EPCOR WATER SERVICES

Appendix G-1

Business Case

ACCESS MAINTENANCE HOLE PROGRAM

May 31, 2024

TABLE OF CONTENTS

1.0 OVERVIEW

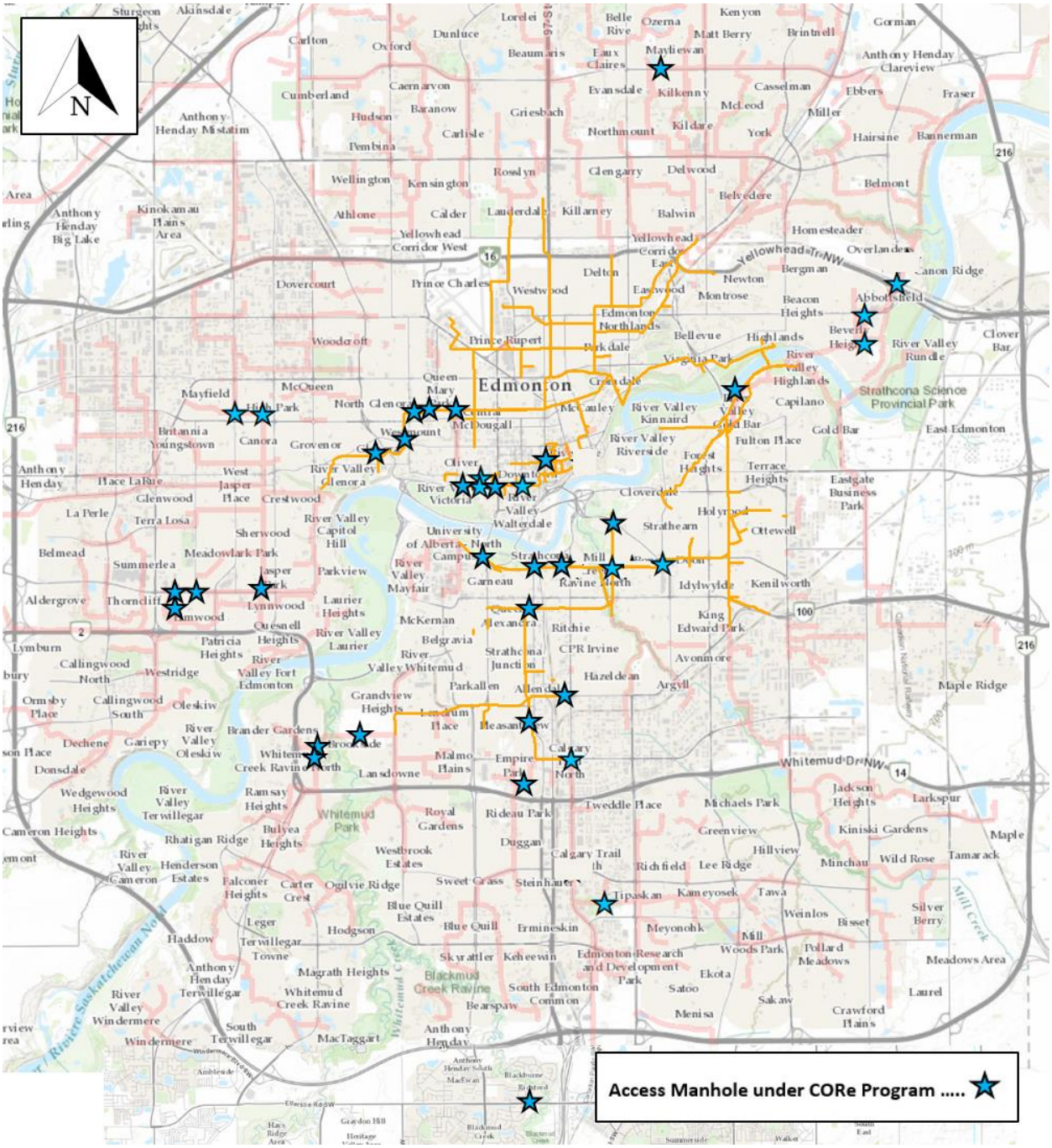
1. The Access Maintenance Hole Program is a critical component of EPCOR Water Services' (EWS) Corrosion and Odour Reduction Strategy (CORe). The program includes construction of access maintenance holes on major trunk lines where safe access for inspections and cleaning is required. The Access Maintenance Hole Program targets trunk lines with poor existing access availability, where odour causing sediment accumulations are expected and where there is a risk of moderate to severe deterioration of the sewer structure from hydrogen sulfide (H2S) corrosion. This program supports the large trunk inspection program by providing safe, reliable access to the trunks. EWS has forecasted the total program capital expenditure during the 2025-2027 PBR term at $21.7 million.

2.0 BACKGROUND

2. The CORe strategy was initiated in 2019 to understand, mitigate and prevent sewer odour issues across the city using a combination of capital and operational interventions. The CORe strategy focuses on preventing the formation of H_2S gas, reducing community odour impacts, and lengthening the life of sewer network assets. Under CORe, EWS segregates the city into regions with consistent odour issues, those with dynamic odour issues, and those with emerging odour issues. Different approaches have been proposed for each region to ensure that causes of the odour are fully understood and to ensure that capital projects will provide sustainable relief. The capital projects and operating activities in CORe can be classified into four themes of investment: PREVENT, OPTIMIZE, MONITOR and CONTROL.

3. The Access Maintenance Hole Program is a critical component of the CORe strategy under the PREVENT theme. This annual program constructs access maintenance holes on major trunk lines to mitigate health and safety risks, financial risks, environmental risks, and risks of customer service disruptions by providing safe access for inspections and cleaning. The program was initiated in 2019 as a key CORe deliverable. Since 2019, 28 access maintenance holes have been completed and a further 10 access maintenance hole projects have been initiated and are proceeding towards or undergoing construction with their completion occurring before the end 2024. Figure 2.0-1 below shows the completed and ongoing locations.

Figure 2.0-1
Access Maintenance Hole Locations



4. There are approximately 165 km of sanitary and combined large trunk sewers (1,200 mm diameter and larger) constructed over the past 100 years to varying standards and specifications.

5. As the Access Maintenance Hole Program supports the large trunk inspections, risk ranking of trunks is used as the main criteria in developing candidate locations for access maintenance hole construction, and therefore high priority is given to the candidates that provide access to the high-risk trunks.

6. In 2023, a condition assessment study of the entire large trunk sewer network was completed using both observed defects and deterioration models based on age, material type, and waste type and produced a condition rating for each pipe. The resulting condition ratings were used to develop the Likelihood of Failure (LOF) for each pipe. Along with the LOF scores, Consequences of Failure (COF) scores were also completed across all six consequence categories using the EPCOR Risk Management Standards and Risk Matrix. The six consequence categories include Health and Safety, Environment, Regulatory, Reputation, Service Interruption, and Financial. A theoretical risk score was then calculated for each pipe and the results are shown on the matrix in Figure 2.0-2.

Figure 2.0-2
Large Trunk Risk Matrix (#pipes(km))

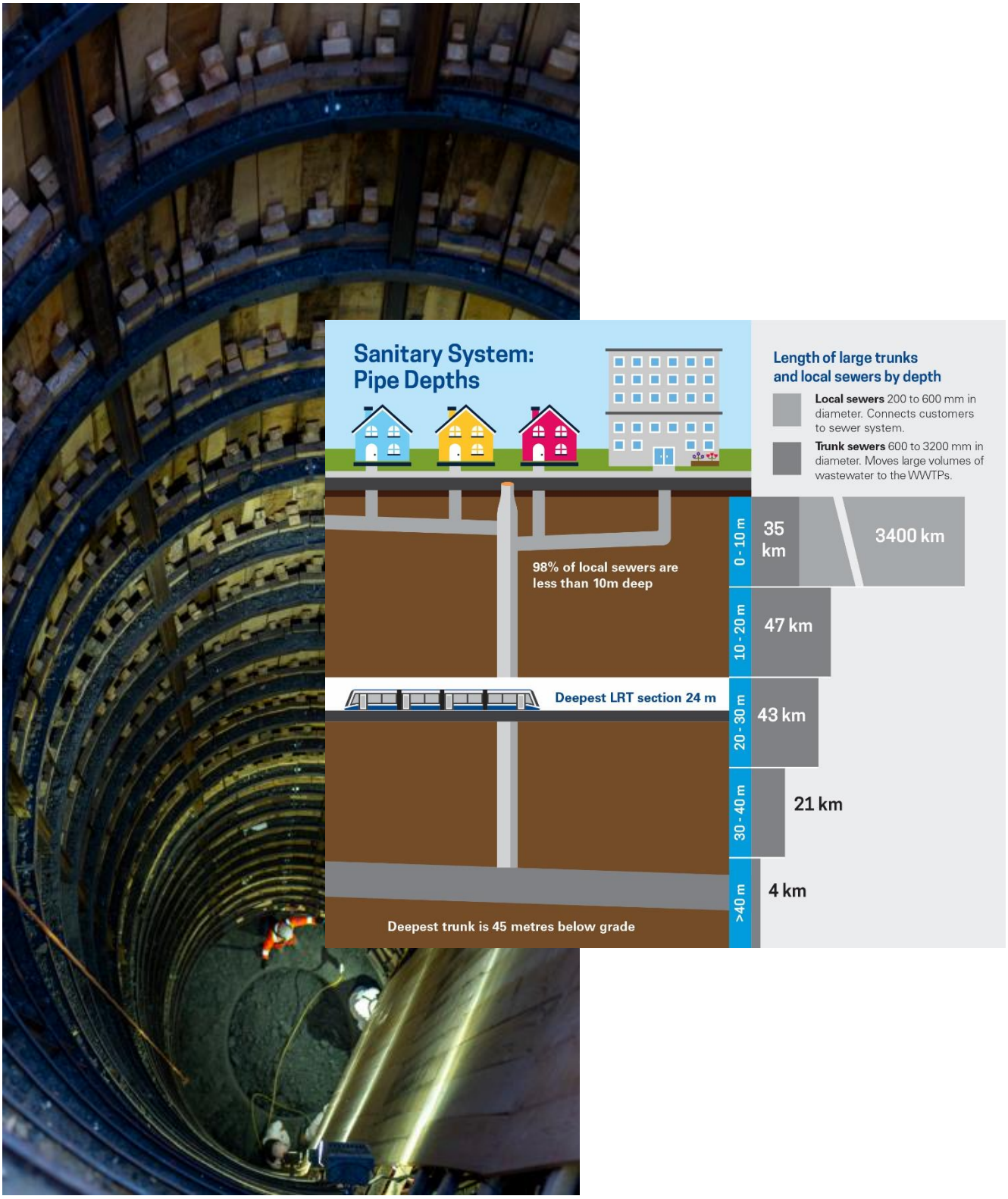
Consequence	Likelihood 1 Remote	2 Rarely	3 Very Unlikely	4 Unlikely	5 Likely	6 Almost Certain
6 Severe						
5 Major	12 (3.8 km)	53 (4.5 km)	285 (22.5 km)	146 (13.8 km)	24 (2.2 km)	
4 Significant	81 (6.8 km)	90 (6.5 km)	387 (26.6 km)	248 (24.9 km)	94 (10.3 km)	
3 Moderate	31 (3.0 km)	91 (7.9 km)	367 (21.1 km)	84 (5.9 km)	74 (4.7 km)	
2 Minor						
1 Slight						

7. In addition, the program also takes CORe factors into consideration including measured H_2S concentration inside the trunk and public odour complaints in proximity to the asset. In

general, new access maintenance holes are given greater priority in areas where public odour complaints over the past 5 years exceeds a rate of 10 complaints/km^2 or where sewer H_2S concentration exceeds a 24 hour average of 2.5 parts per million.

8. Figure 2.0-3 shows a graphical image of typical access maintenance holes under construction for a large trunk Constructed as part of the CORe program, the maintenance hole pictured had a depth of 35m which is not unusual for trunks in the cities core areas.

Figure 2.0-3
Typical depths of access maintenance holes on large trunk sewers



9. The price of a constructing a new access maintenance hole is largely based on their required depth. For the large trunk system, sewer depths often exceed 15 meters below grade with some reaching as far down as 40 meters below grade. Many of the trunks with poor access provisions are the older, deeper trunks located closer to the city core. Since these older trunks are often also the highest risk trunks most of the current access maintenance hole candidates have typically had depth requirements exceeding 20 meters.

3.0 JUSTIFICATION

10. The Access Maintenance Hole Program is critical for managing several identified risk factors including health and safety, financial, and customer service disruptions. Without access to the sanitary system, the accumulation of odour causing sediments cannot be safely identified through inspection or remediated using cleaning technologies due to unsafe access. Safe access for inspections is critical to identify sources of H_2S, concrete corrosion, structural failures, and whether the line contains sags or deposits of sediment/fat that requires cleaning. To safely access the major trunk lines, technicians and robotic inspectors require maintenance holes that provide direct line of sight to the trunk, at distance intervals less than 500 m for the 1,200 mm to 1,800 mm trunk size and 800 m for larger than 1,800 mm. This allows for the safe navigation around major bends, weirs and drops. The Access Maintenance Hole Program is designed to provide those conditions at trunks with known odour issues across the city. The odours can impact quality of life for nearby residents and lead to reduced asset service life or unexpected asset failures by causing concrete corrosion. The premature aging of the sewer assets can result in customer service disruptions and require costly emergency repairs.

11. There are approximately 160 existing access maintenance holes in service on the 165 km of large trunk sewers. This indicates that on average, there is one access maintenance hole for every 1,000 m of large trunk. In addition, access maintenance holes are not consistently distributed along the large trunks, with some sections being properly provisioned and other sections having no suitable access at all.

12. The new access maintenance holes constructed to date under the CORe program have also been beneficial for trunk rehabilitation and emergency repair activities. The construction of two access maintenance holes in Empire Park not only allowed inspectors to identify structural failures in the connected trunk line prior to trunk line collapse but are also being used to support the on-going rehabilitation and repair activities. Two access maintenance holes recently completed in Brookside under the CORe program were used to support emergency repairs to the

Whitemud Creek trestle by providing safe access points to the trunk line immediately upstream of the trestle bridge.

4.0 PROGRAM SCOPE

13. The scope of the Access Maintenance Hole Program during the 2025 – 2027 PBR term includes construction of approximately 18 new access maintenance holes across the city, with roughly 6 scheduled per year. These access maintenance holes will be constructed along major large trunks with poor existing access that contributes to downstream sewer odour problems due to excessive sedimentation and debris accumulation. In addition to prioritizing locations on high risk trunks, candidate locations are chosen based on the following criteria:

- The trunk has been determined not to have sufficient access for inspections to be completed in a safe manner. According to the current design standards, maintenance hole spacing for large trunks should not exceed 500 m for 1,200 to 1,800 mm diameter trunks, and not exceed 800 m for trunks with diameters that exceed 1,800 mm. Spacing beyond these distances would be considered as insufficient access.
- The asset is a sanitary or combined trunk sewer of a diameter greater than 650 mm.
- Downstream H_2S concentrations exceed an average of 2 parts per million (ppm) over 24 hours or reach a peak concentration above 10 ppm at least once a day, or are suspected of reaching such concentrations if access is not available for monitoring.
- Sections of trunks with sharp bends, drill drop maintenance holes, or flat to negative slopes are given precedence as those specific features drastically increase access difficulty and are high risk areas for asset deterioration and odour nuisance.
- The location choice should consider access safety during construction, potential impacts to traffic and not conflict with nearby buried utilities.

14. The timing and location of candidates for access maintenance hole may change as understanding develops. Factors that alter candidate viability include surface access limitations, conflicting construction schedules (e.g. LRT, neighborhood renewal) and the presence of nearby buried utilities. The final selection strives to have maintenance holes placed in locations that are beneficial for both odour control and future rehabilitation needs to maximize the value of each maintenance hole.

15. Costs for each access maintenance hole project will vary depending on depth, geotechnical assessments, location, bypass, etc., and therefore the number that can be completed within the allocated budget will also vary.

5.0 ALTERNATIVES CONSIDERED

16. Current inspection and trunk cleaning technologies cannot effectively address the existing sewer system where long stretches of trunk sewer exist without proper access. Therefore, there are no viable “structural” alternatives for access maintenance holes.

5.1 Alternative 1 – Do Nothing

17. Doing nothing does not meet the CORe strategy objectives and is not an acceptable alternative because of the inherent risks inaccessibility pose to the existing system. The limited access conditions across the city prohibit safe inspection and cleaning activities and severely limits our understanding of the state of the sanitary and combined sewer network. Because of the limited access, proper planning to address sewer odour and corrosion issues is difficult especially in areas without easily identifiable point sources for odour, such as pump stations. For example, in communities such as Bonnie Doon, the limited access has made it difficult to identify all the sources of odour affecting the area. Providing reliable, safe, and regular access is a critical requirement for managing our existing system.

5.2 Alternative 2 – Decrease relative to the Proposed Plan

18. This alternative would reduce the number of access maintenance holes constructed under the program during the PBR term. While a decrease would reduce the impact to the rate payer in the short term, reduced investment would allow the limited access issues to remain while odours and corrosion continue to cause issues in the system. This could result in higher operational and maintenance costs, increased safety risks, as well as increased future rehabilitation costs for trunk sewers. Similar to the do-nothing option, this does not meet the strategy objectives and is not an acceptable alternative.

5.3 Alternative 3 – Increase relative to the Proposed Plan

19. This alternative would increase the number of access maintenance holes constructed under the program during the PBR term. Further accelerating investment in access maintenance holes would present resourcing and costing challenge that would be disproportionately larger than the resulting reduction in risk. The current rate of access maintenance hole construction is based on the capabilities of existing internal resources in EWS to engineer and execute the work.

To construct a larger number of access maintenance holes per year, external resources would need to be retained. Using external resources to construct access maintenance hole has typically increased the project costs by between 30 to 40%. Once sufficient access to the trunk is provided, inspections typically identify a need to clean and repair trunk sections. The recommended pace aligns with the operational and capital capacity to execute on the work identified once access to the trunk is made available.

6.0 COST FORECAST

20. Costs are estimated based on the reported costing for the most recently completed access maintenance hole projects from 2019 to 2023. The following assumptions were made to forecast the capital expenditures:

- Construction shaft depths are between 15 to 40 meters.
- Sufficient space is available for construction equipment.
- Access maintenance holes are designed and built using in house resources.
- The roads have moderate to heavy traffic requiring active traffic control provisions.
- Locations present on arterial or collector roads require coordination with the City of Edmonton for the duration of the road detour.
- The target trunk line requires only standard structural strengthening to support the access maintenance hole.
- Geotechnical investigations will be completed by external resources.

21. The scope of this program can be adjusted to remain within the budget targets, as some locations can be deferred to the next year.

Table 6.0-1
Access Maintenance Hole Program Capital Expenditure Forecast 2025-2027 ($ millions)

	2025	2026	2027	Total
Total Capital Expenditures	7.0	7.2	7.5	21.7

7.0 KEY RISKS AND MITIGATION PLANS

22. Table 7.0-1 provides key risks and mitigation plans associated with executing this program.

Table 7.0-1
Key Risk and Mitigation Plans for Access Maintenance Hole Program

Risk	Mitigation Plan
1. Health and Safety Risk - This project requires heavy construction activities that include, excavations, crane use, confined space entry and working in high traffic areas.	EWS's construction team will follow EPCORs best practices for ground disturbances and follow all safety procedures and plans. EWS will ensure that external contractors submit safety plans the meet or exceed EPCOR health, safety, and environment (HSE) requirements prior to commencing any work.
2. Risk of Customer Disruptions - During construction, the projects can have an impact on the neighborhood by causing disruptions to traffic, releasing sewer gasses, and making noise.	EWS will schedule activities to minimize all impacts and work may need to be adapted if unexpected conditions occur that can worsen impacts on neighbours and residents. EWS will ensure maintenance holes are designed to not act as egress points for odour, and the project must monitor upstream and downstream impacts
3. Financial Risk – Unknown geotechnical conditions, utility conflicts and poor trunk condition can increase the project cost. Actual contractor bids may vary from the estimates. Materials and skilled labour are subject to market variability. There are also project unknowns that may affect costing.	EWS's design team will conduct desktop geotechnical studies during the design stage and commit to appropriate redesigns in advance when adverse geotechnical condition are anticipated. In the event of poor structural integrity of the trunk, additional project funding has been assigned to allow for moderate structural rehabilitation and support for the interface between the trunk and the new maintenance hole. The project will obtain information on all underground utilities during design stage and conduct hydrovac exposure to confirm utility locations EWS manages financial risks by conducting preliminary design and obtaining manufacturer's quotes for establishing the project budget. The financial risks will become more evident as further design is completed and scope will be adjusted accordingly.

8.0 RESOURCES

4. All activities related to project management, inspections, assessment, design, and construction will be undertaken by internal EWS resources. External resources will be used for geotechnical assessments.

EPCOR WATER SERVICES

Appendix G-2

Business Case

DRY PONDS PROGRAM

May 31, 2024

TABLE OF CONTENTS

1.0 OVERVIEW

1. Dry ponds are a critical element of EWS's Stormwater Integrated Resource Plan (SIRP) to mitigate flood risks across Edmonton. Using dry ponds, EWS is able to achieve flood mitigation objectives at a lower overall capital investment than seen with traditional engineering approaches. Dry ponds capture large volumes of stormwater within a neighbourhood during storm events and then release the stormwater slowly back into the existing piped storm trunk network after the storm event. This capture and release reduces the requirements for large sewer trunks to the river, and helps to prevent downstream flooding. For the 2025-2027 PBR term, the Dry Pond Program includes 11 active and planned dry pond projects at various stages of development at a forecast cost of $139.0 million. Of that total cost, $23.6 million is estimated to be covered by grant funding, resulting in net capital expenditures of $115.4 million.

2.0 BACKGROUND

2. The COE had been installing dry ponds throughout the city as part of the City-Wide Flood Mitigation capital program prior to the Drainage Utility transferring to EPCOR. The SIRP analysis, completed by EWS in 2018-19, reaffirmed that dry ponds are a recommended solution for the flooding risks in Edmonton and prioritized the ponds for future investment over the next 20 to 30 years. The SIRP Capital and Operational plan estimated $470 million in dry ponds would be implemented over that time period. Figure 2.0-1 provides examples of two completed dry ponds to provide context on the type of structures that are constructed as part of this program.

Figure 2.0-1
Dry Pond Examples

Parkallen

Steinhauer

3. EWS, together with the City of Edmonton (COE), successfully applied for federal grant funding for dry ponds under the federal Disaster Mitigation and Adaption Fund (DMAF) and in 2020 received a total of $43.6 million to complete 14 dry ponds. The 11 ponds covered within this business case are part of this DMAF funding. This funding applies to 40% of approved external costs, which will significantly reduce the cost to ratepayers over the next decade. As of early 2024, Parkallen, Steinhauer/Ermineskin and Parkdale have been completed.

4. As part of developing the SIRP strategy, EWS identified potential locations for future dry ponds and continues to work with City of Edmonton Open Spaces team to identify locations for safe storage of storm water during an extreme weather event. Each individual dry pond location typically requires three to four years to complete the conceptual design, detailed design, construction, and commissioning. While EWS manages each individual dry pond as a separate capital project, the individual projects are consolidated within this program in order to manage the overall program investment levels within the PBR term, manage project scheduling, and to optimize grant funding.

5. EWS worked with the COE Open Spaces team to review each of the proposed 14 dry pond locations funded under DMAF as required under the COE's Open Space Policy and in accordance with the Open Spaces Needs Justification and Assessment Reporting Procedure. The procedure includes a two phase review process with the COE and entities such as the school boards that use or own the open spaces. Phase one of the Open Spaces review process identifies any major constraints for the proposed development. Phase two of the Open Spaces review process identifies more specific recreational and joint use requirements to inform the detailed design of the dry pond. In 2020, phase one of the Open Spaces review process was completed for all potential dry pond locations identified in the SIRP strategy and the majority of the locations were confirmed to not have any major constraints. The phase two review process will occur for each dry pond once the conceptual design is completed in conjunction with the local community consultation activities that occur during this phase of the project.

3.0 JUSTIFICATION

6. The dry pond projects proposed within EWS's SIRP strategy are intended to mitigate and reduce flood risk in targeted high risk communities. Two aspects in particular drove the SIRP choice to include dry ponds as a major infrastructure upgrade. These aspects are:

i. the lower risk of sewer backups and basement flooding; and
ii. the reduction of ponding on the road after storm events.

7. Dry ponds, and additional storm pipe infrastructure, reduce the peak stormwater flows and reduce the volume of surface runoff entering the combined sewer system thereby lowering the risk of sewer backups and basement flooding. Dry ponds can remove large volumes of stormwater from the drainage system and reduce flooding risk within clusters of communities, in addition to providing benefits in other adjacent neighbourhoods.

8. Dry ponds mitigate a variety of risk categories:

- Health and Safety Risk – Basement flooding can put residents, contractors, and EPCOR employees at risk through contact with raw sewage and can affect the physical and mental health of the occupants. Surface flooding and street ponding increases risk of traffic accidents and injuries.
- Environmental Risks – Excessive combined flows could lead to floods and sewage spills, damaging and contaminating the natural environment. This can affect usage of facilities by the public, require substantial investment to restore the areas, and violate the Approval-to-Operate issued by Alberta Environment and Protected Areas (AEPA).
- Financial Risks – Surface flooding and basement backups from large storm events can be costly to manage and clean up and can lead to significant claims from customers.
- Service Disruption Risk – Surface ponding in localized sag areas during large storm events can cause water to access the sanitary pipes and/or foundation drains of properties without adequate flood proofing and enter the building, causing flooding and damage.

4.0 PROGRAM SCOPE

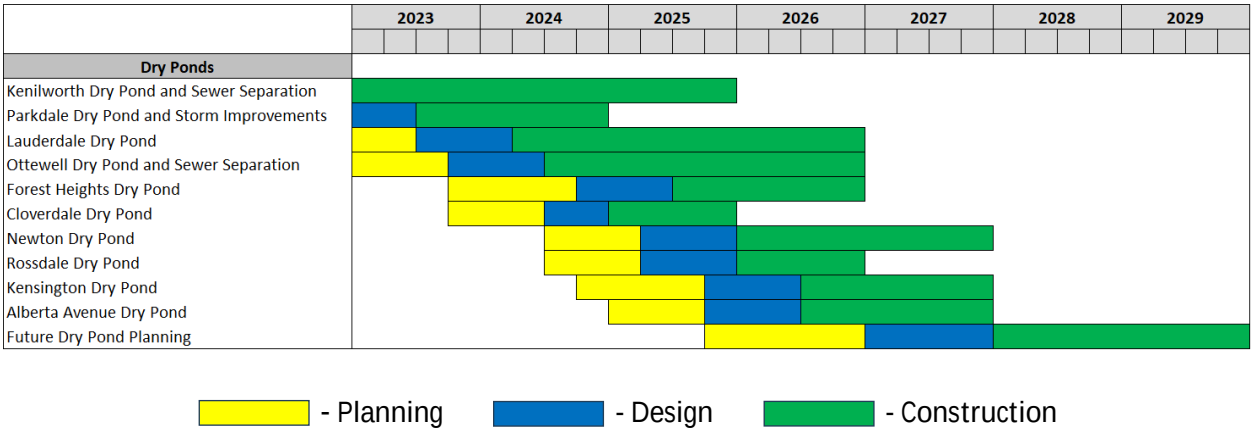
9. The dry pond locations have been prioritized and scheduled based on SIRP risk ranking and based on efficiencies in coordinating with other projects. Dry ponds located within higher flood risk areas are proposed to initiate earlier as they will have the greatest impact to reducing the flood risk throughout the city. For example, if EWS is able to work in coordination with a neighbourhood renewal project, project costs will be lower and the impact to the residents of the area will be reduced. This scheduling coordination plays an important role in delivery cost efficiency for the dry pond program. Typically, the infrastructure included within a dry pond project includes the dry pond, inlet and outlet structures, and neighbourhood storm piping to move the water to and from the pond.

