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To: **The Town of Okotoks**

Date: **September 11, 2024**

Attention: **Mitch Thompson, P.Eng.**

Project No.: **28555**

Cc:

Reference: **Sanitary Master Plan Amendment (South Railway Street)**

From: **Jeremy Shinbine, P.Eng., Sarah Barbosa, P.Eng., ENV SP**

1.0 Introduction

1.1 Purpose

In 2016, ISL Engineering and Land Services Ltd. (ISL) prepared the Sanitary Servicing Master Plan for the Town of Okotoks (the Town). In 2020 and 2022, the Town hired ISL to revise/update the plan based on the Town's new growth plans. Staging plans were developed for existing system improvements along with future system expansion, and servicing concepts were given for the 5-year, 10-year, 25-year, and ultimate servicing horizons. As a corollary to the 2022 study (finalized in 2024), ISL also did an internal sensitivity analysis on the existing South Railway Street (SRS), to find out how much development can happen before surcharging levels go beyond acceptable levels and upgrades are needed. After this sensitivity analysis, the Town did more flow monitoring within the study area to validate the model. **Figure 1.1** shows the existing study area.

The scope of work included:

1. Review recently acquired rain gauge and flow monitoring data within the study area to validate the dry and wet weather flows within the existing model.
2. Update the existing model such that the SRS is consistent with the Town's most recent GIS information.
3. Incrementally add additional flows from D'Arcy Ranch as part of a sensitivity analysis to determine trigger points for upgrades.
4. Document the SRS upgrading trigger points in terms of flow, population, area, and estimated year of development.
5. Evaluate options to delay upgrades to the SRS and ensure alignment of sanitary infrastructure upgrade recommendations with downtown enhancements.
6. Provide cost estimates for any proposed improvements to delay full upgrades along the SRS.

1.2 Background

Background information for previous recommendations along the SRS sewer are summarized below and numbered sequentially for ease of reference. These recommendations are summarized in **Figure 1.2** for reference and relevant figures from previous reports are shown in **Appendix A**. Additionally, the D'Arcy Lands Outline Plan approved by the Town of Okotoks on February 16, 2017, is included as it was used to project full development flow rates in later sections of this memo.

Town of Okotoks Sanitary Servicing Master Plan Update, July 2016 (Project No. 26327)

- **Recommendation #1:** Install a flow plug along NRS at Centre Avenue and Elizabeth Street to divert flows southwards through a 300 mm sewer into SRS. This upgrade has been implemented.
- **Recommendation #2:** Upgrade 165 m of existing 200 mm to 300 mm sewer along Clark Street from the back lane north of Wilson Street to Knight Street. This optional upgrade has not been implemented.
- **Recommendation #3:** Several manholes within the 100-year Sheep River flood extents were recommended to be sealed to reduce severe inflow and infiltration (I-I) during significant events. This upgrade has been implemented.

Town of Okotoks Sanitary Servicing Master Plan Update Memorandum, February 2020 (Project No. 27471)

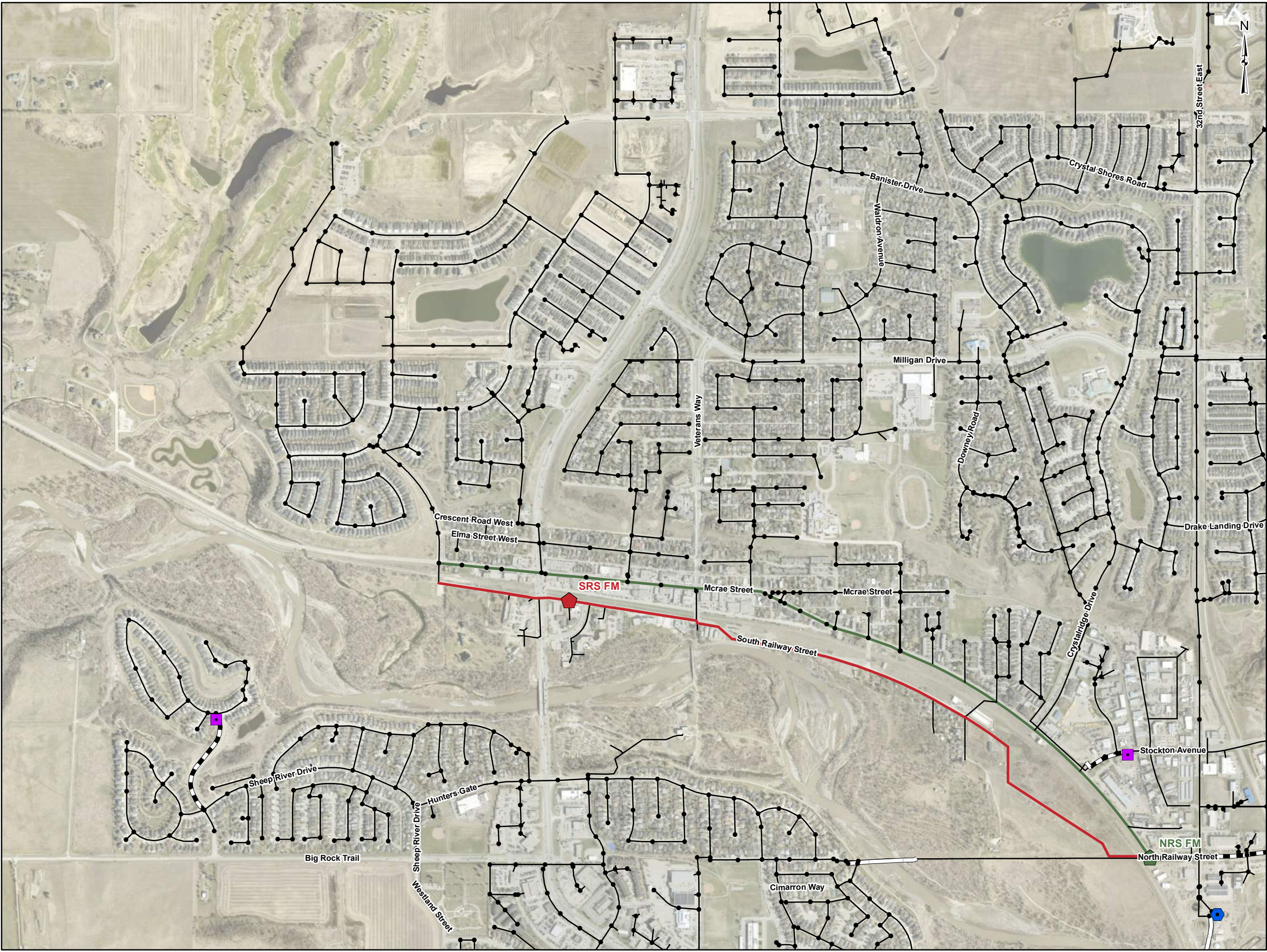
- **Recommendation #4:** Replace existing sewers with 158 m of 525 mm sewer along NRS from the junction of SRS and NRS to Fisher Gate, and then replace 250 m of existing sewer with 750 mm sewer along Fisher Gate from NRS to the Wastewater Treatment Plant (WWTP). This upgrade has not been implemented and upgrading alternatives were reviewed as part of the Town of Okotoks Sanitary Servicing Study Update, April 2024 (Project No. 28019).
- **Recommendation #5:** Replace approximately 1,480 m of existing 200 – 375 mm sewer with 450 mm sewer along SRS from Northridge Drive North to Oak Avenue. This upgrade has not been implemented and interim solutions and alternative upgrading options are being analyzed as part of this memorandum. For context, the cost of this upgrade was estimated to be \$3.9M (in 2020 dollars). This would equate to approximately \$4.6M in 2024 dollars (as per the Bank of Canada's Inflation Calculator).

Town of Okotoks South Railway Street Sensitivity Analysis, August 2022 (Project No. 28019 – Internal Deliverable)

- The sensitivity analysis used the existing system scenario as a basis with additional constant flows being added to the upstream end of the SRS at Mountainview Gate and west of Riverside Drive.
- Flows were increased incrementally to pinpoint the key surcharging levels of interest (e.g. flooding to ground surface, surcharging to within 2.5 m of ground, etc.).
- The allowable flow level of service was then calculated as the flow rate which caused the manhole to surcharge to within 2.5 m of the ground surface.
- Results from this assessment have been updated and built upon as part of this project.

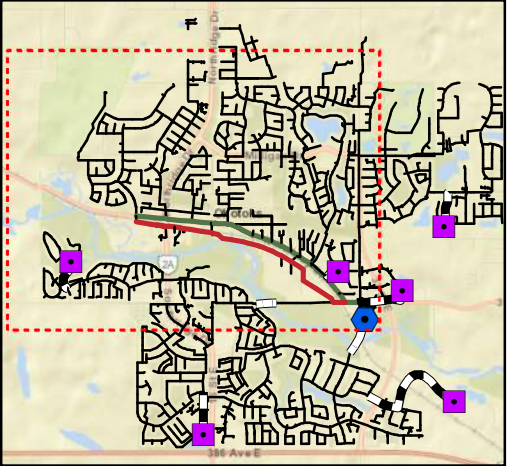
Town of Okotoks Sanitary Servicing Study Update, April 2024 (Project No. 28019)

- **Recommendation #6:** the preferred upgrading alternative for the NRS was determined to be:
 - Replace the existing 450 mm and 525 mm sewers along NRS from the SRS/NRS junction to Fisher Gate with a 900 mm sewer;
 - Replace the existing 450 mm along Fisher Gate with a 1,050 mm sewer; and
 - Twin the existing 900 mm just upstream of the WWTP inlet with an additional 900/1,050 mm sewer (size depends on future growth densities).
- **Recommendation #7:** Upgrade 407 m of existing 250 mm to 300 mm sewer along NRS from McRae Avenue to Poplar Avenue.



LEGEND

- Manhole
- NRS Flow Monitor
- SRS Flow Monitor
- WWTP
- Lift Stations
- Sanitary Sewers
- NRS
- SRS
- ▬ Forcemains
- ▬ Syphon



TITLE
STUDY AREA

PROJECT
SANITARY MASTER PLAN AMENDMENT (SOUTH RAILWAY STREET)
CLIENT
THE TOWN OF OKOTOKS

DATA SOURCES
- Topographic Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT
P, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand),
NGCC, (c) OpenStreetMap contributors, and the GIS User Community
Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

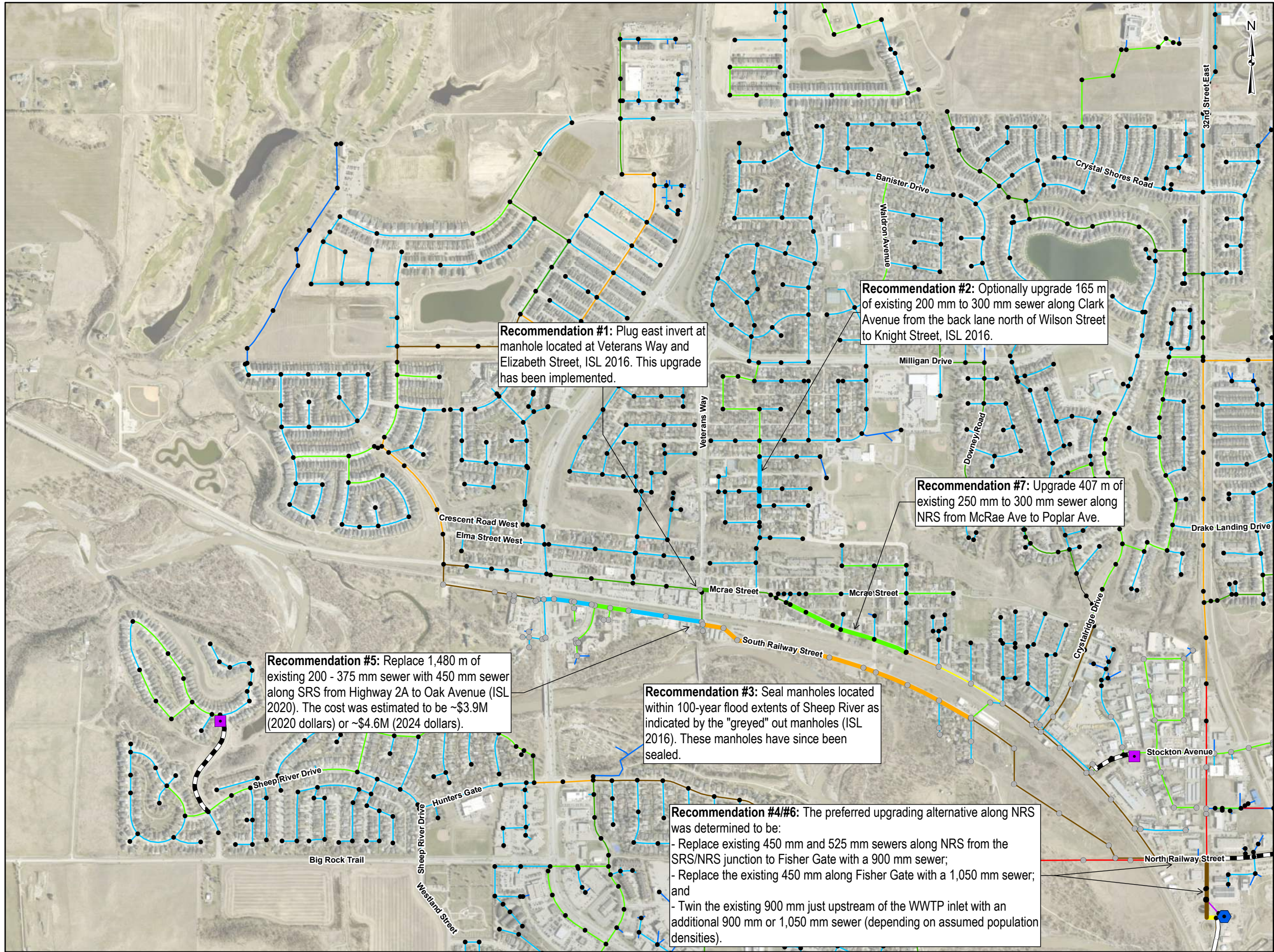
PROJECTION
NAD 1983 CSRS 3TM 114

0 87.5 175 350
1:12,500 Meters



FIGURE 1.1
DATE 9/10/2024
PROJECT NO. 28555
AUTHOR JS

Document Path: Z:\SharedModels\Jeremy\28555- Okotoks Sanitary Sewer Study\01_GIS\Figure 1.2 - Background Information.mxd



- LEGEND**
- WWTP
 - Lift Stations
 - Sanitary Manholes
 - Syphon
 - Forcemains
- Sanitary Sewers**
- Unknown
 - <= 150 mm
 - 200 mm
 - 250 mm
 - 300 mm
 - 350 mm
 - 375 mm
 - 450 mm
 - 525 mm
 - 675 mm
 - 900 mm

Note: Bold pipes and greyed out manholes indicate locations of previous upgrading recommendations.

TITLE
BACKGROUND INFORMATION

PROJECT
SANITARY MASTER PLAN AMENDMENT (SOUTH RAILWAY STREET)
CLIENT
THE TOWN OF OKOTOKS

DATA SOURCES
- Topographic Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

PROJECTION
NAD 1983 CSRS 3TM 114

0 87.5 175 350
1:12,500 Meters



FIGURE 1.2
DATE 9/10/2024
PROJECT NO. 28555
AUTHOR JS

2.0 Modelling Approach

2.1 Model Updates

The existing hydrodynamic MIKE URBAN model was constructed and calibrated for the Sanitary Master Plan and was updated in 2020, 2022, and in 2024. The SRS has been updated as part of this project based on the most recent GIS information provided by the Town. **Figure 2.1** shows the sanitary sewer diameters from the updated GIS database which is now reflected in the model.

2.2 Level of Service

A single level of service (LOS) was applied for both the existing and future system assessments. The chosen LOS is the 50-year 24-hour Q4 Huff Storm (referred to herein as the 50-year), to be consistent with previous assessments and the criteria selected by the City of Calgary. A Huff rainfall distribution replicates a storm with a moderate peak intensity, which is ideal for wastewater system analysis. The initial RDII boundary condition for the root zone storage (Lini) for each catchment was adjusted such that the L/Lmax ratio is 50% at the beginning of the design storm simulations. This design storm has been implemented as the Town's level of service for wet weather flow due to its proximity to Calgary. The rainfall hyetograph for this event is shown in **Chart 2.1**.

