

# Riverview and Windermere Ultimate Sanitary Servicing

## Purpose – To Support UPE01567 Council Report

### Summary

This report provides the technical rationale for the removal of the South Edmonton Sanitary Sewer (SESS) SW5, SW6 and SW7 trunks in the Riverview and Windermere areas, from the overall Sanitary Servicing Strategy Fund (SSSF) plan and approve the following changes detailed below:

#### SW6 & SW7

- elimination of SESS SW6 and SW7 (river crossing); and
- inclusion of the Riverview pump station and Riverview forcemain system sanitary facilities in SSSF funding model

#### SW5

- elimination of SESS SW5

The sizing and timing for construction of major sanitary infrastructure is primarily driven by two factors:

- per person water consumption which correlates to per person sewage generation; and
- inflow/infiltration (I/I) which is the excess water that enters the sanitary system either during a rain event or from groundwater.

Through a detailed analysis of the actual sanitary flows in SW Edmonton, EPCOR has confirmed that the original design assumptions that determined the configuration and timing of these portions of the SSSF system are no longer valid. Average per person water consumption in new areas of development is currently at 160 L/person/day vs. the 350 L/person/day that was assumed at the time the SSSF strategy was originally developed prior to 1997. Research suggests that future indoor per person consumption will be around 140 L/person/day. Inflow and infiltration (I/I) rates in Riverview and Windermere are also lower than the original design assumptions, likely due to improved construction practices and materials.

Reductions of sanitary generation and I/I eliminates the requirement for the future SESS SW5, SW6 and SW7 segments as the existing already built SSSF components in this region have capacity to support growth in this region. In lieu of SESS SW6 and SW7, the Riverview pump station and forcemain system is required. This servicing change also eliminates a complex river

crossing along with reducing the overall SSSF trunk expenditures for servicing the SW area of the city.

Moving forward, EPCOR through the Sanitary Integrated Resource Plan (SanIRP) will plan the future SSSF trunk and storage segments based on a system monitoring approach to determine timing, alignment and servicing options. This will ensure the efficient and sustainable expansion of the sanitary system (utilizing the most up-to-date design metrics), and maximize the use of existing infrastructure.

## Background

The SSSF program was developed in the 1990s to support growth in new areas. The concept was to store wet weather flows in these newly constructed large storage trunks to avoid overloading the downstream system.

As illustrated in Figure 1, sanitary trunk segments SW5, SW6 & SW7 were originally intended to provide sanitary conveyance and storage for ultimate servicing of the Riverview and Windermere areas. The requirement was for deep trunks (25-30 m) as well as a complex inverted siphon river crossing.