10. Another important consideration for the scheduling of the program is managing the projects to meet overall annual program spending budget. Dry pond and storm separation projects have large capital expenditures, which can lead to years with significantly more capital

spend than others. To mitigate these variances, dry pond project timelines may be adjusted within the PBR period. For the 2025-2027 PBR term, EWS is planning to have a mix of dry pond projects at various stages of development in any one year to better manage project resources.

11. There are 11 known pond projects that will fall within the 2025-2027 PBR term. These projects will either be in planning, design, or construction, and by the start of the PBR term will have received approval or a Letter of Support from the COE as part of the Open Spaces phase two review process. In addition, there will be several projects that will initiate their phase two Open Spaces review and planning phase towards the end of the PBR term, however these locations have not yet been selected. Figure 4.0-1 shows the schedule for the 11 known ponds in the Dry Pond Program for the 2025-2027 PBR term.

Figure 4.0-1
Dry Pond Schedule (2023-2029)



12. As noted above, there are 11 scheduled dry pond projects that fall within the Dry Pond Program for the 2025-2027 PBR term.

12.1 *Kenilworth Dry Pond and Sewer Separation*

The Kenilworth Dry Pond will mitigate the high flood risk within the neighbourhood due to sewer surcharging and surface flooding. This project has completed the installation of separated sewers connecting to the existing system. The dry pond and underground storage at the school sites will commence in 2024, with neighbourhood piping to the west and south to be completed in 2024 and 2025.

12.2 *Lauderdale Dry Pond*

The Lauderdale neighbourhood is high risk due to sewer surcharging and surface flooding. Sewer separation construction will start in 2024 and will continue until 2026. Dry Pond construction is scheduled to commence in 2025 or 2026, depending on contractor schedules. This project has had many discussions with the COE regarding slopes and accessibility, and amenities.

12.3 *Ottewell Dry Pond and Sewer Separation*

The Ottewell neighbourhood is high risk due to sewer surcharging and surface flooding. Sewer separation construction will start in 2024 and will continue until 2026. Dry Pond construction is scheduled to commence in 2025. The project has been in contact with COE's Building Great Neighbourhood's (BGN) renewal since the initiation stage, and construction scheduling has been coordinated between the projects.

12.4 *Forest Heights Dry Pond*

The Forest Heights Dry Pond will work to mitigate the high flood risk due to sewer surcharging in the neighbourhood. The project land use justification report has been reviewed by the COE, and early design is progressing. Construction is projected to start mid-2025 and be complete by the end of 2026.

12.5 *Cloverdale Dry Pond*

The Cloverdale neighbourhood is high risk due to combined sewer surcharging and also surface flooding. The project will address some groundwater infiltration issues at the park space. The project land use justification report has been reviewed by the COE, and design is progressing. Construction is projected to be completed in 2025-2027 PBR period.

12.6 *Newton Dry Pond*

The Newton Dry Pond is planned to mitigate combined sewer surcharging and surface flooding in Newton and surrounding neighbourhoods. Newton is very high risk, and this project will reduce flooding risk in Newton and surrounding neighbourhoods by alleviating some of the capacity issues downstream. The project is currently in the concept validation stage. Construction of the project is expected to be completed by the end of 2027.

12.7 *Rossdale Dry Pond*

The Rossdale neighbourhood is high risk due to combined sewer surcharging, as well as riverine flooding. The dry pond project has been coordinating with both the COE's BGN and the River Crossing development projects. The project is currently undergoing concept validation review.

12.8 *Kensington Dry Pond*

This project will work to mitigate a high risk basin within the neighbourhood boundary, as well as high risk areas in the surrounding communities. This project could potentially reduce flooding on Yellowhead Trail by alleviating some of the capacity issues downstream within 107th Street Trunk. The project is currently in the concept validation stage.

12.9 *Alberta Avenue Dry Pond*

This project will work to mitigate a high risk basin within the neighbourhood boundary, as well as high risk areas in the surrounding communities. There is significant surface ponding in Alberta Avenue, in addition to widespread surcharging of the combined system. Targeted sewer separation and storage also work to mitigate these risks. This project will be coordinated with sewer separation projects in the neighbourhood.

12.10 *Future Dry Pond Planning*

EPCOR and the COE are currently evaluating alternative locations candidates for future dry pond projects and will start the concept validation review upon the selection of a

future sites. The target communities will be examined to ensure that the flood risk reduction solutions are comprehensive and collaborative.

5.0 ALTERNATIVES CONSIDERED

5.1 Alternative 1 – Do Nothing

13. Not implementing dry pond projects and related sewer separation would provide little to no flood mitigation for Edmonton high risk neighbourhoods. EWS would not be able to achieve the commitments set out in the SIRP strategy that was presented to City Council in 2019. Residents would see continued flooding during minor and major events. Additionally, there are financial risks associated with potentially not fully utilizing the DMAF grant funding if EWS is not able to complete the agreed scope of work prior to the timelines committed with the Federal Government.

14. EWS is regulated by AEPA and under approval to operate the collection system there is a commitment and requirement to reduce contaminant loading from collection system entering the river. Dry ponds and separated storm sewers reduce the volume of water going to combined sewer system, which will reduce the frequency of combined sewer overflow events as well as volume of combined sewer discharges resulting in overall contaminant loading reduction. Not proceeding with the ponds would require an assessment of additional measures at the outfall locations to meet the AEPA requirements. EWS chose to not proceed with this alternative given the above risks and its commitments to the COE, AEPA and its customers.

5.2 Alternative 2 – Delay Timing for Pond Investments

15. The overall capital investment during the 2025-2027 PBR term could be reduced by extending the timeframe to complete the high priority dry ponds. Under this alternative, EWS would still complete all of the proposed ponds within the 20-30 year period, however, some of the ponds would be shifted beyond the 2025-2027 PBR term. Under this alternative, dry ponds in the planning stage would not be initiated within the 2025-2027 PBR period and would be shifted to initiate in the 2028+ PBR at a higher level of investment that planned originally as part of the SIRP strategy. The risk with this approach is that ongoing flooding risks within high risk stormwater subbasins would continue, resulting in higher risk of property damage to residents. Additionally, there are financial risks associated with potentially not fully utilizing the DMAF grant funding if EWS is not able to complete the agreed scope of work prior to the agreed timelines

committed with the Federal Government. This alternative was rejected on the basis of this additional risk.

5.3 Alternative 3 – Grey Infrastructure

16. Without the ability to construct dry ponds throughout the existing urban area, the increased volumes of stormwater would require the construction of a significant network of stormwater trunks and new outfalls throughout the city. This alternative would require building wide-spread neighbourhood sewer separation, storm tunnels and outfalls. In some neighbourhoods, additional local pipe sewers would be installed to capture the peak storm volumes while limiting surface ponding of water. In the combined sewer areas, sewer separation would be completed. Additional outfalls would also be required. The COE had completed some preliminary estimates of implementing a grey infrastructure approach to manage storm volumes with cost estimates of up to $4.6 billion with an 80 year timeframe to construct due to the complexities of adding a new storm trunk tunnel network through the existing urban area. This alternative was not considered based on the much higher cost impact to ratepayers.

6.0 COST FORECAST

17. Cost estimates for active projects are based on detailed design construction estimates and/or tender prices. Cost estimates for pond projects where detailed design is not complete were developed based on historical costs from previously completed pond projects, an estimate for the area for each pond, and the following assumptions:

- No significant utility conflicts
- Standard construction methods and timelines will be applied
- Where sewer separation is required, a standard unit rate for the various lengths of sewers will be applied
- External consultants will be used during the extent of the project for design and construction support
- External contractors will be used for construction
- Consultant fees are based on previous projects, project complexity and construction costs
- Contingencies are based on project phase and complexity and range from 30-50%
- For projects where the dry pond location land is owned by Edmonton Public School Board, the estimated costs are based on previous pond acquisitions from this entity, as well as estimates from EPCOR's internal real estate group.

- Any land purchased for a dry pond will be owned by the COE with access rights provided to EWS
  for the dry pond operation and maintenance.

18. Table 6.0-1 provides the capital expenditure forecast for the Dry Pond Program for the 2025-2027 PBR term.

Table 6.0-1
Dry Pond Program Capital Expenditure Forecast 2025-2027 ($ millions)

	2025	2026	2027	Total
1. Total Capital Expenditures	43.6	66.6	28.8	139.0
2. Less: Grant Funding	11.5	11.3	0.8	23.6
3. Net Project Costs	32.1	55.3	28.0	115.4

19. Table 6.0-2 provides the capital expenditure forecast for the Dry Pond Program by pond project for the 2025-2027 PBR term. For each project, the source of the cost forecast is specified. Pond projects denoted with "(D)" indicate that costing estimates for the project are based on design construction estimates from consultants and project managers. Projects denoted with "(H)" indicate costing estimates that are using historical unit rates for dry ponds based on their conceptual size.

Table 6.0-2
Dry Pond Program Capital Expenditure Forecast by Project 2025-2027 ($ millions)

	2025	2026	2027	Total
POND PROJECTS				
1. Kenilworth Dry Pond and Sewer Separation (D)	8.2	-	-	8.2
2. Lauderdale Dry Pond (D)	11.9	20.5	-	32.4
3. Ottewell Dry Pond and Sewer Separation (D)	13.0	14.7	-	27.7
4. Forest Heights Dry Pond (H)	4.6	9.4	-	14.0
5. Cloverdale Dry Pond (H)	3.3	-	-	3.3
6. Newton Dry Pond (H)	0.6	6.0	17.5	24.1
7. Rossdale Dry Pond (H)	0.9	4.9	-	5.8
8. Kensington Dry Pond (H)	0.7	9.1	5.9	15.7
9. Alberta Avenue Dry Pond (H)	0.3	1.6	4.3	6.2
10. Future Dry Pond Planning (H)	0.1	0.5	1.1	1.7
11. Total Capital Expenditures	43.6	66.6	28.8	139.0
12. Less: Grant Funding	11.5	11.3	0.8	23.6
13. Net Project Costs	32.1	55.3	28.0	115.4

(D) – Cost forecasts are based on design construction estimates
(H) – Cost forecasts are based on historical costs

7.0 KEY RISKS AND MITIGATION PLANS

20. Table 7.0-1 provides a summary of key risks associated with executing the Dry Pond Program.

Table 7.0-1
Key Risks and Mitigation Plans

Risk	Mitigation Plan
1. Execution Risk - Some dry pond project sites may have competing land requirements which may limit the development of a dry pond.	EWS has engaged with the COE as part of the Open Spaces Repurposing procedure. The initial review of the dry pond sites has been complete, with the majority of the sites not showing significant constraints. During project development and initiation, EWS drafts a land justification report which contains more detail than the initial review. Since dry ponds have the potential to change recreation amenities, neighbourhood greenspaces and trees, and have other community impacts, the justification report must be circulated across multiple departments and stakeholders for review prior to approval.
2. Execution Risk – There may be public resistance to the selected project sites	EWS will work engage with residents, community leagues, and users to ensure the need for the dry pond is understood. Coordination with the COE on construction phasing to be considered when necessary to maintain amenity access. EWS will identify additional or modified recreational amenities in the final design. EWS will undertake public consultation throughout the design process to get feedback and make changes to accommodate community needs. EWS will work with the COE to make the area appealing, inviting and part of the community open space inventory and aligned with the COE Breathe objectives for green spaces.
3. Financial Risk - Availability of DMAF funding. Actual contractor bids may vary from the estimates. Materials and skilled labour are subject to market variability. There are also project unknowns that may affect costing.	EWS has put together a Grant Funding Committee to assist with development and delivery of grant funding. If projects are undertaken within proposed program timelines, then funding should be available. The committee also looks at additional grant funding opportunities from the Province as projects move into active construction phases. The activities in this program have been previously carried out, and a general understanding of the tasks and costs have been developed. Project costing is typically reviewed to ensure it aligns with assumptions and expectations. To mitigate cost escalations, thorough planning and proactive measures are essential. This can include detailed cost estimates during the planning phase, contingency budgets, and a comprehensive risk identification and analysis. Contracts should be clear with provisions for addressing unforeseen cost increases. Regular monitoring, strong relationships with contractors and suppliers, and experienced project managers are important to reduce the likelihood of cost increases. Value engineering to evaluate alternative materials, construction methods, or design modifications can also help to mitigate price increases.

8.0 RESOURCES

21. External consultants will be hired for each location for the extent of the project. They will assist with concept validation, preliminary and detailed design, as well as construction support. As an external cost, this should be applicable for DMAF reimbursement as DMAF funding is contingent on the use of external consultants and contractors. EWS will handle delivery of the project and will outsource construction services as per requirements of the grant funding. COE Open Spaces is a partner throughout the project, circulating project details for comments from various COE departments. EPCOR Communications and Public Engagement team will be working with the project from concept development stage until project completion and has been budgeted for as an operating cost.

EPCOR WATER SERVICES

Appendix G-3

Business Case

PRIVATE DEVELOPMENT CONSTRUCTION COORDINATION PROGRAM

May 31, 2024

Table of Contents

1.0 OVERVIEW

1. The Private Development Construction Coordination Program is an annual program that includes costs to support the planning and development processes and facilitate the construction of new wastewater collection infrastructure by private developers. The costs in this program cover EPCOR Water Service's (EWS) and the City of Edmonton's (COE) costs for staff to review land development applications, technical reports, and design drawings, and EWS's cost to complete inspections and record as-built drawings. This program also covers the COE's costs to administer the Permanent Area Contribution (PAC) system and other drainage cost sharing levies. The COE's personnel costs are paid for by EWS under the terms of the Urban Form and Corporate Strategic Development Services Agreement (SLA), and a portion of those costs are subsequently capitalized by EWS. A total spend of $16.1 million, exclusive of recoveries from inspection fees, is expected over the 2025-2027 PBR term.

2.0 BACKGROUND

2. This is an annual program that supports land planning and development processes. Land development in Edmonton is driven by developers who utilize consultants and contractors to plan, design, and construct drainage infrastructure which is then turned over to EWS as contributed assets under the COE's Servicing Agreement process. This program is essential to the development of the drainage system in alignment with EPCOR's long-term plans and to support future urban development with consideration for the requirements of system operations and maintenance. As EWS will assume ownership of these assets upon completion, it is essential that EWS be involved throughout the planning, design, and construction process.

3. Throughout the development process, various applications, technical reports, design drawings, and other documents are submitted for review and acceptance from a wastewater utility perspective. EWS and the COE collaborate on these processes, as outlined in the Urban Form and Corporate Strategic Development Services Agreement. EWS performs inspections during and after construction, completes acceptance certification, and records as-built information. In addition, the COE administers development levies for the cost sharing of new infrastructure designed to provide additional capacity to support future development between benefiting landowners.

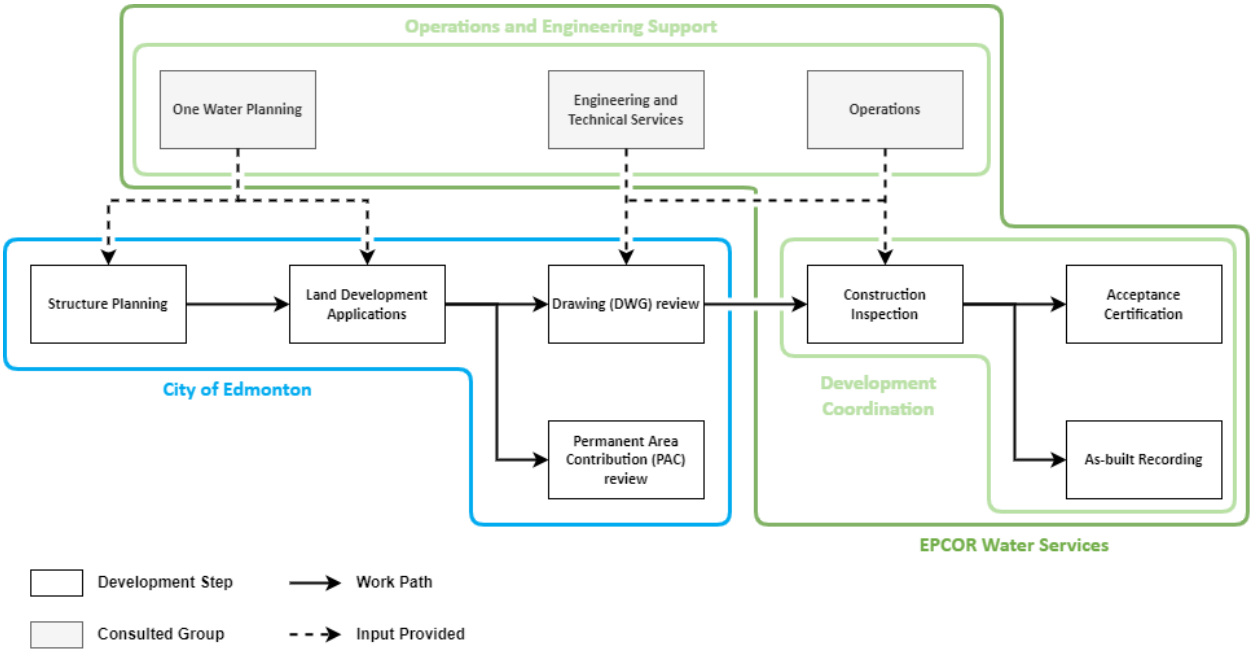
3.0 JUSTIFICATION

4. This program funds activities that are required to ensure that new developments are designed and built with infrastructure that is suitable to support future development objectives and that can be operated and maintained for its intended lifespan. It also ensures that infrastructure is recorded accurately in EWS's Geographic Information System (GIS). This program ultimately facilitates the growth of the drainage network and EWS's customer base.

4.0 PROJECT/PROGRAM SCOPE

5. The activities associated with this program are outlined in Figure 4.0-1. These activities are distributed between the COE and EWS. The COE completes Structure Planning, Land Development Application, and Engineering Drawing Review, with input from EWS teams as requested. COE also administers the Permanent Area Contribution program. EWS completes construction inspections and issues acceptance certifications as part of the integration of new drainage infrastructure into the EWS network as contributed assets.

Figure 4.0-1
2019-2023 Private Development Construction Coordination Work Distribution



6. This is an annual program beginning on January 1st and ending on December 31st each year.

5.0 ALTERNATIVES CONSIDERED

5.1. Alternative 1 – Do nothing

7. One alternative is to not complete any type of review, inspection, or recording activities for private development projects. This would mean relying entirely on the engineer who designs and certifies on behalf of the developer that the infrastructure is constructed in accordance with the standards. Without EPCOR's participation in the COE's planning and development processes, the quality, integrity, and reliability of privately constructed drainage infrastructure would be jeopardized, as well as compliance with regulations, standards, and environmental requirements. Operational and maintenance costs would increase due to improper planning, design, and installation of drainage infrastructure. In addition, the orderly sequential development of the drainage system could break down, making it difficult or inefficient to service future subdivisions. This would ultimately lead to negative impacts on EPCOR's finances, operation, and reputation.

5.2. Alternative 2 – Reduced Involvement

8. A second option is to reduce EWS's involvement in the development process. This would be achieved by reducing involvement during the structure planning, land development application, and engineering drawing review stages, relying on the COE to provide those services. Further reductions could be achieved by reducing the involvement during infrastructure construction and removing operational support from the inspection system. EWS's only involvement would be for certification inspection and the issuance of acceptance certificates. This increases the potential for longer term operational and maintenance concerns not being addressed early in the process, resulting in increased costs for either EWS or the development industry for rectification of impacts to customers. This option has been rejected.

5.3. Alternative 3 – Third-Party Reviewers

9. The option to rely on a third-party engineers is not considered viable in Edmonton due to the volume of submissions, our approval to operate, and the potential for issues with consistency if the hired firm were to change year over year. EWS would risk losing institutional knowledge and control over the quality of submissions and the infrastructure as it would be entirely dependent on the consulting firm. This option has been rejected.

6.0 COST FORECAST

10. This program has been in operation for six full calendar years, starting after Drainage Services was transferred from the COE to EPCOR in September 2017. The actual costs and recoveries for 2019 through 2023 are broken down as shown in Table 6.0-1.

Table 6.0-1
2019-2023 Private Development Construction Coordination Program Costs ($ millions)

Year	COE Activity Costs	EWS Costs (salaries, mileage, overhead, etc.)	Recoveries (Inspection Fees)	Total
1. 2019	$2.2	$1.6	($0.2)	$3.6
2. 2020	$2.1	$1.5	($0.3)	$3.3
3. 2021	$2.1	$1.9	($0.2)	$3.8
4. 2022	$2.3	$2.4	($0.3)	$4.4
5. 2023	$2.5	$2.0	($0.9)	$3.6

11. Program costs were determined using historical internal and external data. Internal EPCOR hours, shown as equivalent FTE values, are shown in Table 6.0-2. Program hours by job type were analyzed and applied to the PBR term. External costs related to Service Level Agreement transfers for services provided by the COE are estimated at $2.3 million per year. The historical COE FTE equivalents are shown in Table 6.0-2 and cost allocation information is presented in Table 6.0-3.

Table 6.0-2
2019-2023 Private Development Construction Coordination Resources (FTEs)

Activities \ Year	2019	2020	2021	2022	2023	5-year avg
Activities completed by EWS[1]						
1. Program Coordination	0.5	1.0	1.3	1.8	1.8	1.3
2. Field Construction Inspection	4.5	4.8	5.3	6.5	5.3	5.3
3. Operational support for inspection activities	0.8	0.3	0.8	0.3	0.3	0.5
4. Operational support for engineering review	0.8	0.8	1.3	1.3	1.0	1.0
5. Land administration services	0.3	0.3	0.3	0.3	0.3	0.3
6. Infill Water and Sewer Servicing support	0.5	0.3	0.3	0.5	0.3	0.4
7. As-built recording	2.3	1.5	1.8	2.3	2.0	2.0
EWS total	8.8	8.0	10.0	12.8	10.0	10.0
Activities completed by COE						
8. Land development application (LDA) review	6.2	5.1	4.9	4.9	4.9	5.2
9. Drawing (DWG) review	8.8	8.0	8.0	8.0	8.0	8.2
10. Permanent Area Contribution (PAC)	3.8	4.4	4.4	4.4	4.4	4.3
COE total	18.8	17.5	17.3	17.3	17.3	17.6
Total effort	27.6	25.5	27.3	30.1	27.3	27.6

[1] An FTE is assumed to be 2000 hours/calendar year

Table 6.0-3
2019-2023 COE Service Level Agreement Transfer Allocations ($ millions)

Year	Allocation	1. Edmonton Service Center Public Services	2. Sanitary Servicing Strategy Fund Management	3. Land Development Applications (LDA)	4. Drawing Review (DWG)	5. Permanent Area Contribution (PAC)	6. Planning Administration	Total Allocation
2019	Program Portion	-	-	$0.7	$1.0	$0.5	-	$2.2 (61%)
	Other Capital Portion	-	$0.3	-	-	-	-	$0.3 (8%)
	Operating Portion	$0.1	-	$0.8	-	$0.1	$0.1	$1.1 (31%)
	Task Total	$0.1	$0.3	$1.5	$1.0	$0.6	$0.1	$3.6 (100%)
2020	Program Portion	-	-	$0.6	$1.0	$0.5	-	$2.1 (64%)
	Other Capital Portion	-	$0.3	-	-	-	-	$0.3 (9%)
	Operating Portion	$0.1	-	$0.6	-	$0.1	$0.1	$0.9 (27%)
	Task Total	$0.1	$0.3	$1.2	$1.0	$0.6	$0.1	$3.3 (100%)
2021	Program Portion	-	-	$0.6	$1.0	$0.5	-	$2.1 (64%)
	Other Capital Portion	-	$0.3	-	-	-	-	$0.3 (9%)
	Operating Portion	$0.1	-	$0.6	-	$0.1	$0.1	$0.9 (27%)
	Task Total	$0.1	$0.3	$1.2	$1.0	$0.6	$0.1	$3.3 (100%)
2022	Program Portion	-	-	$0.6	$1.2	$0.5	-	$2.3 (66%)
	Other Capital Portion	-	$0.2	-	-	-	-	$0.2 (6%)
	Operating Portion	$0.1	-	$0.7	-	$0.1	$0.1	$1.0 (28%)
	Task Total	$0.1	$0.2	$1.3	$1.2	$0.6	$0.1	$3.5 (100%)
2023	Program Portion	-	-	$0.6	$1.3	$0.6	-	$2.5 (68%)
	Other Capital Portion	-	$0.2	-	-	-	-	$0.2 (5%)
	Operating Portion	$0.1	-	$0.7	-	$0.2	$0.1	$1.0 (27%)
	Task Total	$0.1	$0.2	$1.3	$1.3	$0.8	$0.1	$3.7 (100%)

12. Program recoveries come solely from Inspection Fees paid by developers when they enter into servicing agreements with the COE. The amount of revenue is dependent on development activity levels, which is linked to market conditions and fluctuates each year. However, there is also potential for different types of growth and a certainty of development upon economic rebound. Edmonton has diversified as a city over the last 5 years, with expanding development within regions within the city boundary along with redevelopment in mature neighbourhoods.

13. Recoveries varied significantly over the 2019 to 2023 period with 2023 being an anomalous year. This was due to a delay in recovery remittance for the previous years and the

associated transfer of funds occurring in 2023. Recoveries have been estimated based on the level of development activity seen over the past five years and the corresponding program utilization, adjusted for the anticipated development activity within the PBR term. The pace of development remains uncertain, therefore an estimate of $312,000 was used.

14. Forecast capital expenditures and contributions for the 2025-2027 PBR term are shown in Table 6.0-4.

Table 6.0-4
Private Development Construction Coordination Program Capital Expenditure Forecast
($ millions)

	2025	2026	2027	Total
1. Total Capital Expenditures	5.2	5.4	5.5	16.1
2. Contributions (recoveries)	(0.3)	(0.3)	(0.3)	(0.9)
3. Total Project Costs	4.9	5.1	5.2	15.2

7.0 KEY RISKS AND MITIGATION PLANS

15. Key risks and mitigation plans associated with execution of this program are described in Table 7.0-1.

Table 7.0-1
Key Risks and Mitigation Plans

Risk	Mitigation Plan
1. Execution Risks - A key execution risk is the possible lack of adequate staffing to handle workloads, particularly when complex situations or issues arise.	On a regular basis, EWS will carefully monitor resource and work levels and adjust as necessary.
2. Third Party Risks – the extensions of the drainage system are completed by third party contractors. There remains a risk of cross-connections between the sanitary and stormwater systems and of releases of detrimental substances to the environment.	EWS construction inspectors are on site on a regular basis to adequately assess the activities and associated risks and provide direction to mitigate the risks to the existing system and the environment. Contraventions result in immediate stoppage of work, and internal forces are used for remediation and risk control
3. Financial Risks - The number of submissions and construction projects is under the control of developers and consultants, who are under the influence of market conditions. Costs and revenues can fluctuate if market conditions vary.	The activities in this program have been previously carried out, and a general understanding of the tasks and costs have been developed. EWS will monitor costs and revenues each month as part of its regular capital management and governance processes with an effort to manage any anticipated cost increases.

8.0 RESOURCES

16. Internal EWS resources as well as COE resources will be used for the execution of this program.

EPCOR WATER SERVICES

Appendix G-4

Business Case

LOW IMPACT DEVELOPMENT PROGRAM

May 31, 2024

TABLE OF CONTENTS

1.0 OVERVIEW

1. The Low Impact Development (LID) Program will construct and design LID installations throughout Edmonton on both public property and privately-owned commercial, industrial, and institutional properties in alignment with the Stormwater Integrated Resource Plan (SIRP) strategy. Implementation involves significant coordination with both the City of Edmonton (COE) and private owners of industrial and commercial property where LID installation will support the overall system. LID is a critical element of EWS's SIRP strategy to mitigate flood risks across the city. LID provides another strategy to achieve climate change adaptation and to maintain and improve the health of the local creeks and the North Saskatchewan River (NSR). The SIRP Capital and Operational plan estimated $480 million in LID would be implemented over the next 20 to 30 years.