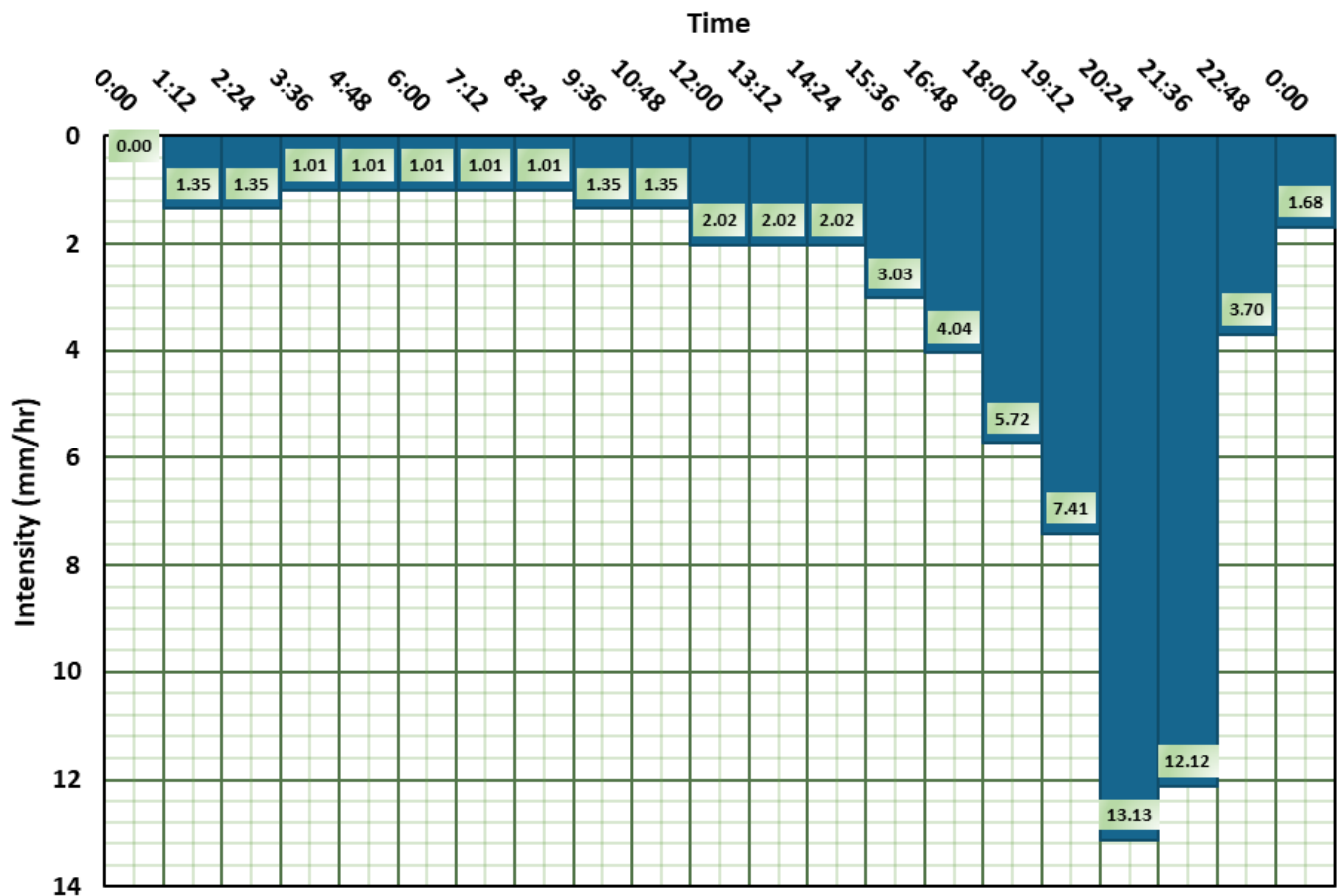
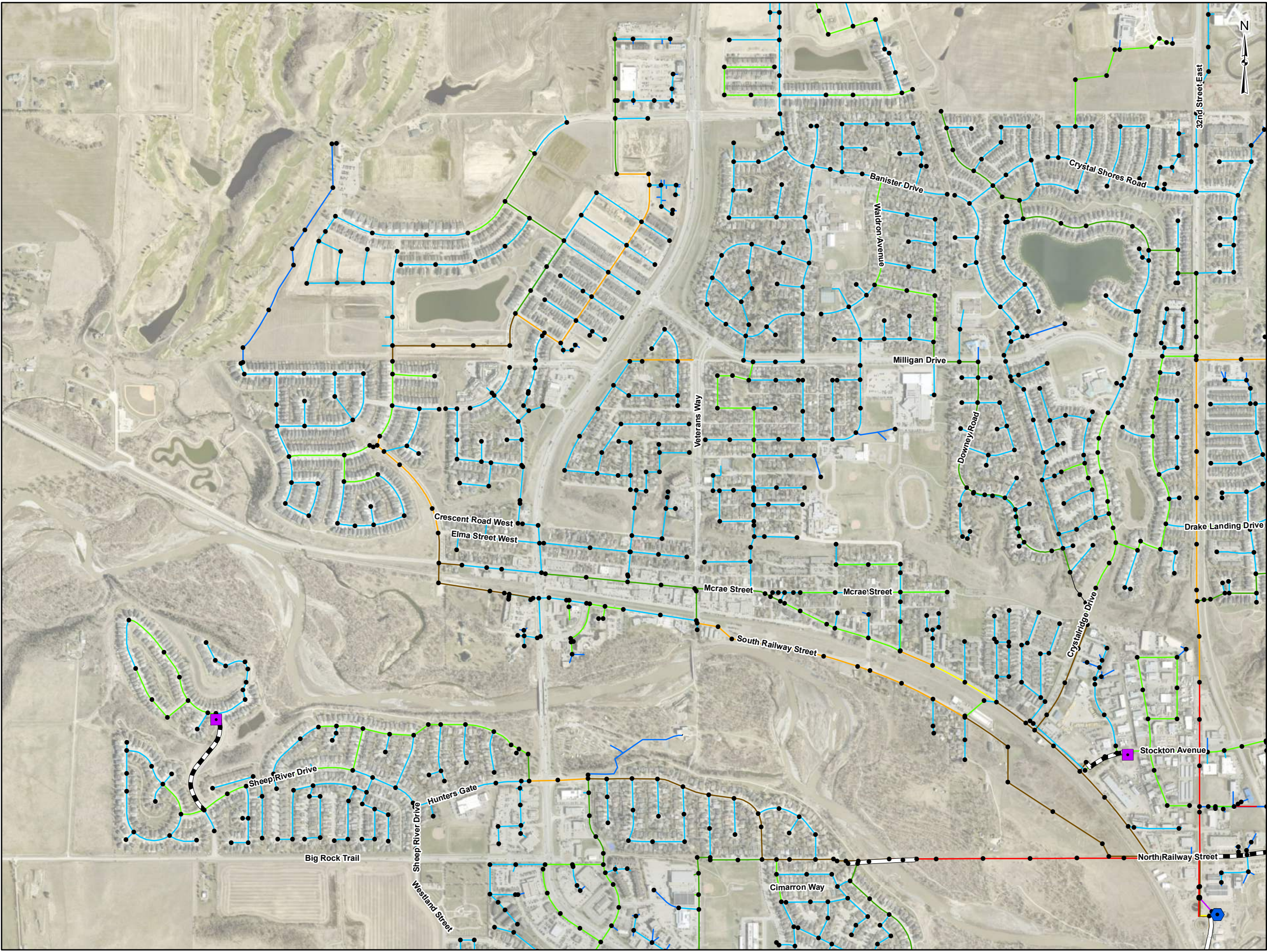


Chart 2.1 50-Year, 24-Hour Q4 Huff Storm Rainfall Hyetograph

Document Path: Z:\SharedModels\JeremyS\28555 - Okotoks Sanitary Sewer Study\01_GIS\Figure 2.1 - Existing Sanitary Sewer Diameters.mxd



LEGEND

- WWTP
- Lift Stations
- Sanitary Manholes
- Syphon
- Forcemains

Sanitary Sewers

- Unknown
- <= 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 375 mm
- 450 mm
- 525 mm
- 675 mm
- 900 mm

TITLE
**EXISTING SANITARY SEWER
DIAMETERS**

PROJECT
SANITARY MASTER PLAN AMENDMENT (SOUTH RAILWAY STREET)
CLIENT
THE TOWN OF OKOTOKS

DATA SOURCES
- Topographic Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

PROJECTION
NAD 1983 CSRS 3TM 114

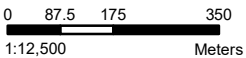


FIGURE 2.1
DATE 9/10/2024
PROJECT NO. 28555
AUTHOR JS

2.3 Assessment Criteria

The performance of the sanitary system is ultimately determined based on the available freeboard between the ground elevation and high-water level elevation (represented by the maximum hydraulic grade line, or HGL) at each manhole for each assessment design rainfall storm. Based on this, the maximum allowable surcharge in the gravity portion of the sanitary sewer systems must remain at least 2.5 m from the ground surface. A freeboard of 2.5 m adheres to the City of Calgary's allowable surcharge criteria defined in the Design and Asset Performance Objectives for Hydraulic Modelling – Revision 1 memorandum (City of Calgary, 2012). It is understood that many parcels along the SRS do not have basements, thus, the 2.5 m benchmark for upgrading should be examined based on the Town's risk tolerance. To facilitate this, additional benchmarks of 1.0 m and 0.3 m (~1 ft) to peak HGL have also been considered.

3.0 System Analysis

3.1 Flow Monitoring Data Validation

Flow monitoring data was recently acquired at two locations along the SRS and NRS as shown in [Figure 1.1](#). The flow monitoring data is summarized in [Chart 3.1](#). There were three instances (June 29, July 4, and September 22) where there were significant spikes in the flow monitoring data due to hydrant flow testing in the upstream D'Arcy sewershed. These spikes have been removed from the data. Additionally, where some of the monitored data showed up as negative values, they were set to 0 mm depths (which can be seen in the SRS flow monitor). Note that only depth data was available for the flow monitors, therefore the review is based on a comparison between monitored and modelled depths.

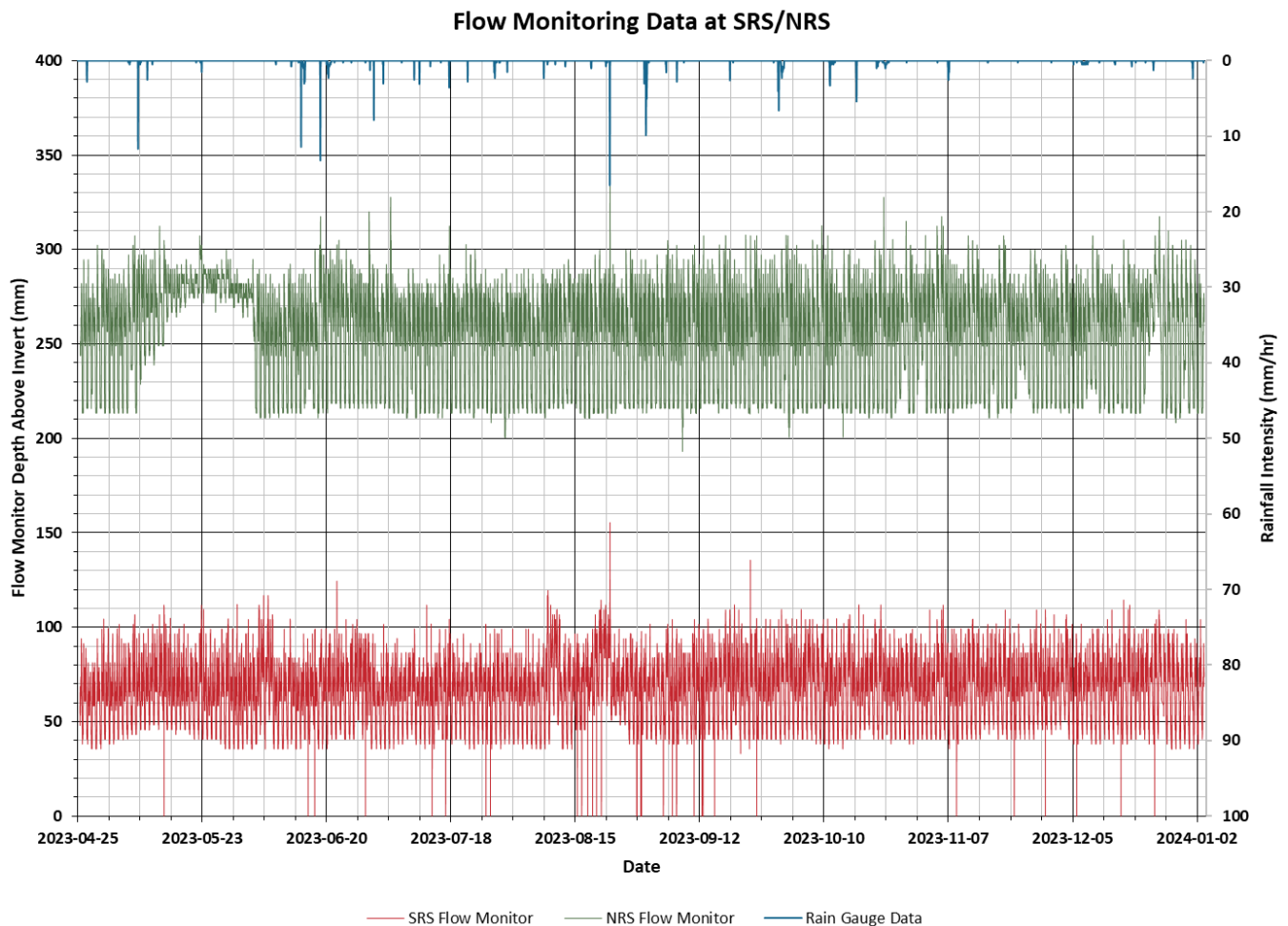


Chart 3.1 Summary of Rain Gauge and Flow Monitoring Data

To validate the existing model, the rain gauge data was assessed to determine a representative storm event to model. [Table 3.1](#) summarizes the five largest events that occurred over the monitoring period, organized by precipitation depth (mm). From this, the June 18, 2023 event (2:00 PM) was selected (bolded below) since there are several days of dry-weather flow prior to the storm event; thus, both dry-weather flow (DWF) and wet-weather flow (WWF) conditions can be verified in the model.

Table 3.1 Significant Rainfall Events

Largest Events	Duration	Maximum Intensity	Average Intensity	Precipitation
	hr	mm/hr	mm/hr	mm
2023-06-18 14:00	3.0	13.2	6.0	18.0
2023-08-22 19:00	2.0	16.5	8.8	17.5
2023-08-30 22:00	2.0	9.7	8.3	16.5
2023-05-08 14:00	2.0	11.7	6.5	13.0
2024-06-14 06:00	2.0	11.4	6.2	12.5

Table 3.2 summarizes the June 18 rainfall event and the comparison between modelled and monitored flow depths within the SRS and NRS sewer trunks. It should be noted that the rain gauge represents the rainfall at one location and cannot accurately measure the aerial depletion of rainfall throughout the Town. Thus, modelling the rain gauge data by applying it globally across all catchments may not accurately represent real-life conditions and may impact the wet weather results.

Table 3.2 Comparison of Modelled and Monitored Flow Levels in SRS/NRS

Property	SRS Location			NRS Location		
	Model	Monitor	Discrepancy	Model	Monitor	Discrepancy
Dry-Weather Period (June 16 - 18, 2023)						
Average Level (mm)	87	64	36%	188	250	-24%
Maximum Level (mm)	117	99	18%	256	300	-15%
Wet-Weather Period (June 18 - 20, 2023)						
Maximum Level (mm)	132	99	33%	306	318	-4%

The following conclusions have been made regarding the model:

- Model results show that SRS modelled depths are consistently higher than monitored depth data.
- The NRS trunk is shown to be consistently lower than the flow monitoring data; however, PWWF conditions (which are the critical component of this study) are reasonably similar; thus, the model appears to simulate downstream wet weather conditions with reasonable accuracy.
- The discrepancy between monitored and modelled levels are on the order of 30 mm for the SRS (for a 200 mm sewer) and up to 60 mm for the NRS (for a 450 mm sewer) which indicates the difference in levels is relatively small compared to the pipe size.
- Based on City of Calgary IDF curve information, a 3.0-hour duration storm with an average intensity of 6.0 mm/hr is slightly lower than a 2-year return period.
- Furthermore, the flow level data shows that the depth did not exceed the pipe size diameter at any point throughout the monitoring period implying that the sewers are properly sized at least for a 2-year return period.
- The model appears adequately calibrated and should reasonably estimate upgrading trigger points with some level of conservatism within the SRS catchment. The NRS catchment is slightly unconservative.

3.2 Existing System Performance

After validating the existing system model, the 50-year storm was simulated over the sanitary sewer network and the results are summarized in **Figure 3.1** for capacity utilization (maximum flow over capacity) and depth to peak HGL and in **Figure 3.2** for spare capacity. Similar to results from previous studies, the existing system assessment shows surcharging along SRS from Northridge Drive to Veterans Way with sewers surcharging within 2.5 m of the ground surface and spare capacity ranging from -10 L/s (peak discharge is 10 L/s greater than capacity) to 25 L/s. It should be noted that many of the sewers along SRS are shallow and under 2.5 m in depth to begin with. The model results may show “yellow” nodes indicating sewer levels exceeding the 2.5 m depth criteria, but where sewers are “green” indicating available capacity, this likely indicates shallow sewers and the HGL may in fact be within the pipe despite it being within 2.5 m of the ground surface. Despite some surcharging, the existing SRS can likely handle additional flows prior to needing upgrades which is investigated in the following section.

3.3 Sensitivity Analysis

A sensitivity analysis has been performed to determine how much additional sewage the existing system along SRS can accommodate prior to requiring upgrades. A constant flow was added at the upstream end of the SRS system at Mountainview Gate and Elizabeth Street to simulate future development within the D’Arcy area. Flow projections for the 100% development of the D’Arcy area are summarized in **Table 3.3**, which are based on the D’Arcy Lands Outline Plan approved by the Town of Okotoks on February 16, 2017 (see **Appendix A**). Some of this area has already developed, including some residential parcels on the south side and commercial parcels at the northeast corner. The “Remainder” column within **Table 3.3** estimates the areas left to be developed and their flow projections. Thus, the trigger points for upgrading the SRS are based on the remaining residential area to be developed.

Table 3.3 D’Arcy Lands Development Flow Projections

Parameter		Total	Remainder
Area	Net Residential (ha)	60.8	54.5
	Net Non-Residential (ha)	4.1	0.0
	Total (ha)	64.9	54.5
Population	Number of Residential Lots (lot)	2,171	2,039
	Population Density (c/lot)	2.78	2.78
	Population (c)	6,035	5,668
Generation Rates	Residential (L/c/d)	255	255
	Non-Residential (L/ha/d)	8,525	8,525
Average DWF	Residential (L/s)	17.8	16.7
	Non-Residential (L/s)	0.4	0.0
	Total (L/s)	18.2	16.7
Peaking Factors	Residential	3.2	3.2
	Non-Residential	5.0	0.0
Peak DWF	Residential (L/s)	56.4	53.4
	Non-Residential (L/s)	2.0	0.0
	Total (L/s)	58.4	53.4
Inflow-Infiltration	Unit Rate (L/s/ha)	0.28	0.28
	I-I Rate (L/s)	18.2	15.3
Peak WWF (L/s)	Total	76.6	68.7

Scenarios with incrementally increasing flows were simulated to determine the point at which the SRS upgrading is required. The scenarios included the existing wet-weather flow simulation during a 50-year return period, and scenarios for an additional 5 L/s, 10 L/s, 15 L/s, 20 L/s, 25 L/s, 30 L/s, 35 L/s, and 40 L/s.

It is understood that many parcels along the SRS do not have basements, thus, consideration of several benchmarks was considered, including a depth to peak HGL of 2.5 m, 1.0 m, and 0.3 m.

The existing SRS longitudinal profile is shown on [Figure 3.3](#) with each of the HGLs for each scenario. Modelling results show that the SRS sewer between Northridge Drive and Veterans Way surcharges extensively during most of the scenarios. During a 50-year storm at existing levels of development, there is some minor surcharging that exceeds the depth threshold of 2.5 m, or the crown of sewer if shallow. Within 2.5 m of the ground surface, basement flooding risks are moderate. Once future development adds an additional 15 L/s to the SRS, surcharging will reach within 1.0 m of the ground surface and any basements will be at significant risk of basement flooding. At an additional 20 L/s and beyond, surcharging reaches within 0.3 m of the ground surface and flooding of basements from Northridge Drive to Veterans Way is expected.

Since 15 L/s is the trigger point for upgrading along the SRS, [Table 3.4](#) estimates what this flow rate amounts to in terms of additional residential area developed and timing (area-weighted projection between 2024 and 2029). As shown, the 15 L/s upgrading trigger point will occur within 1.0 year, implying that the upgrading recommendation should be implemented as soon as possible. In other words, within one year, the HGL during a 50-year event could rise to within 1.0 m of the ground surface which puts basements at a significant risk of flooding.

