



Inspiring sustainable thinking



Town of Okotoks

Final Report

Sanitary Servicing Master Plan Update

July 2016





ISL Engineering and Land Services Ltd. is an award-winning full-service consulting firm dedicated to working with all levels of government and the private sector to deliver planning and design solutions for transportation, water, and land projects.

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July 18, 2016

Our Reference: 26327

Town of Okotoks
P.O. Box 20, Stn Main
5 Elizabeth Street
Okotoks, AB T1S 1K1

Attention: Jeremy Huet, P.Eng., Senior Engineer

Dear Sir:

Reference: Town of Okotoks – Sanitary Servicing Master Plan Update - Final Report

Enclosed is the final report for the Town of Okotoks Sanitary Servicing Master Plan Update study. We trust that it meets your needs.

The key objective of this project is to assess the Town's current sanitary conveyance infrastructure capacity and the future needs for projected Town populations. The Sanitary Servicing Master Plan Update will provide the Town with direction on infrastructure implementation alternatives to service the projected populations, while ensuring infrastructure remains fully functional in providing appropriate level of service. This information will aide in making informed decisions on capital projects, and will provide solutions for efficient, economic and sustainable municipal services to residents.

We sincerely appreciate the opportunity to undertake this project on your behalf. Should you have any questions or concerns, please do not hesitate to contact the undersigned at (403) 254-0544.

Sincerely,

Geoffrey Schulmeister, P.Eng.
Manager, Water and Environment



Corporate Authorization

This document entitled “Sanitary Servicing Master Plan Update” 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.

Rafal Jadzinski, P. Eng.
Water Resources / Municipal Engineer



Acknowledgements

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Town of Okotoks

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ISL

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Sarah Barbosa, E.I.T.

EPCOR

Darren Peel, Site Manager,
Okotoks Operations



Executive Summary

Introduction

ISL Engineering and Land Services Ltd. (ISL) was retained by the Town of Okotoks (the Town) to complete an update to the Town's existing 2009 Sanitary Master Plan. This project was initiated in response to increased growth in the Town as well as revisions to future population projections, outlined in the Growth Study and Financial Assessment Report. The intent of the study is to provide a framework for existing system capacity upgrades and the future wastewater servicing system for the Town as well as to provide capital costing for any remedial measures for capital planning and future off-site levy considerations. This framework should provide a "road map" for the Town to follow to ensure sound wastewater system planning.

Study Objectives

The Study was prepared to achieve the following objectives:

1. To develop a hydrodynamic MIKE URBAN model of the Town's existing wastewater collection system and calibrate it to provide accurate capacity assessment.
2. To use the calibrated model to prepare capacity assessment of the existing wastewater servicing system and its ability to perform under existing and growth conditions.
3. To determine what, if any, upgrades for existing Town infrastructure are required to meet servicing objectives under existing conditions
4. To review existing inflow-infiltration rates observed under wet weather conditions.
5. To develop future sanitary servicing system within the annexation area for both 30-year and 60-year growth horizons slated for full buildout of these lands by 2043 and 2073, respectively.
6. To determine what upgrades for existing City infrastructure are required to meet servicing objectives under future 30-year and 60-year growth horizons.
7. To provide a framework for future wastewater capital planning.
8. To provide costs related to infrastructure requirements.
9. To comment on possible staging of infrastructure and/or growth areas, where applicable.
10. To update the Town's existing off-site levies once preferred upgrades and servicing options are selected.

Wastewater Collection System - Conclusions

Conclusions for the Study are as follows:

Existing Conditions

1. The existing sanitary system performs adequately under dry weather flow conditions.
2. The existing sanitary system generally performs adequately under the 1 in 50-year 24-hour 4th Quartile Huff Storm as per the City of Calgary's assessment guidelines, with a few exceptions where it experiences localized minor surcharge conditions. A list detailing sections and the corresponding locations of the affected trunks is provided in **Section 6.3.1**.
3. The existing sanitary system generally performs adequately under the inflow-infiltration allowance of 0.28L/s/ha as per the Alberta Environment and Parks' guidelines, with a few exceptions where it experiences localized minor surcharge conditions. A list detailing sections and the corresponding locations of the affected trunks is provided in **Section 6.3.2**.
4. The existing sanitary system generally performs adequately under the May 27th 2011 rainfall event, with a few exceptions where it experiences localized surcharge conditions. It should be noted that this historical rainfall event resulted in more severe surcharge conditions along North Railway Street and Clark Avenue when compared to the other two assessment rainfall events. A list detailing sections and the corresponding locations of the affected trunks is provided in **Section 6.3.3**.
5. Generally speaking all existing forcemains perform adequately under the existing dry weather flow conditions as the operational velocities range between the preferred values of 1.0m/s and 2.5m/s as discussed in **Section 6.3.4**.