2. The LID Program includes forecast capital expenditures of $51.3 million for the 2025-2027 PBR term.

2.0 BACKGROUND

3. LID installations and small storage are a part of the SLOW theme of the SIRP strategy. SIRP is a system wide integrated approach to mitigate flood risk by reducing the health, safety and social risk of flooding with lower overall capital investment than compared to traditional engineering approaches. SIRP recommended a five theme strategy for flood mitigation (SLOW, MOVE, SECURE, PREDICT and RESPOND) that included a mix of grey infrastructure (trunks and tunnels) and green infrastructure (dry ponds, low impact development). The SLOW theme refers to slowing the entry of stormwater into the sewer system, groundwater or surface waters by collecting it in small storage infrastructure and absorbing it in green infrastructure, such as LID, creating space in the collection system during storm events. LIDs incorporate vegetation, engineered soils and natural processes into the built environment to manage stormwater, mitigate the impacts of climate change and to maintain healthy and sustainable communities. Green infrastructure was first advanced as a component of stormwater management and flood risk mitigation over 25 years ago, and today it is applied in communities across North America.

4. In developing the SIRP strategy, EWS studied storm patterns in the Edmonton region. The decision to incorporate green infrastructure was driven by two main factors: the significant impact of ponding on roads after storms, and the fact that most storms in Edmonton are small, with intense events affecting smaller areas over a short duration. Edmonton's storms are often localized and intense, surrounded by less intense rainfall. LID is effective in capturing lower water

volumes in the storm's periphery, helping pipes and ponds handle the intense core of the storm. City-wide LID implementation can divert runoff from most rainfall-affected areas, reducing the impact on the collection system.

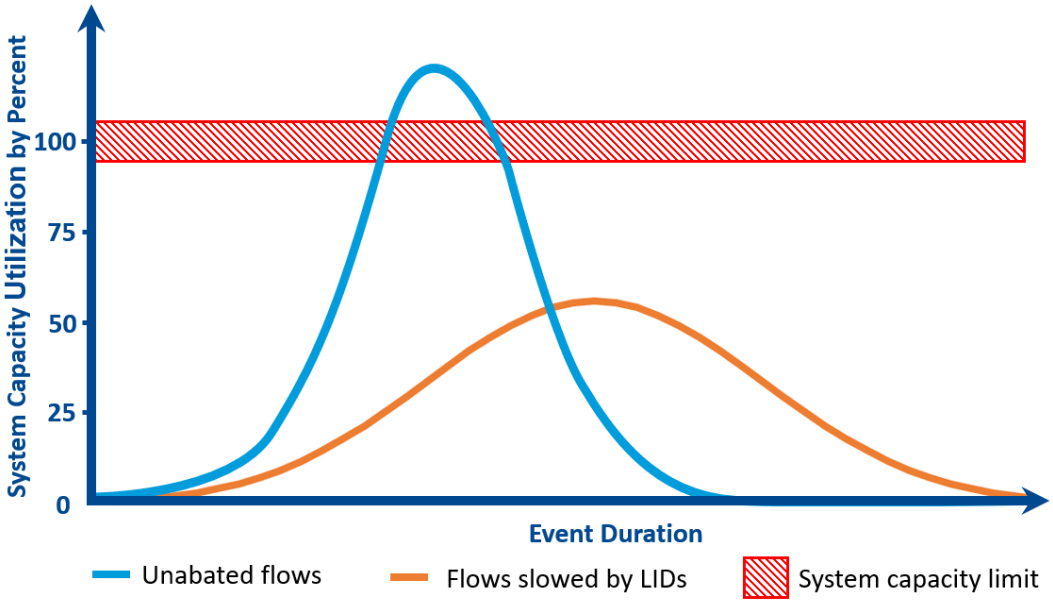
5. Green infrastructure installations have two primary functions for flood mitigation - retention and detention. Retention allows surface runoff to infiltrate into the specialized soils to be used by plants or to evaporate. Detention allows a delayed release of the remainder of stormwater runoff into the sewer system, thereby reducing peak stormwater flows and the demand on sewer infrastructure.

6. EWS developed the SIRP Risk Framework for a number of stormwater catchment areas within the city and identified approximately 1,392 sub-basins. These sub-basins were then risk ranked based on urban and riverine flooding hazard levels using four perspectives: social, financial, health and safety, and environmental. EWS is recommending investment in LID for each sub-basin based on previously completed engineering studies, additional data/information analysis and system wide assessment for hydraulic feasibility. EWS will continue to develop these strategies to overcome barriers to implementing LID, ensure cost effectiveness of implementation, and provide positive impacts to local communities. These efforts include partnering with the COE and private property owners.

3.0 JUSTIFICATION

7. Implementation of LID within SIRP sub-basins will reduce the flood risk levels of those areas as the LID reduces peak flows so that the system doesn't become as inundated during a rain event. This is conceptually illustrated in Figure 3.0-1. For both conventional system designs and those employing LIDs, the same volume of storm water is handled and conveyed by the storm water collection system. However, by slowing the storm water down using LIDs, the duration of the event in the collection system is increased given the system more time to handle the flows and greatly diminishing the peak flows experienced by the system.

Figure 3.0-1
Conceptual representation of capacity impacts from using LIDs



8. Beyond contributing to the SLOW theme of SIRP, LID implementation also aligns with the Integrated Watershed Management Strategy (IWMS) and supports the Wastewater Integrated Resource Plan (WW IRP). While LID installations are climate change adaptation measures, they also provide supplementary benefits. LID implementation has the ability to both improve water quality and reduce inflow and infiltration into the system. Water quality benefits come from green infrastructure's ability to manage surface runoff at the source, reducing the volume of water released. The engineered soil and vegetation promote natural processes to capture, absorb and filter the water. Water that isn't captured within the LID facility is filtered, removing solids and other contaminants from the runoff before it leaves the facility. In addition, LID can be more cost effective over its life span compared to conventional grey stormwater infrastructure such as sewer pipes, ditches, swales, and larger storm water management facilities.

9. LID meets multiple land development and stormwater management objectives and is becoming more common throughout North America as measures to adapt to climate change. Continued implementation of this program will help to meet the SIRP flood risk reduction targets, support EPCOR's commitment to climate change adaptation, and maintain and improve NSR health.

4.0 PROGRAM SCOPE

10. The scope of this program includes design and construction of LID installations throughout Edmonton, with a focus on COE-led projects. The COE-led LID projects will work in conjunction with the COE's ongoing projects and programs, such as Building Great Neighbourhoods (BGN) or the Urban Planning and Economy programs. These LID are typically installed within the Public Right of Way or installed with COE owned land holdings including open spaces and publicly accessible COE facilities. At any one time, there can be about 15 to 25 ongoing LID projects in progress, all at various stages. In addition to the COE-led LID projects, there will also be several EPCOR-led projects included in the program as well. These projects will focus on LID installations on both private and public parcels of land or areas with flooding concerns to provide additional stormwater storage from the property and surrounding areas including public roadway.

11. The scope of work will include the following:

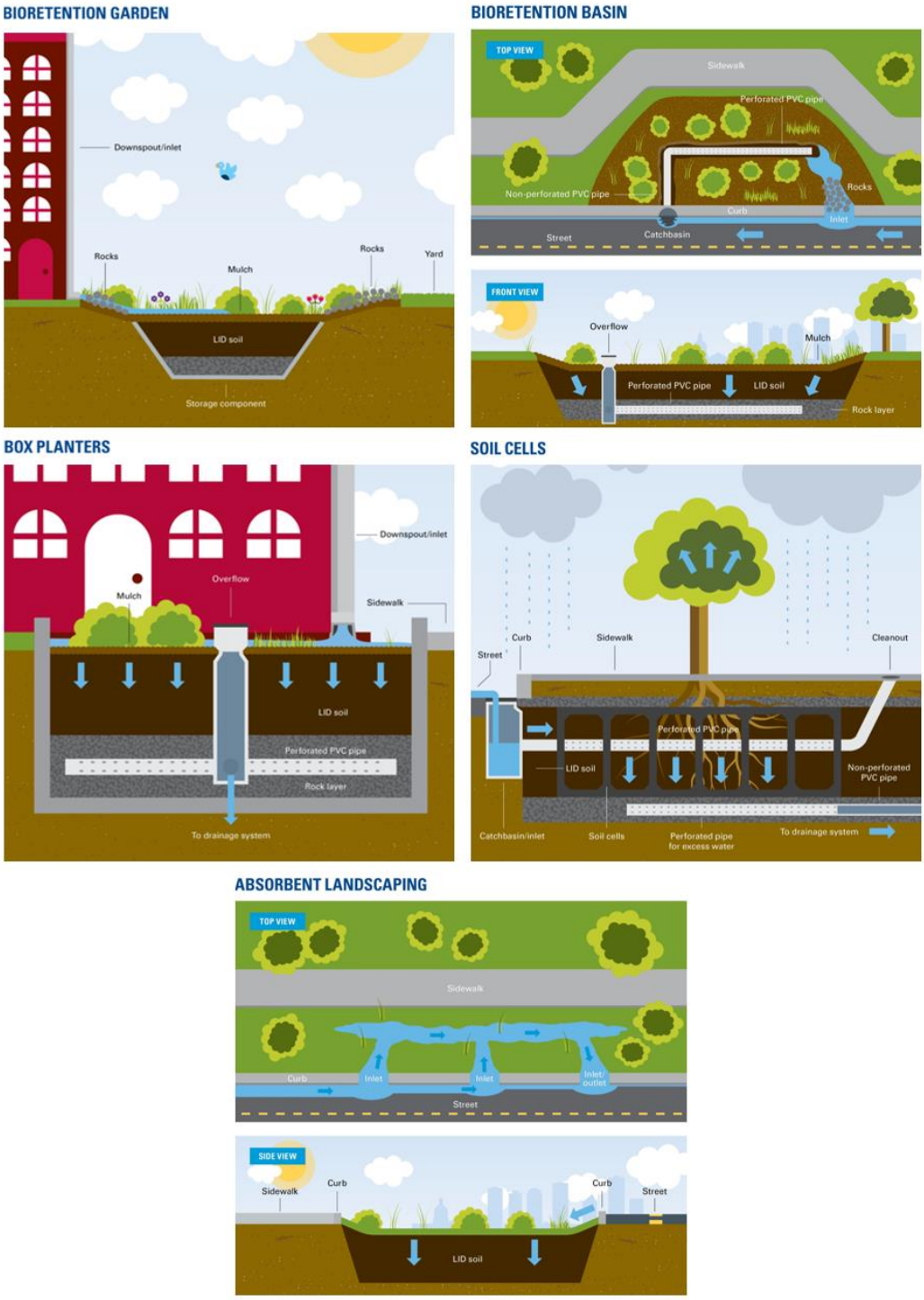
- Liaising and coordinating with COE departments and customers for LID development and inclusion within programs/properties.
- Developing concept designs including identification and delineation of potential LID locations, calculation of catchment areas and imperviousness, storage provided by LID, type of LID installation, cost-benefit analysis, and identifying general constraints (such as utilities and existing trees).
- Developing preliminary designs including preliminary layouts of each proposed LID feature, drawing packages, refinement of calculations such as storage capacity, runoff volume reduction, and peak flow attenuation and reduction, cost estimates for construction, and stakeholder engagement.
- Developing detailed designs including detailed grading plans, planting plans, profiles/cross sections, details, specifications, and refined calculations.
- Construction, construction management, inspection, and commissioning of LID.

12. As of now, specific sites for the 2025-2027 PBR term have not been determined. Outreach and communication efforts with the COE and other customers and partners will be ongoing to identify appropriate locations.

13. Within the scope of this program is the construction and addition of LID systems that provide storage, slow down storm flows, and overall reduce flood risk. These can include but are not limited to bioretention gardens, bioretention basins, box planters, soil cells, absorbent

landscaping, permeable pavement, soakaway pits, small scale storage, and green and blue roof conversions so long as storage benefits can be demonstrated and quantified. Some examples of LIDs are illustrated in Figure 4.0-1.

Figure 4.0-1
Examples of Some Types of LID Installations



14. LID designs on private parcels require to be approved by EWS prior to commencement of their construction. EWS funds the portion of storage that the LID provides in exceedance of the storm water management requirements of the site.

5.0 ALTERNATIVES CONSIDERED

5.1 Alternative 1 – Do Nothing

15. Not implementing LID infrastructure would require implementing an approach similar to the COE's original Flood Mitigation Strategy. Grey infrastructure would collect and divert more runoff to the collection system, moving problems from one area to another as the overall system capacity would not improve. Adding more pipes without retaining volume at the source would not help with system capacity and would also bring faster and cause more environmental damage to natural watercourses such as creeks and the NSR.

16. EWS operates under the regulatory oversight of Alberta Environment and Protected Areas (AEPA), and as part of its approval to operate the collection system, there is a commitment and requirement to decrease solids loading from the system entering the river as part of our IWMS. Implementation of green infrastructure will help to mitigate and reduce these loadings through volume reduction by natural processes such as plant absorption and infiltration, along with the retention and treatment of runoff at its source, ensuring that EWS remains compliant with its total loading objectives. The additional capacity in established areas, particularly those with combined sewer service, aligns with COE infill targets and aids in minimizing both the frequency and volume of combined sewer overflow occurrences. Reaching EWS's SIRP and Total Loadings Plan targets would be unattainable with the do nothing alternative.

5.2 Alternative 2 - Installation of LID in Public Road Right of Way and Public Lands Only

17. Based on the COE land use report, "Roadways" only make up about 4% of the city's area, therefore it would be very difficult to meet SIRP targets using only Public Road Right of Way and Public Lands. LID construction within Public Road Right of Way without working in conjunction with the COE would be very disruptive to the public. The current program pairs LID construction with urban/neighbourhood renewals to minimize this disruption. To execute this program in conjunction with COE projects, EWS must rely heavily on the COE and must work within the scope and confines of their renewal projects.

5.3 Alternative 3 - Installation of LID on Private Properties Only

18. Based on the COE land use report, "Commercial" and "Industrial" properties make up 11% of the city's area and are primarily impervious areas. Installation of LID facilities on Commercial/Industrial properties can be completed in some cases minimal disturbance to the public. However, it would be very difficult to meet the main SIRP objective of flood mitigation if funding was only allocated to Commercial/Industrial properties. The capital spend is therefore being limited to between $2.0 to $3.0 million per year, with additional support being proposed as a stormwater rebate program beginning in the 2025-2027 PBR term. This rebate would be an operating expense.

5.4 Alternative 4 - Installation of LID on Public and Private Properties

19. Installation of LID facilities in conjunction with a number of COE programs as well as through EPCOR-led projects in cooperation with private commercial/industrial/institutional customers allows EWS to more effectively and efficiently plan LID facilities moving forward. The increased options provide more flexibility to invest dollars into areas that offer more benefit to the storm and combined system. The increased flexibility also provides the greatest opportunity to meet environmental and SIRP targets. Where possible, the LID program will be coordinated with capital projects with surface works such as dry ponds and outfall rehabilitation. This is the recommended alternative. Its pace of installation addresses the identified needs to reduce the present flood risk and capacity constraints in the storm and combined sewer system.

6.0 COST FORECAST

20. The total forecasted expenditure for the 2025-2027 PBR term is $51.3 million. The number of sites completed will vary depending on the scope of the projects. Factors that may influence this include the size and number of LID facilities constructed for each project, catchment area, ease of installation, and LID type. The COE-led projects are assumed to be completed almost entirely externally for both design and construction, as typical projects coordinated with the COE are contractually managed by the COE. EPCOR-led projects will be completed with a mix of both internal and external resources for both design and construction.

21. Table 6.0-1 provides the forecast for the LID program for the 2025-2027 PBR term.

Table 6.0-1
LID Program Capital Expenditure Forecast 2025-2027 ($ millions)

	2025	2026	2027	Total
Total Capital Expenditures	17.6	16.6	17.1	51.3

22. Table 6.0-2 provides a breakdown of costs for the COE-led projects and the EPCOR-led projects.

Table 6.0-2
LID Program Capital Expenditure Forecast 2025-2027 Breakdown ($ millions)

	2025	2026	2027	Total
1. COE-Led Delivery	15.6	14.6	15.0	45.2
2. EPCOR-Led Delivery	2.0	2.0	2.1	6.1
3. Total	17.6	16.6	17.1	51.3

7.0 KEY RISKS AND MITIGATION PLANS

23. Table 7.0-1 summarizes the key risks and mitigation plans associated with this program.

Table 7.0-1
Key Risks and Mitigation Plans

Risk	Mitigation Plan
1. Risk of Limited uptake by commercial/industrial property owners - As this is a relatively new program, there is a risk that none of the identified properties will agree to be part of the program. Although EPCOR is funding design and construction of the LID, there will always be some impact to the property that the site owner(s) will have to agree to.	• Developing a list of potential sites using streamlined tools such as FME • Developing key messaging around LID and agreements to better communicate EPCOR's needs • Reaching out to partners such as the COE's BIA resources and other programs such as the cornerstore program to help communicate about EPCOR's LID program and the benefits of LID • Education, networking and presentations to communicate about LID to a wider audience
2. Construction Risks - Risk of utility conflicts, bad soil conditions/high groundwater table, restoration requirements, lack of space, and conflicts with other construction projects.	• Started designing LID earlier in the project • Regular touchpoints/meetings with project teams • Hold lessons learned each year, and improve procedures and processes, such as getting survey earlier in the project and completing hydrovac in areas of utility congestion
3. Financial Risk - Materials and skilled labour are subject to market variability. There are also project unknowns that may affect costing. Further change orders or unknown conditions that cannot be seen until demolition is complete	• The activities in this program have been previously carried out, and a general understanding of the tasks and costs have been developed. Project costing is typically reviewed to ensure it aligns with assumptions and expectations. To mitigate cost escalations, thorough planning and proactive measures are essential. This can include detailed cost estimates during the planning phase, contingency

	budgets, and a comprehensive risk identification and analysis. Contracts should be clear with provisions for addressing unforeseen cost increases. Regular monitoring, strong relationships with contractors and suppliers, and experienced project managers are important to reduce the likelihood of cost increases. Value engineering to evaluate alternative materials, construction methods, or design modifications can also help to mitigate price increases.

8.0 RESOURCES

24. For LID projects initiated and led by COE, the program will be run according to the Memorandum of Understanding between EPCOR and the COE. The COE's Project Development and Delivery Model will be used to manage and implement projects. EWS will work closely with the COE to manage scope and forecasts, in addition to monitoring forecasts and spending.

25. For LID projects initiated and led by EWS, a combination of internal and external resources will be used for both design and construction. Internal resources will be used to manage implementation, construction, and contract management, up to and including project close-out. The existing Master Service Agreements (MSA) can be leveraged for design and both drainage works and surface restoration.

EPCOR WATER SERVICES

Appendix G-5

Business Case

DRILL DROP MAINTENANCE HOLE RENEWAL PROGRAM

May 31, 2024

TABLE OF CONTENTS

1.0 OVERVIEW

1. The Drill Drop Maintenance Hole (DDMH) Renewal Program is an annual program to systematically rehabilitate or replace failing DDMH which are small diameter shafts extending from the ground surface into the deep trunk sewer. These assets were built at time of the trunk line construction using corrugated metal pipes (CMP) or cast iron (CI) pipe that are highly susceptible to corrosion, and many are beyond their expected life. The scope includes inspections, risk assessment, prioritization, design, and construction of the DDMHs. During the 2025-2027 PBR term, this program is forecast to complete 18 DDMHs full replacements with a total capital spend of $29.8 million which contributes to reducing the overall risk of significant failure of these structures.

2.0 BACKGROUND

2. DDMHs were constructed as equipment or emergency access points during tunneling construction of deep trunk sewers. They are small diameter shafts extending from the ground surface into the trunk sewer and housed power cables, lighting, and ventilation systems during construction of the sewer. Many were left in place following completion of the trunk instead of being properly abandoned, and numerous DDMHs were subsequently utilized as receiving maintenance holes for local sewers. CMP and CI are prone to corrosion, and only have a typical lifespan of 30-40 years. Consequently, many of the DDMHs are beyond their expected life.

3. The Drill Drop Renewal Program was originally initiated in 2006 to address the risk of failure of these maintenance holes. Records indicate that approximately 300 DDMHs existed in the drainage system at that time. In December 2020, a comprehensive risk-based inspection plan was developed to get a baseline condition on the entire DDMH inventory. Closed Circuit Televising (CCTV) is required to determine condition of the assets, and since 2020, nearly all of the asset category has had a baseline inspection completed. Through rehabilitation, replacement, and abandonment work, the DDMH inventory has reduced from approximately 300 to 233 DDMHs.

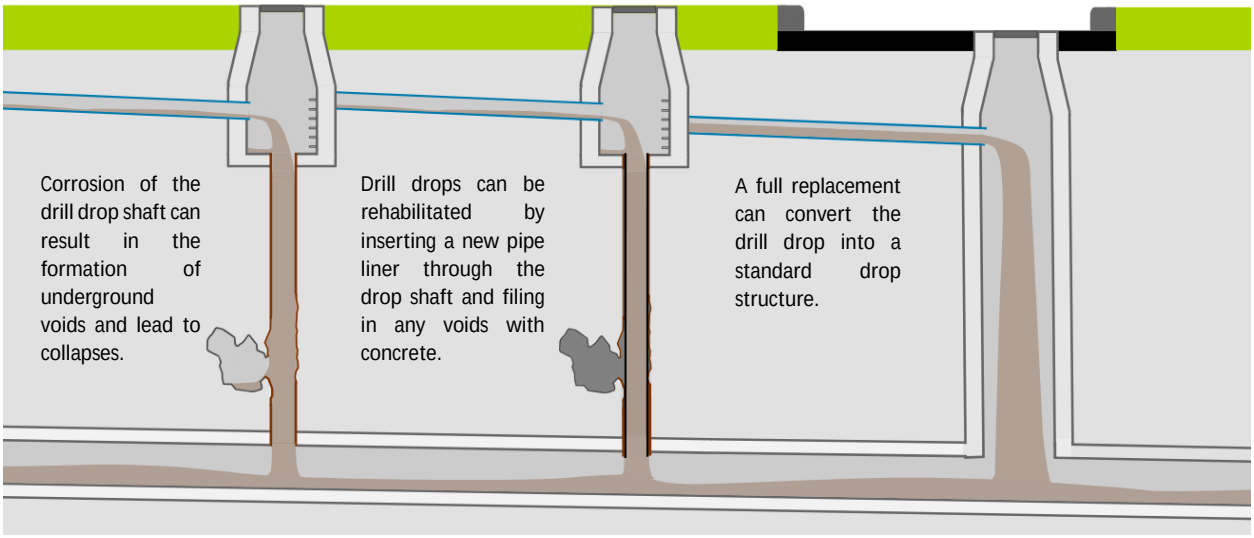
4. There are three methods used for DDMHs:

1) Full Replacement – This method must be used where the DDMH is in such poor condition and no viable rehabilitation option is available. Functionality can also be the driver for full replacement if there are a number of sewer connections present, and if there is a risk of back-ups or inability to remove an obstruction.

2) Rehabilitation (Relining) – This includes options such as slip lining or cured in place pipe and cannot be used where there are side connections to the trunk or if the DDMH is corroded away. This method reduces the hydraulic capacity of the DDMH.
3) Abandonment – If there are no connecting local sewers into the DDMH, and the location is not required for trunk access, the DDMH can be abandoned.

5. The method for each DDMH will be selected based on its structural integrity, connection type to the trunk, access points, and other engineering considerations. Figure 2.0-1 shows both the rehabilitation and full replacement options for DDMH.

Figure 2.0-1
DDMH Rehabilitation and Replacement



3.0 JUSTIFICATION

6. DDMH failures can lead to roadway subsidence or sinkhole formation, resulting in public safety and traffic impacts, flooding, environmental spills, and costly emergency repairs. A notable example of a failure was at a location on Allendale Road and Calgary Trail in August of 2018. Upon inspection, it was determined that from 16 m below ground to the trunk sewer, 7 m of the CMP maintenance hole was missing and a large void had formed. Where the DDMH previously connected to the trunk sewer, a hole remained and within several days, settlement of the road surface was seen in the wheel path of vehicles. The location is a very busy intersection and therefore a high safety risk to the public and also caused major traffic disruption in the area. As this DDMH is part of the combined system, the failure allowed for flow of untreated wastewater

to the soil in the surrounding area. The total cost of emergency repairs was $3.5 million, and the work took 16 months to complete.

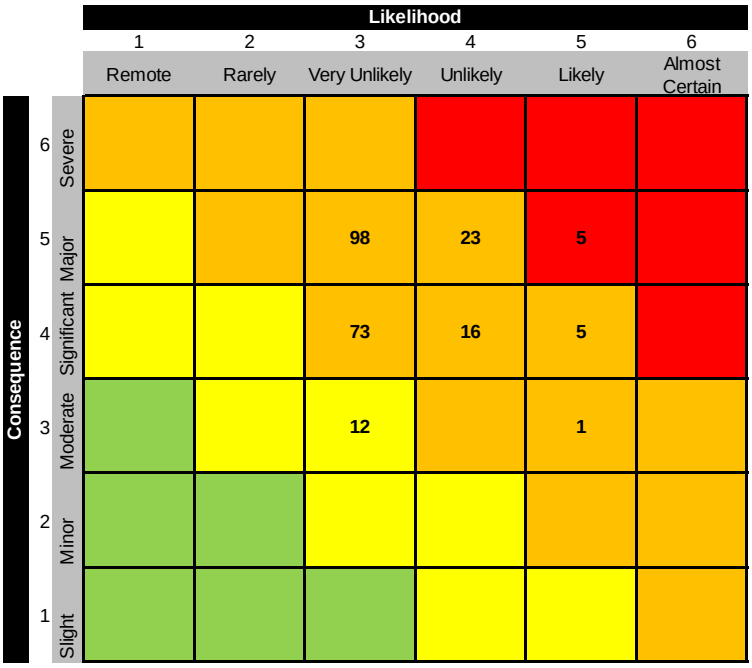
7. Another recent example is of the DDMH at Calgary Trail and Saskatchewan Drive on a combined trunk. While a large hole and visible void were initially discovered through proactive inspections, it escalated into an emergency project when the bottom of the existing DDMH collapsed, causing flow backups and the release of untreated wastewater into the surrounding soil. The response required multiple costly bypasses, clearing of debris from the collapse, and filling of several large voids. Given its location, the project was highly disruptive to traffic and the local community, negatively impacting the reputation of EPCOR Water Services (EWS). This project resulted in a nine month completion timeline at a total cost of $3.2 million.

8. By proactively replacing or abandoning DDMHs, EWS can continue to manage the risk appropriately to reduce risk exposure, especially as about 95% or 218 of these are approaching or past their design life. Selection of DDMHs for replacement will be based on those identified as requiring immediate replacement to prevent voids, collapses or sinkholes. DDMHs are prioritized based on risk assessments, number of inlets, functionality, depth of trunk, road classification/location, and synergy with other projects. The risk assessments consider age, waste type, proximity to environmentally sensitive areas, depth, roadway classification and customer impacts due to pipe and roadway failures.

9. During the current PBR term of 2022-2024, EWS undertook a proactive inspection program of all DDMH to determine asset condition. Due to these baseline inspections, current condition is known for a significant portion of the asset category, with the remaining location inspections estimated to be completed by mid-2024.