Table 3.4 Level of Development Scenarios

Flow Scenario	Upgrade Triggered?	Equivalent Residential Area	Equivalent Population	Estimated Time Frame
		ha	c	
+5 L/s	No	3.3	341	0.3
+10 L/s	No	6.8	705	0.6
+15 L/s	Yes	10.4	1,084	1.0
+20 L/s	Yes	14.2	1,474	1.3
+25 L/s	Yes	18.0	1,874	1.7
+30 L/s	Yes	22.0	2,283	2.0
+35 L/s	Yes	26.0	2,699	2.4
+40 L/s	Yes	30.0	3,123	2.8
Ultimate	Yes	54.5	5,668	5.0 (2029)

3.4 Upgrading Options and Recommendations

There are several options for reducing the SRS surcharging and upgrading options are annotated in plan view on [Figure 3.4](#). Previous reports recommended upgrading approximately 1,480 m of existing 200 – 375 mm sewer with 450 mm sewer along SRS from Northridge Drive to Oak Avenue which was on the order of \$3.9M (2020 dollars). To offset the ultimate upgrading requirements along the SRS, the following upgrading options have been considered as an interim solution prior to implementing the upgrades described in [Section 1.2](#) and their hydraulic impacts are discussed further down in [Table 3.5](#):

- Upgrade Option #1:** Remove the existing plug at Manhole NW-116 at Mountainview Gate and Elizabeth Street to allow WWF to split between the SRS and the Elizabeth Street sewer (ultimately to the NRS trunk). The cost estimates for this option assume some minor regrading of the existing 450 mm sewer along Elizabeth Street east of NW-116. This extra cost is to account for the impact of conservation of momentum at flow split manholes

which may require sewer regrading to achieve a desirable flow split between SRS and the Elizabeth Street sewer.

2. **Upgrade Option #2:** Plug the south invert at Manhole NW-116 and remove the existing plug at the east invert to divert flows away from SRS and into the Elizabeth Street sewer.
3. **Upgrade Option #3:** Upgrade 240 m of existing 200 mm to 450 mm sewer along South Railway Street just upstream of Veterans Way. This upgrade is required as part of the ultimate upgrading concept, thus, is not a throwaway cost. Additional consideration for extending the upgrading length is considered later in this memo but is documented on [Figure 3.4](#) for reference.
4. **Upgrade Option #4:** Oversize sewers along Mountainview Gate with an orifice at the downstream end of the oversized sewer to create inline storage upstream of the SRS.
5. **Upgrade Option #5:** Install an offline storage tank within available green space upstream of the SRS adjacent to Mountainview Gate to control peak WWF. The storage tank should be designed only to activate during wet weather events and will require a small lift station to pump out the tank post-event.

The pros and cons of each upgrading option are shown in [Table 3.5](#) along with their relative costs compared to one another. Due to the operational and maintenance requirements, risk of odour concerns, and relatively high cost of sanitary sewer storage, Options #4 and #5 are not recommended.

Table 3.5 Upgrading Option Pros and Cons

Option	Relative Cost	Pros	Cons
#1 NW-116 Flow Split	\$	• Easy and cost-effective to implement • Minimal operational requirements • Lower operating costs	• Increases risk to the Elizabeth Street sewer from Mountainview Gate to Veterans Way
#2 NW-116 Diversion	\$	• Easy and cost-effective to implement • Minimal operational requirements • Lower operating costs	• Increases risk to the Elizabeth Street sewer from Mountainview Gate to Veterans Way • The surcharging caused along Elizabeth Street happens upstream of the intended upgrades along NRS, thus, the upgrading along NRS cannot help offset some of the flows from SRS
#3 SRS Upgrading	\$\$	• Minimal operational requirements • Lower operating costs • Required as part of ultimate development regardless (no throwaway costs)	• Minor increase in risk to downstream SRS since reducing surcharging will allow flow downstream unhindered
#4 Inline Storage	\$\$	• Can offset upgrading requirements downstream • Easier to maintain than offline storage	• Risk of buildup of fats, oils and grease • Risk of increased odours adjacent to existing residential neighbourhood
#5 Offline Storage	\$\$\$	• Can offset upgrading requirements downstream	• Relatively high maintenance • Requires a lift station to empty • Risk of increased odours adjacent to existing residential neighbourhood

Option #1, #2, and #3 were modelled at the trigger point (+15 L/s) to determine the hydraulic benefit. The SRS longitudinal profile is shown on [Figure 3.5](#) and includes HGLs for the existing condition, +15 L/s upstream (existing condition), and Options #1 through #3 (at +15 L/s upstream). Similarly, [Figure 3.6](#) shows the impacts of Options #1 and #2 on the Elizabeth Street sewer from Elizabeth Street and Mountainview Gate to Riverside Drive and Veterans Way.

Table 3.6 shows the hydraulic conditions for each scenario and compares the critical nodes along SRS (manhole NW-8, MUID 253) and Elizabeth Street sewer (manhole NW-106, MUID CF). Option #3 provides the best solution since it effectively reduces the surcharging, does not increase risk to Elizabeth Street or NRS, and is part of the ultimate system upgrading requirements (therefore not a throw-away cost). As D'Arcy continues to develop, additional pipe sections could also be implemented in stages to split up the costs of the ultimate system upgrading requirements.

Table 3.6 Hydraulic Impacts of Upgrading Options #1 through #3

Scenario	Depth to Peak HGL (m)		Conclusion
	SRS	Elizabeth Street Sewer	
Existing	2.03	2.94	Existing conditions feature minor surcharging above the obvert along SRS and minimal flow within the Elizabeth Street sewer.
+15 L/s (Ex.)	0.89	2.94	15 L/s of upstream development causes surcharging to within 1.0 m of the ground surface along the SRS. There are no changes in the Elizabeth Street sewer (plugged).
Option #1	1.80	2.83	Allowing flows to split between SRS and Elizabeth Street sewer reduce the surcharging close to the 2.5 m depth criteria; however, there will be a minor increase in risk to the Elizabeth Street sewer due to additional flows. This option appears to help reduce the surcharging significantly but as D'Arcy continues to develop, the risk will continue to increase along the Elizabeth Street sewer as more flows split and enter this sewer. This is an adequate short-term option but is ultimately a throw-away cost since the flow split will eventually need to be removed and the SRS will need upgrading. Thus, this option is not recommended.
Option #2	2.31	1.89	The surcharging is fully removed along the SRS; however, there is a significant amount of surcharging within the Elizabeth Street sewer because of the diversion which creates a risk of basement flooding. Additionally, there appears to be more basements along the Elizabeth Street sewer and NRS implying that the increased risk could impact a larger population. Thus, this option is not recommended.
Option #3	2.20	2.94	Upgrading 240 m of sewer along SRS reduces the surcharging significantly close to the 2.5 m depth criteria. Additionally, there is no increase in risk to the Elizabeth Street sewer since it remains plugged. Peak dry weather flows in the upgraded 450 mm sewers have also been reviewed and high-level Manning calculations show that velocities can achieve acceptable self-cleansing velocities. This is the recommended option because the surcharging is effectively reduced, there is no increase in sewer surcharging elsewhere along the system, and this upgrade is eventually needed as part of the ultimate system upgrading requirements and can be seen as an investment in the future system.

The recommended upgrading option (Option #3) was then simulated to determine how much longer future upgrading requirements could be deferred. Modelling results on **Figure 3.7** show the HGL along the SRS with Option #3 at the following scenarios: +15 L/s, +20 L/s, +25 L/s, +30 L/s, +35 L/s, and +40 L/s. Results show that the HGL increases as the peak flows increase and further upgrading would be triggered at the +25 L/s scenario (18.0 ha and within approximately 1.7 years).

Further upgrading along the SRS profile where the HGL slope is steepest, i.e., upgrading the existing 200 – 250 mm sewers to 450 mm upstream of Option #3 all the way to Northridge Drive could then potentially further improve HGL conditions based on Recommendation #5 from the Town of Okotoks Sanitary Servicing Master Plan Update Memorandum, February 2020 (Project No. 27241). Once this is implemented, it is expected that upgrading downstream (east) of Veterans Way could be postponed until the + 68.7 L/s scenario (ultimate development of D'Arcy lands within 5 years). **Figure 3.8** summarizes the sensitivity analysis for the + 25 L/s scenario throughout ultimate development (+ 68.7 L/s). It should be noted that in 5.0 years, if upgrading along the SRS from Veterans Way to Northridge Drive is pursued, there will be areas in the downstream SRS that exceed the 2.5 m criteria, and even the 1.0 m criteria in areas. Thus, upgrading should consider the risk associated with upgrading upstream pipe sections instead of starting at the downstream end. The Town should consider design of the entire length of future SRS upgrades at the same time so they can be implemented in a timely manner.

As shown above and in **Figures 3.7** and **3.8**, upgrading Option #3 is required within 1.0 year and will require further upgrading as soon as 1.7 years in the future (extension of Option #3 up to Northridge Drive). Thus, it is likely more cost-effective to design and construct both sections as part of one construction project. This will result in overall cost-savings. Upgrades should consider insulation for frost protection since some sections of the SRS are shallow.

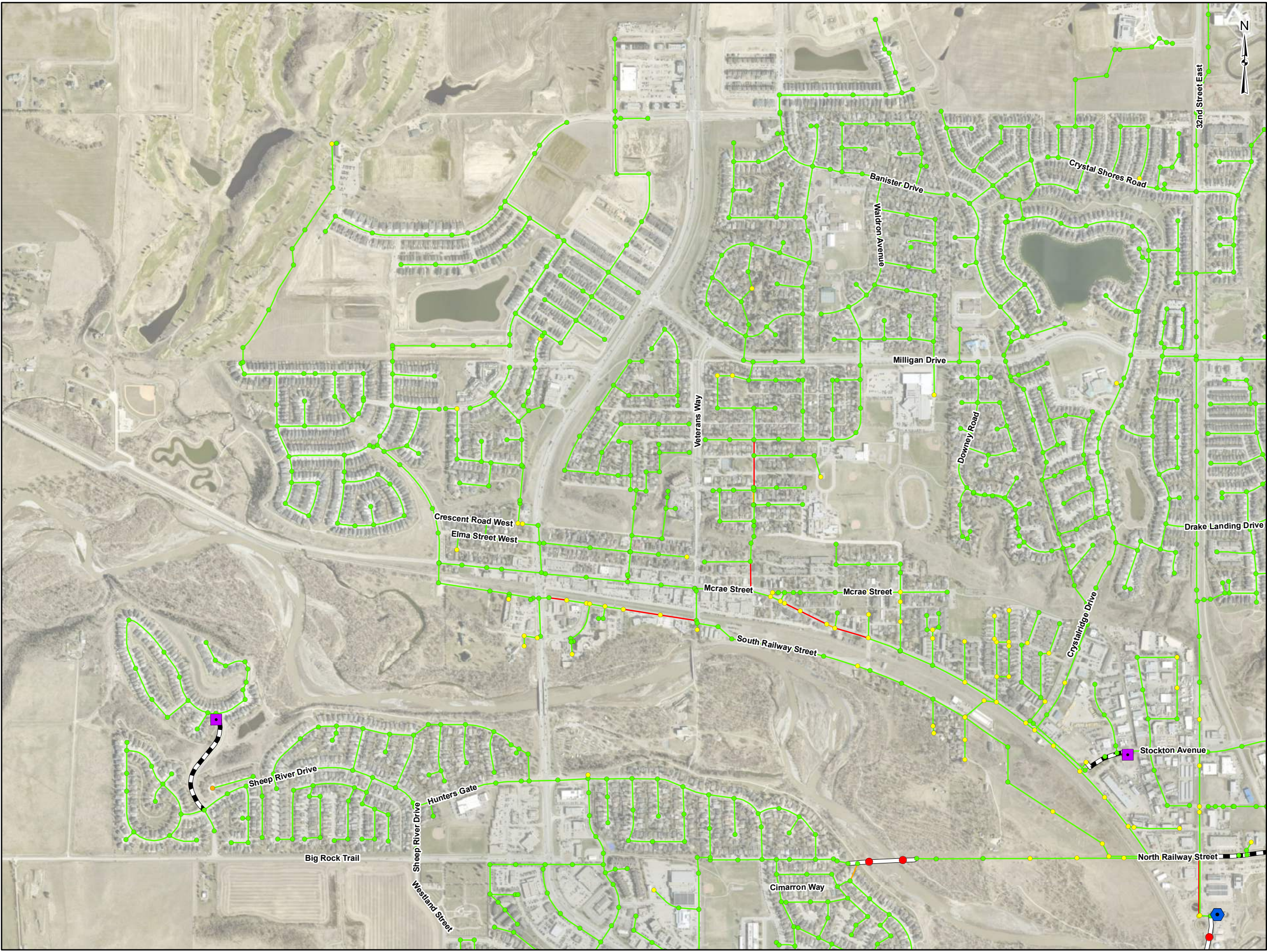
3.5 Cost Estimates

High level cost estimates have been prepared for the three upgrading options that were analyzed and are summarized in **Table 3.7** and details are provided in **Appendix B**. As shown, the recommended upgrading consists of Option #3 plus the extension, which totals approximately \$1,664,000.

Table 3.7 Upgrading Option Cost Estimates

Item	Option #1	Option #2	Option #3	Option #3 Extension
Cost (\$)	\$ 128,000	\$ 60,000	\$ 512,000	\$ 676,000
Engineering, 10% (\$)	\$ 13,000	\$ 6,000	\$ 51,000	\$ 68,000
Contingency, 30% (\$)	\$ 39,000	\$ 18,000	\$ 154,000	\$ 203,000
Total Cost (\$)	\$ 180,000	\$ 84,000	\$ 717,000	\$ 947,000

Document Path: Z:\SharedModels\JeremyS\28555- Okotoks Sanitary Sewer Study\01_GIS\Figure 3.1 - Existing 50-Year Performance - CoverQ.mxd



LEGEND

- WWTP
- Lift Stations
- Syphon
- Forcemains

Maximum HGL Relative to Ground (m)

- Less than -2.5 m
- 2.5 m to -1.0 m
- 1.0 m to -0.3 m
- 0.3 m to 0.0 m
- Greater than 0.0 m

Peak Discharge Relative to Pipe Capacity

- Less than 86%
- Between 86% and 100%
- Greater than 100%

TITLE
EXISTING SYSTEM 50-YEAR PERFORMANCE
CAPACITY UTILIZATION AND
DEPTH TO PEAK HGL

PROJECT
SANITARY MASTER PLAN AMENDMENT (SOUTH RAILWAY STREET)
CLIENT
THE TOWN OF OKOTOKS

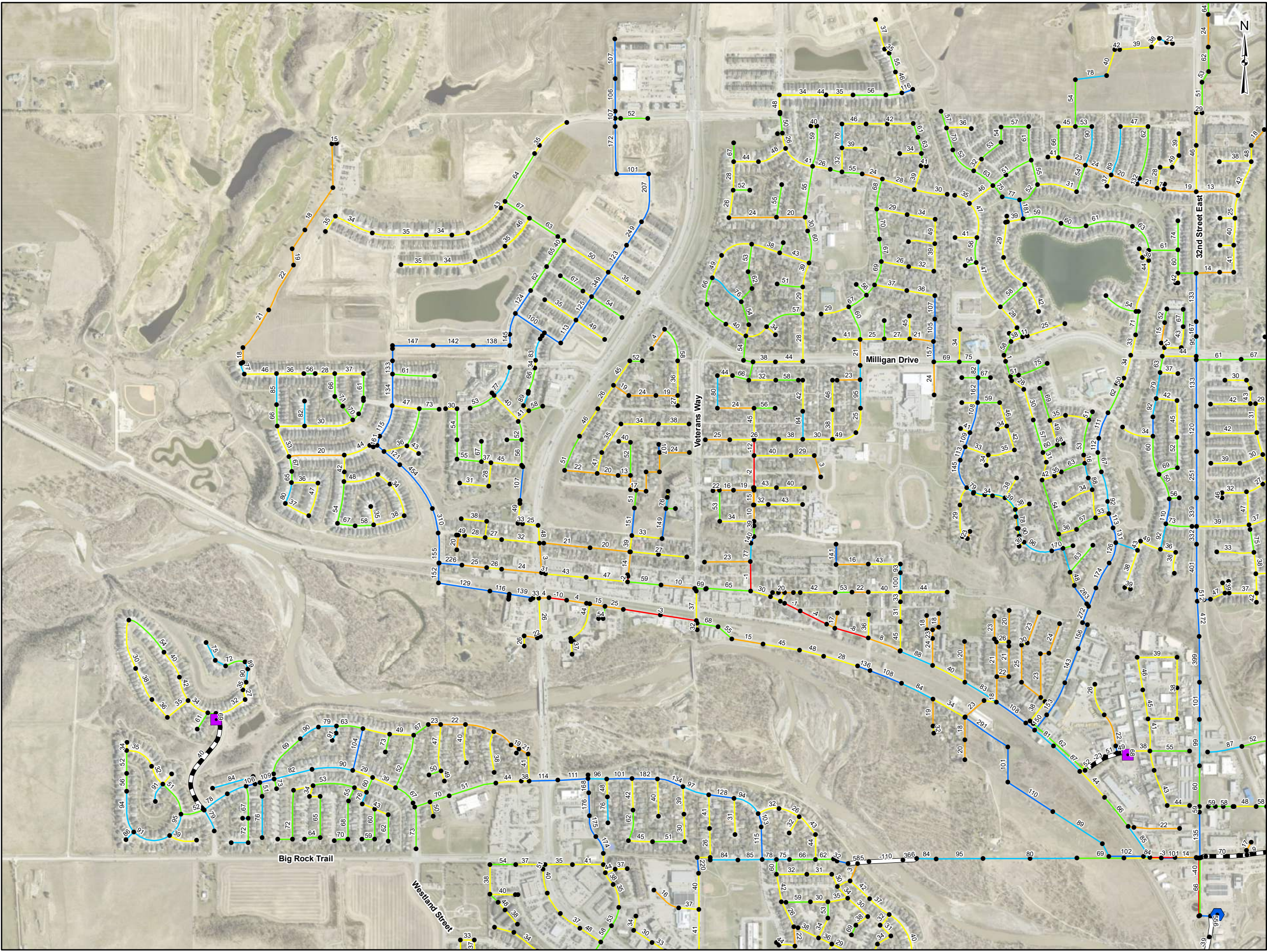
DATA SOURCES
- Topographic Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

PROJECTION
NAD 1983 CSRS 3TM 114

0 87.5 175 350
1:12,500 Meters



FIGURE 3.1
DATE 9/10/2024
PROJECT NO. 28555
AUTHOR JS



LEGEND

- WWTP
- Lift Stations
- Manholes
- Syphon
- Forcemains

Spare Capacity (L/s)

- Less than 0 L/s
- 0 - 25 L/s
- 25 - 50 L/s
- 50 - 75 L/s
- 75 - 100 L/s
- Greater than 100 L/s

NOTE: SPARE CAPACITY IS LABELLED IN L/S.