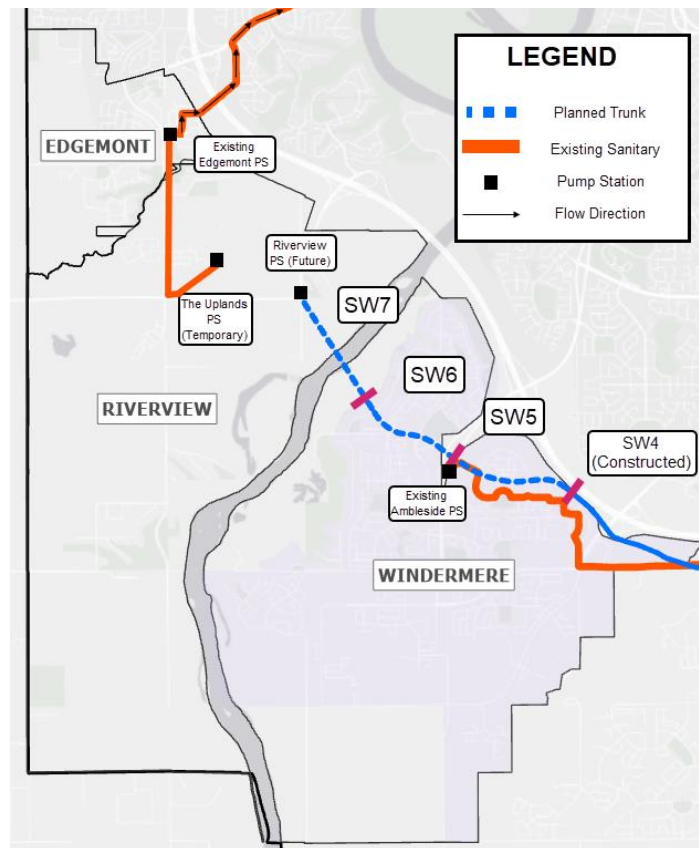


Figure 1: Approved SSSF Servicing Plan (SW Edmonton)

## Changing Sanitary Flows

Since the 1990's when the SSSF concept was initiated, water conservation and efficiency has reduced the wastewater generation of EPCOR's customers. Present day wastewater generation in this area is 40 to 55% lower at this stage of development, compared to the original SSSF planning projections. Further, the measured I/I in the Edgemont, Riverview and Windermere areas are also less than originally anticipated at this stage of development. The combined reductions to sanitary flow allows the long term utilization of the excess capacity in the existing trunk system.

The table below provides the historical design standards used with the SSSF concept development as well as the current and future projected standards as water conservation continues to improve in the city and EPCOR implements the inflow/infiltration reduction as part of the Storm Integrated Resource Plan (SIRP) and SanIRP strategies for the Utility.

Table 1: SSSF Design Standards

	SSSF Concept Development	2017 SSSF Plan	Current Design Standards	Future Design
Sewage Generation Rate (L/person/day)	350	300	220	140
I/I Allowance (L/s/ha)	0.28	0.28	0.28	0.14
Sag Manhole inflow Allowance (L/s/manhole)	0.4	0.4	0.4	0.1
Number of Sag Manholes	1 per 3.3 Ha	1 per 3.3 Ha	1 per 3.3 Ha	1 per 3.3 Ha
Occupancy Per Unit	2.87	2.87	2.87	2.87

### Edgemont/Riverview Servicing

The Edgemont and Riverview areas are currently provided sanitary servicing via the Edgemont pump station. Based on the original design criteria, it was estimated in 2017 that the Edgemont pump station would reach its capacity of 243 L/s around 2022 to 2024 based on population in the neighbourhood; and necessitate the construction of the SW6 & SW7 trunks.

A detailed assessment of current and future projected flows compared with Edgemont pump station capacity, confirmed that significantly more development can be serviced through the Edgemont pump station than was originally planned and still be below the design target for maximum flow from this part of the city into the SSSF system.

The Riverview pump station and forcemain system will be required to service the Riverview area in lieu of the SW6 and SW7 segments. The detailed design of the Riverview forcemain has not been completed.

The figure below compares the measured average and peak flows for Edgemont pump station vs. design capacity in L/s.