6. The analysis suggests that both South and West siphons record low velocities during average and peak dry weather flow conditions and thus do not meet the preferred minimum velocity of 1.0m/s that is ideal to occur at least once a day. Having said that, no clogging or any other operational issues have been recorded in the past by the Town and EPCOR, and as a result no remediation measures are proposed at this time. For more details please refer to **Section 6.3.4**.
7. The existing South siphon was found to have a capacity in the order of 186L/s, which consequently yielded a spare capacity ranging from ~150L/s to ~165L/s based on the existing peak wet weather flows produced by all three assessment scenarios as shown in **Table 6.12 of Section 6.3.4**.
8. The existing West siphon was found to have a capacity in the order of 190L/s, which consequently yielded a spare capacity ranging from ~65L/s to ~100L/s based on the existing peak wet weather flows produced by all three assessment scenarios as shown in **Table 6.12 of Section 6.3.4**.
9. The review of the inflow-infiltration rates and volumes based on all three assessment rainfall events, as discussed in **Section 6.2**, suggests that sewers located within Site 2 i.e. upstream of “FM #2 – 2011” flow monitor experience higher than average inflow-infiltration and thus are most likely a source of substantial I-I into the existing sanitary system. All other sites recorded I-I rates of less than 0.28L/s/ha.
10. The review of the flood hazard map as per the Alberta Environment and Park’s data suggests that six (6) and eighty-one (81) existing manholes are within a 100-year floodplain and flood fringe, respectively. These eighty-seven (87) manholes constitute a substantial source of the high inflows into the sanitary system during extreme rainfall and flooding events as it was the case in June 2005.

30-year Growth Horizon (2043) Conditions

1. The Town’s sanitary system does not meet the adopted LOS (50-year 24-hour 4th Quartile Huff Storm) under 30-year level of growth as a number of major trunks experience substantial surcharge conditions. Namely the aforementioned Elizabeth Street/North Railway trunk and South Railway trunk, in addition to 32nd Street trunk north of the Sheep River will require upgrading. Please note that future sanitary catchments in the southwest were revised after the preliminary assessment runs, such that more area will be serviced by the proposed Highway 7 and 32nd Street South trunk and the new south siphon crossing, to eliminate the need to upgrade Woodhaven Drive trunk along with the existing West siphon. A list detailing sections and the corresponding locations of the affected trunks is provided in **Table 7.6 of Section 7.3**.
2. The analysis suggests that the imminent Wind Walk Development (Service Area 30-16) can be serviced by the existing Cimarron Trunk and the downstream West siphon under 30-year growth horizon scenario provided that trunk along Fisher Gate immediately upstream of the WWTP is upgraded as part of the North Railway Street upgrades as discussed in **Section 9.2**.
3. The existing West siphon was found to have a spare capacity in the order of 7.2L/s based on the peak weather flow under 30-year level of growth as shown in **Table 7.9 of Section 7.3**.
4. The existing South siphon was found to be under capacity by ~110.9L/s based on the peak weather flow under 30-year level of growth, as shown in **Table 7.9 of Section 7.3**, assuming the proposed Highway 7 and 32nd Street South trunk would tie in immediately upstream of the existing siphon. However, the recommended servicing option for the south lands considers a brand new alignment for the new south river crossing resulting in the future flows from these lands not being conveyed by the existing siphon.
5. The proposed servicing option for the 30-year level of growth, determined based on a comprehensive Triple Bottom Line (TBL) analysis, is presented in **Figures 9.1 to 9.5**.
6. The proposed 30-year upgrades consisting of twinning of the existing sanitary sewers are presented in **Figure 9.6**, while their equivalent upgrades in the form of upsizing or replacement of the existing sewer are depicted in **Figure 9.7**.



60-year Growth Horizon (2073) Conditions

1. The Town's sanitary system does not meet the Town's adopted LOS (50-year 24-hour 4th Quartile Huff Storm) under 60-year level of growth as a number of major trunks experience severe surcharge conditions. The extent of surcharge along 32nd Street E north of the Sheep River is more profound compared to the 30-year level of growth, while the North and South Railway trunks experience the same level of surcharge. As a result, the recommended pipe sizes of upgrades for the 32nd Street trunk as per above will need to be further increased.
2. The analysis suggests that the imminent Wind Walk Development (Service Area 30-16) can be serviced by the existing Cimarron Trunk and the downstream West siphon under 60-year growth horizon scenario provided that trunk along Fisher Gate immediately upstream of the WWTP is upgraded as part of the North Railway Street upgrades as discussed in **Section 9.2**.
3. The existing West siphon was found to have a spare capacity in the order of 1.3L/s based on the peak weather flow under 60-year level of growth as shown in **Table 7.9 of Section 7.3**.
4. The existing South siphon was found to be under capacity by ~155.3L/s based on the peak weather flow under 60-year level of growth, as shown in **Table 7.9 of Section 7.3**, assuming the proposed Highway 7 and 32nd Street South trunk would tie in immediately upstream of the existing siphon. As stated above, the recommended servicing option for the south lands considers a brand new alignment for the new south river crossing resulting in the future flows from these lands not being conveyed by the existing siphon.
5. The proposed servicing option for the 60-year level of growth, determined based on a comprehensive Triple Bottom Line (TBL) analysis, is presented in **Figures 9.14 to 9.18**.
6. The new South siphon river crossing, which is a part of the recommended 30-year servicing option, will provide a sufficient combined capacity to convey the 60-year peak wet weather flows, as shown in **Figure 9.18**.
7. The proposed 60-year upgrades consisting of twinning of the existing sanitary sewers are presented in Figure 9.19, while their equivalent upgrades in the form of upsizing or replacement of the existing sewer are depicted in **Figure 9.20**.