TITLE
EXISTING SYSTEM 50-YEAR PERFORMANCE
SPARE CAPACITY

PROJECT
SANITARY MASTER PLAN AMENDMENT (SOUTH RAILWAY STREET)
CLIENT
THE TOWN OF OKOTOKS

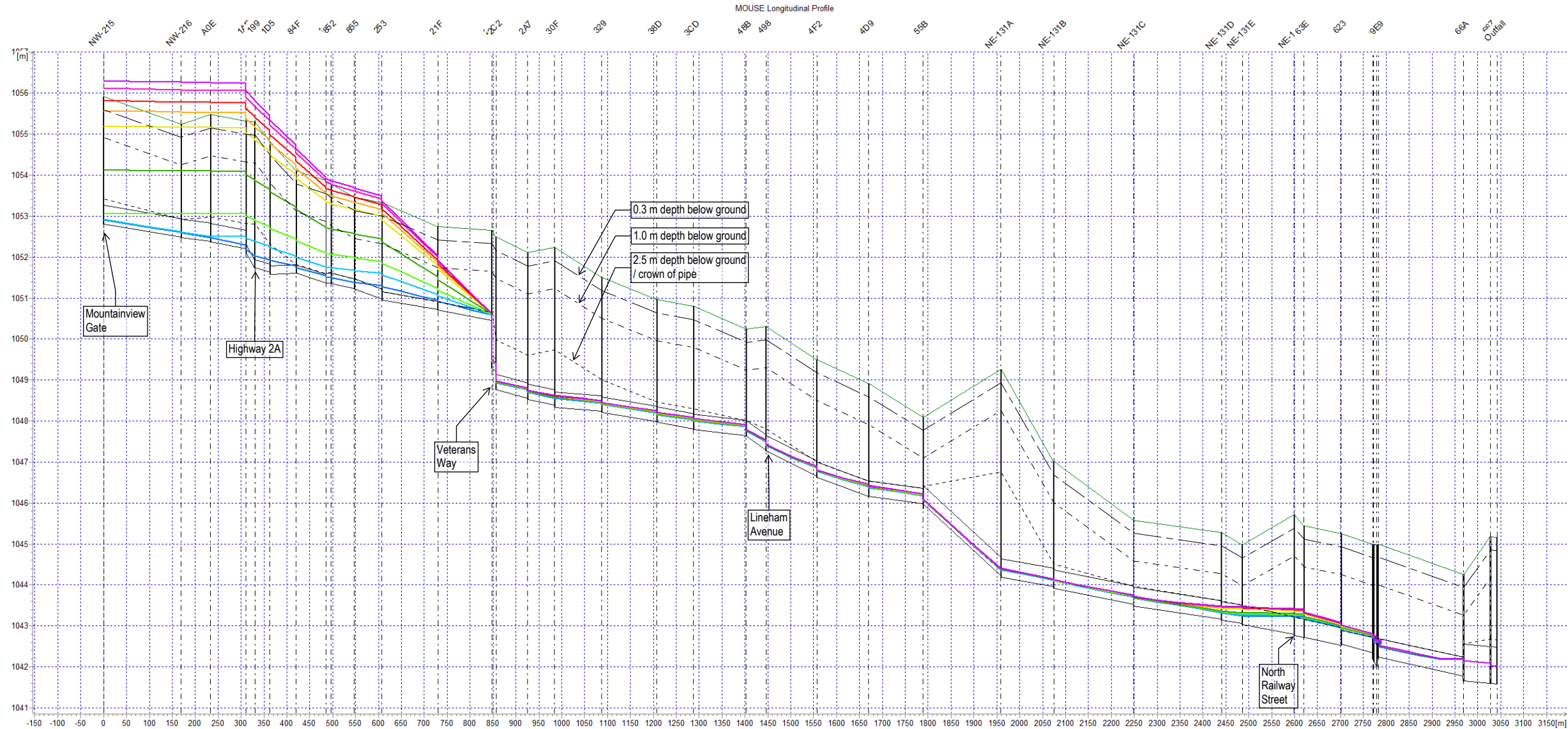
DATA SOURCES
- Topographic Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

PROJECTION
NAD 1983 CSRS 3TM 114
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1:12,500 Meters



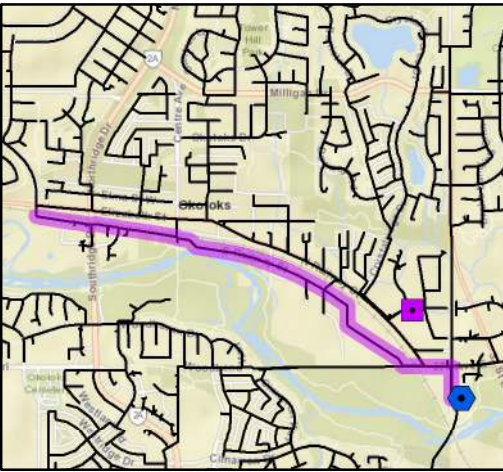
FIGURE 3.2
DATE 9/10/2024
PROJECT NO. 28555
AUTHOR JS

Document Path: M:\eremj\S28555 - Okotoks Sanitary Sewer Study\01_GIS\Figure 3.4 - Existing SRS HGL Profile Sensitivity Analysis.mxd



Link Diameter	0.4500			0.2000			0.2500			0.2000			0.3750						0.4500						0.4500		0.9000					
Length	169.189	63.846	77.620	57.085	65.169	59.883	122.299	117.535	68.848	59.051	103.081	120.239	80.152	114.950	110.845	113.021	118.875	169.542	115.551	174.214	191.932	112.635	81.205	69.085	186.424	58.550						
Slope	0.22			-0.05 0.35			0.25 0.41 0.19			0.21			0.30 0.24 0.09			0.19 0.20 0.13			0.77 0.55 0.40			0.16			0.25							
Capacity	0.1464	0.1332	0.1575	0.0086 0.0229			0.0450			0.0170			0.0177			0.1126 0.1004 0.0608			0.0907 0.0936			0.0740			0.1539 0.1309 0.0819			0.3399 0.1501 0.1592 0.1374 0.1521 0.1399 0.1566		0.1668 0.5740		
Existing Max Flow	0.0175			0.0182			0.0189 0.0191			0.0200			0.0202 0.0203			0.0446 0.0455 0.0456			0.0457			0.0458			0.0462 0.0468 0.0474			0.0489 0.0493 0.0503 0.1421			0.1003 0.3320	

8/11/2011 12:44:00 PM



TITLE
SRS LONGITUDINAL PROFILE
EXISTING SYSTEM SENSITIVITY
ANALYSIS

PROJECT
SANITARY MASTER PLAN AMENDMENT (SOUTH RAILWAY STREET)
CLIENT
THE TOWN OF OKOTOKS

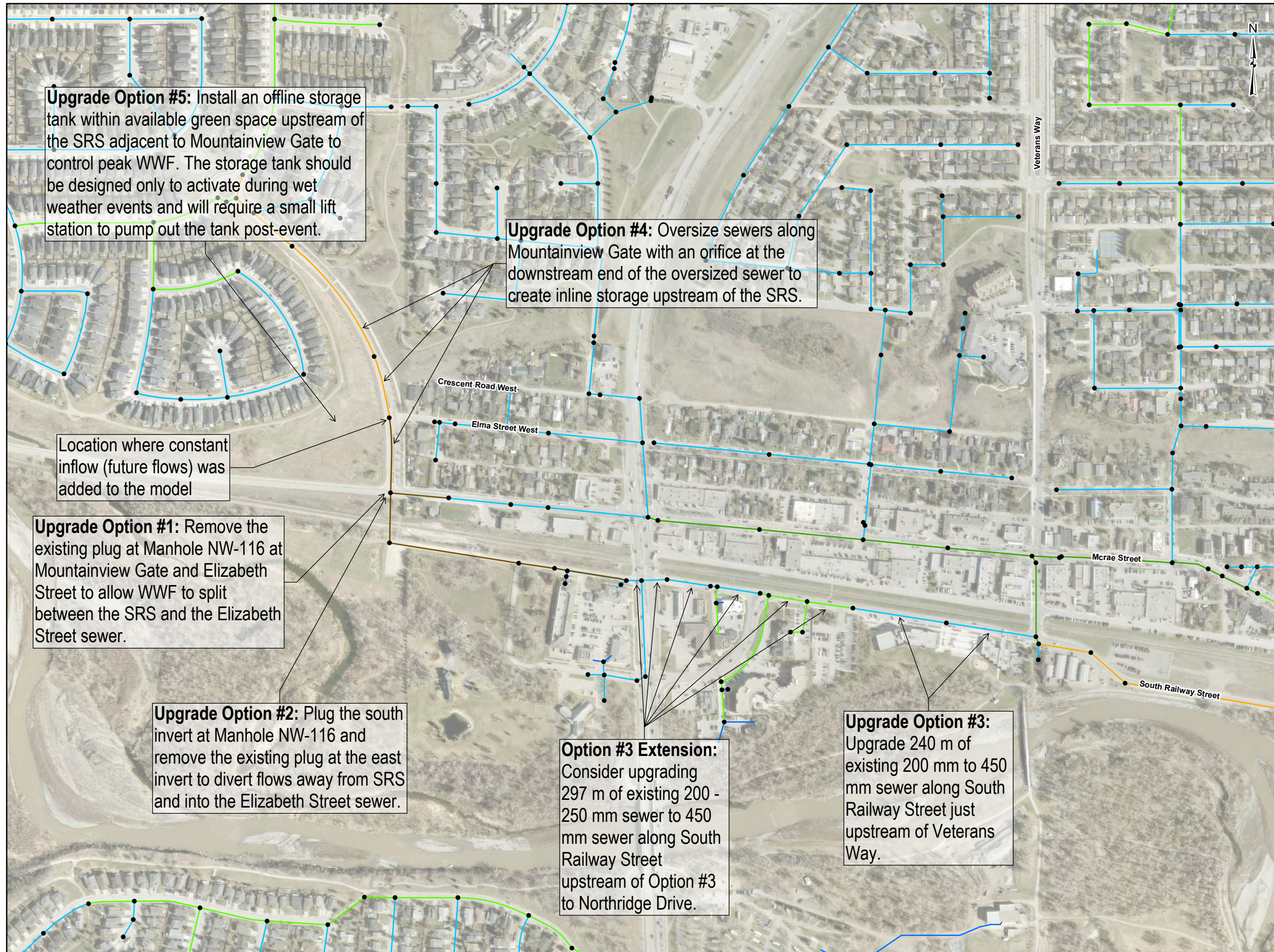
DATA SOURCES
- Topographic Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT
P, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand),
NGCC, (c) OpenStreetMap contributors, and the GIS User Community

PROJECTION
NAD 1983 CSRS 3TM 114
0 150 300 600
1:21,135 Meters



FIGURE
3.3
DATE
2024-05-17
PROJECT NO.
28555
AUTHOR
JS

Document Path: Z:\SharedModels\JeremyS\28555 - Okotoks Sanitary Sewer Study\01_GIS\Figure 3.4 - Upgrading Options.mxd



LEGEND

- WWTP
- Lift Stations
- Sanitary Manholes
- Syphon
- Forcemains

Sanitary Sewers

- Unknown
- ≤ 150 mm
- 200 mm
- 250 mm
- 300 mm
- 350 mm
- 375 mm
- 450 mm
- 525 mm
- 675 mm
- 900 mm

TITLE UPGRADING OPTIONS

PROJECT
SANITARY MASTER PLAN AMENDMENT (SOUTH RAILWAY STREET)
CLIENT
THE TOWN OF OKOTOKS

DATA SOURCES
- Topographic Map: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

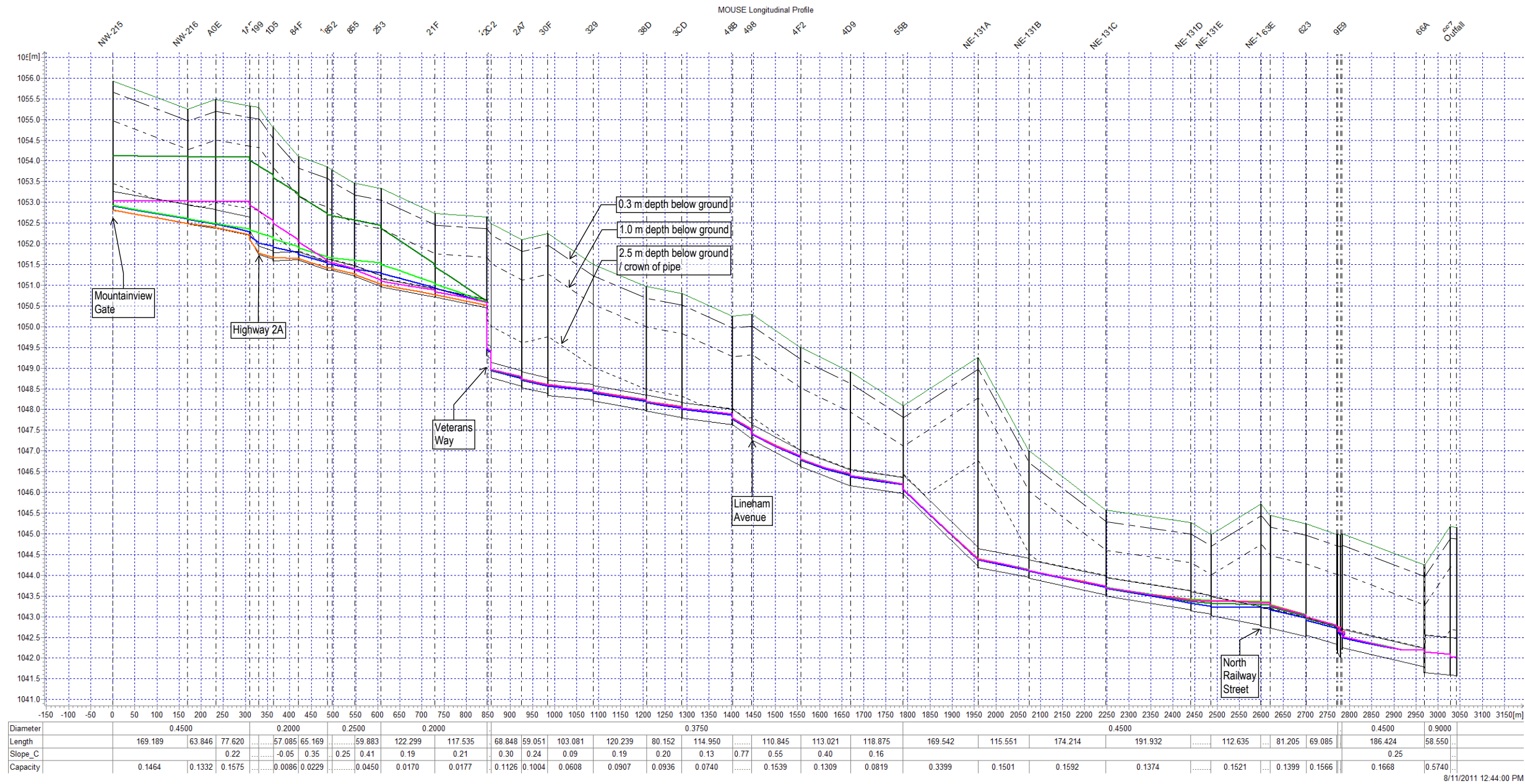
PROJECTION
NAD 1983 CSRS 3TM 114

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1:5,000 Meters



FIGURE 3.4
DATE 9/10/2024
PROJECT NO. 28555
AUTHOR JS

Document Path: M:\erem\S28555 - Okotoks Sanitary Sewer Study\01_GIS\Figure 3.6 - Upgrading Analysis - SRS HGL Profile.mxd



LEGEND

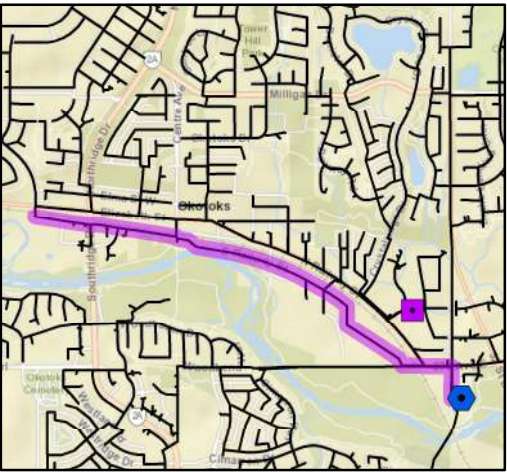
- WWTP
- Lift Stations
- SRS Profile
- Sanitary Sewers

HGL Profile Scenario

- Base Scenario
- +15 L/s (Existing)
- Option #1 (+15 L/s)
- Option #2 (+15 L/s)
- Option #3 (+15 L/s)

Depth Below Ground Level

- 0.3 m
- 1.0 m
- 2.5 m / crown of pipe



TITLE
UPGRADING ANALYSIS
SRS LONGITUDINAL PROFILE

PROJECT
SANITARY MASTER PLAN AMENDMENT (SOUTH RAILWAY STREET)
CLIENT
THE TOWN OF OKOTOKS

DATA SOURCES
- Topographic Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

PROJECTION
NAD 1983 CSRS 3TM 114
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1:21,135 Meters

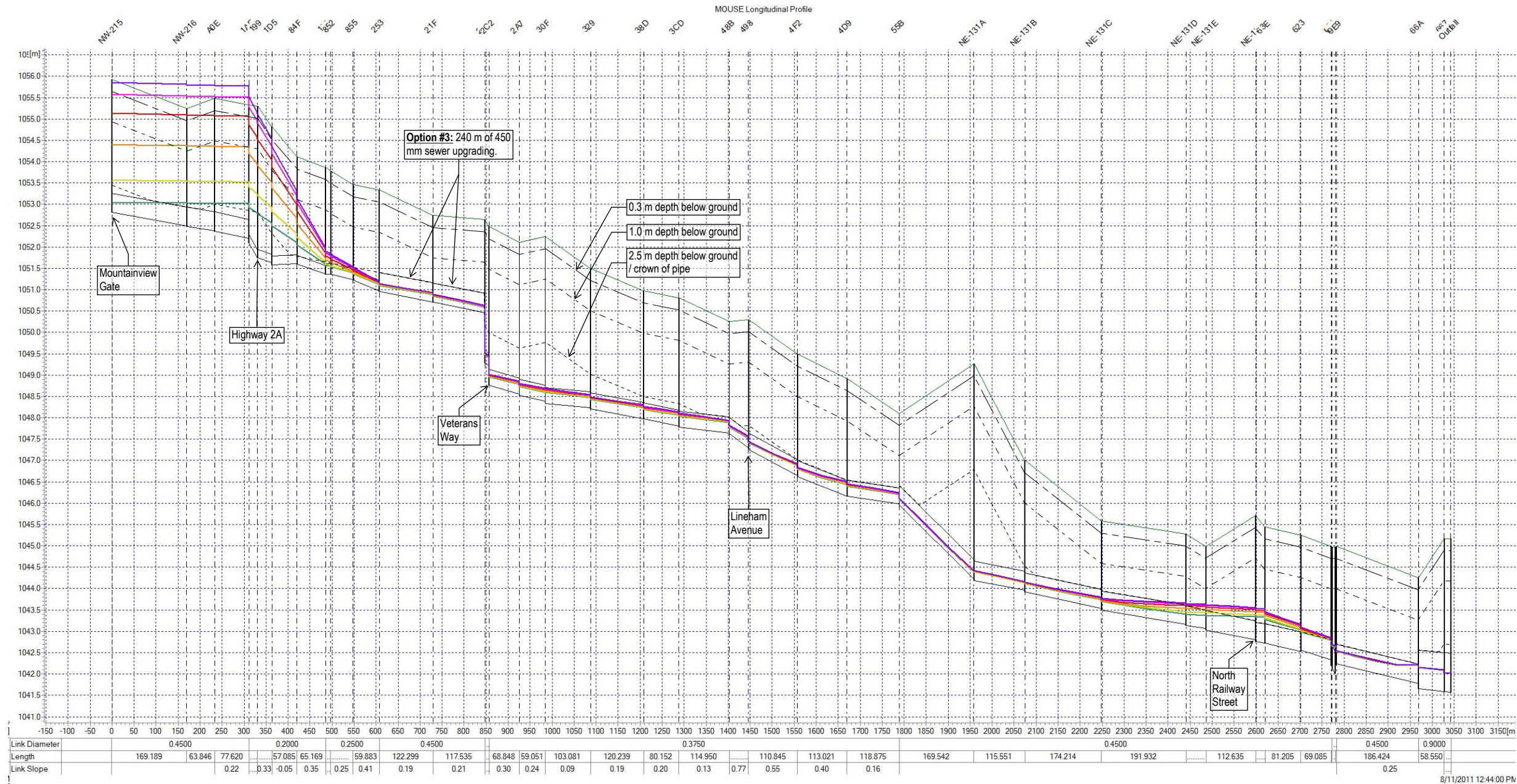


FIGURE 3.5
DATE 2024-05-22
PROJECT NO. 28555
AUTHOR JS



FIGURE	3.6
DATE	2024-05-22
PROJECT NO.	28555
AUTHOR	JS

Document Path: Z:\SharedModels\JeremyS28555 - Okotoks Sanitary Sewer Study\01_GIS\Figure 3.7 - Option 03 Sensitivity Analysis.mxd



