	0.45	0.41	375	65.1	0.50	0.50	450	75.9	0.41	0.36	450	86.0	0.44	0.41	450	95.8	0.47	0.45	450	105.1	0.50	0.50
503377	1992	109.3	PVC	0.009	250	42.7	0.57	0.758	375	55.8	0.37	0.34	375	68.9	0.42	0.42	375	78.1	0.45	0.47	375	88.2	0.48	0.53	450	98.8	0.40	0.37	450	107.4	0.42	0.40
502209	1991	69.5	PVC	0.031	300	43.8	0.35	0.256	300	57.0	0.40	0.33	300	69.1	0.55	0.40	300	79.2	0.47	0.49	300	89.3	0.52	0.52	300	98.8	0.56	0.58	300	108.5	0.60	0.63
511503	1979	4.1	PVC	0.007	375	65.3	0.46	0.434	450	78.4	0.39	0.32	450	93.9	0.41	0.38	450	100.6	0.46	0.41	450	110.7	0.47	0.45	450	121.2	0.50	0.50	450	129.8	0.56	0.53
503360	1979	91.0	PVC	0.014	375	67.5	0.45	0.328	450	80.6	0.34	0.24	450	130.6	0.42	0.39	450	116.9	0.40	0.35	450	151.5	0.46	0.45	525	152.5	0.37	0.30	450	150.2	0.45	0.45
501179	1991	40.9	PVC	0.016	250	67.5	0.75	0.907	375	80.6	0.42	0.37	375	107.4	0.49	0.49	375	102.9	0.48	0.47	450	121.6	0.40	0.34	450	134.5	0.43	0.38	450	132.3	0.42	0.37
503231	1975	115.6	CP	0.021	375	69.0	0.47	0.271	375	82.1	0.50	0.32	375	105.4	0.56	0.41	375	104.4	0.57	0.41	375	116.0	0.60	0.46	450	133.3	0.51	0.32	450	133.6	0.52	0.32
512906	1975	25.4	CP	0.001	525	69.4	0.42	0.417	600	82.5	0.38	0.35	600	103.8	0.42	0.44	600	104.8	0.43	0.44	600	114.9	0.45	0.48	600	131.8	0.46	0.56	600	134.0	0.47	0.57
512907	1975	96.7	CP	0.003	450	70.8	0.47	0.451	525	83.9	0.42	0.35	525	102.0	0.47	0.43	525	106.2	0.49	0.45	525	116.3	0.50	0.49	600	130.7	0.45	0.39	600	135.5	0.46	0.40
503230	1975	29.8	CP	0.003	525	70.9	0.34	0.318	525	84.0	0.38	0.38	525	100.7	0.38	0.45	525	106.3	0.40	0.48	600	116.4	0.35	0.37	600	129.8	0.37	0.41	600	135.5	0.38	0.43
500765	1975	91.7	CP	0.032	250	71.3	0.68	0.669	250	84.4	0.77	0.79	375	100.8	0.41	0.32	375	106.7	0.42	0.34	375	116.8	0.44	0.37	375	129.7	0.45	0.41	375	136.0	0.46	0.43
503547	1975	90.3	CP	0.031	250	100.6	0.79	0.959	250	120.8	0.95	1.15	375	129.9	0.45	0.42	375	136.0	0.46	0.44	375	146.1	0.48	0.47	450	158.4	0.39	0.32	450	165.2	0.40	0.33
502020	1975	38.6	CP	0.036	250	101.9	0.74	0.899	250	132.2	0.91	1.17	375	131.1	0.44	0.39	375	137.3	0.45	0.41	375	147.4	0.47	0.44	375	159.6	0.49	0.48	450	166.5	0.38	0.31
502021	1990	53.4	PVC	0.003	600	102.0	0.52	0.313	600	117.8	0.42	0.36	600	131.1	0.45	0.40	600	137.4	0.46	0.42	600	147.5	0.48	0.45	675	159.6	0.42	0.36	675	166.6	0.43	0.37
511037	1990	61.7	PVC	0.003	375	104.2	0.95	1.156	600	118.4	0.40	0.38	600	133.0	0.43	0.42	600	139.6	0.45	0.44	600	149.7	0.46	0.47	675	161.6	0.41	0.37	675	168.9	0.41	0.39
501012	1990	92.1	PVC	0.003	375	104.7	0.93	1.146	600	118.1	0.50	0.37	600	133.0	0.54	0.42	600	140.2	0.58	0.44	600	150.3	0.49	0.47	675	161.7	0.44	0.37	900	169.4	0.32	0.18
503259	1990	20.2	PVC	0.002	375	105.2	0.84	1.217	375	118.3	0.89	1.37	375	132.9	0.94	1.54	375	140.4	1.00	1.63	675	150.7	0.48	0.36	675	161.9	0.49	0.39	675	169.9	0.50	0.41