10. A risk assessment was completed for all the DDMH inventory based on age, material type, waste type, and inspection information, producing a condition rating for each DDMH. The resulting condition ratings were then used to develop the Likelihood of Failure (LOF) for each DDMH. Along with the LOF scores, Consequences of Failure (COF) were also completed across all six consequence categories using the EPCOR Risk Management Standards and Risk Matrix. The six consequence categories include Health and Safety, Environment, Regulatory, Reputation, Service Interruption, and Financial. The EPCOR Risk Matrix has been utilized to show the current results which are displayed in Figure 3.0-1 below. Any DDMHs remaining to be inspected are shown with their pre-inspection risk score.

Figure 3.0-1
DDMH EPCOR Risk Matrix Results



11. Of the 233 remaining DDMHs in service, 221 rank either High or Medium-High risk. There are currently 13 ongoing and planned projects that will be completed ahead of the 2025-2027 PBR period. The asset category therefore has the following remaining requirements:

1. As 4 of the 11 DDMHs in LOF 5 are currently in progress for replacement, the remaining 7 DDMHs will require replacement or abandonment as soon as possible. Operations will be continuously monitoring these locations until they are replaced.
2. 32 of the DDMHs in LOF 4 are backlogged waiting for replacement or abandonment and require continuous monitoring at various intervals until they are replaced.
3. Of the remaining 190 locations in LOF 4 and LOF 3, 85 will require scheduled monitoring until they deteriorate to the point of requiring replacement. This monitoring is an operational task and is out of scope of this program.

12. The approach to maintaining a Medium-High risk backlog is driven by the object to minimize the impacts on rate payers. By prioritizing and regularly monitoring the backlog locations, we are able to manage the risk until they can all be planned for rehabilitation, replacement, or abandonment.

4.0 PROGRAM SCOPE

13. The scope of renewal for DDMHs will include either rehabilitation, full replacement or abandonment. As the DDMHs in the highest risk categories will be targeted first, the initial focus will be on replacement or abandonment as these locations are in very poor condition. The capital program for the 2025-2027 PBR term includes inspections to confirm asset conditions, assessment and prioritization, design, and construction. The annual scope of work includes the following:

- Inspections of approximately 20 DDMHs to confirm asset condition
- Assessment and prioritization of DDMHs
- Design of 5-7 DDMHs going forward for replacement
- Geotechnical investigations
- Construction of 5-7 DDMH replacements
- Assets placed into service

5.0 ALTERNATIVES CONSIDERED

14. The alternative to the program is to leave the DDMHs and deal with them reactively instead of proactively. If this program is not continued and existing deterioration in the DDMHs remains unaddressed, failures are likely to occur potentially causing underground voids. This could lead to sinkholes in the middle of high traffic arterial roadways where many DDMHs are located which is a significant safety concern. Other considerations are environmental impacts from holes in sanitary or combined DDMHs which could cause soil contamination, interruption of service to residents and high costs of unplanned emergency repairs. To illustrate the cost effectiveness of a proactive approach, the Allendale emergency DDMH project cost a total of $3.5 million. In comparison, several recent proactive DDMH projects, one in Queen Mary Park and one in Strathcona, cost a total of $1.4 million and $1.6 million respectively. In general, proactive work is roughly 2-3 times more cost effective relative to a reactive response in the event of a failure. The advantage to this reactive alternative is that there may be lower impact to the rate payers in the immediate PBR term, however if more emergencies continue to occur, the costs in the long term will be increased.

6.0 COST FORECAST

15. EWS has forecast total program capital expenditures during the 2025-2027 period at $29.8 million. This reflects an increase in average annual spending on this program from $4.4

million per year to $8.9 million per year. This increase is required to address the known DDMH deficiencies found through the baseline inspections completed in the current PBR term. More investment is needed to address the DDMHs in the system before they become emergency projects because of the inherent risks of these DDMHs. These system failures present a high safety risk for EWS employees and the public.

16. The program cost estimates for the 2025-2027 PBR term shown in Table 6.0-1 are based on historical information such as past inspection costs, past design costs and past construction costs of similar DDMH projects that occurred within the last few years. Costs for each DDMH project will vary depending on the depth, geotechnical assessments, location, condition, etc. The costs were developed with the following assumptions:

- Approximately 20 DDMH inspections will be completed by internal resources over the PBR term to confirm current condition of the infrastructure ahead of design and construction
- 6 replacements will be required each year
- Replacements will be completed by internal resources
- Geotechnical investigations will be required for each location, and will be completed by external resources
- Replacements are assumed to cost approximately $1.5 million per location
- Project cost estimates are based on costs incurred for inspection, design, and construction of similar projects that occurred over the past several years

Table 6.0-1
DDMH Program Capital Expenditure Forecast ($ millions)

	2025	2026	2027	Total
Total Capital Expenditures	6.5	10.9	12.4	29.8

7.0 KEY RISKS AND MITIGATION PLANS

17. As these assets continue to deteriorate, the risk of failure will continue to increase. Failure can lead to subsidence or sink holes on arterial roadways, resulting in health and safety risks for the public, costly emergency repairs, service impacts, and/or sewage leakage and spills to the environment leading to incompliance and fines. The most effective measure to mitigate these risks is to continue with proactive replacement of deteriorating DDMHs. Execution risks, such as safety concerns for workers on a busy roadway site and traffic disruptions on high traffic roadways, can be mitigated by ensuring an experienced project manager is engaged to follow all proper safety procedures on site and to develop an optimal construction staging plan. Another

execution risk is cost escalations which can impact the overall budget. Cost escalations can arise due to various factors such as unforeseen ground conditions, fluctuations in material or labour costs, delays in permits or approvals, or unexpected design modifications. This risk can be mitigated through contingency planning, regular cost monitoring, and experienced project managers.

8.0 RESOURCES

18. All activities related to project management, design, drafting, construction coordination and inspection, and as-built recording, will be undertaken internally by EWS, eliminating the need for external consultants. Construction of DDMHs will also be completed by internal resources. Geotechnical assessments will be completed through external resources. Where possible, work will be coordinated with other projects or maintenance activities to minimize costs.

EPCOR WATER SERVICES

Appendix G-6

Business Case

FLEET – VEHICLES AND MOBILE EQUIPMENT PROGRAM

May 31, 2024

TABLE OF CONTENTS

1.0 OVERVIEW

1. EPCOR Water Services (EWS) operates and maintains a fleet of vehicles and mobile equipment (light trucks, heavy trucks, offroad equipment and trailers) that are necessary to build, operate, maintain and repair EWS' wastewater collection system. This ongoing program consists of the lifecycle replacement of vehicles and equipment that have reached the end of their service lives and the purchase of vehicles and equipment to address growth. The availability and dependability of EWS' fleet is essential to ensuring that EWS' wastewater collection system is maintained in a reliable manner and its operations are carried out safely, efficiently, and effectively. EWS has forecast total program capital expenditures during the 2025-2027 PBR term of $26.8 million.

2.0 BACKGROUND

2. EWS uses fleet assets to build, operate, maintain, and repair the wastewater collection system across Edmonton. EWS currently employs a fleet of 345 units for projects and operations support for the wastewater collection system. These include the vehicle types described in Table 2.0-1.

Table 2.0-1
Description of Fleet Vehicle and Mobile Equipment Types

Fleet Type	Description, and examples of vehicles
1. Light Duty	Vehicles with a gross vehicle weight (GVW) that is roughly less than 9,000kg
2. Medium Duty	Vehicles with a GVW roughly between 9,000 kg and 15,000 kg
3. Heavy Duty	Vehicles with GVW that can exceed 15,000 kg
4. Equipment	Backhoes, forklifts, cranes, excavators, loaders, drills, etc.
5. Trailers	Cargo trailers, dump trailers, tilt trailers, tank trailers, office trailers, etc.
6. Vans	Enclosed unibody motor vehicles

3. EWS has completed a bottom-up cost/benefit assessment to estimate the number of fleet vehicles that will reach their end of life (EOL) during the upcoming PBR term. EOL estimates are based on historical fleet longevity data and can vary by vehicle type, asset usage and historical maintenance needs. Generally, EOL for most fleet assets is comparable to the asset's financial service life of 10 years. Based on the bottom-up fleet analysis, it is estimated that approximately 114 fleet assets will have reached EOL before the end of 2027 as is shown in Table 2.0-2.

Table 2.0-2
Fleet Vehicle and Mobile Equipment Counts, EOL Estimate

Fleet Type	Total Vehicle Count	Total Count of EOL assets by 2027
1. Light Duty	73	42
2. Medium Duty	51	10
3. Heavy Duty	39	15
4. Equipment	62	40
5. Trailer	100	6
6. Van	20	1
7. Total	345	114

4. Availability of fleet assets is another indicator guiding the determination of fleet investment needs. Availability quantifies the approximate likelihood that fleet assets are in good operational condition and available for use. The overall availability target set by Fleet Services is 89% which is in line with industry standards. As can be seen in Table 2.0-3, availability in 2023 was sufficient across most fleet asset categories except for heavy duty vehicles at 82%. The low availability for heavy duty vehicles is primarily because that specific fleet type cannot be easily supplemented with rentals. As a result, current fleet availability will not be a primary driver for new fleet investments in the 2025-2027 PBR term.

Table 2.0-3
2023 Fleet Availability by Vehicle and Mobile Equipment Type

Fleet Type	Availability
1. Light Duty	97.7%
2. Medium Duty	96.3%
3. Heavy Duty	82.1%
4. Equipment	94.2%
5. Trailer	97.4%
6. Van	96.2%
7. Total	94.2%

5. Across most fleet type classes, rentals are used in the short-term by EWS to maintain reliable fleet-wide availability and to manage short term disruption risks. Rentals can be taken on for periods as short as a day, or up to periods spanning several years. However, sustained, long-term use of rental fleet asset by EWS is not cost effective and over reliance can have a detrimental impact on customer rates. To determine the 2025-2027 PRB term fleet investment needs, EWS reviewed rental usage metrics and, when justified through growth, made recommendations to replace rented assets with owned fleet assets. As shown in table 2.0-4, EWS

has identified that there are currently 35 leased fleet assets in inventory that are currently being rented in perpetuity due to growth needs.

Table 2.0-4
Number of Perpetually Rented Vehicle and Mobile Equipment by Type

Fleet Type	Availability
1. Light Duty	17
2. Medium Duty	13
3. Heavy Duty	0
4. Equipment	2
5. Trailer	0
6. Van	3
7. Total	35

6. Replacement opportunities for the leased fleet pool has not been reviewed in previous PBR submissions. The backlog of 35 leased fleet assets recommended for replacement with owned assets is due to growth that has occurred since Drainage Services was first transferred to EPCOR in 2017. It is anticipated that the quantity of recommended replacements for leased assets will decrease in subsequent PBR filings as a result having addressed the current backlog.

3.0 JUSTIFICATION

7. As shown in the example provided in Figure 3.0-1, EWS fleet assets approaching EOL require additional repair and maintenance work, leading to higher operational costs and extended periods of down time. This downtime further impacts operational efficiency of work crews unless alternatives such as rental units are available. However, rentals can only be obtained for a limited number of non-specialized, customer-built units, as shown in Table 3.0-1, and can increase the operational burden of the fleet program.

Figure 3.0-1
Annual Operational Cost for Heavy Duty Truck Category by Age of Asset*

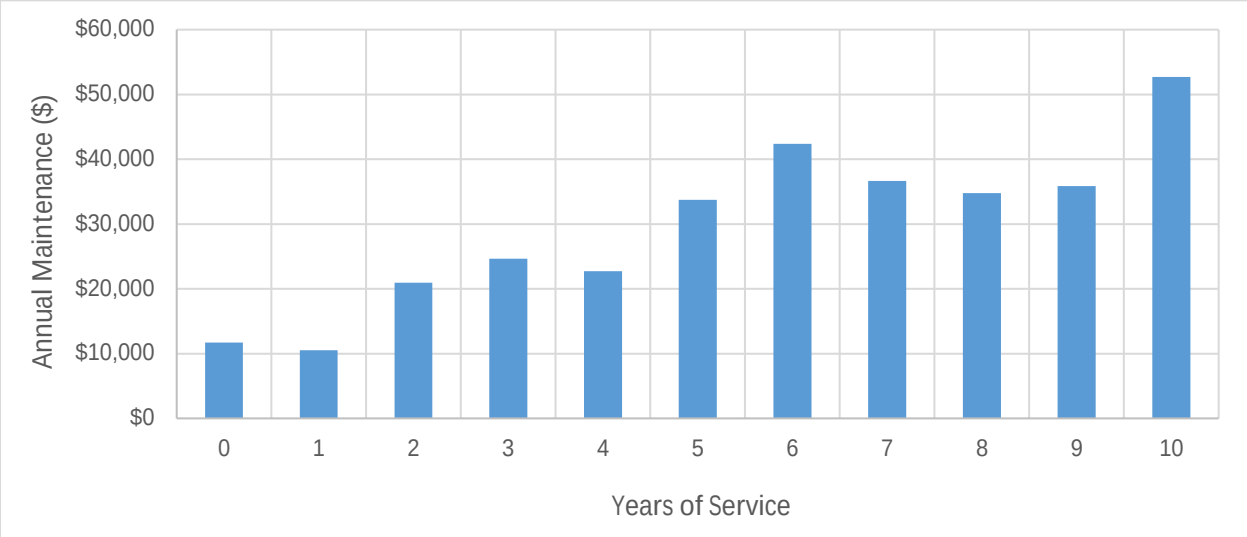


**Figure 3.0-1 is not adjusted for kilometers driven per year, which tends to decrease as fleet assets age and can affect annual maintenance costs.*

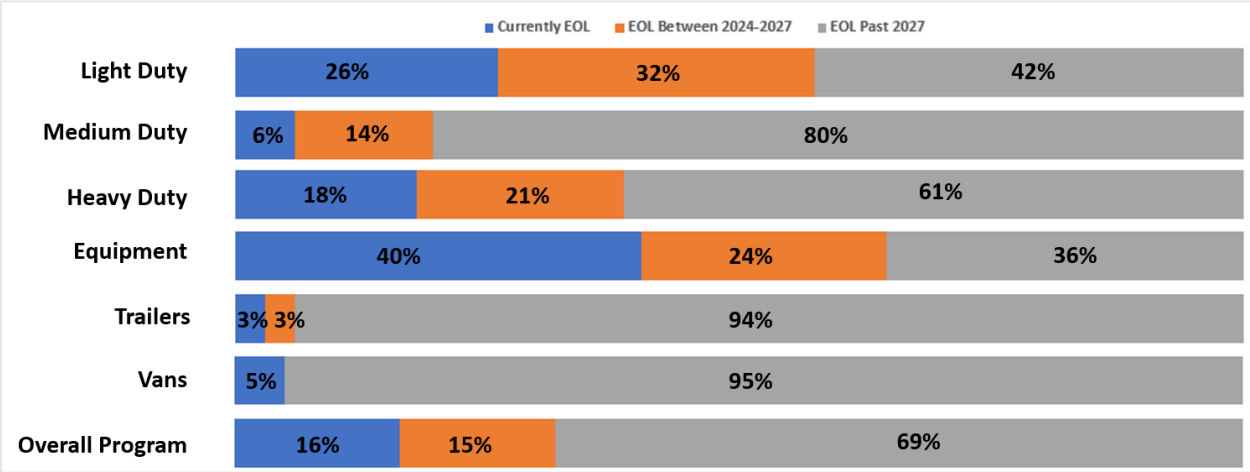
Table 3.0-1
Availability of Rentals for Replacements by Fleet Type

Fleet Type	Light Duty	Medium Duty	Heavy Duty	Equipment	Trailers	Vans
Rental Availability	Moderate	Poor	Very Poor	Poor	Very Poor	Poor

8. Fleet assets approaching EOL also begin to approach the limits of design tolerance levels and it is typical to experience an increased level of safety issues as the assets age out. As such, failure to replace fleet assets which have reached the EOL will result in increased operating costs, reductions in worker safety, and reductions in productivity.

9. As of 2024, 16% (~55 units) of the fleet assets have exceeded their useful operating life. By 2027, if no action is taken, 31% (~114 Units) of the fleet assets will have exceeded their useful operating life cycle as shown in Figure 3.0-2.

Figure 3.0-2
Fleet Future EOL Breakdown



4.0 PROGRAM SCOPE

10. EWS has forecast total program capital expenditures during the 2025-2027 PBR term of $26.8 million to purchase a total of 124 fleet assets.

11. A total of 35 leased fleet units will be replaced with owned units in the 2025-2027 PBR term as shown in Table 4.0-1. The 35 leased assets being replaced are based on an analysis of fleet growth requirements where it was determined that the purchase of the units is required in lieu of renting in perpetuity.

Table 4.0-1
Leased Fleet Program Replacements by Type for 2025-2027

Fleet Type	Forecasted Leased Unit Replacements
1. Light Duty	17
2. Medium Duty	13
3. Heavy Duty	0
4. Equipment	2
5. Trailer	0
6. Van	3
7. Total	35

12. The remaining capital expenditures for the program will go towards replacing owned fleet assets reaching their EOL. There are 89 EOL fleet assets that will be replaced from the pool of owned assets in the 2025-2027 PBR term as shown in Table 4.0-2.

Table 4.0-2
Owned Fleet Program Replacements by Type for 2025-2027

Fleet Type	Current Number of Owned Units	Forecasted EOL Unit Replacements
1. Light Duty	56	38
2. Medium Duty	38	5
3. Heavy Duty	39	11
4. Equipment	60	27
5. Trailer	100	6
6. Van	17	2
7. Total	310	89

13. By the end of 2027, the number of outstanding fleet assets at EOL will be reduced from 55 to 25. The majority of outstanding EOL fleet assets in 2027 will consist of equipment fleet category items. Within the equipment category, inspection and asset usage data indicates that there are several equipment types that can be anticipated to maintain a useful operational life that will extend into the subsequent PBR term with minimal impact to availability and program maintenance costs.

5.0 ALTERNATIVES CONSIDERED

5.1. Alternative 1 – Rent to offset new EOL based purchases

14. In this alternative, assets reaching their EOL would be replaced with leased equivalents.

15. This alternative was rejected because EWS cannot rent or lease many of the fleet assets it requires as they are not available in the marketplace. Many of EWS' fleet assets are custom built to ensure they are suitable and safe to perform the necessary work. For example, EWS requires storage provisions for specialized parts, tools, and instruments. EWS requires modifications and customizations to ensure contaminated materials are handled appropriately. EWS also requires modifications to ensure vehicles and equipment are reliable and suitable for use in severe winter conditions.

16. This alternative is also not expected to be cost effective over the long-term. Typical long-term cost implications from perpetual leasing are generally in the range of 30% to 40% in similar industries. Due to the specialized needs of the fleet assets for EWS, the cost impact from rentals may be even higher.

5.2. Alternative 2 – Continue to rent to offset growth based purchases

17. In this alternative, instead of replacing the 35 perpetually leased fleet vehicles with owned vehicles, EWS would instead continue to rent the vehicles in perpetuity.

18. Because the current rental pool is meant for short term use, generic purpose rentals without any specialized modifications are currently used. Their lack of specialized features can be accommodated in the short-term through the support of the existing owned fleet. However, if they were to be rented in perpetuity as a policy, arrangements with the rental supplier would be necessary to acquire rentals with significant and custom built modifications.

19. Even if such modified units could be acquired as rentals, this alternative was rejected because renting equivalent fleet assets indefinitely is not cost effective. An NPV analysis was completed comparing this alternative scenario verses the status quo. Based on this NPV analysis, this would result in a cost impact to customers that would be 29% greater than buying the equivalent vehicles outright.

5.3. Alternative 3 – Accelerated Investment

20. This alternative would increase program spending to purchase a larger number of fleet assets, increase fleet-wide availability, and decrease the number of outstanding EOL assets remaining by the end of 2027 to be lower than the anticipated 25 units currently expected.

21. This alternative was rejected because it not cost-effective. With the current rate of fleet acquisitions, fleet availability is expected to be acceptable. The purchase of additional units would be likely to introduce assets with low usage while still increasing total fleet maintenance needs. Additionally, further decreasing the number of outstanding EOL assets from 25 by 2027 is anticipated to have no or only marginal benefits since that allowance is serving as a buffer for assets that may be found to still be in satisfactory condition by 2027. Further reductions to the outstanding EOL pool has the potential to retire fleet assets prematurely.

5.4. Alternative 4 – Reduced Investment

22. This alternative represents a partial reduction in capital spend either by pushing more units past their effective operating period or by leveraging fleet needs with a higher proportion of rentals.

23. This alternative was rejected based on the anticipated increases in maintenance cost, impact to overall availability as vehicle downtimes increase with age, and the cost burden of providing additional support with rentals.

24. EWS will however continue to seek opportunities to reduce investment needs with minimal impacts to overall operability. If fleet assets are found to remain in good/fair condition even at their anticipated EOL, they will be retained. Further, EWS will be evaluating approaches to further consolidate rental pools in the light-duty vehicle category which could result in reduced investment needs within the 2025-2027 PBR term.

5.5. Alternative 5 – Capital Dominated Investment Profile

25. In this alternative, both growth and EOL needs are met through the purchase of owned fleet assets at a rate that leaves no more than 25 outstanding EOL assets in service by 2027. This is projected to require the purchase of 124 fleet assets across all fleet categories at a cost of $26.8 million. This is the preferred option based on the total reduction on risk and cost benefit to EWS and its customers.

6.0 COST FORECAST

26. The projected number of replacements over the 2025-2027 PBR term is 124 units. Capital costs for each fleet asset includes:

- Engineering Design – define specification of unit and draft drawings where applicable.
- Chassis – Procure vehicle chassis from chassis manufacturer.
- Upfitting – Fabricate upfitting on chassis.
- Prep-For Service – EPCOR brand decaling, GPS, training materials, pre-delivery inspections etc.

27. Table 6.0-1 provides the program costs for the 2025-2027 PBR term.

Table 6.0-1
Fleet – Vehicles and Mobile Equipment Program Capital Expenditure Forecast ($ millions)

	2025	2026	2027	Total
Total Capital Expenditures	8.9	7.0	10.9	26.8

28. Table 6.0-2 shows the breakdown of 2025-2027 PBR costs for leased replacements by fleet type.

Table 6.0-2
Leased Fleet Program Replacement Costs by Type for 2025-2027 ($ millions)

Fleet Type	Forecasted Leased Unit Replacements	Forecasted Cost
1. Light Duty	17	1.6
2. Medium Duty	13	2.4
3. Heavy Duty	0	0.0
4. Equipment	2	0.7
5. Trailer	0	0.0
6. Van	3	0.4
7. Total	35	5.3

29. Table 6.0-3 shows the breakdown of 2025-2027 PBR costs for owned replacements by fleet type.

Table 6.0-3
Owned Fleet Program Replacement Costs by Type for 2025-2027 ($ millions)

Fleet Type	Forecasted EOL Unit Replacements	Forecasted Cost
1. Light Duty	38	3.7
2. Medium Duty	5	0.9
3. Heavy Duty	11	5.4
4. Equipment	27	10.6
5. Trailer	6	0.5
6. Van	2	0.3
7. Total	89	21.5

7.0 KEY RISKS AND MITIGATION PLANS

30. EWS is subject to changing types and volumes of work, changing work practices or tools that can result in different vehicle requirements. These changes can result in more, less, or different types of vehicles and equipment being required. To mitigate this risk, EWS regularly reviews the EWS fleet to identify changing needs and potential synergies that can be addressed through the Fleet life-cycle replacements. These reviews can result in units being deferred, re-purposed, sold resulting in fleet reductions or their replacement being built to an updated configuration or specification to better accommodate new tools, work, or work practices.

Table 7.0-1
Key Risks and Mitigation Plans

Risk	Mitigation Plan
1. Health and Safety - Risk associated with worker injury while upfitting units.	Third party vendors are used to upfit the units at their facilities.
2. Financial - Risk associated with committing costs for chassis by ordering units prior to the year they are to be replaced.	This risk is offset by the earlier delivery of the chassis ordered allowing for upfitting to be completed prior to the specified deadline.
3. Supply Chain Disruptions - EWS continues to face longer than historical lead times, quotas, allocations and order cancellations of various fleet and equipment types and components.	EWS has ensured there is sufficient flexibility in Master Service Agreements to pursue alternative procurement options if service providers are not able to deliver on EWS' requirements. EWS has also ensured that Fleet Capital replacements are being considered sufficiently in advance to accommodate the longer lead times and mitigate the risk of units being run to failure.

8.0 RESOURCES

31. All activities related to project management will be undertaken by EPCOR Commercial Services. While procurement of fleet assets may be executed by leveraging existing master service agreements, large value/complex purchases will be procured through public tender to ensure competitive pricing. EPCOR primarily uses master service agreements for fleet acquisitions but can use non-competitive justifications and other procurement methodologies to navigate supply chain challenges.

EPCOR WATER SERVICES

Appendix G-7

Business Case

FLOW CONTROL FACILITIES REHABILITATION PROGRAM

May 31, 2024

Table of Contents

1.0 OVERVIEW

1. The Flow Control Facilities (FCF) Rehabilitation Program is an annual program that focuses on the renewal of aging lift stations and real time control (RTC) assets on the wastewater collection system across the city. Maintaining an acceptable level of environmental protection and service requires ongoing rehabilitation efforts. Through this program, EPCOR Water Services (EWS) can systematically rehabilitate or replace deteriorated flow control facility assets to mitigate the risks of deterioration and failure. Total program capital expenditures for the 2025 – 2027 PBR term is forecasted at $20.3 million. Based on historical projects, the program will support the rehabilitation of approximately 8 sites including lift stations, RTCs, syphon structures or other flow control infrastructure.

2.0 BACKGROUND

2. Flow Control Facilities encompass a broad range of assets that interact with wastewater to directly impact how the wastewater is conveyed through the sewer system. Flow Control Facilities often include buildings, sub-structure components, mechanical systems, and electrical controls. Some examples of Flow Control Facilities include lift stations for moving wastewater up gradient, RTC stations for storage operations, and syphon buildings which provide access and heating, ventilation, and air conditioning (HVAC) for river crossing tunnels.

3. EWS owns and maintains 91 lift stations, 4 RTCs, 9 sewer control gate stations, 3 syphon tunnels and over 70 other Flow Control Facilities such as manual gates and weirs. As the system ages, it is important to assess the condition of Flow Control Facilities to avoid emergencies and prioritize renewal to deal with deterioration. This annual program allows EWS to rehabilitate or replace deteriorated facilities to mitigate the risks of failure and maintain an acceptable level of environmental protection and service. This program aligns with EPCOR's asset management objectives by identifying emerging risks and managing them appropriately, reducing risk exposure and reducing negative impacts on the environment.

4. Flow Control Facilities are being inspected to assess their physical condition and performance by Wastewater Collection teams. Deficiencies are cataloged and then assessed to help determine the needs for rehabilitation. Inspections have been completed for all lift stations, RTC's and gates, while inspections are on-going for syphons and weirs. Based on the inspections, a Likelihood of Failure (LOF) and Consequence of Failure (COF) rating is determined. The results are plotted on EWS's Risk Matrix to inform capital investment. The COF score is based on the

service population, business sectors served and relation/proximity to critical crossings or environmentally sensitive areas.

5. RTC's and lift stations have similar structures and mechanical systems. Their inspections include assessing the condition of the site and building, substructure, pipes, valves, gates, motors, and pumps, etc. Assets found to have the highest LOF scores have issues such as deteriorated site and building condition, concrete structure cracks, mechanical systems that are beyond their useful life, leaks, etc. as shown below in Figure 2.0-1 for lift stations and Figure 2.0-2 for RTC gates.