LEGEND

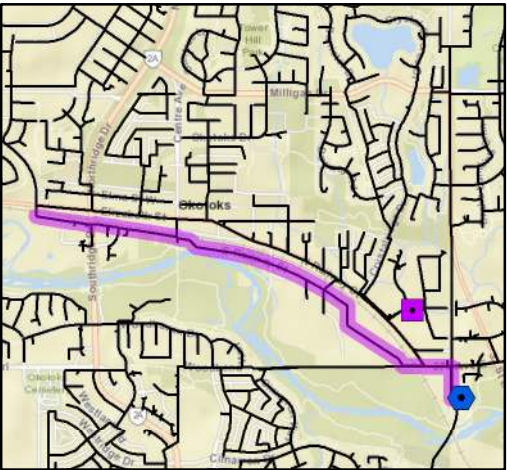
- WWTP
- Lift Stations
- SRS Profile
- Sanitary Sewers

HGL Profile Scenario

- +15 L/s (1.0 years)
- +20 L/s (1.3 years)
- +25 L/s (1.7 years)
- +30 L/s (2.0 years)
- +35 L/s (2.4 years)
- +40 L/s (2.8 years)

Depth Below Ground Level

- 0.3 m
- 1.0 m
- 2.5 m / crown of pipe



SRS LONGITUDINAL PROFILE
OPTION #3 SENSITIVITY
ANALYSIS

PROJECT
SANITARY MASTER PLAN AMENDMENT (SOUTH RAILWAY STREET)
CLIENT
THE TOWN OF OKOTOKS

DATA SOURCES
- Topographic Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT
P, NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand),
NGCC, (c) OpenStreetMap contributors, and the GIS User Community

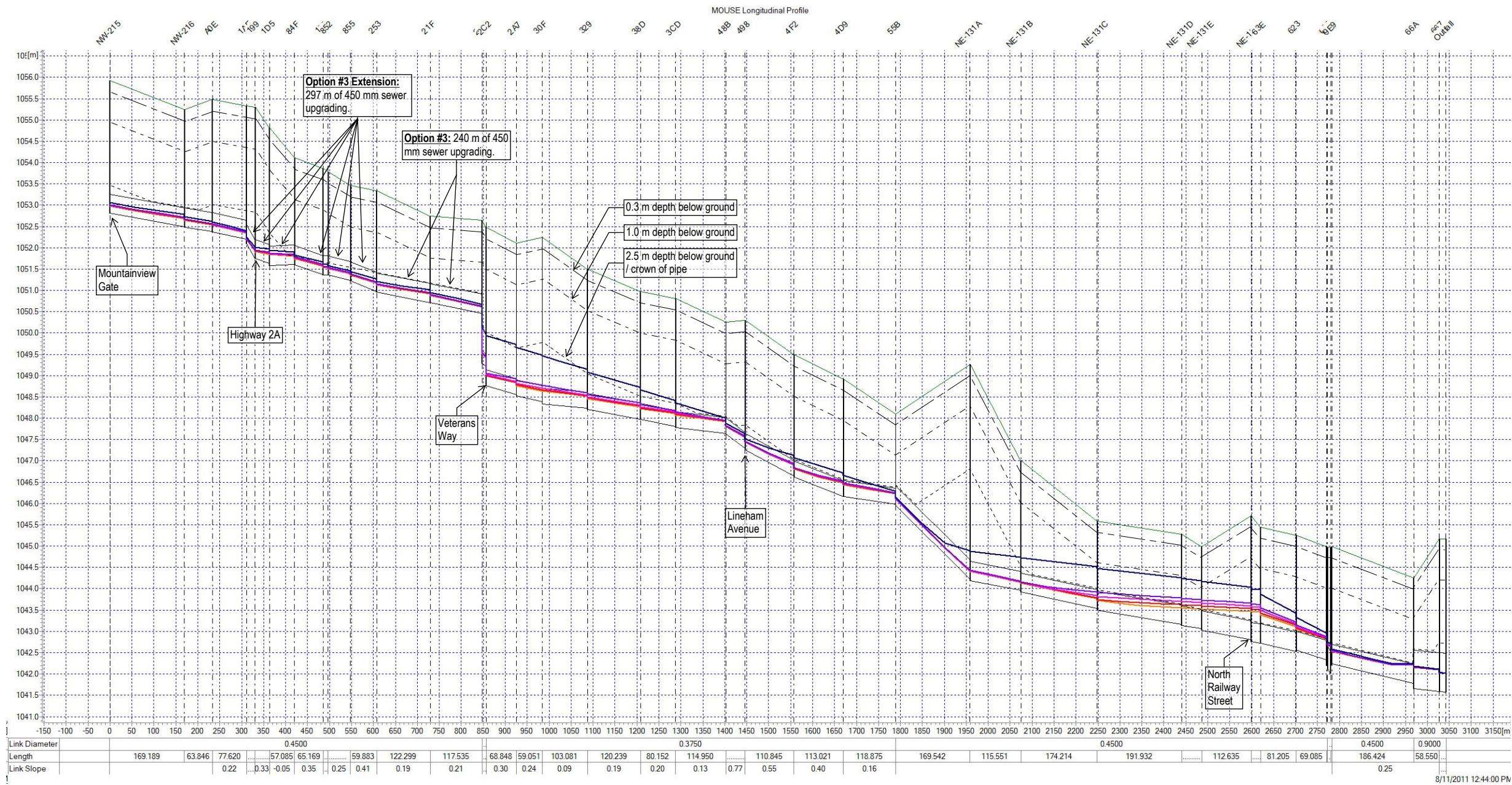
PROJECTION
NAD 1983 CSRS 3TM 114

0 150 300 600
1:21,135 Meters



FIGURE 3.7
DATE 8/15/2024
PROJECT NO. 28555
AUTHOR JS

Document Path: Z:\SharedModels\JeremyS28555 - Okotoks Sanitary Sewer Study\01_GIS\Figure 3.8 - Option 03 Extended Sensitivity Analysis.mxd

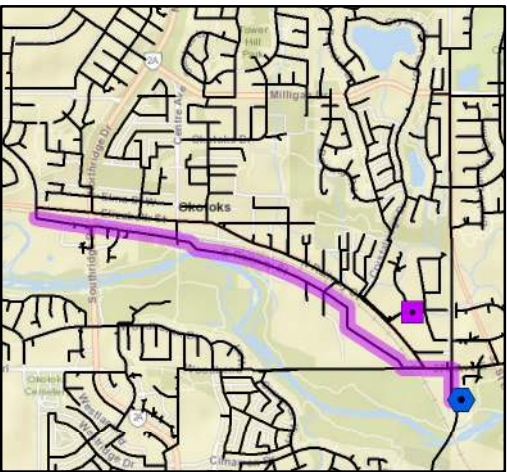


LEGEND

- WWTP
- Lift Stations
- SRS Profile
- Sanitary Sewers
- HGL Profile Scenario**
 - +25 L/s (1.7 years)
 - +30 L/s (2.0 years)
 - +35 L/s (2.4 years)
 - +40 L/s (2.8 years)
 - +68.7 L/s (Ult.) (5.0 years)

Depth Below Ground Level

- 0.3 m
- 1.0 m
- 2.5 m / crown of pipe



SRS LONGITUDINAL PROFILE
OPTION #3 EXTENSION
SENSITIVITY ANALYSIS

PROJECT
SANITARY MASTER PLAN AMENDMENT (SOUTH RAILWAY STREET)
CLIENT
THE TOWN OF OKOTOKS

DATA SOURCES
- Topographic Map: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

PROJECTION
NAD 1983 CSRS 3TM 114

0 150 300 600
1:21,135 Meters



FIGURE 3.8
DATE 8/16/2024
PROJECT NO. 28555
AUTHOR JS

4.0 Conclusions and Recommendations

4.1 Conclusions

Conclusions from this study include:

- The model was updated with newly acquired GIS information, and several sewer lengths along the SRS were modified to show correct diameters.
- The model was verified by running the model with rain gauge data and the results of modelled depth were compared against flow monitoring depth data at two locations along the SRS and NRS. Results showed that the model is slightly conservative for the SRS but reasonably approximates the peak WWFs.
- The existing system sensitivity analysis showed that once D'Arcy develops to an equivalent peak WWF of 15 L/s, upgrading will be required since the surcharging will reach within 1.0 m of ground level, which is seen as a critical depth that has a high likelihood of basement flooding. 15 L/s of peak WWF is estimated to be equivalent to an additional 10.4 ha of residential development within D'Arcy, and could develop within approximately one year (based on linear interpolation of full D'Arcy development anticipated by 2029).
- ISL considered five upgrading options to reduce surcharging within the SRS while offsetting the ultimate upgrading requirements outlined in [Section 1.2](#).
- It was determined that interim storage may not be a feasible short-term solution due to ongoing maintenance requirements, risks of odour, and relatively high capital costs. Meanwhile, implementing upstream flow splits and diversions to reduce the flows in SRS can reduce the surcharging, but create a risk elsewhere in the system.
- Option #3, or strategic upgrading of sewer sections along the SRS is the preferable solution for the following reasons:
 - effectively reduces the surcharging in the short term while also delaying most of the upgrading length required along the SRS;
 - offsets further upgrades along the SRS until the + 25 L/s scenario (18.0 ha of development or within approximately 1.7 years);
 - is required as part of the ultimate upgrading and is therefore not a throwaway cost; and
 - offers the safest solution since it does not divert flows and increase the risk of surcharging elsewhere.
- Additional upgrading upstream of Option #3 all the way up to and including the crossing of Northridge Drive to 450 mm will further improve HGL conditions and additional upgrading downstream of Veterans Way can be postponed until the + 68.7 L/s scenario (ultimate development of D'Arcy lands within 5 years).
- Based on Option #3 offsetting future upgrades only for an additional 0.7 years after construction (1.7 years total from today), it makes more sense to design and construct both of these upgrades together (Option #3 plus the extension to Northridge Drive). These upgrades should be implemented within the next year.

4.2 Recommendations

The Town should consider design and construction of Option #3 plus the extension to Northridge Drive over the course of the next year before the first upgrading trigger is reached (estimated to be 10.4 ha of residential development or 15.0 L/s). Together, the recommended upgrading includes replacing 537 m of existing sewer with 450 mm sewer along the SRS from Veterans Way to Northridge Drive. This is estimated to cost \$1,664,000. Upgrades should consider insulation for frost protection since some sections of the SRS are shallow.

With this upgrade in place, downstream upgrades east of Veterans Way would not be required for 5.0 years (anticipated full development of D'Arcy). It should be noted that there is some risk associated with upgrading upstream pipe sections instead of starting at the downstream end and the Town should consider design of the entire length of future upgrades at the same time so they can be implemented in a timely manner.



5.0 References

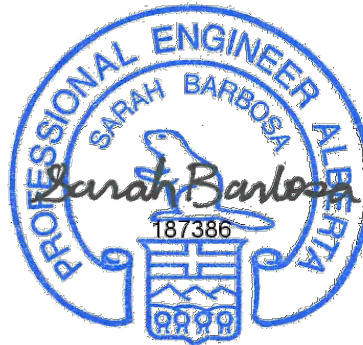
1. ISL Engineering and Land Services Ltd. July 2016. Town of Okotoks Sanitary Servicing Master Plan Update Final Report.
2. ISL Engineering and Land Services Ltd. February 2020. Okotoks Sanitary Servicing Master Plan Update Memorandum (Project No. 27471).
3. ISL Engineering and Land Services Ltd. August 2022. Town of Okotoks South Railway Street Sensitivity Analysis (Project No. 28019 – internal deliverable).
4. ISL Engineering and Land Services Ltd. April 2024. Town of Okotoks Sanitary Servicing Study Update (Project No. 28019).
5. Stantec Consulting Ltd. D'Arcy Lands Outline Plan (Approved by Okotoks MPC February 16, 2017).
6. The City of Calgary. May 31, 2012. Design and Asset Performance Objectives for Hydraulic Modelling – Revision 1.
7. Alberta Government. March 2013. Standards and Guidelines for Municipal Waterworks, Wastewater and Storm Drainage Systems – Part 4 Wastewater Systems Guidelines for Design, Operating and Monitoring of a Total of 5 Parts.
8. The City of Calgary. October 2020. Design Guidelines for Subdivision Servicing 2020.

6.0 Authorization

This document entitled "Sanitary Master Plan Amendment (South Railway Street)" has been prepared by ISL Engineering and Land Services Ltd. (ISL) for the use of the Town of Okotoks. The information and data provided herein represent ISL's professional judgment at the time of preparation. ISL denies any liability whatsoever to any other parties who may obtain this report and use it, or any of its contents, without prior written consent from ISL.



Jeremy Shinbine, P.Eng.
Technical Author



September 11 2024

Sarah Barbosa, P.Eng., ENV SP
Technical Reviewer

Permit to Practice

ISL Engineering and Land Services Ltd.

RM Signature: 

RM APEGA ID: 66731

Date: 2024 September 12

Permit Number P4741

The Association of Professional Engineers
and Geoscientists of Alberta

Geoffrey Schulmeister, P.Eng., SCPM
Corporate Authorization

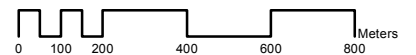


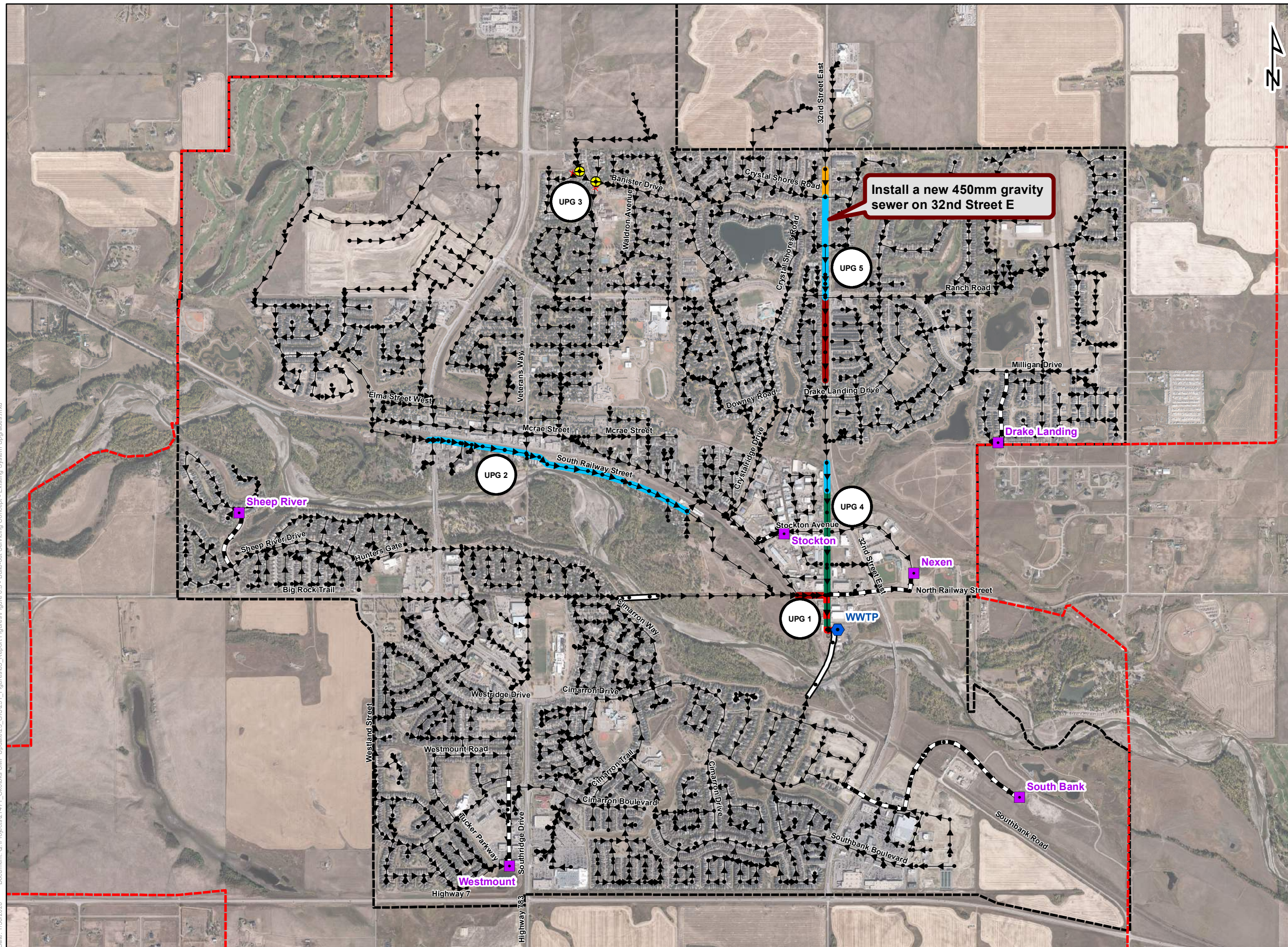
APPENDIX
Figures from Previous Reports

A

Legend

- 1:18,000





Legend

- Manhole
- Lift Station
- ⬢ Wastewater Treatment Plant
- ⊕ Proposed Plug To Divert Flows
- Sanitary Pipe
- ▬▬▬ Forcemain
- ▬▬▬ Siphon
- ▬▬▬ Pre-Annexation Boundary
- ▬▬▬ Post-Annexation Boundary

Upgrade

- 375mm Gravity Sewer Upsize
- 450mm Gravity Sewer Upsize
- 525mm Gravity Sewer Upsize
- 750mm Gravity Sewer Upsize
- 900mm Gravity Sewer Upsize