500894	1996	157.6	CP	0.032	375	105.3	0.40	0.338	375	118.5	0.43	0.38	375	132.8	0.46	0.43	375	140.5	0.47	0.45	375	150.8	0.49	0.48	375	161.8	0.51	0.52	375	170.0	0.53	0.55
503456	1996	35.7	CP	0.015	375	109.5	0.51	0.517	375	122.7	0.55	0.58	375	137.0	0.59	0.65	375	144.8	0.61	0.68	375	155.1	0.64	0.73	375	165.9	0.67	0.78	375	174.3	0.70	0.82

Upgrade Gravity Main Hydraulic Modeling Results

					2046 PWWF 5-Year I&I No Additional Capita				2046 PWWF 5-Year I&I 5,000 Additional Capita				2046 PWWF 5-Year I&I 10,000 Additional Capita				2046 PWWF 5-Year I&I 15,000 Additional Capita				2046 PWWF 5-Year I&I 20,000 Additional Capita				2046 PWWF 5-Year I&I 25,000 Additional Capita				2046 PWWF 5-Year I&I 30,000 Additional Capita			
Gravity Main ID	Install Year	Length (m)	Material	Slope (/)	Diameter (mm)	Flow (L/s)	d/D	q/Q	Diameter (mm)	Flow (L/s)	d/D	q/Q	Diameter (mm)	Flow (L/s)	d/D	q/Q	Diameter (mm)	Flow (L/s)	d/D	q/Q	Diameter (mm)	Flow (L/s)	d/D	q/Q	Diameter (mm)	Flow (L/s)	d/D	q/Q	Diameter (mm)	Flow (L/s)	d/D	q/Q
500702	1999	41.6	PVC	0.012	375	109.6	0.55	0.582	375	122.8	0.59	0.65	375	137.1	0.63	0.73	375	144.9	0.66	0.77	375	155.2	0.69	0.82	375	165.9	0.73	0.88	375	174.4	0.76	0.93
500703	1999	146.0	PVC	0.012	375	110.8	0.55	0.584	375	124.0	0.59	0.65	375	138.0	0.63	0.73	375	146.1	0.66	0.77	375	156.4	0.69	0.82	375	166.7	0.73	0.88	375	175.6	0.76	0.93
500701	1996	112.1	PVC	0.007	450	105.7	0.47	0.456	450	117.1	0.50	0.51	450	129.0	0.53	0.56	450	135.9	0.55	0.59	450	144.8	0.57	0.63	450	153.6	0.60	0.66	450	161.3	0.62	0.70
511029	1988	21.9	PVC	0.005	450	124.3	0.56	0.624	450	137.5	0.60	0.69	450	151.2	0.63	0.76	450	159.6	0.65	0.80	450	169.8	0.68	0.85	450	180.0	0.70	0.90	450	189.0	0.73	0.95
500694	1996	117.4	PE	0.186	400	126.8	0.26	0.141	400	140.0	0.27	0.16	400	153.7	0.28	0.17	400	162.1	0.29	0.18	400	172.4	0.30	0.19	400	182.6	0.31	0.20	400	191.6	0.31	0.21
500697	1996	140.0	PE	0.106	400	126.9	0.29	0.187	400	140.1	0.31	0.21	400	153.8	0.32	0.23	400	162.2	0.33	0.24	400	172.5	0.34	0.25	400	182.7	0.36	0.27	400	191.6	0.36	0.28
501965	1993	41.7	PVC	0.088	300	151.4	0.52	0.527	300	164.6	0.54	0.57	300	178.3	0.57	0.62	300	186.7	0.59	0.65	300	197.0	0.61	0.69	300	207.2	0.63	0.72	300	216.1	0.65	0.75
501964	1993	94.1	PVC	0.092	300	151.4	0.51	0.515	300	164.6	0.54	0.56	300	178.3	0.56	0.61	300	186.7	0.58	0.64	300	197.0	0.60	0.67	300	207.2	0.62	0.71	300	216.1	0.64	0.74
501962	1993	56.2	PVC	0.091	300	151.5	0.51	0.520	300	164.7	0.54	0.57	300	178.5	0.57	0.61	300	186.8	0.58	0.64	300	197.2	0.60	0.68	300	207.4	0.62	0.71	300	216.3	0.64	0.74
501953	1993	36.1	PVC	0.089	300	151.5	0.52	0.524	300	164.7	0.54	0.57	300	178.5	0.57	0.62	300	186.8	0.59	0.65	300	197.2	0.61	0.68	300	207.4	0.63	0.72	300	216.3	0.65	0.75
501952	1993	65.1	PE	0.150	300	151.5	0.44	0.405	300	164.7	0.47	0.44	300	178.5	0.49	0.48	300	186.8	0.50	0.50	300	197.2	0.52	0.53	300	207.4	0.53	0.56	300	216.3	0.55	0.58