Wastewater Collection System – Recommendations

Recommendations for the Study are as follows:

Existing Conditions

1. The recommended upgrades to the existing system under the current conditions have an estimated total cost of \$413,000 as summarized in **Section 6.4**.
2. **Upgrade #1:** To resolve the elevated maximum HGL along North Railway Trunk, it is recommended to divert flows from Elizabeth Street trunk to South Railway Street trunk by plugging the east outgoing pipe at the Centre Avenue and Elizabeth Street intersection, and realigning approximately 11 metres of sewer to ensure the inverts at the Centre Avenue and Elizabeth Street intersection are matched. This localized fix was found to be sufficient to address minimal surcharge conditions along North Railway Street trunk under the existing conditions at an estimated cost of \$28,000 as discussed in **Section 6.4**.
3. **Optional Upgrade:** To address surcharged section of sewer along Clark Avenue based on the May 27th 2011 rainfall event and feedback from the Town, it is proposed to upgrade roughly 165m of trunk at an estimated cost of \$254,000 as discussed in **Section 6.4**. Please note that the 50 year 24 hour Huff design storm, which was accepted by the Town as a level-of-service, did not result in substantial surcharge conditions along Clark Avenue. Hence, this upgrade is considered optional based on the field observations and residents' feedback.
4. **Upgrade #O1 & #O2:** To substantially reduce the inflow into the sanitary system in case of severe flooding events, it is recommended to seal all manholes within the 100-year floodplain and flood fringe at an estimated cost of \$131,000 as discussed in **Section 6.4**.



30-year Growth Horizon (2043) Conditions

1. The cost of constructing the recommended sanitary servicing system within the annexed lands to meet the 30-year population and land growth is estimated at \$27,320,000.
2. The recommended upgrades for the existing system to meet the 30-year level of growth have an estimated total cost of \$9,965,000 (including the existing upgrades) and are listed in **Tables 9.2 and 9.3**.

These upgrades consist of:

- **Upgrade #2 & #3:** Constructing roughly 260m of a 450mm PVC offload sewer from the South Railway Trunk to the North Railway Trunk (tie-in at Crystal Ridge Drive) at an estimated cost of \$411,800. This upgrade includes a new CPR crossing.
- **Upgrade #4 & #5:** Constructing roughly 276 metres of a 450mm PVC offload sewer, connecting the North Railway Trunk to South Railway Trunk from Elizabeth Street to Riverside Drive at an estimated cost of \$467,400. This upgrade includes a new CPR crossing.
- **Upgrade #6:** Twinning the existing section of Riverside Drive from the west end of the trunk to just east of Northridge Drive with ~150m of 300mm sewer at an estimated cost of \$234,500. Alternatively, this section of trunk could be replaced with a single 375mm sewer at an estimated cost of \$288,500.
- **Upgrade #7:** Twinning the existing section of South Railway Trunk from just east of Northridge Drive to Center Avenue with ~495 metres of 300mm sewer at an estimated cost of \$789,500. Alternatively, this section of trunk could be replaced with a single 375mm sewer at an estimated cost of \$951,700.
- **Upgrade #8:** Twinning the existing section of South Railway Trunk from Center Avenue to just west of Lineham Drive with ~550 metres of 300mm sewer at an estimated cost of \$870,900. Alternatively, this section of trunk could be replaced with a single 450mm sewer at an estimated cost of \$1,134,500.
- **Upgrade #9:** Twinning the existing section of North Railway Trunk from Crystal Ridge Drive to Fisher Gate with ~725 metres of 375mm sewer at an estimated cost of \$1,441,500. Alternatively, this section of trunk could be replaced with a single 525mm sewer at an estimated cost of \$1,828,000.
- **Upgrade #10:** Twinning the existing section of Fisher Gate from the intersection with North Railway Street to the WWTP with ~230 metres of 525mm sewer at an estimated cost of \$426,500. Alternatively, this section of trunk could be replaced with a single 675mm sewer at an estimated cost of \$587,000.
- **Upgrade #11:** Diverting flows away from Sunset Crescent by plugging the west outgoing pipe at the Sunset Crescent and Banister Drive intersection; as well as diverting flows away from Robinson Drive by plugging the south outgoing pipe at the Robinson Drive and Banister Drive intersection. These upgrades are estimated to cost \$6,000.
- **Upgrade #12:** Twinning the existing section of 32nd Street E Trunk from half way of Fisher Crescent to the wastewater treatment plant with 795 metres of 450mm sewer at an estimated cost of \$1,418,000. Alternatively, this section of trunk could be replaced with a single 600mm sewer at an estimated cost of \$1,875,000.
- **Upgrade #13:** Twinning the existing section of 32nd Street E Trunk from the intersection with Milligan Drive south with 300 metres of 375mm sewer at an estimated cost of \$500,000. Alternatively, this section of trunk could be replaced with a single 450mm sewer at an estimated cost of \$626,000.
- **Upgrade #14 (A&B):** Constructing 550 metres of a 300mm interceptor trunk along the 32nd Street from the Crystal Shores Road to Milligan Drive at an estimated cost of \$878,000. Alternatively, the downstream section of the proposed interceptor trunk could be increased to 375mm in case a section of the existing sewer is planned to be replaced with a single pipe instead of twinning for a total estimated cost of \$991,000.
- **Upgrade #15:** Twin the existing section of 32nd Street E Trunk from the intersection with Crystal Shores Road north with 150 metres of 250mm sewer at an estimated cost of \$233,000. Alternatively, this section of trunk could be replaced with a single 300mm sewer at an estimated cost of \$278,000.