Coordinate System:
CANAD83-3TM114

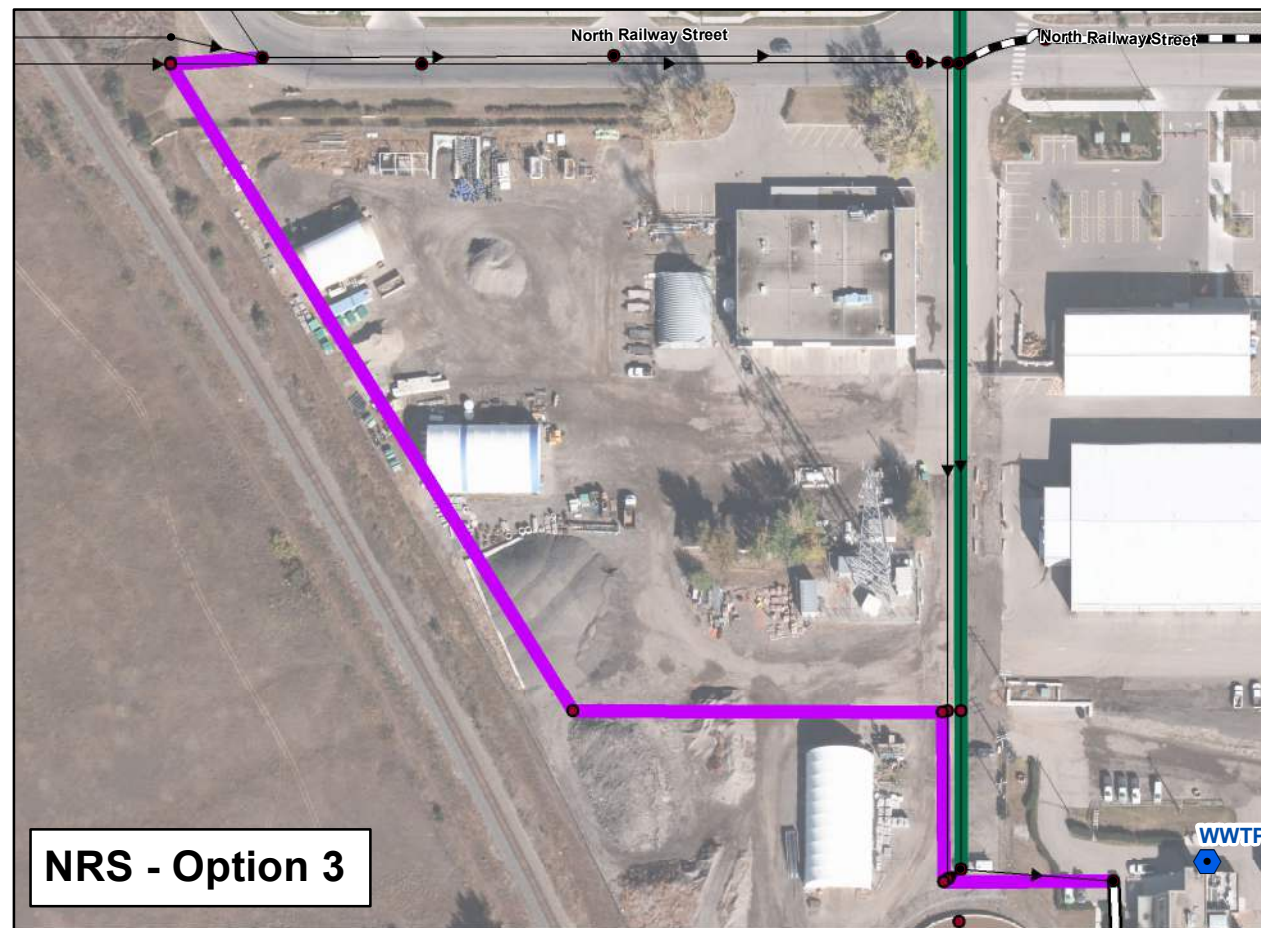
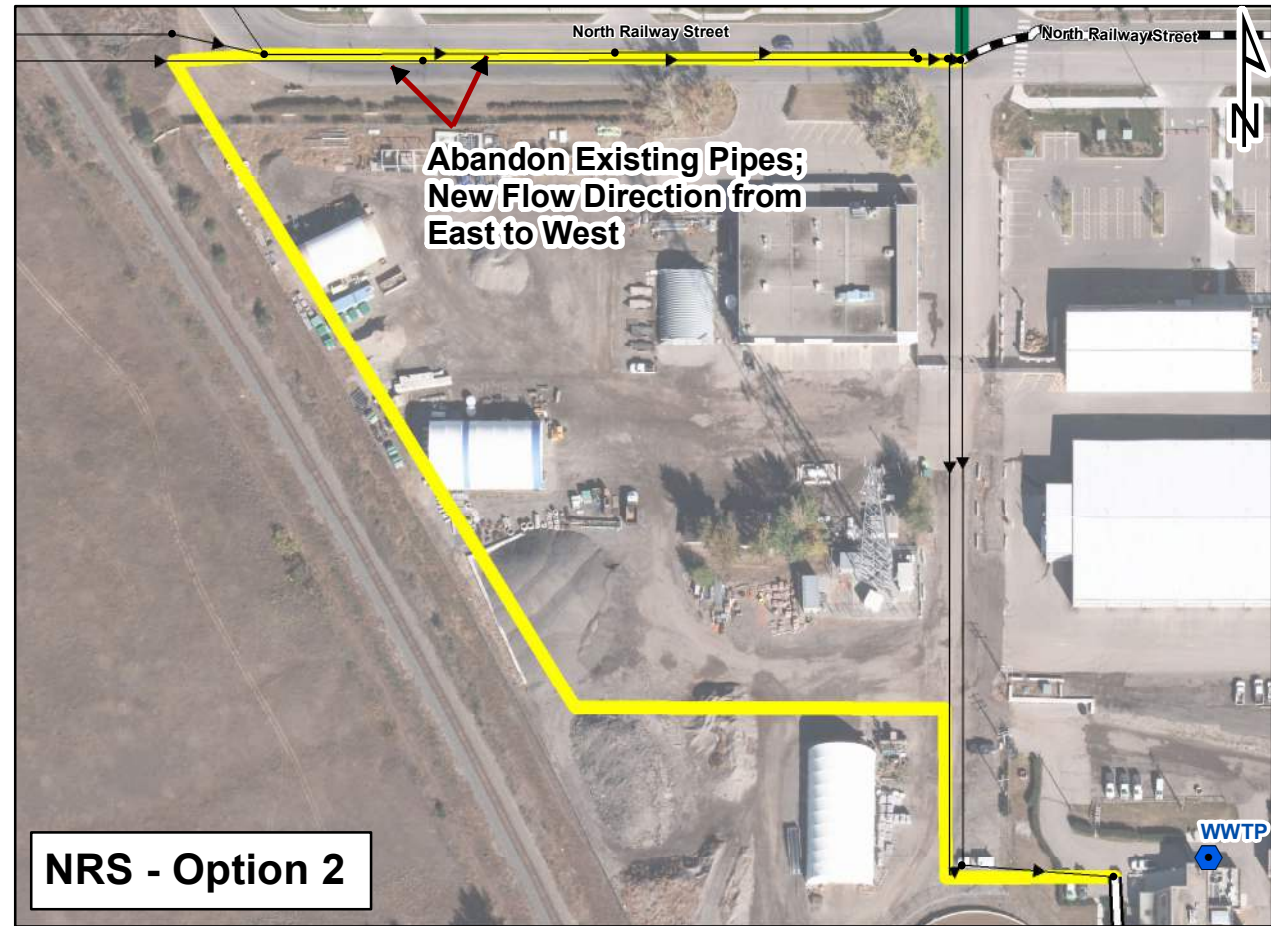
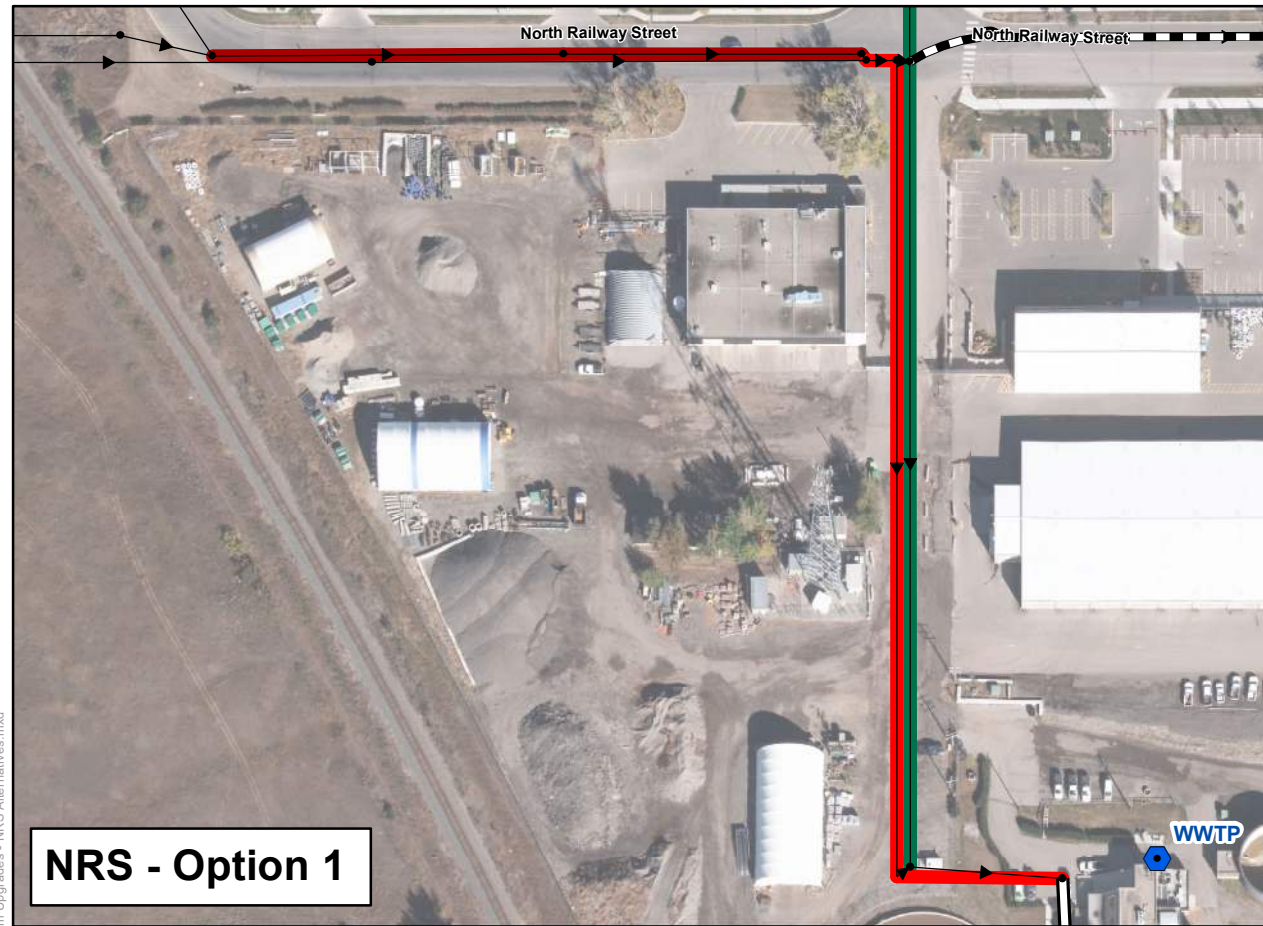
1:20,000

0 200 400 800 Meters

FIGURE 6.3
BUILD-OUT GROWTH HORIZON
RECOMMENDED UPGRADES
TO EXISTING SYSTEM
SANITARY MASTER PLAN UPDATE

Okotoks
Historic Past. Sustainable Future

ISL



Coordinate System:
CANAD83-UTM114

1:1,750

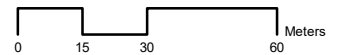
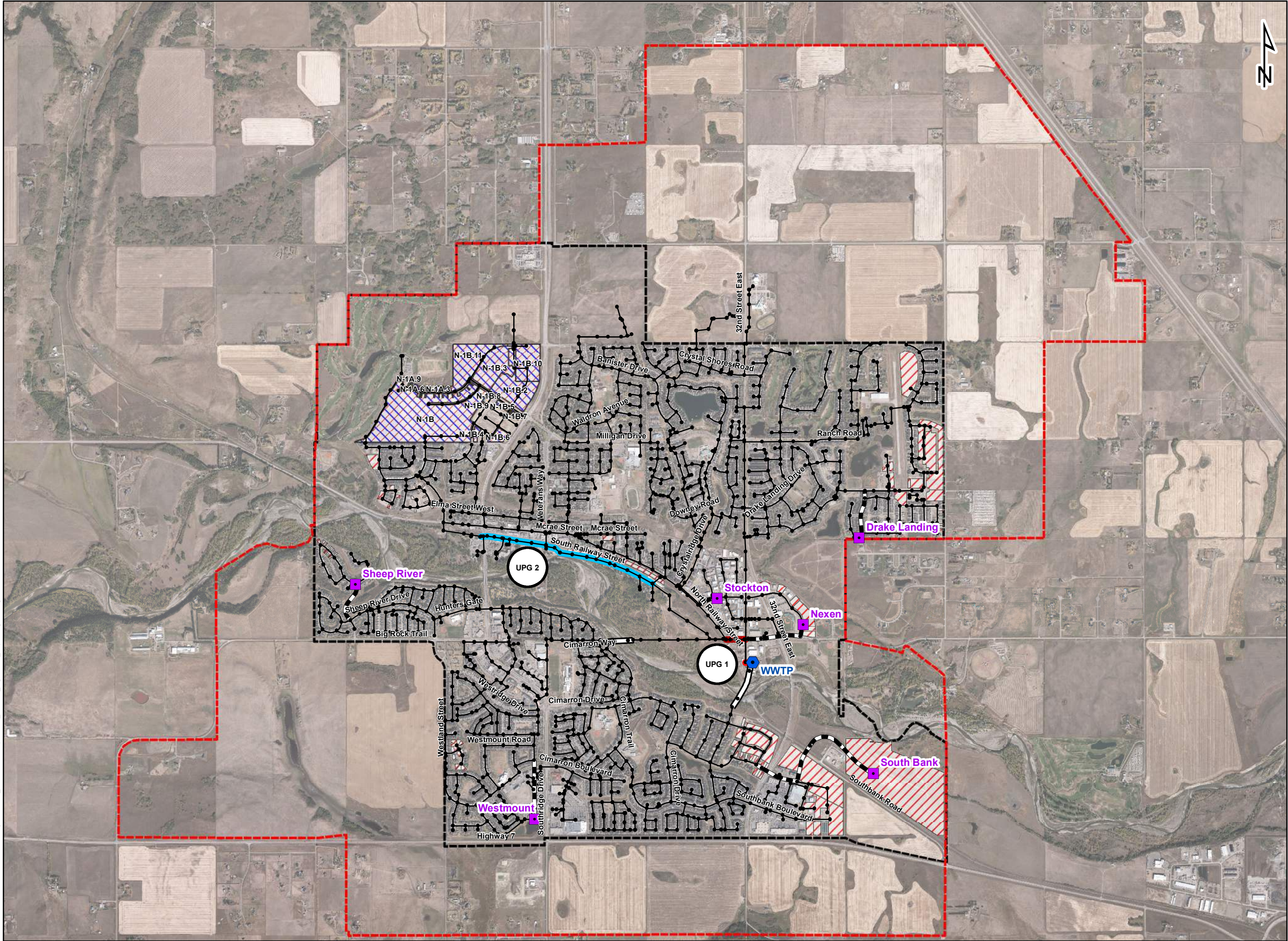


FIGURE 6.6
BUILD-OUT GROWTH HORIZON
RECOMMENDED UPGRADES
NRS ALTERNATIVES
SANITARY MASTER PLAN UPDATE





Legend

- Manhole
- Lift Station
- ⬡ Wastewater Treatment Plant
- Sanitary Pipe
- ▬ Forcemain
- ▬ Siphon
- ▭ Pre-Annexation Boundary
- ▭ Post-Annexation Boundary

Growth Horizon

- ▨ 2024 (Includes Densification)
- ▨ 2024 / 2029

Upgrade

- 450mm Gravity Sewer Upsize
- 525mm Gravity Sewer Upsize
- 750mm Gravity Sewer Upsize

Coordinate System:
CANA83-3TM114

1:30,000

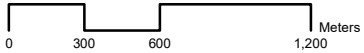
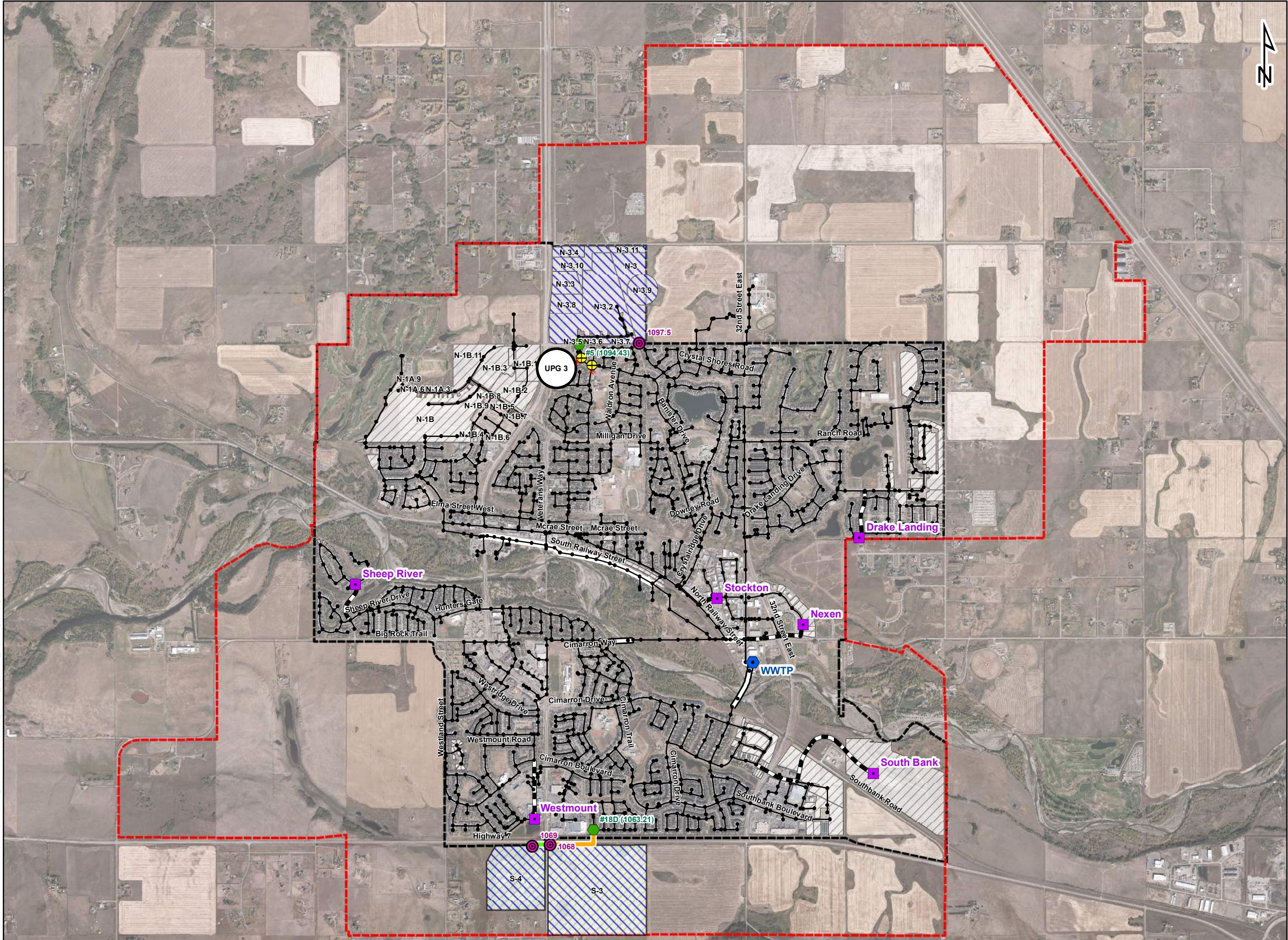