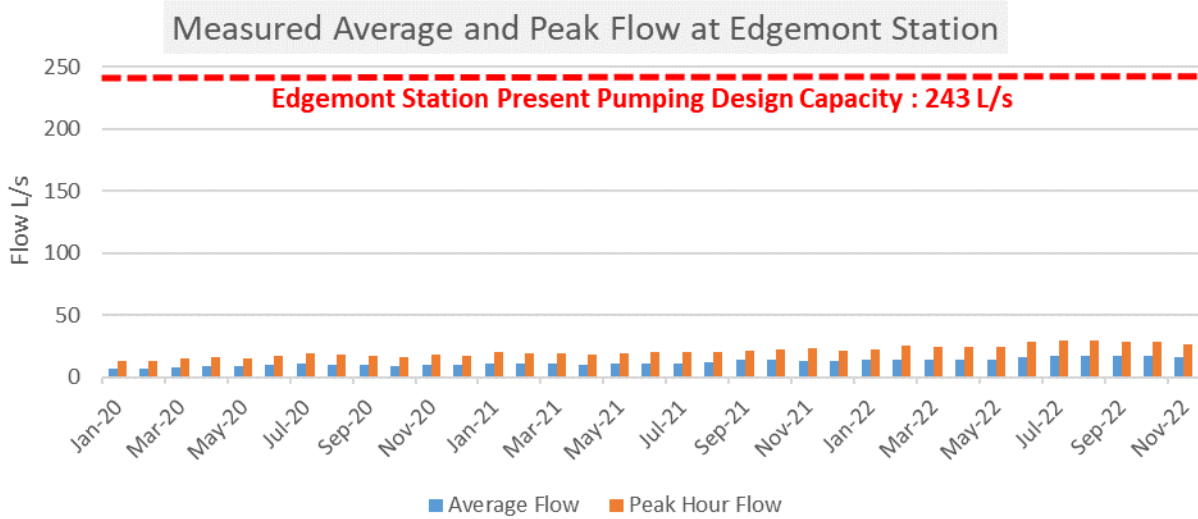


Figure 2: Edgemont Pump Station Flow

To better understand why the actual flow rates seen are below the anticipated design values both the sanitary sewer flows and the inflow infiltration flow rates were reviewed comparing the historical and anticipated future design standards. This is summarized in the tables below.

Table 2: Projected Edgemont/Riverview Dry Weather Flows

Year	Population			Dry Weather Sanitary Flow (L/s)			
	Edgemont	Riverview	Total	SSSF Concept	2017 SSSF Plan	Current Design Standards	Future Design
2022	5,284	1,815	7,100	29	25	18	12
2032	10,992	9,644	20,637	84	72	53	33
2042	12,640	24,480	37,120	150	129	95	60
2052	12,640	38,830	51,470	209	179	131	83
2062	12,640	53,711	66,351	269	230	169	108

Table 3: Projected Edgemont/Riverview Wet Weather Flows

Year	Contributing Area (ha)			Inflow/Infiltration (L/s)			
	Edgemont	Riverview	Total	SSSF Concept	2017 SSSF Plan	Current Design Standards	Future
2022	138	111	249	100	100	100	42
2032	197	284	481	193	193	193	82
2042	210	438	648	260	260	260	110
2052	210	588	798	320	320	320	136
2062	210	760	970	389	389	389	165

The following table presents a summary of the total projected Edgemont and Riverview design flows.

Table 4: Projected Edgemont and Riverview Design Flows

Total Flow: Dry Weather Sanitary + Inflow Infiltration (L/s)								
Year	Edgemont				Edgemont and Riverview			
	SSSF Concept	2017 SSSF Plan	Current Design Standards	Future	SSSF Concept	2017 SSSF Plan	Current Design Standards	Future
2022	77	74	69	32	129	125	118	54
2032	124	117	107	51	277	265	246	115
2042	135	128	116	56	410	389	355	171
2052	135	128	116	56	529	499	451	219
2062	135	128	116	56	658	620	558	273

From the table above compared to the actual measured flows (Figure 2), the only design scenario projection that currently matches actual flows seen at the Edgemont pumpstation is the future scenario. The SSSF concept, 2017 SSSF plan, and current design standards scenarios over-estimate total flows for the current population served. This can be attributed to smaller population in the area and also the I/I assumptions still too high for the actual amounts seen in current construction.

Considering the future design scenario, Edgemont and Riverview total flow will exceed the Edgemont PS design flow of 243 L/s after 2052. At this point, additional storage will be considered within the sanitary catchment area. From a sensitivity perspective utilizing the current design standard scenario, capacity limitation for the Edgemont pump station would occur in 2032 at the earliest.

Extrapolating the actual flows in the Edgemont area with the ultimate population for both neighbourhoods and realistic inflow/infiltration rates, EPCOR has determined that the sanitary

flow rates from the entire Riverview and Edgemont area will be below the original anticipated ultimate flows from Edgemont alone. As the area continues to expand additional flow monitoring and analysis will confirm and inform future design standards assumptions for this area and timing for upgrades to pump stations and or requirement for additional storage.