60-year Growth Horizon (2073) Conditions

1. The cost of constructing the recommended sanitary servicing system within the annexed lands to meet the 60-year population and land growth is estimated at \$49,190,000 (including the 30-year servicing option), hence yielding an incremental cost of \$21,870,000.
2. The recommended upgrades for the existing system to meet the 60-year level of growth have an estimated total cost of \$11,155,000 (including the existing and 30-year upgrades), hence yielding an incremental cost of \$1,190,000. These upgrades are detailed in **Tables 9.7 and 9.8**.
3. As stated above, a number of 30-year upgrades along 32nd Street E north of the Sheep River will need upsizing in addition to a new section of sewer as per upgrade #16. Hence, it is proposed to construct those upgrades based on the ultimate (60-year) sizing as follows:
 - **Upgrade #12:** Twin the existing section of 32nd Street E Trunk from half way of Fisher Crescent to the wastewater treatment plant with 795 metres of 675mm sewer at an estimated cost of \$1,706,000. Alternatively, this section of trunk could be replaced with a single 900mm sewer at an estimated cost of \$2,302,500.
 - **Upgrade #13:** Same sizing as specified for 30-year level of growth in case of twinning. Alternatively, this section of trunk could be replaced and upsized to a single 525mm sewer at an estimated cost \$989,000 based on the 60-year peak wet weather flows.
 - **Upgrade #14 (A&B):** Same sizing as specified for 30-year level of growth in case of twinning. Alternatively, this section of trunk could be replaced and upsized to a single 375mm and 450mm sewer for section A and B, respectively, at an estimated cost \$1,055,000 based on the 60-year peak wet weather flows.
 - **Upgrade #15:** Twin the existing section of 32nd Street E Trunk from the intersection with Crystal Shores Road north with 150 metres of 300mm sewer at an estimated cost of \$240,000. Alternatively, this section of trunk could be replaced with a single 375mm sewer at an estimated cost of \$293,000.
 - **Upgrade #16:** Twin the existing section of 32nd Street E Trunk from half way of Fisher Crescent north with 150 metres of 375mm sewer at an estimated cost of \$250,000. Alternatively, this section of trunk could be replaced with a single 450mm sewer at an estimated cost of \$316,000.

Wastewater Collection System – Future Study Recommendations

The following additional studies and measures are recommended as a part of the Okotoks Sanitary Servicing Master Plan Update:

1. Undertake further flow monitoring focusing on the trunks encompassed by flow monitor #2 (2011) to pinpoint the areas responsible for high inflow-infiltration to be followed with remediation measures.
2. Consider a sewer relining program for the Elizabeth Street/North Railway Street and South Railway Street trunks to minimize groundwater seepage into the sanitary system. It would be imperative to determine the extent of degradation of these trunks, if any, by means of deploying CCTV technology to determine if relining is a viable solution.
3. Revisit the Sanitary Master Plan Update roughly every five (5) years to update the hydrodynamic model and analysis with the most up-to-date growth projections. This could provide clarity on the planned location of development, the density of the proposed development, and the potential corresponding upgrades. This should also be undertaken to consider densification within the existing Town boundary.