Figure 2.0-1
EPCOR Risk Matrix Results for Lift Stations

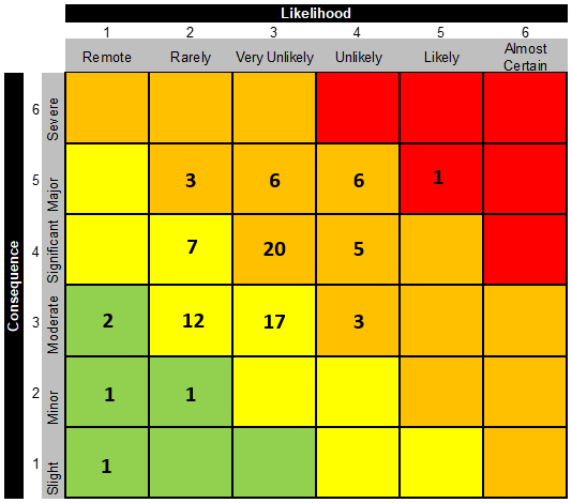
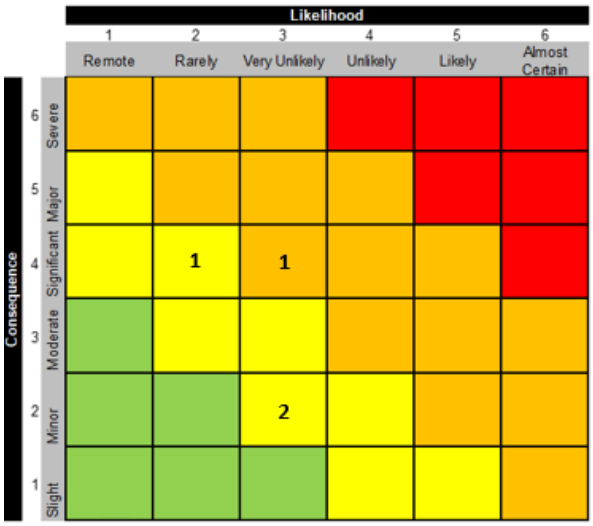


Figure 2.0-2
EPCOR Risk Matrix Results RTCs



6. As shown in Tables 2.0-1 and 2.0-2 a total of 16 lift stations have undergone rehabilitation or have rehabilitation that is soon to be completed including 8 out of the top 10 stations by risk. Remaining projects for the 2025-2027 PBR will be chosen from the remaining medium-high risk stations as shown in Table 2.0-3.

Table 2.0-1
Lift Stations Rehabilitated Completed in Previous PBR Period

Facility Name	LS #	Status
AMBLESIDE	203	Rehabilitation Completed
TWIN BROOKS	163	Rehabilitation Completed
DUNLUCE	130	Rehabilitation Completed
EMPIRE	157	Rehabilitation Completed
RIVERDALE	115	Rehabilitation Completed
DUGGAN	105	Rehabilitation Completed
WESTBROOK	102	Rehabilitation Completed
HAWRELAK	108	Rehabilitation Completed

Table 2.0-2
On-going Lift Stations Rehabilitation Projects

Facility Name	LS #	COF	LOF	Risk	Status
LAURIER HEIGHTS	111	5	5	High	Rehabilitation On-going
WALTERDALE	171	5	4	Medium-High	Rehabilitation On-going
CLOVERDALE	121	5	4	Medium-High	Rehabilitation On-going
INDUSTRIAL HEIGHTS	173	5	3	Medium-High	Rehabilitation On-going
ROYAL GARDEN	156	5	3	Medium-High	Rehabilitation On-going
RUNDLE HEIGHTS	116	4	4	Medium-High	Rehabilitation On-going
EASTGATE INDUSTRIAL	141	4	4	Medium-High	Rehabilitation On-going
NORTH EDMONTON	188	5	3	Medium-High	Rehabilitation On-going
BUENA VISTA	120	3	4	Medium-High	Rehabilitation On-going

Table 2.0-3
Candidate Locations for Rehabilitation in 2025-2027 or Future PBR Terms

Facility Name	LS #	COF	LOF	Risk	Status
QUESNELL HEIGHTS	212	5	4	Medium-High	Under Consideration
ELLERSLIE	168	5	4	Medium-High	Under evaluation for abandonment
YELLOWHEAD EAST	158	5	3	Medium-High	Under Consideration
WEDGEWOOD	155	3	4	Medium-High	Under Consideration
CASTLEDOWNS	119	4	3	Medium-High	Under Consideration
MISTATIM INDUSTRIAL	180	4	3	Medium-High	Under Consideration
BEAUMARIS	131	4	3	Medium-High	Under evaluation for abandonment
CHAMBERY	162	4	3	Medium-High	Under Consideration
GOLD BAR PARK	128	3	4	Medium-High	Under Consideration
HADDOW	187	4	3	Medium-High	Under Consideration
HERMITAGE	132	4	3	Medium-High	Under Consideration
DUNLUCE	159	4	3	Medium-High	Under Consideration
HAMPTONS SAN	195	4	3	Medium-High	Under Consideration
SOUTH EDMONTON	185	5	2	Medium-High	Under Consideration
CLOVER BAR	182	4	3	Medium-High	Under Consideration
HAWKS RIDGE	223	4	3	Medium-High	Under Consideration
GLASTONBURY	184	4	3	Medium-High	Under Consideration
FORT EDMONTON	221	4	3	Medium-High	Under Consideration
TRUMPETER	213	5	2	Medium-High	Under Consideration
WESTRIDGE	110	4	3	Medium-High	Under Consideration
GLENORA RV	113	4	3	Medium-High	Under Consideration
RUNDLE PARK	122	4	3	Medium-High	Under Consideration
BELVEDERE	135	4	3	Medium-High	Under Consideration
GLENORA	112	4	3	Medium-High	Under Consideration
HAMPTONS STORM	195	4	3	Medium-High	Under Consideration

7. The Wastewater Collections FCF team also identifies and tracks the backlog of outstanding mechanical and reliability issues identified through the operation of the FCF assets. The identified backlogs are classified across six reliability categories including, Electrical, External Mechanical (force main and valves), On-site Mechanical, SCADA/Controls, Site Safety and Structural. FCF provides a rough preliminary estimate of the approximate scale of costs for each deficiency noted to assist with understanding the approximate level of need, prior to any in depth

assessment. Currently, 178 backlogged issues have been logged and are being tracked across more than 70 FCF assets.

8. The backlog information supports planning prioritization and scope development by identifying and cataloguing known rehabilitations needs at FCF assets as shown in Table 2.0-4.

Table 2.0-4
FCF Backlog Tracking for 10 Stations out of 70 Inspected

		Preliminary Estimates of Approximate Scale of Cost					
Station	Items Backlogged	Electrical	External Mechanical	On-site Mechanical	SCADA / Controls	Site Safety	Structural
141	3		<$1M	<$1M		<$0.1M	
131	4			<$1M		<$1M	
203	9	<$0.5M		<$1M	<$0.1M	<$0.1M	<$0.1M
212	4	<$0.1M		<$0.5M		<$1M	
168	3		<$0.5M	<$0.5M		<$0.5M	
106	3	<$0.1M				<$1M	
175	3			<$1M		<$0.1M	
199	3	<$1M				<$0.1M	

9. Syphon tunnel inspections are on-going and include the surface structures, substructure sections, tunnels, electrical and HVAC systems. The inspections do not include the sewer pipes which are covered under pipe rehabilitation programs.

10. Inspections for manual/automatic gates and weirs focus specifically on the condition of the asset structure itself. At this time, there are four gates identified that require investment and rehabilitation as shown in Figure 2.0-5. Inspections are still on-going for weirs and priorities may change as new information is received.

Table 2.0-5
All Medium-High Risk Gates

Station #	Facility	LOF	COF	Risk
544	Elsinore Lake Gate	5	2	Medium-High
545	Valencia Lake Gate	5	2	Medium-High
551	Belle Rive Stage 5 Lake Gate	5	2	Medium-High
592	Schonsee Control Gate	5	2	Medium-High

11. There are several separate and smaller programs that implement improvements to lift stations. These include the Lift Station Enhancement Program, the Lift Station Mechanical

Upgrades Program, the Lift Station Electrical Upgrades Program, and the Facility Safety Improvements Program. These programs often implement minor improvements of less than $50,000 per project and are effective at reducing risk when it is driven by single item deficiencies. The FCF Rehabilitation program coordinates with each program to ensure resources are allocated effectively and to identify opportunities for synergies.

3.0 JUSTIFICATION

12. There are several risk categories associated with the deterioration and failure of FCFs:

- Health and Safety Risk – deteriorated or failed facilities pose a safety risk to the EWS staff who operate and maintain the stations. There is also a safety risk to the public if a facility fails and causes spilled sewage and basement backups.
- Environmental Risks – deteriorated or failed FCFs can lead to floods and sewage spills to the local environment and water bodies. This can result in violations of EWS's approval to operate and potential fines.
- Financial Risks – Emergency repairs to failed facilities are more costly than proactive rehabilitation or replacement. Failed assets can also lead to flooding which are costly to manage and clean up and can lead to claims from customers with flooded basements.
- Service Disruption Risk – A failed facility can lead to sewage backup or neighbourhood flooding, which could result in service issues and damage to customer properties.

13. There are several examples that demonstrate the consequences of failure of FCFs and the associated risks that have been addressed in previous PBR terms:

- Walterdale Lift Station: A failure of a gate caused untreated wastewater to be mixed with water from the North Saskatchewan River (NSR) resulting in discharge of untreated wastewater to the river.
- Beverly Raylo Lift Station: This station overflowed multiple times due to high discharge volumes, as well as due to consequences of its internal processes. The overflows spilled untreated wastewater flows to the surrounding environment and river.
- Manning Drive RTC Gate Failure: Corrosion of the gate mechanisms inhibited the operation facility and caused the upstream storage tunnel to become stagnant during dry weather conditions.

14. This proactive annual program allows EWS to rehabilitate, replace, upgrade, or abandon deteriorated infrastructure to mitigate the risks and consequences listed above.

4.0 PROJECT/PROGRAM SCOPE

15. The scope of this program is to evaluate the condition of FCFs, determine what is required to reduce risk, and implement the rehabilitation, replacement, or alternative solutions at those locations.

16. Based on historical experience, major rehabilitation upgrades include the site and building, the substructure, pipes, valves, mechanical (including HVAC), and the instrumentation and controls. The program can be expected to fully rehabilitate approximately 8 sites and complete partial rehabilitation at an additional 5-10 sites including lift stations, RTC gates, syphon structures and other flow control infrastructure over the 2025-2027 PBR term. The number of rehabilitation projects will be dependent on the size of each project, bid prices and scope of work.

17. Program priorities will be based on operational needs, outcomes of the site inspections, and asset risk evaluations. A high-level assessment of priority locations is on-going and is exploring alternative solutions such as adjustments to operational scope or facility abandonment. This review will also consider any unique characteristics of the site and assets that require accommodation. Following this high-level review, further study and concept development will continue for the highest risk assets in the program that are not yet being actioned. This work will include additional inspections if required, development of rehabilitation actions, and a constructability assessment. Once complete, the program will proceed with the implementation of the most effective actions to mitigate the identified risks.

5.0 ALTERNATIVES CONSIDERED

5.1. Alternative 1 – Do Nothing

18. One alternative to the FCFs Rehabilitation Program is to do nothing. If nothing is done, the assets will be at risk of eventual failure and the likelihood of failure will continue to increase as the assets age. This will continue to increase the risk of flooding to the surrounding environment and will increase the safety risk posed to the public and EWS staff. Although the do nothing alternative can provide cost savings and lower impact on the rate payer in the short term, delaying rehabilitation or other solutions will not resolve the problem and will ultimately move required work and higher expenditures to future years.

5.2. Alternative 2 – Replace, Abandon or Convert Facilities

19. There are alternatives to full rehabilitation or replacement that will be considered as part of the evaluation stage of this program to reduce the identified risks. Each facility is unique and will require a different approach based on the deterioration, risk ranking, age, and location. Alternatives to full rehabilitation that can be evaluated include abandonment or redirection of flows. Hydraulic assessments will be required to support the validity of these alternatives and it may require a project scope that necessitates its own project outside of the scope of this business case.

5.3. Alternative 3 – Accelerated Investment

20. A third alternative is to increase the level of spending for rehabilitation in this asset category. While acknowledging that not all assets in this asset category have been inspected at this time, the current recommended spending level is appropriate relative to the risk presently identified in the system. There are no high-risk assets that are not currently being targeted for rehabilitation. Further, out of the top 10 assets by risk, 7 are already within the scope of existing programs. Overall, system risk can be addressed more effectively by investing in the rehabilitation of other assets across EWS.

6.0 COST FORECAST

21. This program is forecast at $20.3 million for the 2025-2027 PBR term. Concept development has not yet occurred and so the program cost forecast is based on historical costs of inspection, planning, design, and construction of past rehabilitation projects. Each facility is unique with distinct characteristics making it difficult to provide accurate cost estimates for rehabilitation, upgrades or replacement prior to concept development and design. The cost estimates will be tracked and refined as the program progresses. Key assumptions in developing the cost forecast are as follows:

- All inspections will be completed internally.
- Concept development and design will be completed by external resources.
- External cost estimates are taken from historical contractor bid prices.
- All other costs are based on historical experience with similar projects.

22. Table 6.0-1 provides the capital expenditure forecast for this program for the 2025-2027 PBR term.

Table 6.0-1
FCF Rehabilitation Program Capital Expenditure Forecast ($ millions)

	2025	2026	2027	Total
Total Capital Expenditures	0.9	9.6	9.8	20.3

7.0 KEY RISKS AND MITIGATION PLANS

23. EWS has identified the key risks and mitigations associated with executing this program in Table 7.0-1.

Table 7.0-1
Key Risks and Mitigation Plans

Risk	Mitigation Plan
1. Health & Safety Risks - Risk of sanitary flooding in the neighborhood during construction, particularly during the summer.	EWS will develop a bypass plan as needed and contingency plan that will ensure minimal adverse impacts especially during rainy season.
2. Environmental Risks – Associated risks may include the removal and disposal of construction debris and working within environmentally sensitive areas such as the river valley.	EWS will identify risks during the planning process and ensure the appropriate mitigation measures for the identified risks are implemented during construction. This includes appropriate delineation of the construction area and executing debris management measures.
3. Execution Risks – Work is expected to occur in a variety of locations, therefore there may be project-specific risks associated with traffic disruptions, noise pollution, and bypass needs. Impacts to traffic is of high concern for work done on assets on or near high traffic roadways, and as most sites are located near residential areas, there are potential construction impacts to neighbourhood traffic and noise levels. Additionally, these sites are often built due to physical barriers that prevent typical gravity conveyance of wastewater. These barriers can make project by-pass needs difficult.	EWS will develop a construction plan to minimize disruptions. This includes coordinating construction work to minimize traffic disruptions and heavy equipment use during morning and evening rush hours. EWS will also identify bypass needs prior to project commencement to ensure work is completed during the best season and with sufficient supporting infrastructure to ensure the sewer network is not disrupted.
4. Financial Risks – Actual contactor bids may vary from the estimates. Materials and skilled labour are subject to market variability. There are also project unknowns that may affect costing.	EWS will include contractors early in the process, clearly identify scope requirements and evaluate options such as bundling multiple project scopes approach when efficiencies can be identified. EWS manages financial risks by conducting preliminary design and obtaining manufacturer's quotes for establishing the project budget. The financial risks will become more evident as further design is completed and scope will be adjusted accordingly.

5. Unknown Asset Condition Risks – Because asset inspections for syphons and weirs are on-going it is possible that one or several assets are found whose condition and likelihood of failure is worse than anticipated. Several syphons have a high consequence of failure. The identification of any unexpected but significant issues affecting a large syphons condition or likelihood of failure can shift the asset to the high-risk category and necessitate more immediate rehabilitation.	EWS will prioritize the inspection of the remaining FCF assets with high and medium high consequences of failure regardless of their anticipated condition. By prioritizing the inspection of these assets early on this program can still ensure their rehabilitation through reprioritization of spending within the program.

8.0 OTHER RESOURCES

24. All activities related to project management, drafting, construction coordination and inspection, and as-built recording, will be undertaken internally by EWS. Design, construction, and geotechnical assessments will be completed by external resources. Where possible, work will be coordinated with other projects or maintenance activities to minimize costs.

EPCOR WATER SERVICES

Appendix G-8

Business Case

HIGH PRIORITY RENEWAL PROGRAM

May 31, 2024

TABLE OF CONTENTS

1.0 OVERVIEW

1. The High Priority Renewal (HPR) Program focuses on emergency and high priority repairs and replacements within the wastewater collection system of assets such as service pipes, catch basins, mainlines, maintenance holes, outfalls, force mains and other small drainage assets where the total project cost is not expected to exceed $250,000. The HPR program also includes proactive service pipe relining to reduce future HPR needs. EPCOR Water Services (EWS) has forecast total program capital expenditures during the 2025-2027 PBR term at $72.2 million.

2.0 BACKGROUND

2. Deterioration of drainage infrastructure as it ages increases the risk of unexpected failures that can disrupt sewer service to homeowners and businesses and result in safety issues or environmental impacts. Typical failures can include collapses or structural failures of sewers, services, maintenance holes, catch basins, outfalls, and force mains. These failures require high priority and emergency replacements or repairs, and in the case of emergencies, immediate attention.

3. EWS owns and operates over 6,500 km of sanitary, storm, and combined sewers and over 446,000 services. More than half of the sewer pipes, as well as more than half of the services, are now over 45 years of age. Historically, within the HPR program, a substantial portion of both high priority and emergency replacement and repair work has occurred on assets between the ages of 50 to 70 years which now makes up approximately 30% of the in-service assets as shown in Figures 2.0-1 and 2.0-2.

Figure 2.0-1
Asset Age of Sewer Pipe by Length

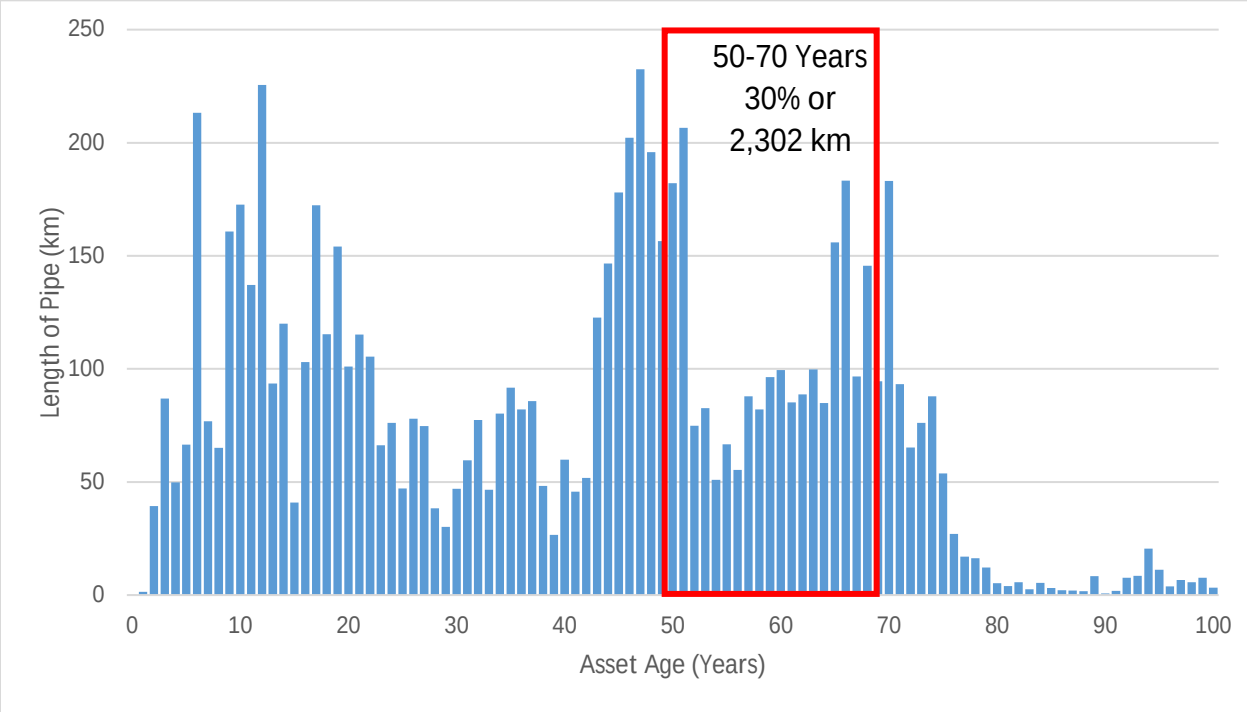
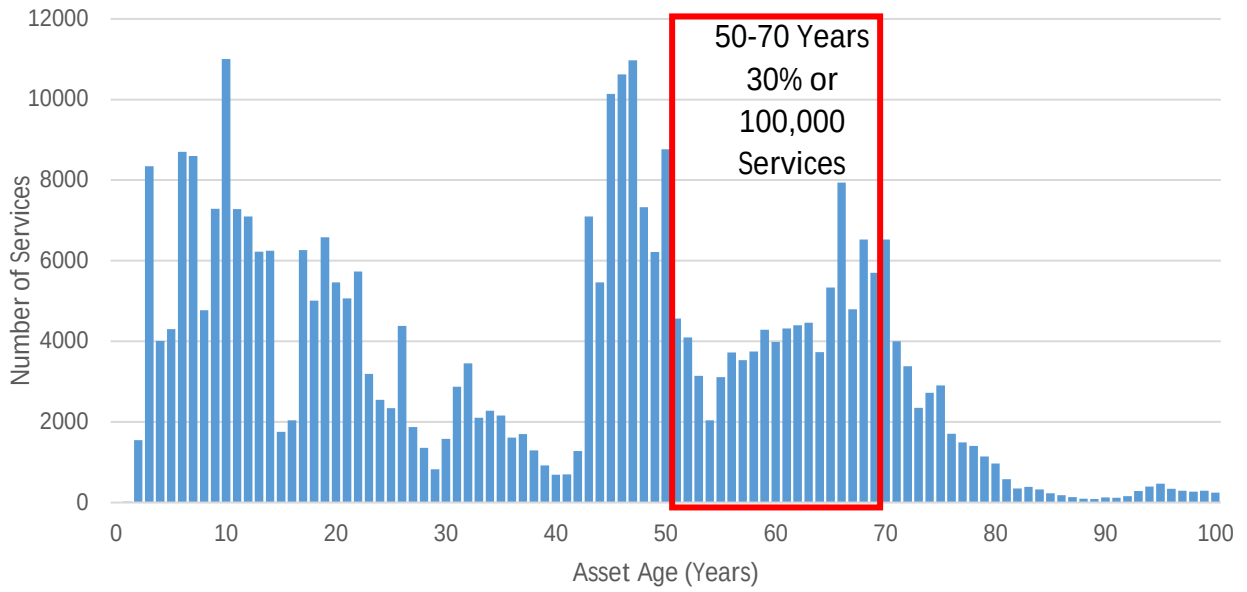


Figure 2.0-2
Number of Services by Asset Age



4. High priorities and emergencies are identified either through regular inspections or through customer calls to the EWS Control Center. EWS's construction crews may replace a pipe section or full length of mainline or service to rectify the situation or there may be a requirement for further assessment before proceeding with design and repair or replacement. Table 2.0-1 explains the difference between emergency and high priority renewal criteria.

Table 2.0-1
Emergency and High Priority Renewal Criteria

Priority	Definitions/Check List	Timeline for Renewal
1. Emergency	• Sanitary service is collapsed/broken on EPCOR side of the property line. • Service Maintenance/Operational crews were unable to release the service. • A Service Maintenance foreman has confirmed that the collapsed/broken pipe is on EPCOR side if it was not clear as per the initial crew visit.	24 Hours / Within a day
2. High Priority	• Sanitary service is in poor condition on EPCOR side of the property line. • There can be one factor or multiple factors contributing to the poor condition. • Service Maintenance/Operational crews were able to release the service. • A Service Maintenance foreman has confirmed the poor condition on EPCOR side if it was not clear as per the initial crew visit.	1 day to 365 days / Within a year

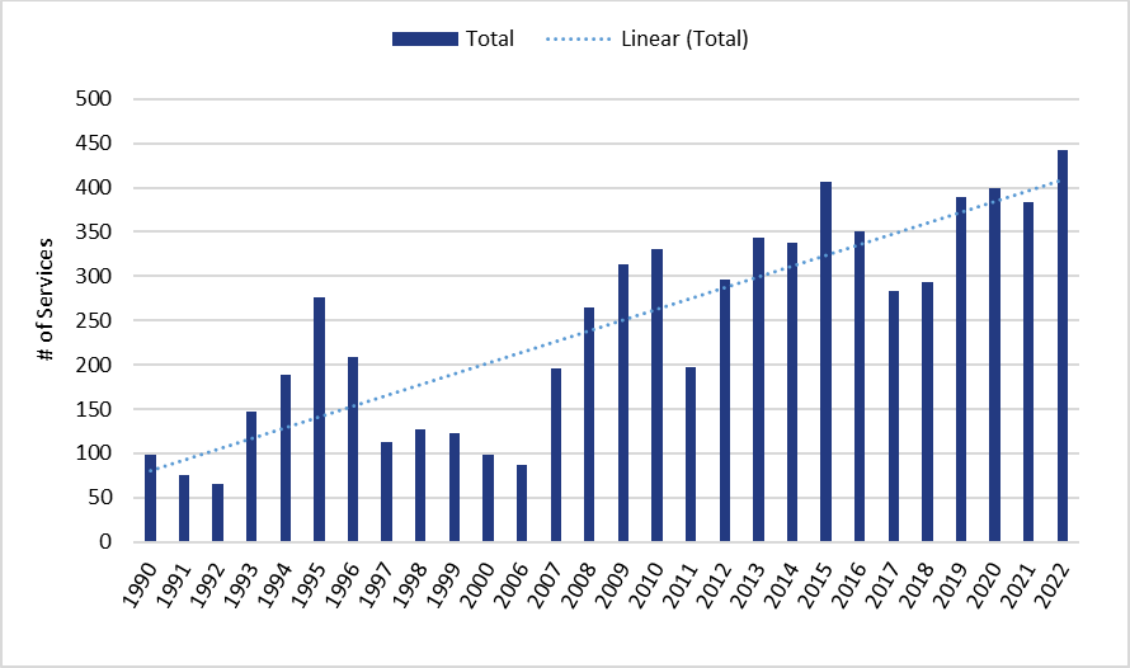
5. Historically, high priority and emergency work completed in the HPR program has been 69% services (around 400 locations per year), 22% catch basins and catch basin leads (around 100 locations per year), and 8% mainlines and maintenance holes (around 50 locations per year). While other infrastructure such as force mains and outfalls can fall under the scope of the HPR program, they typically comprise less than 1% of the program or less than 10 locations per year.

6. Mainlines, maintenance holes, catch basins and catch basin lead failures include failures to the barrel of the structure, the frame and covers, pipe collapse, and disconnections between the basin/barrel and the connecting pipes or leads. These failures can lead to street flooding, backups, environmental releases, or subsidence. As mentioned above, EWS responds to an average of 100 failures of catch basins annually and around 50 maintenance hole and mainline failures annually. Repairs can consist of shallow excavations, frame and barrel replacement, as well as catch basin lead repairs.