Another approach to illustrate the discrepancy between current flows and original design assumptions is to compare on a per lot basis. The below figure illustrates the storage per lot that was used to design the SW6 and SW7 pipe segments originally vs. the measured storage per lot requirements based on the actual flow data. The primary driver for storage in the SSSF system is related to the inflow/infiltration assumptions for the SSSF.

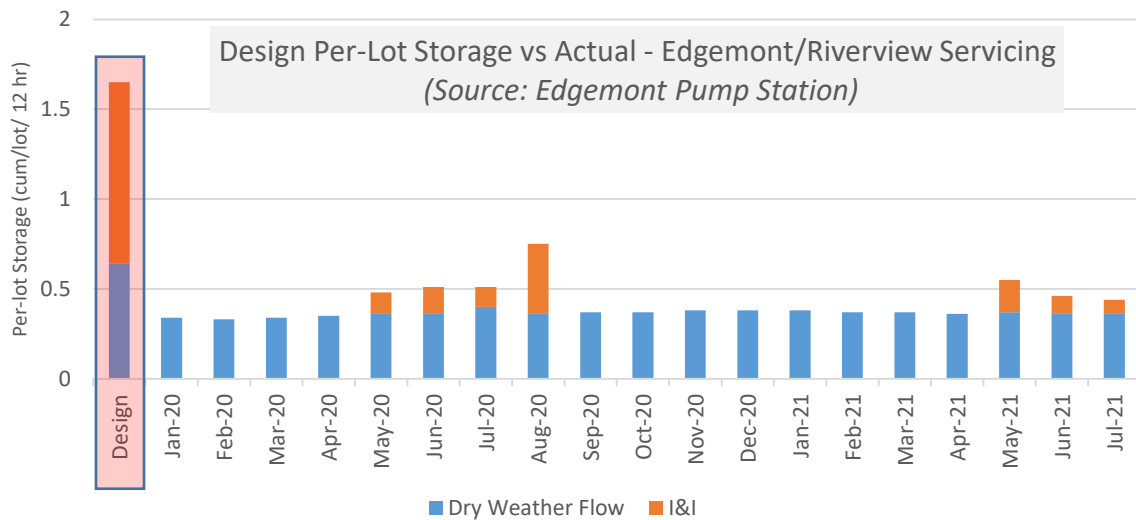


Figure 3: Design Per-Lot Storage vs. Actual (Edgemont/Riverview)

EPCOR's SIRP and SanIRP strategy are focused on I/I reduction and will be targeted in this area to avoid the need for future additional storage. This eliminates the requirements of SSSF funded SW6 & SW7 for future servicing of the Riverview area. If the actual flow trends are higher storage within the Lessard, Edgemont, or Riverview areas can be added at a later date.

This reconfiguration also eliminates the complex siphon that was proposed under the river as the SW7 design. Siphons require a minimum flow to operate without risk of plugging and the lower actual flow rates would have increased the overall servicing risk and reduced service reliability for the Riverview neighbourhood.

As part of EPCOR's integrated resource plans, flow monitors are being installed throughout the drainage network to provide improved understanding and early intervention opportunities to

continue to reduce inflow/infiltration and maximize existing pipe capacity in the entire drainage system. Flows will be monitored as Riverview and Edgemont continue to develop and in the Lessard neighborhood to the north, and if it found that the actual peak flows will exceed the Edgemont pump station capacity, EPCOR will address through upgrades at the pump station or other infrastructure storage components either within the region or downstream in the drainage network. It will be at least 10 to 20 years before any additional upgrades would be considered based on current actual flows. EPCOR will actively manage keeping I/I levels low aligned with the SIRP strategy and active monitoring program, allowing early intervention should I/I values increase.

The removal of the SW5, SW6 and SW7 trunks will result in the small volume of sanitary flows that are generated in Riverview being directed to the West Edmonton Sanitary Sewer (WESS) system rather than SESS. The Gold Bar Wastewater Treatment Plant (WWTP) is forecast to treat about 284 ML/day in average flows during dry weather by 2038 when a decision about final SESS routing is expected to be required. The incremental flows from Riverview moving into the WESS part of the system are forecast to be about 5.5 ML/day, or 1.9% of total dry weather flow to Gold Bar WWTP by 2038. The change is not material, and is expected to have no impact to the operation of the trunk network, to customers, to wastewater treatment operations or future upgrade plans at Gold Bar.