FIGURE 7.3
FIVE YEAR GROWTH HORIZON
SANITARY MASTER PLAN UPDATE





Legend

- Manhole
- Lift Station
- Wastewater Treatment Plant
- Gravity Tie-in Location
- Lowest Elevation Within Service Area
- Proposed Plug To Divert Flows
- Sanitary Pipe
- Forcemain
- Siphon
- Pre-Annexation Boundary
- Post-Annexation Boundary

Growth Horizon

- Developed Service Areas Prior to 2029
- 2029
- 2029 / 2044

Servicing Concept

- 250mm Gravity Sewer
- 375mm Gravity Sewer

**Infrastructure developed prior to the 10 year horizon shown in white.*

Coordinate System:
CANAD83-3TM114

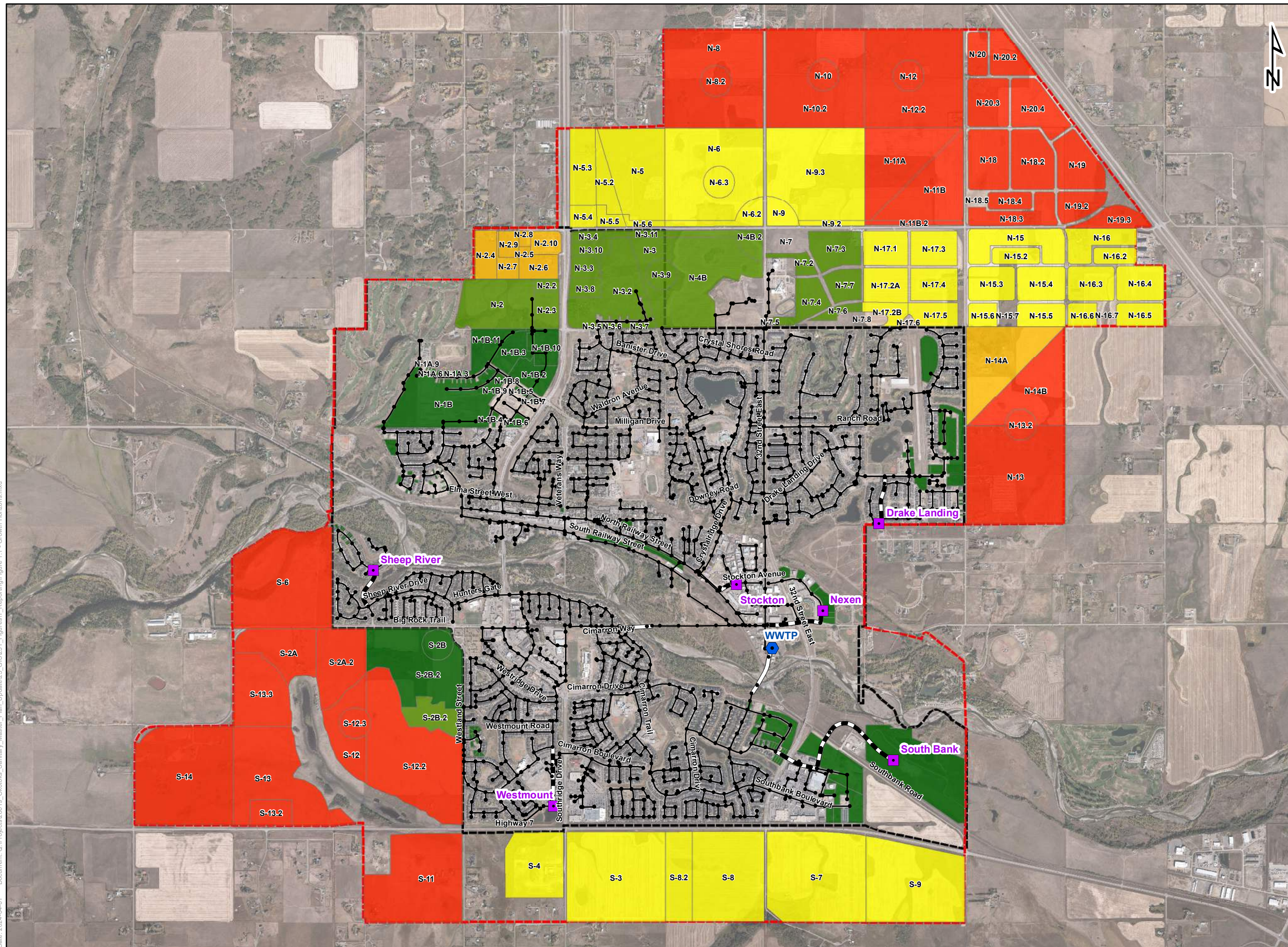
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FIGURE 7.4
TEN YEAR GROWTH HORIZON
SANITARY MASTER PLAN UPDATE







Legend

- Manhole
- Lift Station
- ⬡ Wastewater Treatment Plant
- Sanitary Pipe
- ▬ Forcemain
- Siphon
- ▭ Pre-Annexation Boundary
- ▭ Post-Annexation Boundary

Growth Horizon

- 2029
- 2029 / 2034
- 2034 / 2049
- 2049
- Ultimate

Coordinate System:
CANAD83-UTM14

1:30,000

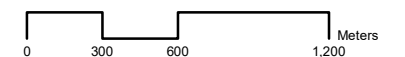
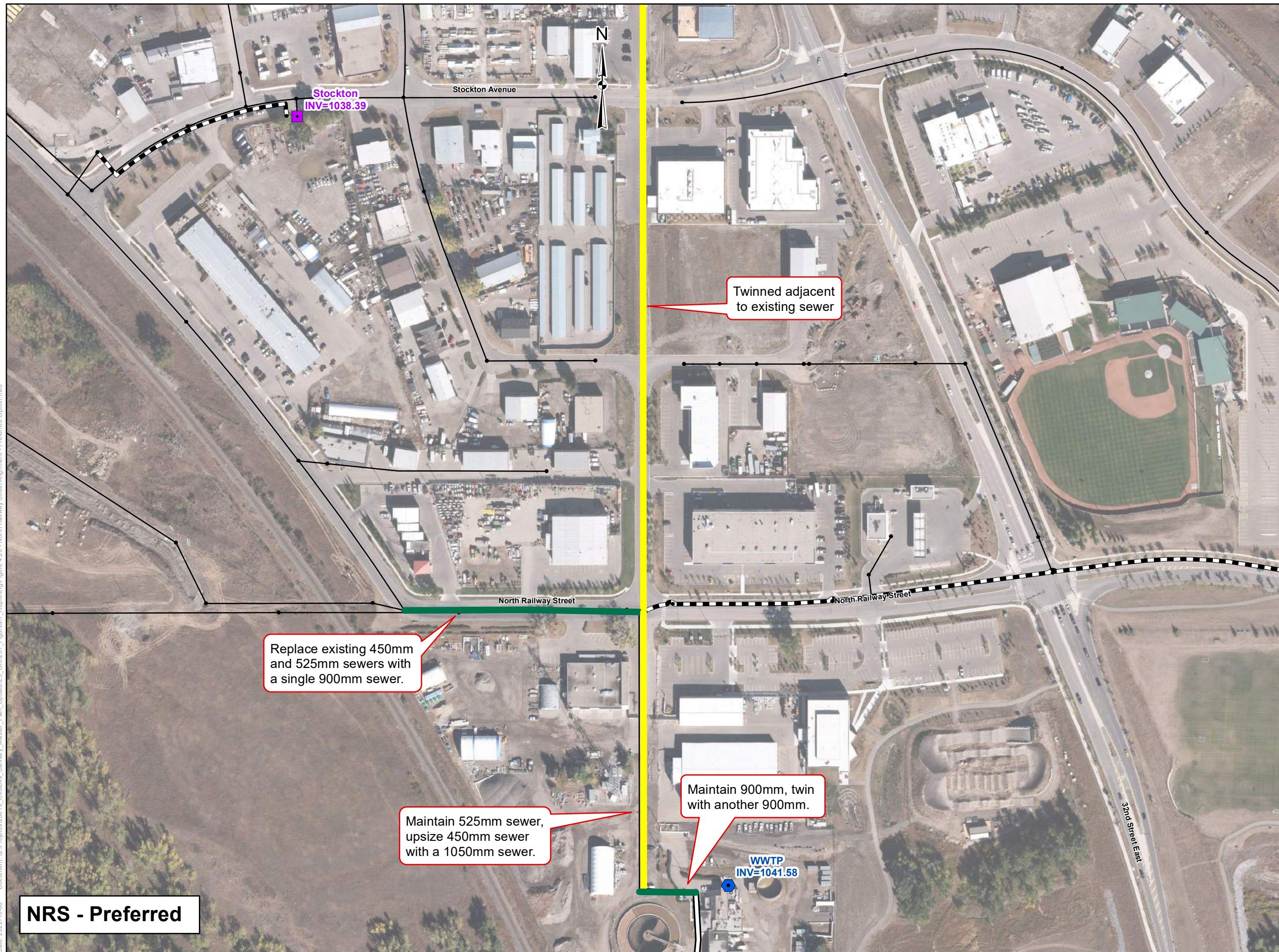


FIGURE 1.1
GROWTH HORIZONS
SANITARY MASTER PLAN UPDATE





NRS - Preferred

Legend

- Manhole
- Lift Station
- ⬡ Wastewater Treatment Plant
- Sanitary Pipe
- - - Forcemain
- == Siphon

Proposed Pipe Size

- 525mm Gravity Sewer
- 675mm Gravity Sewer
- 750mm Gravity Sewer
- 900mm Gravity Sewer
- 1050mm Gravity Sewer

Coordinate System:
CANA83-3TM114

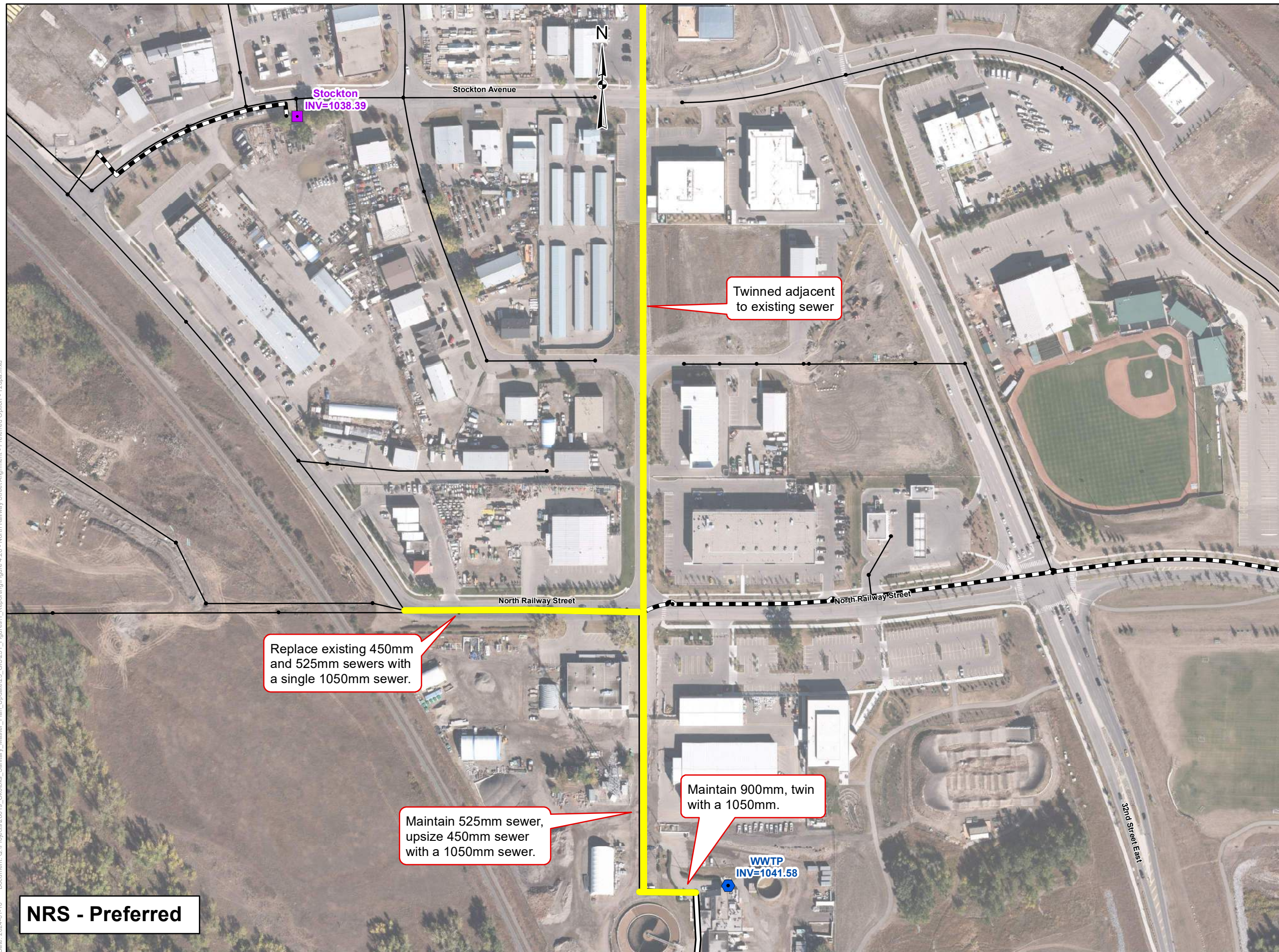
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FIGURE 4.21
NRS ALTERNATIVES (8 UPA)
PREFERRED ALIGNMENT OPTION
SANITARY MASTER PLAN UPDATE



Date: 2024-01-10 Document: C:\Projects\28019_Okotoks_Sanitary_Master_Plan_Update\25_GIS\251_Figures\1_Reporting\Figure 4.28 - North Railway Street Alignment - Preferred Option - 12upa.mxd



Legend

- Manhole
- Lift Station
- ⬡ Wastewater Treatment Plant
- Sanitary Pipe
- Forcemain
- == Siphon

Proposed Pipe Size

- 525mm Gravity Sewer
- 675mm Gravity Sewer
- 750mm Gravity Sewer
- 900mm Gravity Sewer
- 1050mm Gravity Sewer

Coordinate System:
CANAD83-3TM114

1:2,500

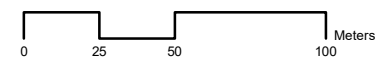


FIGURE 4.24
NRS ALTERNATIVES
PREFERRED ALIGNMENT OPTION
12UPA ALTERNATIVE
SANITARY MASTER PLAN UPDATE



Date: 2024-10-28 Document: C:\Projects\28019_Okotoke_Sanitary_Master_Plan_Update\25_GIS\251_Figures\1_Reporting\Figure 4.30 - Debottlenecking Scenarios - Existing Infrastructure.mxd

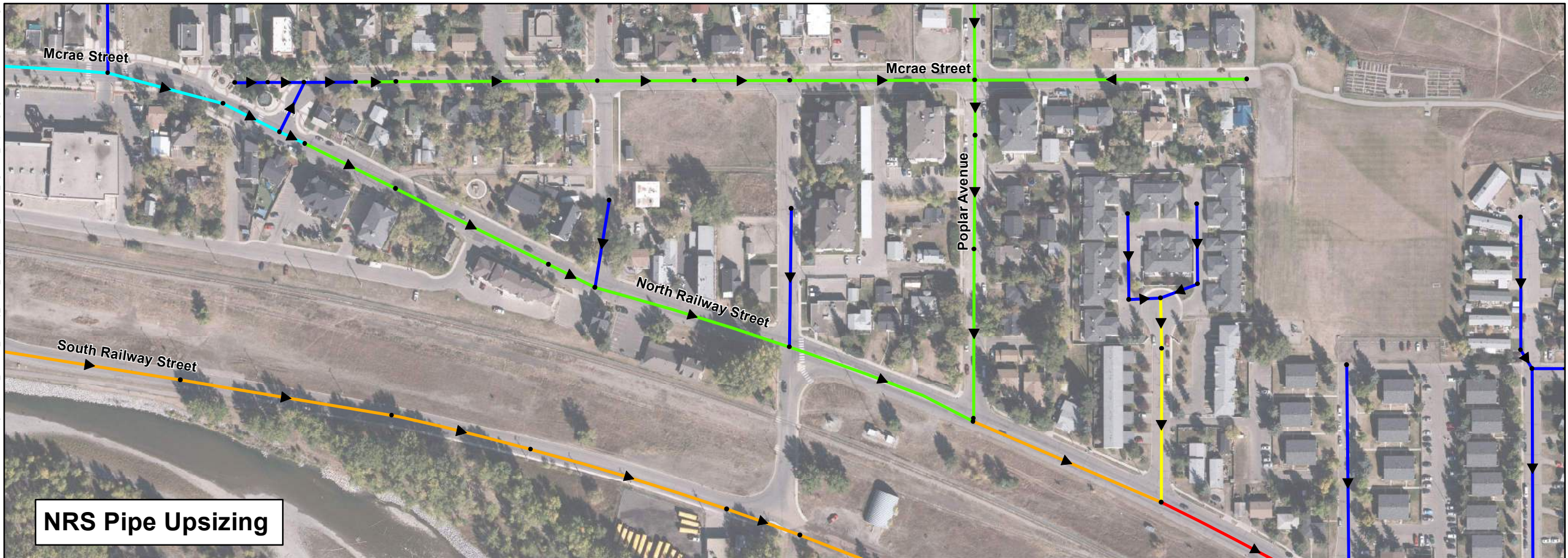


Legend

- Manhole

Pipe Size

- 100-150mm Gravity Sewer
- 200mm Gravity Sewer
- 250mm Gravity Sewer
- 300mm Gravity Sewer
- 350mm Gravity Sewer
- 375mm Gravity Sewer