7. Services owned by EWS are defined as the service pipe from the lateral mainline to the property line. Services within private property from the property line to the home are owned and

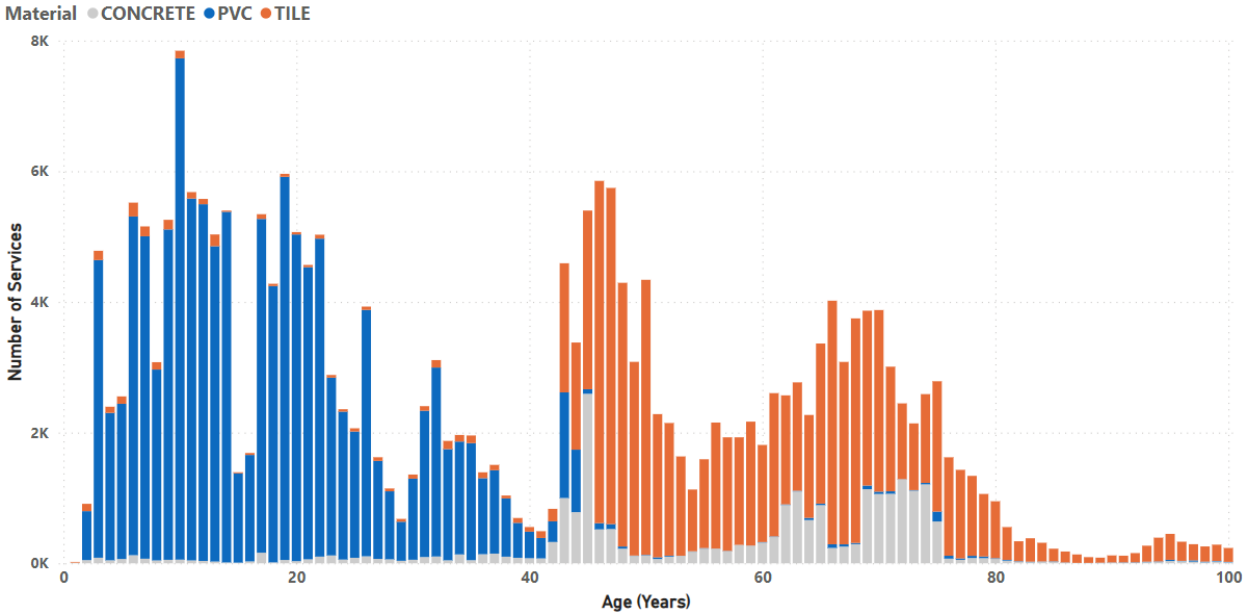
maintained by the owner. EWS maintains over 446,000 sanitary (60%) and storm (40%) services. Most services are over 40 years old with the median ages at 43 years for sanitary services and 47 years for storm services. Due to this aging infrastructure, EWS receives on average 2,300 annual calls related to service issues which result in a high frequency of reactive maintenance. Figure 2.0-3 below indicates that there has been a steadily rising trend of service replacements each year.

Figure 2.0-3
Historical Service Replacements Per Year



8. Service replacements are predominantly 1950's clay tile services, averaging a 65 year life span. Figure 2.0-4 shows that these failures correlate with the peak installation period that started around 1953 and continued to 1961. This peak will start to decline over the next few years before climbing once again to the highest quantity of clay tile installations that occurred between 1974 and 1978. At this time, industry transitioned to polyvinyl chloride (PVC) pipe which are inherently less prone to failures, offering increased reliability and durability compared to clay tile services.

Figure 2.0-4
Upcoming Wave of Services Expected to Experience Failure



9. This data highlights the likelihood of a significant increase in failures within the next 15 years. To effectively address this anticipated rise, proactive renewal of clay tile services before potential failures occur will be incorporated into the program. Proactive repairs will be carried out through relining, employing either a qualified external contractor, or utilizing in-house Blue Light Relining (BLR) technology.

10. BLR is a trenchless relining technology acquired by EPCOR during the current PBR that enhances the efficiency of our crews in completing service repairs. This technology enables EWS to add a proactive component that is not only cost-effective but also well-suited to support the anticipated surge in the volume of service replacements required.

11. With a large cohort of clay tile services approaching 50 years in age, it was anticipated that the number of service failures would begin to increase in proportion to the increasing number of aging assets. The Proactive Service Renewal Program was initiated as a standalone program in the 2022-2024 PBR with the goal of reducing the number of emergency and high priority renewals needed in the future. Proactive renewal provides a means to reduce the risk of failure for a service by reinforcing the existing pipe structure with a liner insert. Because the pipe has not yet failed, the cost of relining is between 20% to 50% lower than an emergency repair for an equivalent pipe and can be completed more promptly and with less overall resources. In the 2025-2027 PBR term, the Proactive Service Renewal program has been presented in combination

with the High Priority Repair Program as it was found that both programs need to coordinate and align project activities to avoid replication of effort, and to support the overall goal of reducing the occurrence of emergency repairs.

12. During proactive, high priority and emergency service renewals, EWS does not currently coordinate with the property owner to identify opportunities for simultaneous renewal to both the section of service owned by EPCOR and the section of service owned by the property owner. There may be several benefits of extending relining to encompass the privately owned asset, such as cost efficiency since deployment has already occurred, decreased risk of customer interruptions from a failure on their side of the asset, and reduced inflow and infiltration entering the sewer system through cracks and holes. With that in mind, EWS is reviewing the feasibility of extending service connection relining activities to also include the private portion which could be included in future PBR terms.

3.0 JUSTIFICATION

13. Due to an aging wastewater collection system, emergency and high priority work is inevitable. Emergencies arise that need to be dealt with in a timely fashion to maintain service for our customers. The HPR Program is essential to address unforeseen failures or urgent situations that may arise in the system. Aging infrastructure is susceptible to unexpected breakdowns, and emergencies such as pipe failures can disrupt service and pose environmental risks. A dedicated program allows EWS to promptly respond to these situations, ensuring timely repairs or replacements to maintain the system's functionality and prevent prolonged service disruptions.

14. Additionally, given that a significant number of the high priority and emergency renewals that arise are related to services, it is beneficial to proactively reline services to mitigate the future burden of a surge of service failures. Risks associated with the growing number of services in poor condition include:

- Financial Risk – open cut emergency repairs are costly, and the number of high priority service replacements are increasing each year.
- Customer Service Disruptions – customer frustration and potential damage to customer properties will increase as more customers deal with service issues such as blockages and sewer back up, and the reputation of EPCOR will be impacted.

15. Proactive relining typically costs between $14,000 and $18,000 per service depending on service length, which is a significant costs savings over the reactive open cut costs of

approximately $38,000 per service. This approach is also less invasive for the customer as in many cases it avoids cutting into sidewalks and roads or impacting existing trees or landscaping. It also reduces the construction time by about half, further reducing the impact to the customer.

16. In addition, the benefit of proactively relining services with structural issues and ongoing maintenance needs is that it eliminates ongoing, repetitive operational maintenance costs, claims, and dissatisfied customers by reducing the number of disruptions and customer complaints associated with service backups and blockages. Relining technology is effective at preventing root intrusions and crack formation/propagation in services, and by prioritizing services on the EWS Root Maintenance Program, it is a solution that can provide a reduction in operational expenses in future PBR terms. With approximately 1,850 services on the Root Maintenance Program currently, the average cost to maintain these services is around $700,000 annually. This program will allow EWS to continue to provide a high level of service to customers by reducing the risk of service failures and minimizing disruptions.

4.0 PROGRAM SCOPE

17. The HPR Program scope will consist of both reactive and proactive renewal.

4.1. High Priority Repair – Reactive Renewal

18. Locations are initially investigated by the Wastewater Collection team. EWS then uses a risk-based approach to review the condition of the asset and prioritize the work. Each location is assessed and given a risk score utilizing a standardized assessment tool. This ensures an objective process is followed and that locations presenting higher risk are prioritized. Situations where an asset is completely blocked or collapsed are considered emergencies, and crews will respond immediately to mitigate damages to the customer.

19. The estimated scope of reactive work is approximately 650 locations per year over the PBR term. Actual work completed will depend on the number and type of high priority or emergency repairs required to restore or maintain service to customers. Based on previous years, it was found that of all work completed in the HPR program, 69% were services, 22% were catch basins and catch basin leads, 8% were mainlines and maintenance holes, with a small number of other repairs (i.e. outfalls, forcemains, etc). Large scale rehabilitations or replacements, generally greater than $250,000, are treated as separate standalone projects outside the scope of this program.

4.2. Proactive Service Renewals

20. As outlined earlier, a surge in required service renewals is anticipated over the next 15 years. This has led to EWS identifying an opportunity to address this challenge by incorporating proactive relining work into the program. Specifically, the focus is on relining services that have not yet reached the stage requiring high priority or emergency replacements. Currently, there are approximately 490 locations that have been identified as needing service replacement or renewal but do not meet the risk ranking criteria to be prioritized in the annual reactive HPR program. These locations are predicted to fail in the next 2-5 years. Most of these locations can be dealt with through a relining method.

21. In addition to the 490 locations identified above, there will also be targeted inspections for service renewals in areas with a history of frequent high priority service repairs or significant numbers of homes on the Root Maintenance Program. Inspections will be reviewed and assessed for condition and operational issues, and subsequently prioritized based on risk scores. The relining work will be undertaken either in-house using the BLR technology or using a qualified external contractor as necessary depending on in-house resource availability.

22. The estimated scope includes approximately 300 service renewals per year, or 900 total over the 2025-2027 PBR term, although the actual number will fluctuate as costs per service will vary depending on length, technology used, etc. The number of renewals completed will be balanced within the overall budget envelope.

5.0 ALTERNATIVES CONSIDERED

5.1. Alternative 1 – Delay Work

23. In this option EWS would decrease total resourcing for the HPR program and reduce the annual number of priority and proactive relining completed. This approach shifts a portion of the backlogged assets into the next PBR term. Given the approaching surge of aging assets, this approach was rejected as it presents the risk of causing a large jump in resourcing and program costs in the subsequent PBR term.

24. In addition, this alternative would continue to place increased demand for services on the Root Maintenance Program. Currently, services that are deemed to be candidates for maintenance are placed on a one or two-year cycle. Service crew's auger roots by means of the private cleanout to ensure the service is not susceptible to infiltration. Maintaining the public

portion in this manner does pose a liability risk, but it also benefits the customers as their pipe also receives root removal at the same time. A disadvantage to this method is that the maintenance cycle does not actually fix the issue and ultimately runs the pipe to failure. This alternative also runs the risk of causing sewer back up in the home. This is not a viable option as EWS has an obligation to maintain service for its customers.

5.2. Alternative 2 – High Priority Repairs with No Proactive Service Relines

25. This alternative would continue to focus on the high priority and emergency repairs, without taking on any proactive relining of services. This would result in the anticipated surge of service failures in the coming years, consequently increasing the need for costly emergency open cut replacements. Open cut replacements involve excavation at an average cost of $38,000 per service. This approach commonly requires excavating and subsequently restoring portions of the public street and sidewalk, as well as private landscaping and driveways. In comparison, a proactive service reline costs between $14,000 and $18,000 depending on the service length and the reline technology used. This alternative is not recommended.

5.3. Alternative 3 – Increased Proactive Service Relines

26. This alternative involves increasing the number of services proactively relined each year. The advantage of increasing investment in proactive relining is that it is a cost-effective means to reduce future high priority and emergency replacements and can decrease the risk of service interruptions for a larger cohort of customers.

27. EWS has identified 490 services as candidates for proactive relining in the 2025-2027 PBR term. The current program scope has allocated $16.2 million for proactive relining in this period which will provide for the relining for approximately 900 services. This provides an allocation for an additional 410 relining locations to be completed which will be identified through the existing planned service inspections. Increasing the reline target to exceed 900 locations is possible by increasing the number of service inspections over the next 3 years. However, the current inspection levels represent an optimal use of current resources relative to present asset risks for the existing cohort of services. Further increasing the resourcing allocations for inspections is not anticipated to provide cost-effective reduction in total system risk relative to other rehabilitation and proactive renewal projects. Further increases in proactive relining was therefore rejected.

5.4. Alternative 4 – Proactive Reline of Public and Private Services

28. This alternative proposes to extend the relining process beyond the property line to include both the public side of the service as well as the private portion up to the home. However, this approach introduces complications and heightened liability concerns associated with working on private property. It also increases the demands on project management or external contractors to coordinate with customers. In addition, the additional costs per service would lead to fewer total relines being completed compared to when only the public side is addressed. While this option may be revisited in future PBR terms, it is not recommended at this time.

5.5. Alternative 5 – High Priority Repairs with Proactive Service Relines

29. This alternative includes continued focus on high priority repairs, while also taking the opportunity to proactively reline services before they reach a state where high priority or emergency replacements are required. This alternative is recommended as a cost effective and risk-based approach.

6.0 COST FORECAST

30. Project costs are estimated based on historic costs for both high priority repairs and proactive service relines. High priority and emergency work is estimated at approximately $38,000 per location, while proactive relines are estimated at an approximate average of $18,000 per location. The capital expenditures for the 2025-2027 PBR term are shown in Table 6.0-1 below.

Table 6.0-1
HPR Program Capital Expenditure Forecast ($ millions)

	2025	2026	2027	Total
1. Total Capital Expenditures	23.4	24.1	24.7	72.2

31. In addition to the table above, Table 6.0-2 provides the estimated capital expenditure by sub-program during the 2025-2027 PBR term, while Table 6.0-3 shows the further breakdown of the High Priority Repair Program by asset type.

Table 6.0-2
Program Cost Breakdown ($ millions)

Program	Capital Expenditure Forecast
1. High Priority Repairs – Reactive Renewals	55.9
2. Proactive Service Renewals	16.3
3. Total Capital Expenditures	72.2

Table 6.0-3
High Priority Repair Asset Cost Breakdown ($ millions)

High Priority Repair Asset Types	Capital Expenditure Forecast
1. Services	38.6
2. Catch Basins and Catch Basin Leads	12.3
3. Mainlines and Maintenace Holes	4.5
4. Other	0.5
5. Total Capital Expenditures	55.9

7.0 KEY RISKS AND MITIGATION PLANS

32. EWS has identified the key risks and mitigations associated with the execution of this program in Table 7.0-1 below.

Table 7.0-1
Key Risks and Mitigation Plans

Risk	Mitigation Plan
1. Environmental Risks – Release of untreated sewage	EWS will train employees to contain potential releases and will hydrovac and dispose of contaminated soil in an approved landfill
2. Customer Service Disruptions	EWS will inform customers of the issue and upcoming work. Emergency utility locates are acquired and service is restored within 48 hours
3. Customer Property Damage	EWS would utilize the score based on EPCOR risk approach to ensure that jobs are prioritized appropriately. Allowing construction crews to complete repair prior to failure.
4. Health and Safety Risks – Sink Holes Disrupting Traffic	EWS will ensure the area is secured immediately and made safe for the public and traffic is diverted. Repairs are prioritized as emergency based on their impact to public safety and disruption to traffic
5. Health and Safety Risks – Reline material not properly cut-out at connections causing sewer backups	Ensure EPCOR hires reline contractors that are competent and have a track record of producing quality work.
6. Financial Risks – Damage to Public Property Materials and skilled labour are subject to market variability. There are also project unknowns that may affect costing.	EWS crews ensure utility locates are in place prior to excavation. EWS will ensure the job is planned to minimize damage to public property. The activities in this program have been previously carried out, and a general understanding of the tasks and costs have been developed. Project costing is typically reviewed to ensure it aligns with assumptions and expectations. To mitigate cost escalations, thorough planning and proactive measures are essential. This can include detailed cost estimates during the planning phase, contingency

	budgets, and a comprehensive risk identification and analysis. Contracts should be clear with provisions for addressing unforeseen cost increases. Regular monitoring, strong relationships with contractors and suppliers, and experienced project managers are important to reduce the likelihood of cost increases. Value engineering to evaluate alternative materials, construction methods, or design modifications can also help to mitigate price increases.

8.0 RESOURCES

33. High Priority renewals are dealt with primarily utilizing in house construction resources. Most sewer replacements are completed with the open cut method with support from external service providers such as hydrovac, fillcrete and asphalt restoration. Proactive service relining will be completed using a combination of both internal and external resources. Internal staff within EWS will undertake project related activities including drafting, project management, construction coordination, as well post rehabilitation inspection.

EPCOR WATER SERVICES

Appendix G-9

Business Case

INFLOW AND INFILTRATION RELINING PROGRAM

May 31, 2024

Table of Contents

1.0 OVERVIEW

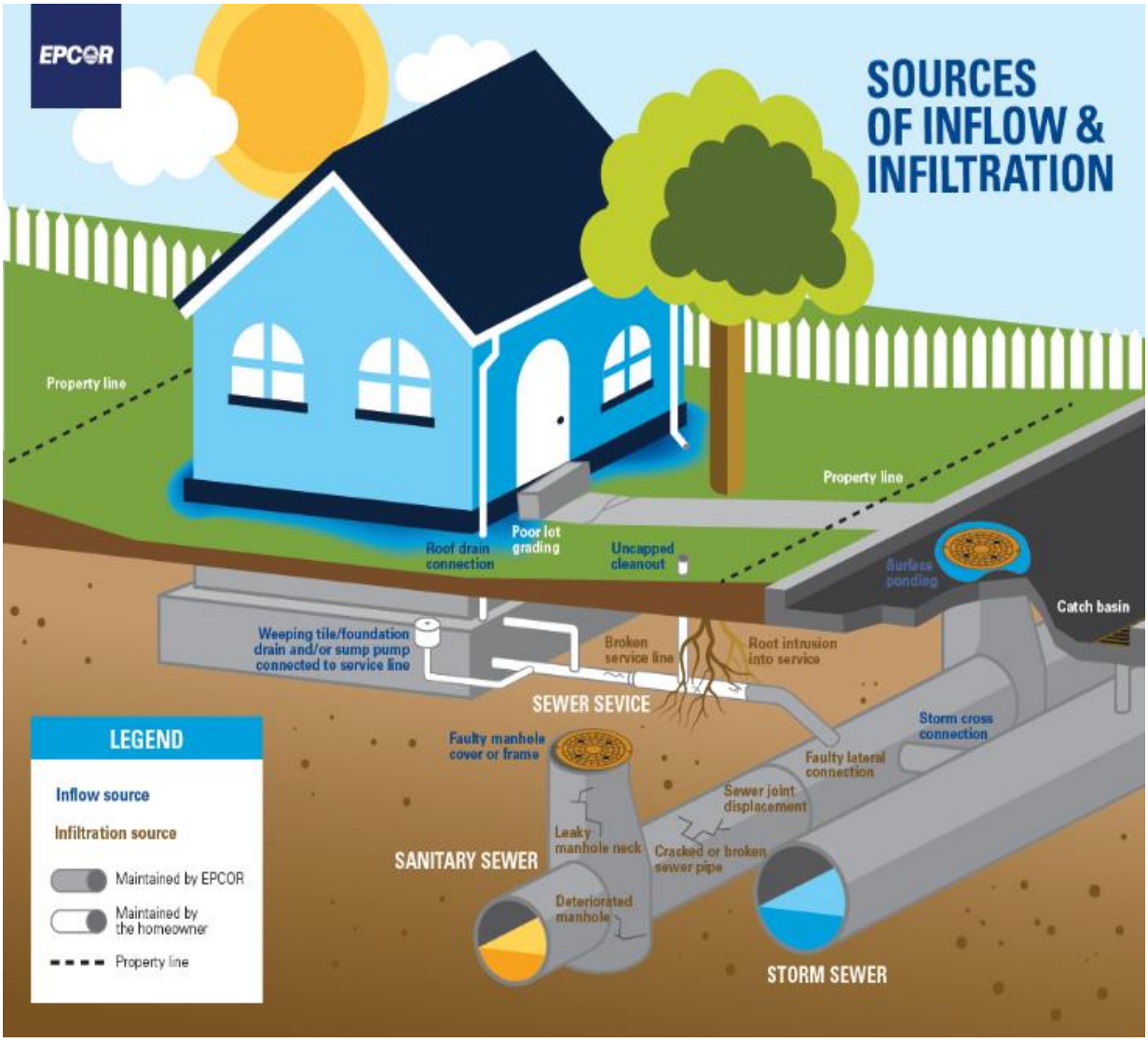
1. The Inflow and Infiltration (I/I) Relining Program consists of annual programs focused on reducing inflow and infiltration into the sanitary and combined sewer systems to decrease the risk of flooding due to sewer backups and to create capacity within the existing sewer network to accommodate the City of Edmonton's growth targets. The scope of this program includes the inspection, repair, and relining of manholes and sanitary and combined sewer pipes in areas, with high I/I such as local sags, and low-lying areas. EPCOR Water Services' (EWS) has forecast the total program capital expenditures during the 2025-2027 PBR term at $29.2 million.

2.0 BACKGROUND

2. EWS's Stormwater Integrated Resource Plan (SIRP) is a system wide integrated approach to mitigate flood risk by reducing the health, safety, and social risk of flooding with lower overall capital investment than compared to traditional engineering approaches. SIRP recommended a five-theme strategy for flood mitigation (SLOW, MOVE, SECURE, PREDICT and RESPOND) that included a mix of grey infrastructure (trunks and tunnels) and green infrastructure (dry ponds, low impact development). The SIRP I/I Relining Program is a critical component of the SIRP Strategy under the SECURE theme.

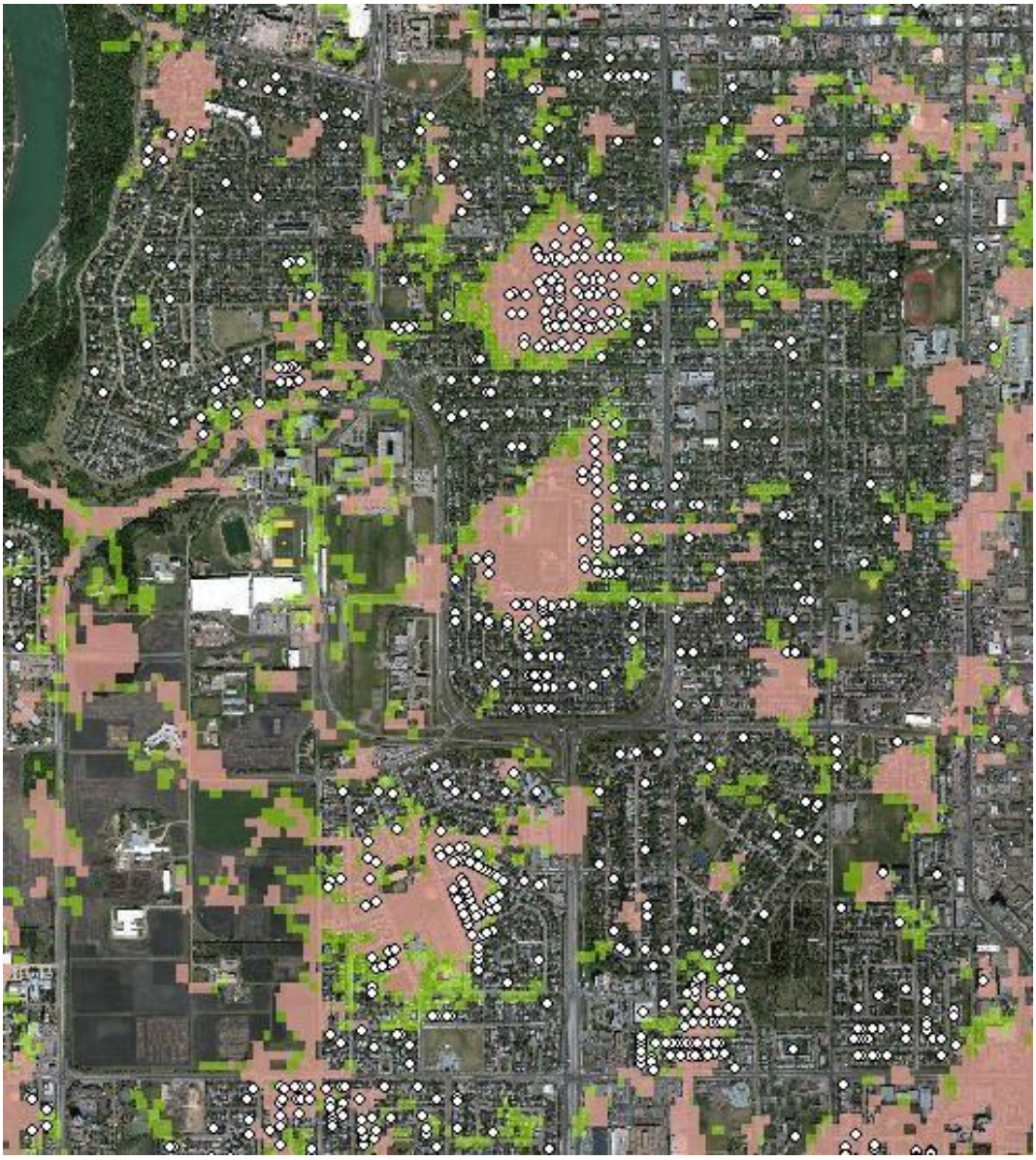
3. I/I reduces the capacity of the collection system by allowing stormwater and groundwater flows to enter into the sanitary and combined system through cracks or holes in the infrastructure, or by direct connections of roof or foundation drains. SIRP identified that there is an increased risk of basement flooding in areas where water ponding occurs on the road prior to draining through the piped stormwater network. These low-lying areas have a higher risk of I/I through cracks and open joints, increasing the risk for sewer backups during extreme rainfall events. This can lead to increases in health, safety, environmental and financial risks for EWS and its customers due to the potential for sewer backups, basement flooding, environmental contamination, costly emergency repairs, and service disruptions. The increased flood risk in localized sag areas is illustrated in Figure 2.0-1, depicting various paths through which stormwater can enter properties during flooding events. The longer the storm water pools on the road surface, the greater the risk of it accessing the sanitary pipes and/or foundation drains of properties lacking adequate flood proofing, potentially entering the buildings. The SIRP strategy therefore focuses on programs aimed at mitigating the risk of system overloading and water ponding in these localized sag areas during a storm event.

Figure 2.0-1
Typical Household Connections



4. The higher risk of ponding to properties was evident from the risk analysis of the stormwater sub basins where water was predicted to pond on the roads after a storm event. Historical basement flooding records for Edmonton confirmed this increased risk level as shown in Figure 2.0-2. This figure identifies customer calls to 311 to report flooding events from 2003 to 2016 represented by white dots. The pink and green areas represent the ponding areas identified by the insurance industry pluvial flood modelling using federal topographical maps under various storm intensities. The strong correlation between predicted ponding locations and historical basement flooding records suggests that I/I significantly contribute to basement flooding.

Figure 2.0-2
Comparison of Ponding Areas from Insurance Maps with 2003-2016 Basement Floods



5. In addition to supporting SIRP objectives, this program also supports EWS's Sanitary Integrated Resource Plan (SanIRP). SanIRP focuses on ensuring the high operational, environmental, and financial performance of the sanitary and combined sewer collection system in the long-term as the city transitions to growth through infill development. It is common for some stormwater to enter sanitary sewers through I/I, and in practice, nearly half of the capacity of a sanitary pipe is reserved for the additional flows introduced by a storm event. SanIRP

recommends the reduction of I/I to increase capacity of the system. Implementation of this program provides capacity for future growth in the existing sanitary and combined sewer collection system.

6. The I/I Relining program consists of Proactive Manhole Sealing and Proactive Pipe Relining, which are focused on securing individual properties in higher risk areas against flooding. Through this program, the volume of stormwater entering the sanitary and combined sewer networks will be reduced.

3.0 JUSTIFICATION

7. Relining work is critical to reducing I/I and minimizing the potential for sewer backups and basement flooding in low-lying areas during extreme rainfall events. Relining is an effective solution for reducing I/I by sealing cracks, fractures, and joints in the existing infrastructure through the addition of a new, impermeable lining, preventing I/I from entering the system.

8. Consequences of not completing this program include:

- Health and Safety Risks – Excessive I/I could pose a safety risk to the EWS staff who operate and maintain the drainage infrastructure. There is also a safety risk to the public if the area is flooded due to high I/I causing spilled sewage and basement backups.
- Environmental Risks – Excessive I/I could lead to floods and sewage spills to the local environment or water bodies and may cause damage or contamination to the natural environment and wildlife. This will affect the usage of these facilities by the public and require substantial investment to restore the affected areas. The release of untreated sewage into the environment also violates Drainage's Approval-to-Operate issued by Alberta Environment and Protected Areas.
- Financial Risks – High I/I can lead to flooding which is costly to manage and clean up and can lead to claims from customers with flooded basements impacting the level of service and expectation of customers.
- Reputational Risks – High I/I could lead to neighbourhood flooding especially for customers in localized sag areas.