No decision has been made about the final destination of the SESS network. The final segment of the SESS network will connect to either the Gold Bar WWTP or the Alberta Capital Region WWTP, and will not be required until 2038 at the earliest. No decision on the routing is required or expected until after 2030. The decision by Council will be informed by public and stakeholder engagement, updated technical information, and recommendations from the SSSF and EPCOR.

### Windermere Servicing

The Windermere area is currently provided sanitary servicing via the Ambleside pump station (Ambleside, Windermere and Keswick) as well as via a gravity trunk connection to SW3 (Glenriding). Based on the original design criteria, it was planned that Ambleside pump station would provide temporary servicing for the area, until the SW5 trunk was constructed. The SW5 trunk was originally planned to connect to SW6 and SW7 to deliver flows from Riverview and provide additional storage to support Windermere growth into the SESS system.

With Riverview flows being managed by the Edgemont pump station, the SW5 trunk section would only receive flow contributions from the Ambleside pump station contributing area. A detailed analysis of the current and projected flows compared with Ambleside pump station was undertaken to assess the downstream trunk capacity needs and the future utilization of the Ambleside pump station.



The figure below compares the measured average and peak flows for Ambleside vs. design capacity in L/s.

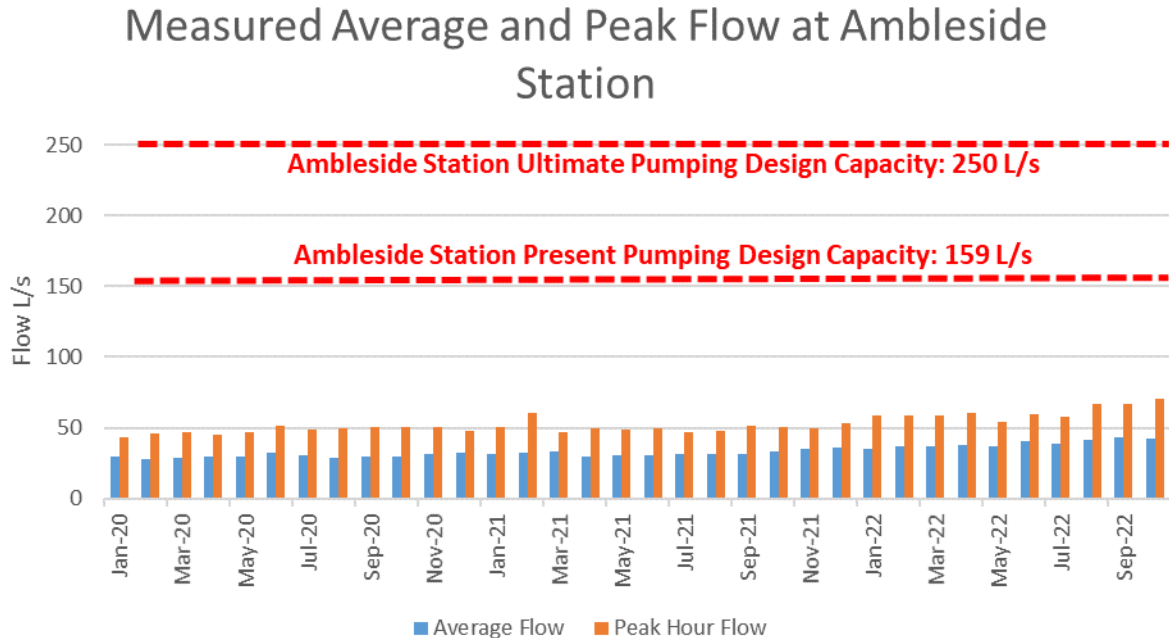


Figure 4: Ambleside Pump Station Flow