Coordinate System:
CANAD83-UTM114

1:2,500

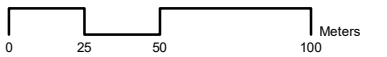
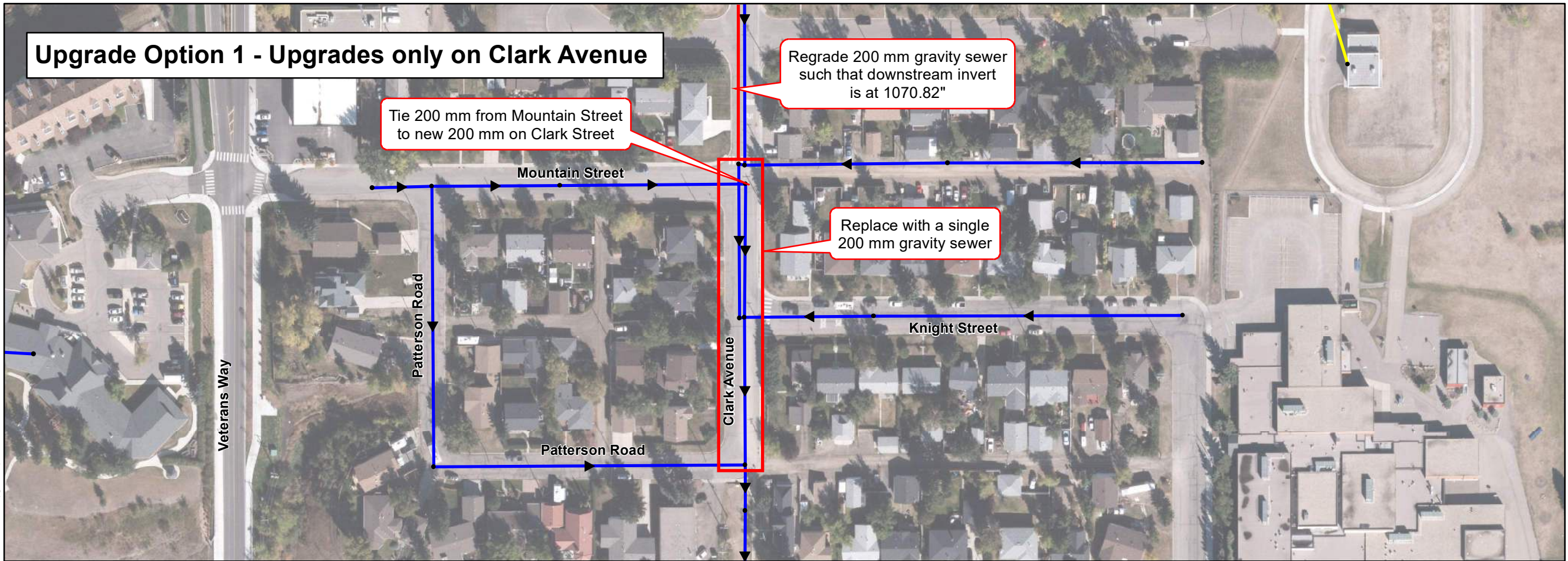


FIGURE 4.25
DEBOTTLENECKING SCENARIOS
EXISTING INFRASTRUCTURE
SANITARY MASTER PLAN UPDATE



Date: 2024-03-01 Document: C:\Projects\28019_Okotoks Sanitary Master Plan_Update\25_GIS\251_Figures\1_Reporting\Figure 4.31 - Debottlenecking Scenarios - Clark Avenue Upgrade Options.mxd



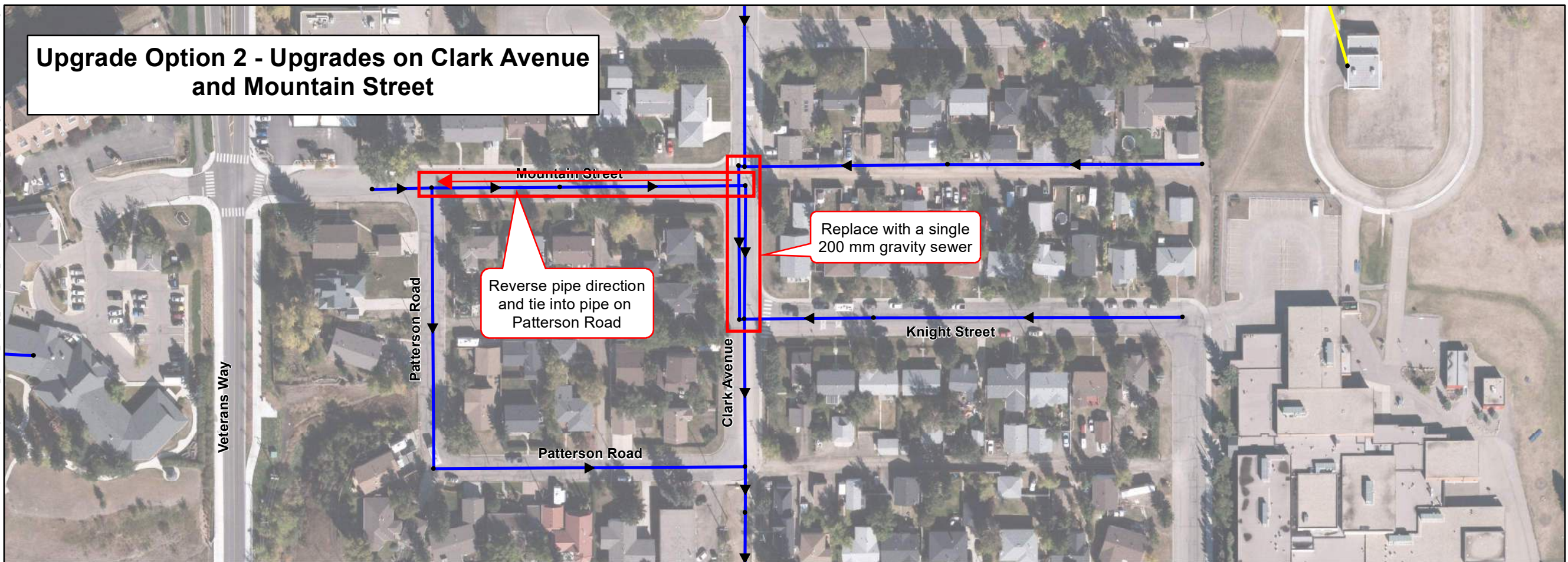
Legend

• Manhole

Pipe Size

100-150mm Gravity Sewer

200mm Gravity Sewer



Coordinate System:
CANA83-3TM114

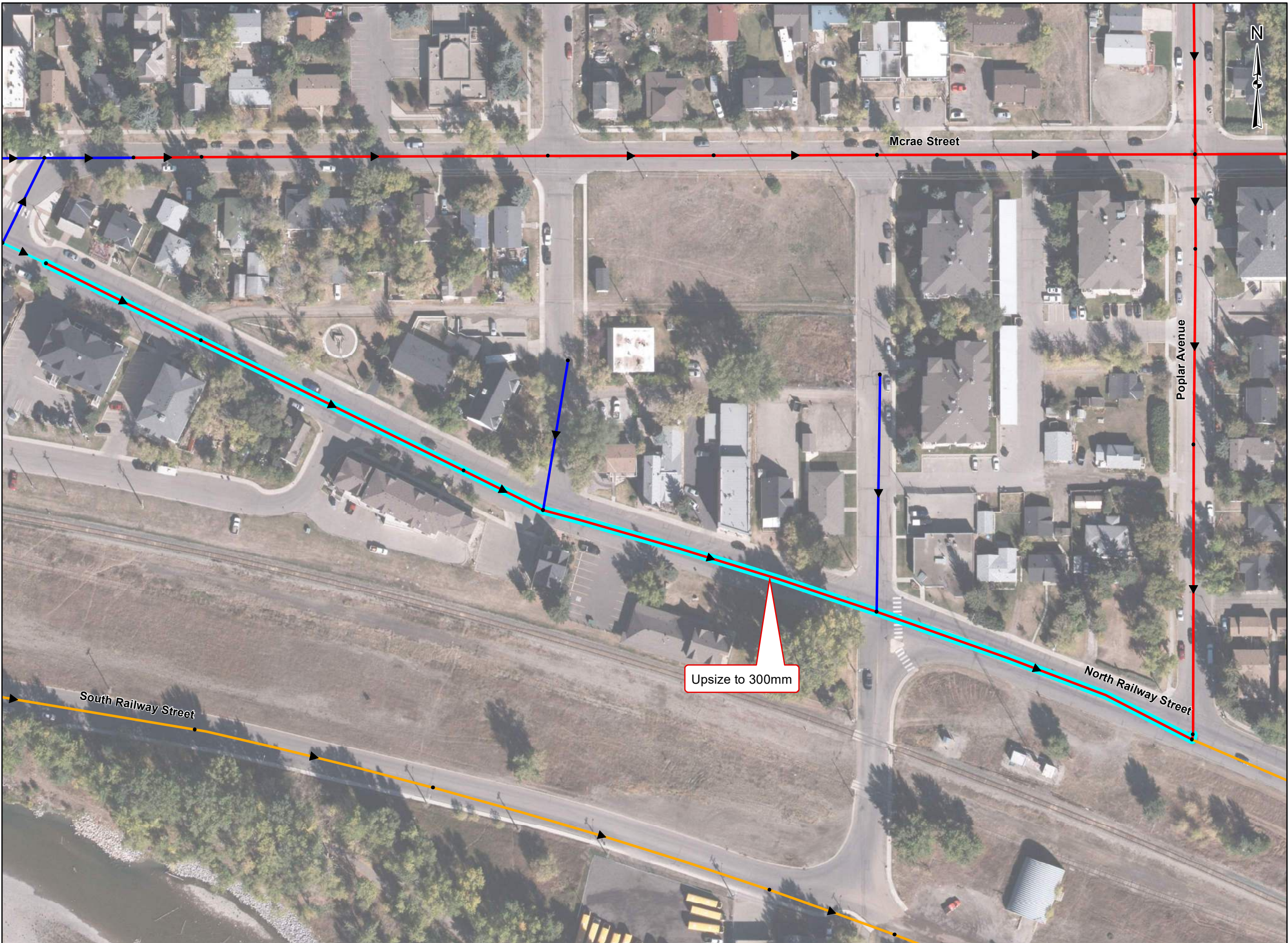
1:1,600



FIGURE 4.26
DEBOTTLENECKING SCENARIOS
CLARK AVENUE UPGRADE OPTIONS
SANITARY MASTER PLAN UPDATE



Date: 2024-10-28 Document: C:\Projects\28019_Okotoke Sanitary Master Plan_Update\25_GIS\251_Figures\1_Reporting\Figure 4.34 - Debottlenecking Scenarios - North Railway Street Upgrades.mxd



Legend

- Manhole
- ➔ 200mm Gravity Sewer
- ➔ 250mm Gravity Sewer
- ➔ 300mm Gravity Sewer
- ➔ 375mm Gravity Sewer
- ➔ North Railway Street Upgrade

Coordinate System:
CANA83-3TM114

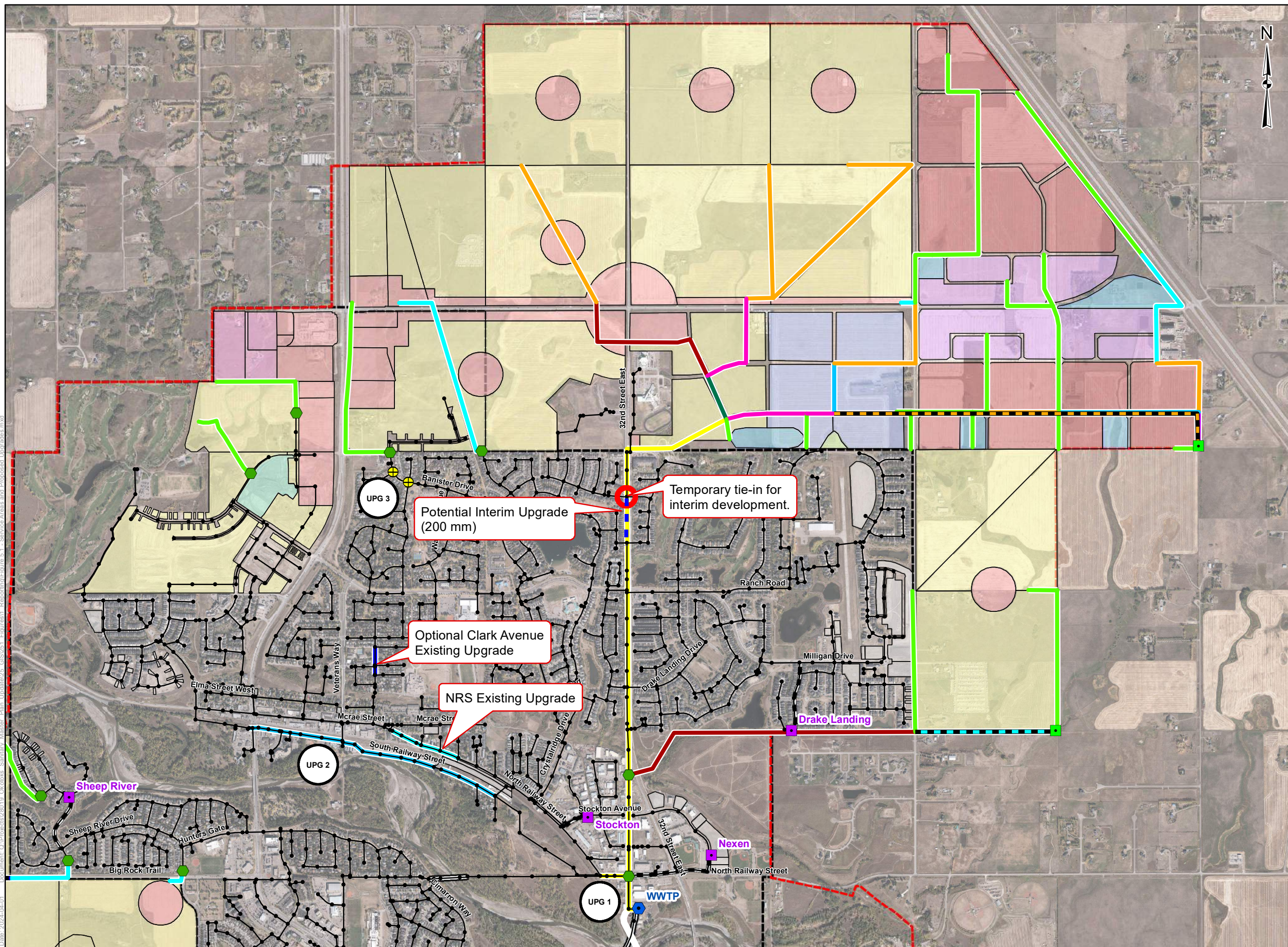
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FIGURE 4.29
DEBOTTLENECKING SCENARIOS
NORTH RAILWAY STREET UPGRADES
SANITARY MASTER PLAN UPDATE



Date: 2024-04-01 Document: O:\Projects\28019_Okotoks Sanitary Master Plan Update\25_GIS\251_Figures\1_Report\Figure 5.1 - Service Areas and Proposed Upgrades.mxd



- Legend**
- Lift Station
 - Proposed Lift Station
 - Gravity Tie-in Location
 - Wastewater Treatment Plant
 - Proposed Plug To Divert Flows
 - Manhole

- Sanitary Pipe
- Pre-Annexation Boundary
- Post-Annexation Boundary

Service Area by Land Use

- Densification
- Commercial
- Employment
- Green Space (Unserviced)
- Highway Business
- Industrial
- Institutional
- Residential
- SWMP (Unserviced)
- Surplus Industrial

Proposed Pipe Size

- 200mm Gravity Sewer
- 250mm Gravity Sewer
- 300mm Gravity Sewer
- 375mm Gravity Sewer
- 450mm Gravity Sewer
- 525mm Gravity Sewer
- 600mm Gravity Sewer
- 675mm Gravity Sewer
- 900mm Gravity Sewer
- 1050mm Gravity Sewer
- 200mm Forcemain
- 300mm Forcemain
- 375mm Forcemain

Coordinate System:
CANAD83-3TM114

1:21,000



FIGURE 5.1
SERVICE AREAS AND
PROPOSED UPGRADES (12 UPA)
SANITARY MASTER PLAN UPDATE





APPENDIX

Detailed Cost Estimates

B



Appendix B - Sanitary Master Plan Amendment (South Railway Street) Detailed Cost Estimates

Project: Sanitary Master Plan Amendment (South Railway Street)
Client: The Town of Okotoks
Project #: 28555
Date: 8/15/2024

Engineering: 10%
Contingency: 30%

Table A.1 - Existing System Upgrading Consideration Detailed Cost Estimates

Item	Description	Unit Rate (\$/unit)	Unit	Quantity (unit)	Cost (\$)	Engineering (\$)	Contingency (\$)	Total (\$)
Upgrade Option #1								
1.1	Remove Existing Plug at Manhole ID NW-116	30,000	m	1	\$ 30,000	\$ 3,000	\$ 9,000	\$ 42,000
1.2	Re-grade 75 m of existing 450 mm sewer along Elizabeth Street	300	m	75	\$ 23,000	\$ 2,000	\$ 7,000	\$ 32,000
1.3	Pavement Rehabilitation	1,000	m	75	\$ 75,000	\$ 8,000	\$ 23,000	\$ 106,000
Interim Upgrade #1 Sub-Total					\$ 128,000	\$ 13,000	\$ 39,000	\$ 180,000
Upgrade Option #2								
2.1	Remove Existing Plug at Manhole ID NW-116 (east) and add plug (south)	30,000	m	2	\$ 60,000	\$ 6,000	\$ 18,000	\$ 84,000
Interim Upgrade #2 Sub-Total					\$ 60,000	\$ 6,000	\$ 18,000	\$ 84,000
Upgrade Option #3								
3.1	Excavate, Backfill, Supply and Installation of 240 m of 450 mm sewer (3.0 m Deep)	650	m	240	\$ 156,000	\$ 16,000	\$ 47,000	\$ 219,000
3.2	1,200 mm Manhole (3 at 3.0 m Deep)	3,600	vm	9	\$ 32,000	\$ 3,000	\$ 10,000	\$ 45,000
3.3	Removal of 240 m of Existing 200 mm Sewer (3.0 m Deep)	350	m	240	\$ 84,000	\$ 8,000	\$ 25,000	\$ 117,000
3.4	Pavement Rehabilitation	1,000	m	240	\$ 240,000	\$ 24,000	\$ 72,000	\$ 336,000
Interim Upgrade #3 Sub-Total					\$ 512,000	\$ 51,000	\$ 154,000	\$ 717,000
Upgrading Extension of Option #3 to Highway 2A								
4.1	Excavate, Backfill, Supply and Installation of 297 m of 450 mm sewer (3.0 m Deep)	650	m	297	\$ 193,000	\$ 19,000	\$ 58,000	\$ 270,000
4.2	1,200 mm Manhole (7 at 3.0 m Deep)	3,600	vm	21	\$ 76,000	\$ 8,000	\$ 23,000	\$ 107,000
4.3	Removal of 175 m of Existing 200 mm Sewer (3.0 m Deep)	350	m	175	\$ 61,000	\$ 6,000	\$ 18,000	\$ 85,000
4.4	Removal of 122 m of Existing 250 mm Sewer (3.0 m Deep)	400	m	122	\$ 49,000	\$ 5,000	\$ 15,000	\$ 69,000
4.5	Pavement Rehabilitation	1,000	m	297	\$ 297,000	\$ 30,000	\$ 89,000	\$ 416,000
Interim Upgrade #3 Sub-Total					\$ 676,000	\$ 68,000	\$ 203,000	\$ 947,000