9. In addition to mitigating the risks identified above, the program's focus on reducing I/I helps to regain pipe capacity for infill development, delaying the potential need for pipe upsizing and prolonging the life of existing infrastructure.

4.0 PROGRAM SCOPE

10. This program will focus on reducing I/I through the implementation of Proactive Manhole Sealing and Proactive Pipe Relining.

4.1. Proactive Manhole Sealing

11. Proactive Manhole Sealing will focus on reducing I/I by relining the top 1.5 meter portion of sanitary manholes as shown in Figure 4.0-1.

Figure 4.1-1: Typical Manhole Before and After Sealing

12. The majority of I/I is due to surface runoff entering a manhole around the manhole neck and cone area which is about 1.2 to 1.5 m below surface. This is the area that receives the most impact from traffic. Unless there is evidence of major cracks along the manhole barrel, relining the top portion of manholes is the most cost effective approach to minimize I/I from entering to sewer pipe through the manhole. In areas where the depth of ponding exceeds 0.30 meters, manhole covers will be partially sealed to further prevent water flowing directly into the manhole through the pick-holes. This will extend the life of manholes and reduce service disruptions due to manhole collapses.

13. EWS has identified more than 9,000 sanitary manholes that are located in ponding areas across the city. Since 2019, EWS has sealed and relined nearly 4,000 of these manholes. EWS is planning to continue to seal and reline the remaining 5,000 manholes based on ponding depth and priority of the SIRP risk ranking. SIRP risk ranking is developed based on a combination of risk level from four different consequence categories: Health and Safety, Environmental, Financial

and Social. Each storm sub-area is then placed into one of eight risk groups (A to H) and assigned a Risk Level of High, Medium High, Medium, Medium Low, and Low.

14. The scope of this program for the 2025-2027 PBR term includes:

- Inspection of manholes in sag areas
- Repair of severe structural defects of manholes prior to relining if needed
- Relining a total of 2,000 manholes located in sag areas within the selected neighbourhoods
- Sealing manhole covers for approximately 1,200 manholes to prevent wet weather inflows through the pickholes.
- Replacing manhole frames in manholes with identified maintenance issues in areas with critical ponding depths.

15. Selected manholes will first be inspected to confirm condition. After the field inspection and condition assessment, EWS will address manholes with severe structural defects prior to relining if required. Based on site inspections, EWS estimates that roughly 25% of manholes will require minor repair works and 5% will require major structural rehabilitation. As there are many products available in the market, the most suitable method for relining and sealing will be finalized at the procurement stage.

16. This program is based on EWS's 10-year plan to complete a total of 9,000 manholes in ponding areas by 2030. As of early 2024, approximately 4,000 of these manholes have been completed.

4.2. Proactive Pipe Relining

17. Proactive Pipe Relining work focuses on relining sanitary and combined sewer pipes in surface ponding areas to reduce I/I from entering through cracks and open joints. Since 2019, about 15 km of relining has been completed annually under this program.

18. Prolonged surface ponding over low-lying areas leads to a higher risk for I/I to occur through cracks and open joints in sewer pipes. Through pipe relining, the volume of stormwater entering the sanitary and combined sewer networks can be reduced. Approximately 1,300 km of sanitary and combined pipes with varying diameters are located in low-lying areas across the city.

19. Focus areas for the program are selected according to the SIRP risk ranking and low-lying areas with surface ponding of greater than 0.3 meters. As described earlier, the SIRP risk ranking is developed based on a combination of risk level from four different consequence categories: Health and Safety, Environmental, Financial and Social. Each storm sub-area is then placed into one of eight risk groups (A to H) and assigned a Risk Level of High, Medium High, Medium, Medium Low, and Low.

20. The I/I relining program priorities are now also driven by growth and capacity needs identified through Sanitary Integrated Resource Plan (SanIRP). SanIRP has identified five priority sanitary planning areas where the confluence of the City's priority growth nodes/corridors and existing piping infrastructure can greatly benefit from increased I/I management. The I/I Relining program will focus investment in 5 priority Sanitary Planning areas for the purpose of reducing the need to build new capacity locally. The 5 priority areas targeted in the 2025-2027 PBR term are Jasper Place, Mill Woods, Yellowhead West, Calgary Trail, and Castle Downs.

21. The scope of this program for the 2025-2027 PBR term includes:

- Review of existing inspection reports of sanitary and combined pipes in low-lying areas to confirm the suitability for relining. This process is required to identify if open cut repairs are required prior to relining due to structural damage of the pipe section.
- Cleaning all pipes and carrying out Closed Circuit Televising (CCTV) inspections to identify any structural damage, if needed, prior to relining.
- Relining of an estimated 40 km of sanitary and combined pipes with diameters of equal or less than 750 mm at low lying areas with surface ponding of greater than 0.3 meters.
- Relining of service laterals as needed. An estimate of 5.5 km of service relines will be required for the 2025-2027 term.
- Temporary bypass pumping required during relining of the pipes.
- Restoring all service lateral connections.

22. Proactive pipe relining reduces the risk of sewer backup and basement flooding due to excessive I/I entering the sanitary and combined sewers at known surface ponding areas. It also creates capacity in the sanitary system to accommodate future growth projections. The program will coordinate with other sewer relining initiatives to ensure alignment and avoid any conflicts of schedule.

23. If it is determined that I/I is a result of sever asset condition deterioration requiring structural repairs then the pipe will fall under the scope of its respective rehabilitation program.

5.0 ALTERNATIVES CONSIDERED

5.1. Alternative 1 – Do Nothing

24. A do-nothing alternative was considered for this project. Not pursuing I/I reduction poses a risk of continued flooding to residents. Significant I/I defects could also lead to failure of the sewers, resulting in a significant service disruption to customers. Unplanned emergency repairs also tend to be more costly than a planned approach.

5.2. Alternative 2 – External Wraps

25. Wraps are a flexible and adhesive butyl material with an abrasion resistant backing. Installation of wraps in place of relining manholes would require excavation and is usually more expensive than relining. The cost for excavation, restoration and external wraps is approximately $10,000 per manhole.

5.3. Alternative 3 – Replace Manholes and/or Pipes

26. This alternative would replace the assets through open cut methods instead of through relining. In general, replacing manholes and pipes is more costly than relining and new installation may not be effective in preventing I/I. For example, the unit cost for relining a 600 mm diameter pipe is about $500/m, while the unit cost for installing a new 600 mm diameter pipe is about $7,500/m. Therefore, in this example, the unit cost for new pipe installation is about 15 times higher than the relining works. In situations where the asset structural condition has deteriorated to the point of requiring replacement, the work would be completed under a separate program, such as Local Sewer Rehabilitation.

6.0 COST FORECAST

27. The program cost estimates are based on previous projects and historical costs. Table 6.0.1 provides the capital expenditures forecast for the 2025-2027 PBR term.

Table 6.0-1
I/I Relining Program Capital Expenditure Forecast ($ millions)

	2025	2026	2027	Total
Total Capital Expenditures	9.5	9.7	10.0	29.2

28. Table 6.0.2 provides the estimated capital expenditures for I/I by program during the 2025-2027 PBR term.

Table 6.0-2
I/I Relining Program Capital Expenditure Forecast by Asset Type ($ millions)

Project	Capital Expenditure Forecast
1. Proactive Manhole Sealing	12.7
2. Proactive Pipe Relining	16.5
3. Total Capital Expenditures	29.2

7.0 KEY RISKS AND MITIGATION PLANS

29. Table 7.0-1 provides a summary of the key risk associated with executing this program and EWS's plans to mitigate these risks.

Table 7.0-1
Key Risks and Mitigation Plans

Risk	Mitigation Plan
1. Health and Safety Risks – High I/I can cause flooding and sewer backup which pose as a drowning and health risk to residents.	Proactive relining of pipes and manholes will reduce the amount of I/I and the associated risk of flooding and sewer backup.
2. Environmental Risks – High I/I can cause flooding and sewer backup which can release untreated sewage into the environment and violate the Approval-to-Operate.	Proactive relining of pipes and manholes in the high risk areas will reduce the amount of I/I and the associated risk of flooding and sewer backup.
3. Execution Risks – Using equipment such as jackhammers when replacing manhole structure may expose workers to silica dust, which over prolonged exposure can lead to silicosis. This condition is serious and can increase the individual's risk of developing cancer among other diseases. Furthermore, working in confined space without proper equipment, training, or permit results in injuries and potential fine from Occupational Health and Safety.	EWS will ensure contractors meet EPCOR safety standards and that contractors provide and follow all work safety plans including emergency response and rescue plan. Additionally, EWS will use appropriate kind of respirator to filter out silica (and other harmful substances) particles suspended in the air as well as using mechanized equipment so that workers are not directly exposed to the dust.
4. Financial Risks – Liner not properly cured resulting in rework and extra cost to the project. Actual contractor bids may vary from the estimates. Materials and skilled labour are subject to market variability. There are also project unknowns that may affect costing. Risk that liner does not properly cure resulting in rework and extra cost to the project.	EWS will require contractors to submit the quality assurance/quality control plan including curing and temperature duration, confirm types of curing using and add clause for contractor to include monitoring for curing time and temperature. The activities in this program have been previously carried out, and a general understanding of the tasks and costs have been developed. Project costing is typically reviewed to ensure it aligns with assumptions and expectations. To mitigate cost escalations, thorough planning and proactive measures are essential. This can

	include detailed cost estimates during the planning phase, contingency budgets, and a comprehensive risk identification and analysis. Contracts should be clear with provisions for addressing unforeseen cost increases. Regular monitoring, strong relationships with contractors and suppliers, and experienced project managers are important to reduce the likelihood of cost increases. Value engineering to evaluate alternative materials, construction methods, or design modifications can also help to mitigate price increases.
5. Customer Impact Risks – Risk of odour release through opening manholes during relining operations.	EWS will use non-odour releasing products, continuously monitor odour and assess the area during construction. EWS will ensure coordination so the manhole are not opened for extended periods of time.

8.0 RESOURCES

30. This program will be delivered by a design bid build method. EWS will complete site inspection, design, procurement, and construction using existing relining master service agreements as it does not have the equipment and expertise in installing liner to pipes and manholes.

EPCOR WATER SERVICES

Appendix G-10

Business Case

LARGE TRUNK REHABILITATION PROGRAM

May 31, 2024

TABLE OF CONTENTS

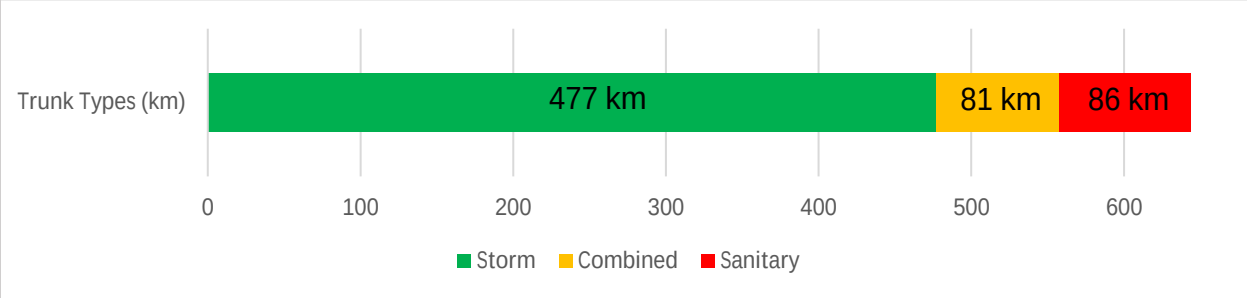
1.0 OVERVIEW

1. The Large Trunk Rehabilitation Program focuses on the rehabilitation of aging large trunks across the city of Edmonton. Large trunks are gravity fed sanitary, storm, and combined sewers greater than or equal to 1,200 mm in diameter. The scope of work includes inspections and rehabilitation of large trunks at a total spend of $85.8 million over the 2025-2027 PBR term.

2.0 BACKGROUND

2. There are approximately 643 km of sanitary, storm, and combined large trunk sewers constructed over the past 100 years to varying standards and specifications. Figure 2.0-1 shows the breakdown of the large trunk infrastructure into sanitary, storm and combined waste types. The average ages for sanitary, storm and combined trunk sewers are 37, 40 and 64 years, respectively. Additionally, premature deterioration has been accelerated by hydrogen sulfide (H_2S) induced corrosion in the sanitary and combined trunks, posing further challenges to the integrity of the infrastructure.

Figure 2.0-1
Large Trunk Infrastructure Breakdown



3. EPCOR Water Services' (EWS) Corrosion and Odour Reduction Strategy (CORe) was initiated in 2019 to understand, mitigate and prevent sewer odour issues across the city using a combination of capital and operational interventions. The CORe strategy focuses on preventing the formation of H_2S gas, reducing community odour impacts, and lengthening the life of sewer network assets. Under CORe, EWS segregates the city into regions with consistent odour issues, those with dynamic odour issues, and those with emerging odour issues. Different approaches have been proposed for each region to ensure that causes of the odour are fully understood and to ensure that capital projects will provide sustainable relief. The capital projects and operating

activities in CORe can be classified into four themes of investment: PREVENT, OPTIMIZE, MONITOR and CONTROL.

4. In 2023, a condition assessment study of the entire large trunk sewer network was completed using both observed defects and deterioration models based on age, material type, and waste type and produced a condition rating for each pipe. The resulting condition ratings were used to develop the Likelihood of Failure (LOF) for each pipe. Along with the LOF scores, Consequences of Failure (COF) scores were also completed across all six consequence categories using the EPCOR Risk Management Standards and Risk Matrix. The six consequence categories include Health and Safety, Environment, Regulatory, Reputation, Service Interruption, and Financial. A theoretical risk score was then calculated for each pipe and the results are shown on the matrices in Figure 2.0-2 and Figure 2.0-3, broken down into storm and sanitary/combined. Figure 2.0-4 shows that of the large trunks, the majority were constructed with concrete materials.

Figure 2.0-2
Storm Trunks Risk Matrix

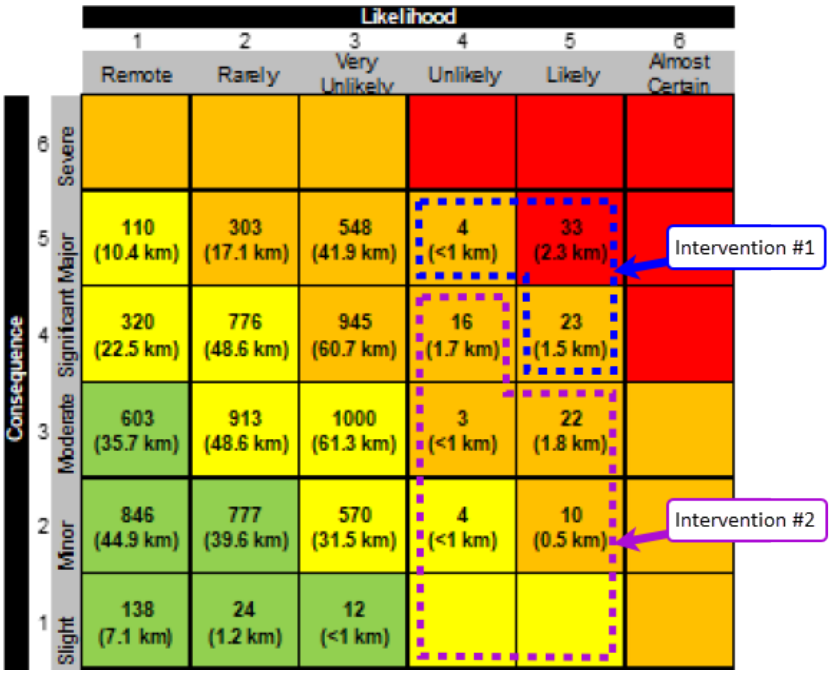


Figure 2.0-3
Sanitary/Combined Trunks Risk Matrix

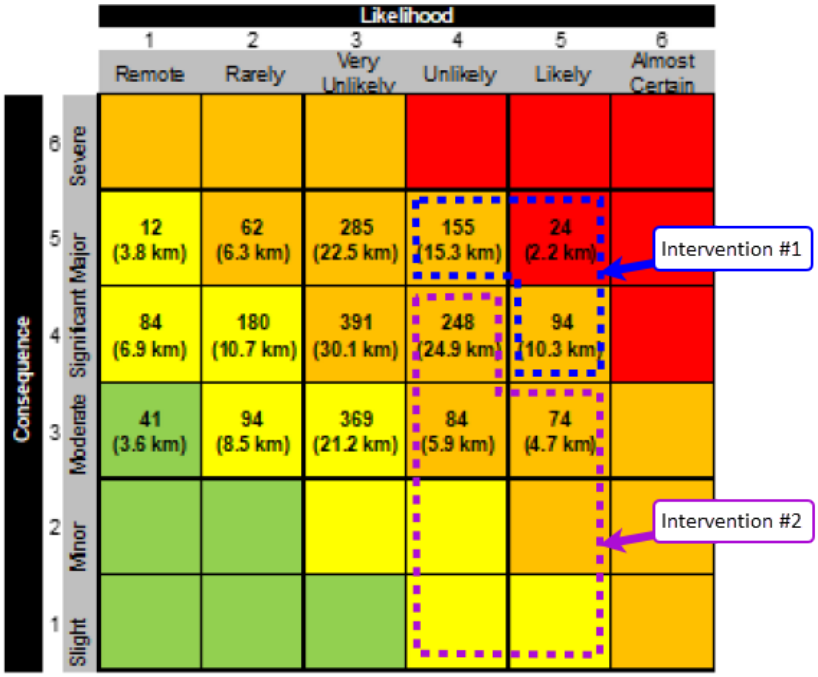
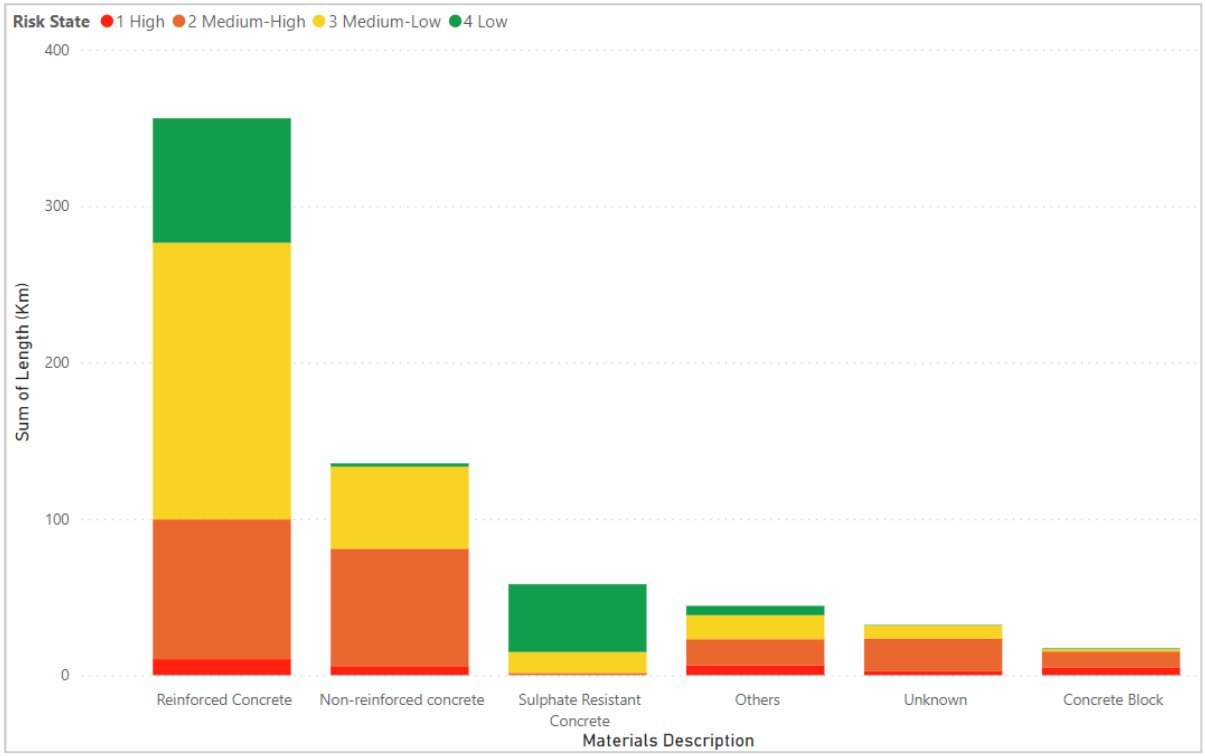


Figure 2.0-4
Large Trunk Material Breakdown by Length of Trunk and Risk



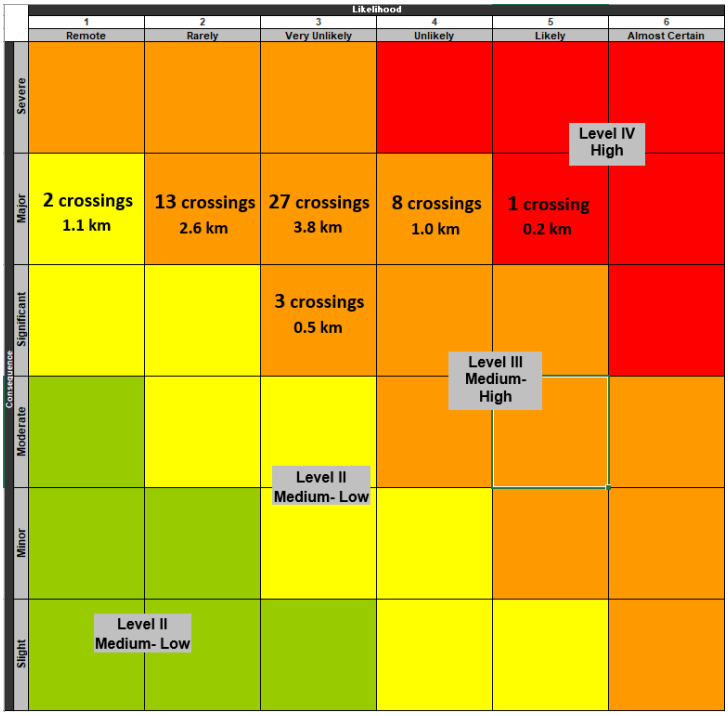
5. As illustrated on Figure 2.0-2 and Figure 2.0-3, each matrix can be divided into intervention actions for rehabilitation planning based on level of risk. There are about 73 km of trunks that fall into Intervention 1 and 2, with 65 km of those being sanitary or combined. This breakdown was used to prioritize further investigation and/or rehabilitation.

6. The Large Trunk Rehabilitation Program is a critical component of the CORe strategy under the PREVENT theme. The program focuses on the rehabilitation of large combined and sanitary trunk sewers greater than or equal to 1,200 mm in diameter. The rehabilitation projects are required primarily to prevent further corrosion to the system and lengthen the life of the assets damaged due to the corrosive gases in the wastewater collection system.

7. In addition to rehabilitation activities, EWS has identified that failures in the large trunk system can be reduced by enabling quick and efficient responses to perform emergency repairs on large trunks. Investments in capital upgrades, improvements or supporting infrastructure that provides bypass capacity is very effective at reducing risk for assets where the consequence of failure (COF) is the main driver.

8. Sections of large trunk that cross under sensitive areas such as the North Saskatchewan River, creeks, lakes, freeways, railways, pipeline corridors and buildings have been identified as assets where a focus on reducing the COF greatly reduces overall risk for the system. EWS is classifying trunk sections passing beneath those areas as major crossings. Major crossings are the focus area for sewer bypass investments. The risk of the top 55 major crossings is shown in Figure 2.0-5.

Figure 2.0-5
Risk Positions for Top 55 Major Crossings



9. A total of 269 major crossings for large trunks have been identified across the collection system. From those, 55 major crossings were further evaluated to identify bypass actions. The 55 major crossings were categorized into five scenarios with their own unique bypass approaches. The scenario types are detailed in Table 2.0-1.

Table 2.0-1
Bypass Approaches by Trunk Scenario

Scenario #	Scenario Description	Bypass Approaches	# Major Crossings
1	Existing pipe(s), route(s) and control structures available when a Bypass is needed.	Using the existing alternative route(s) or control structures.	18
2	Dry weather flows are not high (<1,000 L/s), and the flow can be diverted.	Using temporary pump station(s) / bypass skid(s).	21
3	Dry weather flows are high, and the flow cannot be diverted at the trunk location.	Multiple diversions built upstream or a redundant bypass trunk.	6
4	Dry weather flows are high, but the flow may be diverted or controlled using control gates.	Install control structures or gates to divert flows.	4
5	Dry weather flows are very high, and the flow cannot be diverted anywhere.	Proactive interventions; install a redundant trunk.	6

3.0 JUSTIFICATION

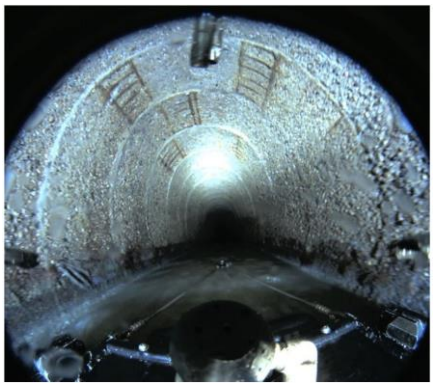
10. Assessing the condition of an aging sewer system, planning for rehabilitation, and improving bypass capacity is crucial for maintaining public health, environmental sustainability, and overall infrastructure resilience. As the system ages, it is prone to deterioration, leaks, and structural issues that can lead to contamination of water sources and pose health hazards. Failure to undertake the rehabilitation of large trunks in High and Medium-High risk categories could result in unexpected large trunk failures. Such failures may incur high emergency costs associated with repairs and have potential to affect large service areas and populations across the city. There are several risks associated with the deterioration and failure of large trunks:

- Health and Safety Risk – Failure of a large trunk could cause a subsidence on high traffic roadways or structural stability issues for infrastructure which poses a safety risk to the public. Replacing or rehabilitating pipe, maintenance hole and chamber will extend the life of the trunk and lower the risks of trunk failure.
- Environmental Risk – Failure of a sanitary or combined large trunk could cause a sewage spill to environment or water bodies (river, creeks, storm water management facilities, etc.) and potential fines. Replacing or rehabilitating pipe, maintenance hole and chamber will extend the life of the trunk and lower the risks of failure.
- Customer Disruption Risk – Failure of large trunks can cause disruption to large service areas impacting many customers and businesses for a few weeks or months and can cause sewer backups into customer's basements. Failed trunks also lead to emergency repairs which are more disruptive to high traffic roadways and therefore to the public. The odour reports and direct measurements of sewer gas surrounding certain assets is an indicator that sewer corrosion is a major risk factor in many trunk lines. Finding the affected trunk lines and implementing appropriate trunk rehabilitation will lower the risks of trunk failure and service interruption.
- Financial Risk – Emergency repairs of failed large trunks are more costly. Depending on the location and consequence of the failure. The proposed large trunk rehabilitation will lower the risks of trunk failure and, therefore, reduce the emergency replacement costs.

11. Figure 3.0-1 shows examples of severe deterioration and voids in large trunks. Capital investment is aimed at mitigating the risk of trunk failure through rehabilitation activities or by minimizing the consequences of failure through efficient bypass approaches. Proactive implementation with steady investment levels will ensure that high-cost emergency replacements are reduced.