The Ambleside pump station receives flows from the Windermere, Ambleside and Keswick neighborhoods with current peak dry weather flows of 70 L/s being received from those neighborhoods at the station. The station presently has a peak capacity of 159 L/s but can be reconfigured with larger pumps and wet well operation adjusted without significant investment, to be able to handle as much as 250 L/s as required. Peak flows based on actual trends are expected to be within the existing pump station capacity for ultimate population buildout. Flows will be monitored as Windermere continues to develop, and if it found that the actual peak flow will exceed Ambleside pump station capacity, EPCOR will address through upgrades at the pump station or other infrastructure components. There will also be the opportunity to further optimize once the development plans for Windermere neighbourhood 5 are circulated for approval. EPCOR will actively manage keeping I/I levels low aligned with the SIRP strategy and active monitoring program, allowing early intervention should I/I values increase.

The below figure illustrates the storage per lot estimates for the Windermere area comparing the design flows based on lots serviced vs. the measured storage per lot requirements based on the actual flow data. The large discrepancy in flows due to water conservation and reduced I&I, has extended the service life of the Ambleside station at its present capacity. The reduced

wastewater generation in the Windermere area, coupled with the removal of requirement to convey flows from the Riverview area, has eliminated the need for the SSSF funded SW5 trunk segment.

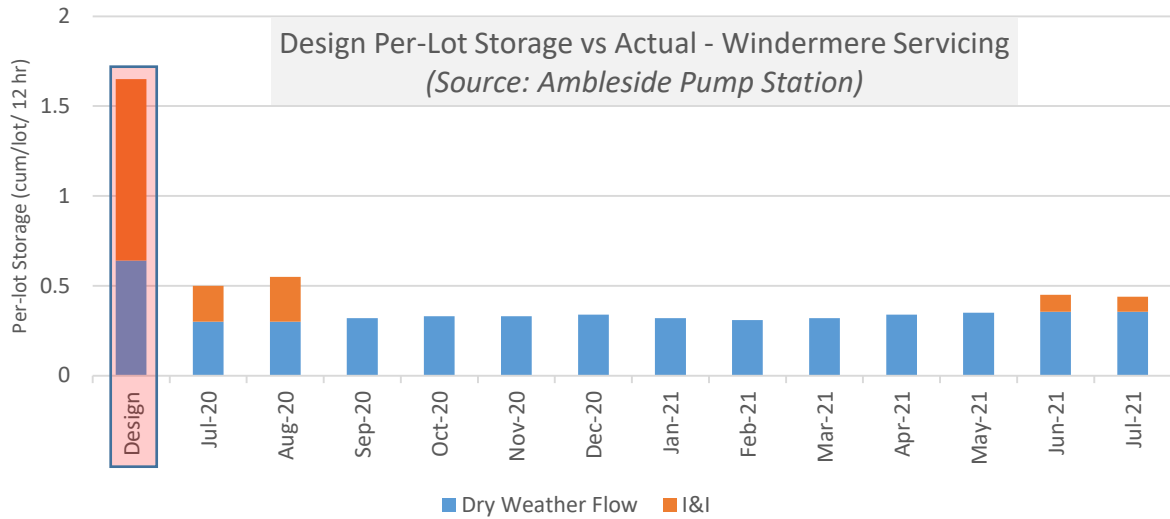


Figure 5: Per Lot Storage vs. Actual (Windermere) vs. Actual (Windermere)

The below figure provides an illustration of the recommended ultimate servicing for the Edgemont, Riverview and Windermere areas.

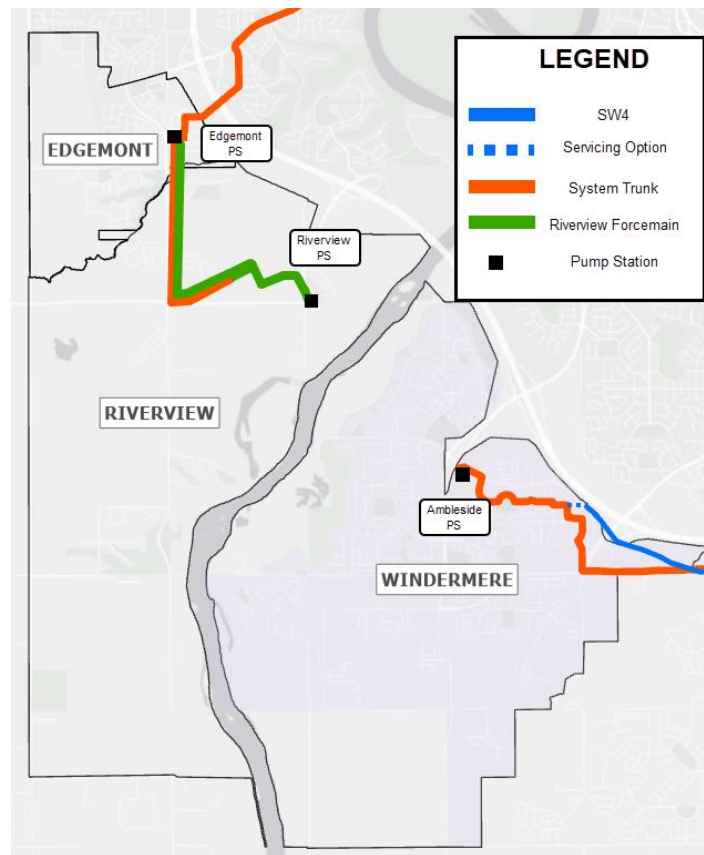


Figure 6: Recommended SSSF Servicing Plan (SW Edmonton)

## Coordination & Engagement

As noted earlier, the removal of SW5, SW6 and SW7 are not expected to impact customers or wastewater treatment operations. EPCOR's engagement has focused on stakeholders who will be impacted by the removal of the segments – including changes to servicing plans, and impacts to the SSSF funding model (retrospective and forward-looking) from the cost-reductions achieved by removing this previously planned, but no longer required, infrastructure. In addition, EPCOR has conducted communications to raise stakeholder and public awareness of declining water consumption and the impact this has on drainage network planning and land use planning.

EPCOR's engagement activities included dialogue with the Sanitary Servicing Strategy Fund (SSSF) committees, City of Edmonton planning departments, the Urban Development Institute (UDI), private developers and consulting firms, the Regional Water Customer Group (RWCG), the Edmonton Metropolitan Region Board (EMRB) and various industry associations including the Building Industry and Land Development Association Alberta (BILD Alberta) and NAIOP (the

Commercial Real Estate Development Association). This information is being assessed for impacts to other developments across the City for infrastructure sizing and timing requirements.

EPCOR has been working collaboratively with the City of Edmonton, SSSF Committees, developers and consultants in the Riverview and Windermere areas to ensure the short- and long-term servicing strategy is prudently designed, staged and executed.

## Next Steps

- EPCOR and City of Edmonton Development Planning are working with the developers to update the Area/Neighbourhood Servicing Plans for the Riverview and Edgemont areas to reflect this change in servicing concept. Approvals will come to Urban Planning Committee after Utility Committee has approved the changes to the SSSF segments for removal of SW6 and SW7
- No changes are required at this time for the Windermere Area/Neighbourhood Servicing plans as the areas currently developing continue to be serviced by the Ambleside lift station connected to SW4. Windermere Neighbourhood 5 will incorporate these design assumption changes when that neighbourhood initiates for development. This will determine the timing for any additional Ambleside lift station capacity upgrades.
- EPCOR will install additional flow monitoring throughout the SW area to support the ongoing review of flows and early intervention should Inflow/Infiltration flows increase as development progresses.
- EPCOR will continue the development of the Sanitary IRP incorporating the future SSSF trunk segments into an integrated resource planning approach. This includes continued focus on water conservation, optimization of existing infrastructure, reducing I/I and increased monitoring of the sanitary network and alignment with The City Plan growth projections.
- EPCOR in conjunction with the SSSF Oversight Committee will support the comprehensive review of the SSSF program, including the development fees structure, considering the findings of this analysis of this one portion of the SSSF.