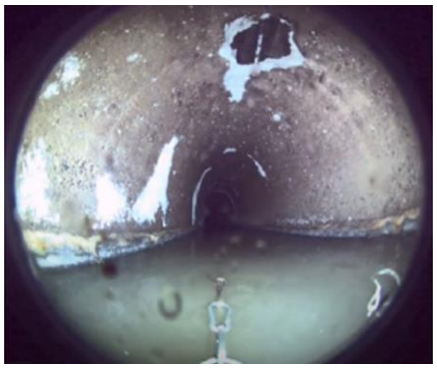
Figure 3.0-1
Examples of Currently Identified Trunk Defects

CMB 14



CMB 104

SAN 8



CMB 51

4.0 PROGRAM SCOPE

12. The Large Trunk Rehabilitation Program will focus on the rehabilitation and/or replacement of large combined and sanitary trunks rated as High and Medium-High risk. Given the complexity of the large trunk rehabilitation work, each project can span multiple years from inspection and design to construction completion, depending on the scope and site-specific constraints. Consequently, there will be multiple large trunk rehabilitation projects ongoing during the 2025-2027 PBR term. Some projects may carry over from previous years or extend beyond 2027 into the next PBR term. A breakdown of the proposed scope is as follows:

- Complete the rehabilitation of the Mill Creek Combined and Combined 94 trunks through on-going rehabilitation projects that will extend into the 2025-2027 PBR term. The projected capital spend during the PBR term is $26.5 million, contributing to a total project cost of $48.9 million.

- Rehabilitate an additional 2-4 km of trunks through new rehabilitation projects with a projected capital spend of $51.3 million.
- Improve two to three critical crossings by incorporating by-pass improvements with a projected capital spend of $15.0 million.

4.1. Trunk Rehabilitation

13. Trunk risk scores are used as the criteria to build the scope of the program. The highest risk candidates in Interventions 1 and 2 are reviewed and considered for inspection to ensure the most risk reduction to the system. In addition to risk, several other factors such as operational issues or synergy with other projects will be considered when refining the prioritization of rehabilitation projects.

14. Of the 65 km of combined and sanitary trunks categorized as High and Medium-High risk in the Intervention 1 and 2 groupings, approximately 11 km, or about 17%, have previously been inspected. Through these existing inspections, it has been determined that 13 large sanitary and combined trunk sections across 10 areas in the city require some type of rehabilitation or replacement. This work is required to address observed issues and defects that reduce the integrity of the trunk and could lead to failures. The locations are detailed in Table 4.0-2.

Table 4.1-2: Currently Identified Trunk Rehabilitation Candidates

Area	Trunk Name	Issues/Defects	Size (mm)	Depth (m)
Bulyea Heights	San 29	Wall Loss exceeds 60%	1200	7.4
McCauley	Cmb_8	Steel Ribbing is exposed	2250x1800	32
Glenora	Cmb_51	Large hole present	1895x1200	28
	CMB_38	Wall Loss reaching 40%	1895x1573	28
University Farm	Cmb_83	Reinforcement exposed, Multiple small holes	1500	23
Meadowlark/Jasper Park	San_8	Multiple small holes and exposed reinforcement, Pipe void	1473x1219	26
Mill Creek	Cmb_40	Wall loss reaching 50%	2630x1685	27
	Cmb 49	Significant corrosion	1200	27
	Cmb_41	Wall loss reaching 50%	1500	32
Belvedere	San_13	Wall loss reaching 50% with exposed reinforcement	1200	10
Lauderdale	Cmb_14	Wall Loss exceeds 60%	1200	9.5
Parkdale	Cmb_104	Reinforcement exposed	1200	17
Parsons Industrial	San_38	Wall loss reaching 55%	1500	24

Lansdown/Malmo Plains	San_3	Large void, multiple small holes and damaged points	1200	15

15. The most cost-effective solution will be developed and implemented and can include relining, spot repair and full replacement. The development of preliminary project scopes began in 2023 based on the pipe condition assessments. All trunk defects, failures and deficiencies were described and rated through an engineering review process that considered their nature, severity, and accessibility. Potential mitigation opportunities were discussed at internal workshops where they were evaluated by their technical viability, safety, and cost. Full projects scopes are scheduled to be completed by mid-2024 and then will be actioned for completion. Prioritization of these locations will be based on the known trunk risk, severity of the defects and resource needs.

4.2. Major Crossings

16. Capital investment for major crossings will be allocated towards both the acquisition of field equipment, such as surface bypass pumping rigs, and the construction of bypass assets. Construction of new bypass assets will primarily focus on the identified Scenario 2 major crossings. While the approximate spending will vary depending on project specific constraints and needs, it is estimated that approximately $2.3 million will be allocated for field equipment purchases and $12.8 million for construction projects. Of the $12.8 million, about $11.3 million will be focused on Scenario 2 major crossings projects, while about $1.5 million will be focused on Scenario 3 major crossing projects.

17. Scenario 2 activities will involve the construction of trunk access shafts on trunks where the flow is sufficiently low to be able to be served by above ground bypass pumps. Scenario 3 activities will involve the construction of bypass pipes or other diversion structures, however during the 2025-2027 PBR term, activities for Scenario 3 trunks are likely to be limited to their identification, preliminary planning, and possibly detailed planning. Construction of new assets for Scenario 3 trunks will continue into the subsequent PBR term.

5.0 ALTERNATIVES CONSIDERED

5.1. Alternative 1 – Do Nothing

18. An alternative to this program is to do nothing and not proactively inspect and rehabilitate high risk large trunk sewers. If nothing is done, the risk is that the infrastructure may be close to failure and if left to deteriorate, will likely cause emergency situations that would result in costly and disruptive repairs. Residents depend on a reliable sewage system that will not cause sewer backups, subsidence, or flooding and if this program is does not continue, it will lead to increased levels of customer dissatisfaction. By targeting inspections of the highest risk local sewers, EWS will have the knowledge and ability to rehabilitate, replace or bypass sections of pipe where the risk of failure is high. This will result in prolonging the useful life of the pipes, improving the overall physical condition, and reducing the risk in the sewer system.

5.2. Alternative 2 – Reduced Scope relative to the Proposed Plan

19. This alternative reduces the number of kilometers rehabilitated or replaced under the program. This reduction in scope could also include patching the worst areas to reduce further deterioration instead of full rehabilitation or replacement, and the locations could be reassessed in the future. A reduced scope decreases the immediate impact to rate payers in the short term as work will be deferred to future PBR terms. However, fewer critical assets will be addressed which can lead to trunk failures causing sewer backups, subsidence, or flooding. By focusing on risk reduction and balancing risk assessments, existing inspections, known deterioration and defects, as well as considering budget and rate impacts, it is not recommended to reduce the targeted scope. This alternative was rejected as it does not address the long-term risks associated with the deteriorated trunk condition.

5.3. Alternative 3 – Accelerated Scope relative to the Proposed Plan

20. This alternative increases the number of kilometers rehabilitated or replaced under the program. This approach would have the opposite affect of reducing scope with more immediate impacts to rate payers in the short term with a corresponding reduction to the likelihood and impact of trunk failures, sewer backups, subsidence, or flooding. Further acceleration of the program will prove challenging to concurrently execute with current resources. EWS would need to scale up its resources internally and acquire new capacity externally. The increased costs are

expected to have a disproportionate impact on customer rates relative to the benefits realized for customers, so this alternative is not recommended for the 2025-2027 PBR term.

6.0 COST FORECAST

21. The program cost estimates for the 2025-2027 PBR term are shown in Table 6.0-1 and are based on costs of trunk rehabilitation from previous projects with the similar scope. The assumptions are as follows:

- The unit construction costs of rehabilitation in place range from $5,000m to $10,000/m depending on the size, depth and location of the rehabilitation.
- An overall contingency of 30% has been included for the estimates based on the current maturity level.
- Trunk rehabilitation construction will most likely use external resources for execution.
- Multi Sensor Inspections (MSI) investigation, geotech investigations and environmental assessments will be completed using external resources.
- In-house resources will be utilized for rehabilitation design, project coordination, engineering during construction, construction completion certification and inspections.

Table 6.0-1
Large Trunk Rehabilitation Program Capital Expenditure Forecast (2025-2027) ($ millions)

	2025	2026	2027	Total
Total Capital Expenditures	34.3	34.7	16.8	85.8

22. In addition to the table above, Table 6.0-2 provides the estimated capital expenditure for the Large Trunk Rehabilitation by project area during the 2025-2027 PBR term.

Table 6.0-2
Large Trunk Rehabilitation Program Capital Expenditure Forecast by Project 2025-2027
($ millions)

Project	2025	2026	2027	Total
1. Mill Creek Combined	10.5	9.0	-	19.5
2. Combined 94	2.8	4.2	-	7.0
3. New Rehabilitation Projects	16.1	16.4	11.7	44.2
4. Sewer Bypass	4.9	5.0	5.1	15.0
5. Total Capital Expenditures	34.3	34.7	16.8	85.8

7.0 KEY RISKS AND MITIGATION PLAN

23. Completion of the large trunk rehabilitation/replacement work would lower the risks associated with the potential trunk failure. The risks associated with execution of the work have also been identified and summarized in Table 7.0-1.

Table 7.0-1
Key Risks and Mitigation Plans

Risk	Mitigation Plan
1. Health and Safety Risks - Working in confined space without proper training or permit results in injuries and potential fine from OH&S during construction.	EWS will ensure that contractors have a safe work plan, emergency response plan and other plans to ensure that it meets EPCOR standards.
2. Environmental Risks - Risk of sewage leakage associated with flow bypass methods during construction results in environmental incompliance and potential fines of several million dollars.	EWS will develop detailed flow monitoring and bypass plan with sufficient standby capacity to reduce the risk of bypass leakage.
3. Execution Risks - Limited access to perform the rehabilitation work may result in construction delays and construction cost increase. Many of the trunks are located beneath arterial roads that require considerable traffic mitigation planning. Critical by-passes are in areas where many of the crossings are untenable to frequent or long interruptions such as provincial highways, city freeways, railroad crossings and environmentally sensitive areas such as rivers and creeks. These locations also cannot be removed from service for extended periods due to the impacts on customers. Each location will require coordination with multiple authorities and stakeholders as well as additional approvals and access agreements. Standard surface-run bypass methods may be unacceptably disruptive to other agencies, authorities, stakeholders, and the public.	At a minimum EWS will develop rehabilitation or replacement alternatives to select the most cost-effective option to perform the work. EWS will engage with stakeholder and identify approval and access agreement needs as a key step early in the project and stage gate process. Alternative bypass methods will be reviewed and infrastructure will be pre-placed where appropriate to allow for rapid deployment of bypass equipment to minimize the environmental impacts and disruption to other infrastructure and the public.
4. Customer Impact Risks - Stakeholder communication issue/concern during construction results in business, resident and councilor inquiries. Additionally, construction on congested road will disrupt traffic.	EWS will prepare a stakeholder communication plan. EWS will also engage experienced construction manager and project manager to develop an optimal construction staging plan and coordinate with the City to obtain OSCAM permits.
5. Financial Risks - Limited access to the trunk to perform the rehabilitation work may result in construction delays and construction cost increase. Actual contractor bids may vary from the estimates. Materials and skilled labour are subject to market variability. There are also project unknowns that may affect costing.	EWS will develop rehabilitation or replacement alternatives to obtain/construct the required access to perform the work. EWS will include contractors early in the process, clearly identify scope requirements and evaluate options such as bundling multiple project scopes approach when efficiencies can be identified. EWS manages financial risks by conducting preliminary design and obtaining manufacturer's quotes for establishing the project budget. The financial risks will become more evident as further design is completed and scope will be adjusted accordingly.

8.0 RESOURCES

24. All activities related to project management, drafting, construction coordination and inspection, and as-built recording, will be undertaken internally by EWS. Concept development, design, and construction will be completed by both internal and external resources. Geotechnical assessments and MSI inspections will be completed by external resources.

EPCOR WATER SERVICES

Appendix G-11

Business Case

LOCAL SYSTEM REHABILITATION PROGRAM

May 31, 2024

TABLE OF CONTENTS

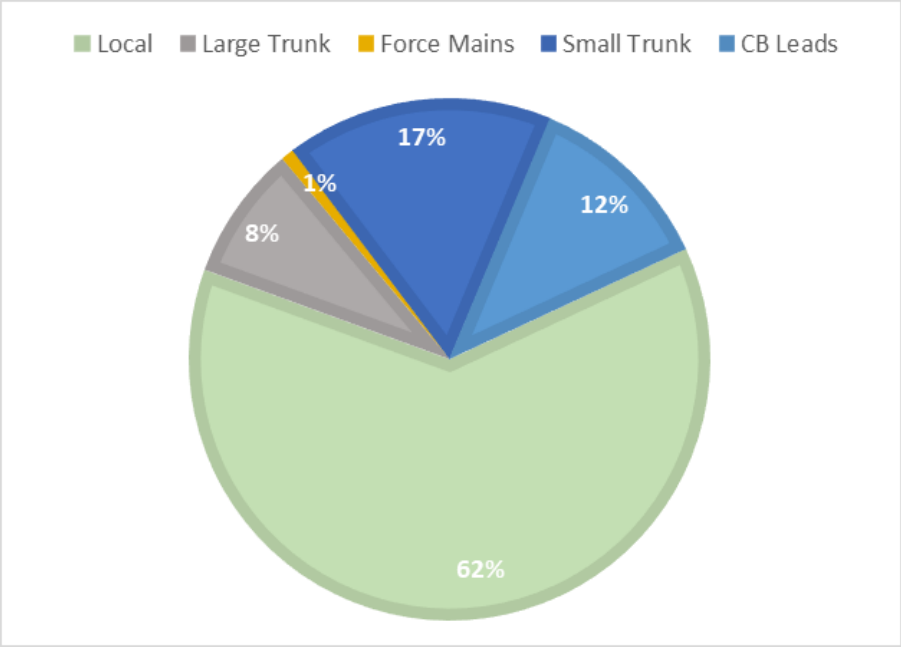
1.0 OVERVIEW

1. The Local System Rehabilitation Program consists of several annual programs focusing on the renewal and replacement of aging local sanitary, storm and combined sewers around the City of Edmonton. The scope of work includes targeted inspections, relining, and open cut repairs of local sewers at a total spend of $60.1 million over the 2025-2027 PBR term. The program expects to rehabilitate 20-25 km of local sewer per year.

2.0 BACKGROUND

2. Local sewers are classified as any mainline sewer smaller than 600 mm. They receive flows from service connections, catch basins, catch basin leads, and other local sewers, and convey the flows to the small and large trunk sewers. Local sewers account for the largest portion of underground pipe in the entire sewer system at approximately 4,900 km and have been constructed over the past 100 years with varying standards and specifications. The graph in Figure 2.0-1 shows the proportions of sewer infrastructure with local sewers accounting for 62% of the total sewer length.

Figure 2.0-1
Proportion of Sewer Infrastructure



3. In 2023, a condition study assessment of the entire local sewer network was completed using both observed defects and deterioration models based on age, material type, and waste

type which produced a condition rating for each pipe. The observed defects were found through Closed Circuit Televising (CCTV) inspections, covering about 39% of the local sewer system. The resulting condition ratings were used to develop the Likelihood of Failure (LOF) for each pipe. Along with the LOF scores, Consequences of Failure (COF) were also completed across all six consequence categories using the EPCOR Risk Management Standards and Risk Matrix. The six consequence categories include Health and Safety, Environment, Regulatory, Reputation, Service Interruption, and Financial. A theoretical risk score was then calculated for each pipe and the results are shown on the matrix in Figure 2.0-2. Figure 2.0-3 below shows that of those local sewers in the Medium-High and High risk categories, the vast majority are made of concrete or clay tile pipe.

Figure 2.0-2
Local Sewer Risk Matrix

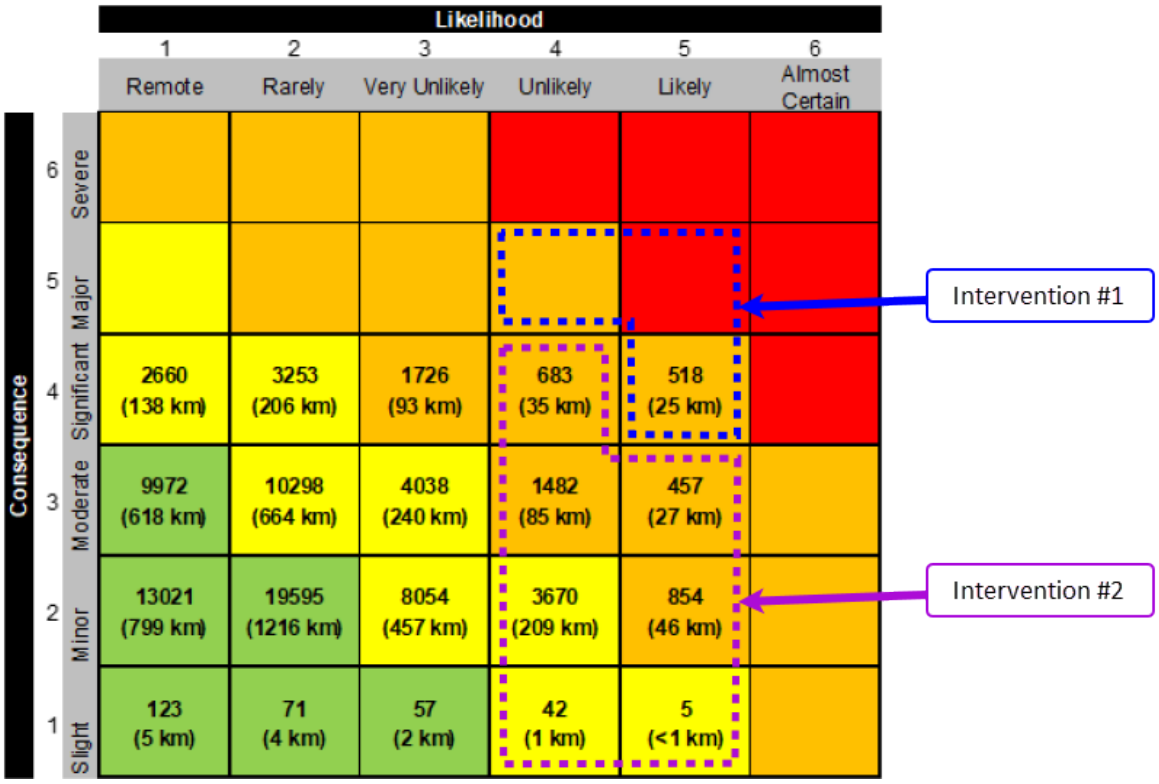
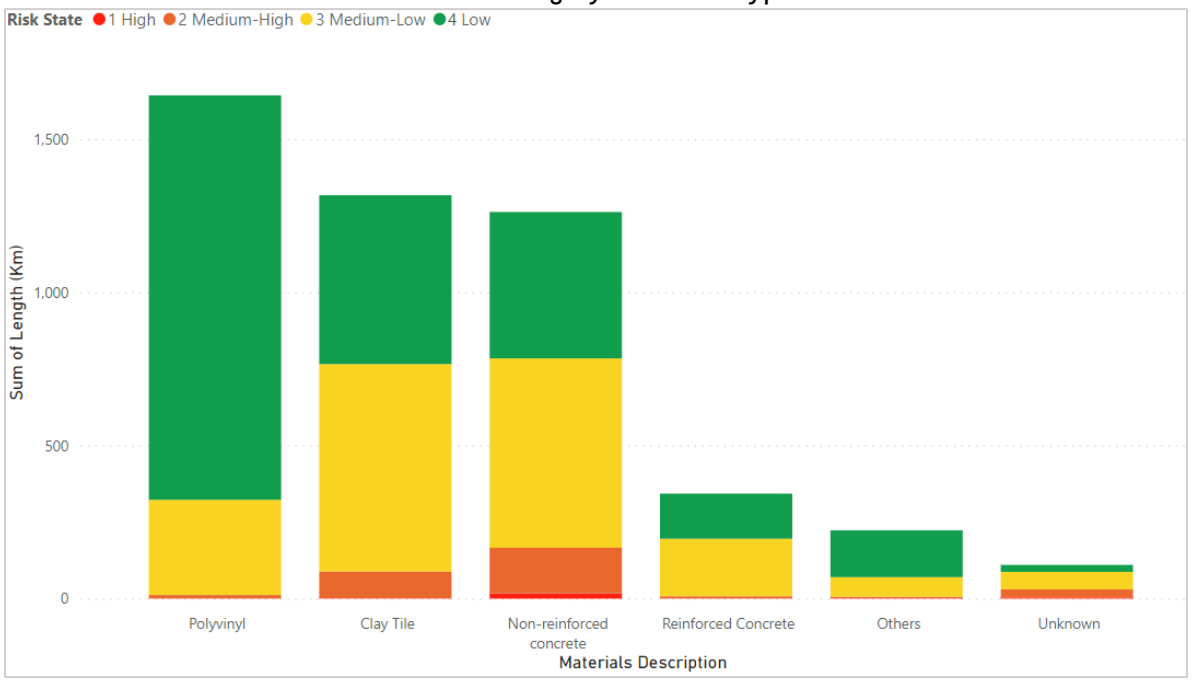


Figure 2.0-3
Risk Ranking by Material Type



4. The results show that just over 300 km of local sewers are considered Medium-High and High risk. As illustrated on the figure, the matrix can be divided into intervention actions for rehabilitation planning based on level of risk. The intervention boundaries were developed based on risk reduction, where assets with LOF scores of 4 or 5 are generally targeted first as they are critical assets that may have failed or are near end of life. Assets with high COF scores but lower LOF are typically in fair condition and can be monitored for any changes in their condition. There are 25 km of pipes that fall into Intervention 1, while about 400 km fall into Intervention 2. Of the 400 km, about 190 are considered Medium-High risk. This intervention breakdown can help to prioritize pipes for further investigation and/or rehabilitation.

5. Historically, the Drainage Neighbourhood Renewal Program renewed local sewers based on neighbourhood boundaries and although the goal was to reduce the potential risk in the system, high risk areas may have been missed. By targeting proactive renewal based on risk, while continuing to coordinate with City of Edmonton (COE) roadway renewal programs such as Neighbourhood Renewal, Alley Renewal, and Arterial and Collector Renewal, EWS is able to inspect and rehabilitate aging local sewer infrastructure through relining and open cut renewal methods on high risk assets, therefore reducing the overall risk in the system.

3.0 JUSTIFICATION

6. Assessing the condition of an aging sewer system and planning for rehabilitation is crucial for maintaining public health, environmental sustainability, and overall infrastructure resilience. As the system ages, it is prone to deterioration, leaks, and structural issues that can lead to contamination of water sources and pose health hazards. There are several key risks categories associated with the deterioration and failure of local sewer infrastructure:

- Health and Safety – Failure of local sewer infrastructure could cause a roadway subsidence which poses a safety risk to the public.
- Environmental – Failure of a sanitary or combined local sewer could cause a sewage spill to the local environment or to the river.
- Customer Disruptions – Failure of local sewers can cause disruption to large service areas which would impact many customers, and can also cause sewer backups into customer's basements. Failed sewers also lead to more emergency repairs which are more disruptive to the roadway and therefore to the public.
- Financial – Emergency repairs of failed local sewers can be more costly than proactive renewal. Claims against EPCOR for sewer backups can also lead to a financial impact.

7. Regular assessments of local sewer pipes help to identify vulnerabilities and enable proactive rehabilitation measures, thereby mitigating the risks identified above. Capital investment should be aimed at reducing the LOF by improving asset condition and extending the life of the infrastructure. Proactive implementation with steady investment levels will ensure that high-cost emergency replacements are reduced.

4.0 PROGRAM SCOPE

8. The Local System Rehabilitation Program scope will consist of both proactive and reactive renewal to address condition and operational issues within the local sewer system. Local sewer rehabilitation can include mainline pipes, catch basins, catch basin leads, or maintenance hole infrastructure. This risk based proactive and reactive renewal approach allows for the optimization of resources by focusing on the pipes with the highest risk first. It ensures that critical issues are addressed promptly, while also considering the cost-effectiveness of rehabilitating pipes with lower risk levels.

4.1 Proactive Renewal

9. Risk scores are used as the criteria for inspection of local sewers to build the proactive scope of the program. Each year, the highest risk candidates are reviewed and considered for inspection to ensure the most risk reduction to the system. As shown in the risk matrix in Figure 2.0-2, the program will target High and Medium-High risk pipes in the Intervention 1 and Intervention 2 groupings. In addition to risk, several other factors will be considered when refining the prioritization of inspections. Coordination with the COE's roadway renewal programs will be assessed, and any medium-high risk local sewers within those locations will be prioritized for inspection. This is estimated to be between 2 to 8 km of pipe.

10. A total of 50 km of inspection will be completed each year. Inspection needs are based on known risk levels, risk targets and projected conditions of this asset type over time. Based on these inspections, the drainage infrastructure will be given a grade according to the Pipe Assessment Certification Program (PACP) and the Manhole Assessment Certification Program (MACP) Ranking System. PACP and MACP are the North American standard for pipe and manhole defect identification and assessment, providing standardization and consistency to the methods in which pipe conditions are identified, evaluated, and managed. Once the infrastructure has been reviewed and graded, a risk assessment and evaluation will be undertaken for each segment to determine a LOF and COF score. From this post-inspection rating, pipes classified as High risk are prioritized for rehabilitation as they are in a condition where attention is required to address serious defects. Pipes classified as Medium-High and Medium-Low risk will be evaluated to determine the necessity of rehabilitation based on their individual scores, the type and severity of defects, and budget availability. There may also be an operational and maintenance reason for renewal or replacement of a pipe such as roots, sags or infiltration. If sags are identified for rehabilitation, they will be dealt with through open cut repairs.

11. Based on historical years of proactive inspections, typically about 40% of the inspected pipe under the current intervention groupings requires relining, while about 1-2% of the pipe requires open cut. Therefore, we expect about 20 km of reline and about 500 m of open cut to be identified from these inspections each year.

12. In addition, the program will coordinate construction with improvements that have been identified through other initiatives that could be completed and/or coordinated at the same time. These types of improvements include Low Impact Development (LID) features, flood proofing, service renewal, inflow and infiltration reduction and/or odour reduction. These

improvements will be funded through separate program budgets. Capitalizing on synergies and aligning with other initiatives improves cost efficiency, ensuring that resources and budgets are utilized optimally, and redundancies are minimized.

4.2 Reactive Renewal

13. The reactive renewal work responds to needs identified in the system through routine inspections or by responding to customer complaints of issues. Sewer defects that require capital funding to address include deformations, holes, root intrusions, cracking, fractures, and/or breaks. Most issues require open cut replacement; however some issues are less significant and can be completed through relining. Locations are identified by EPCOR's operational teams, and if the issue requires an emergency response, the location is sent directly to the High Priority Repair Program for immediate attention. If the issue is not an emergency, then the closed-circuit televising (CCTV) is reviewed, and the infrastructure will be given a grade based on the PACP Ranking System and will follow the process described above to determine the necessity of rehabilitation.

14. Historically, the amount of open cut replacement requirements that are identified through routine inspections or through customer complaints each year is approximately 120 m, while the number of relining requirements identified is approximately 2.5 km annually.

5.0 ALTERNATIVES CONSIDERED

5.1 Alternative 1 – Do Nothing

15. An alternative to this program is to do nothing and not proactively inspect and rehabilitate high risk local sewers or deal reactively with emerging local sewer issues. If nothing is done, the risk is that the infrastructure may be close to failure and if left to deteriorate, will likely cause emergency situations and disruptive repairs. Although the advantage of doing nothing may be short-term cost savings for the rate payer, more expensive emergency repairs will result from infrastructure failures, increasing future capital needs for the High Priority Repair emergency program. Residents depend on a reliable sewage system that won't cause sewer backups, subsidence, or flooding and if this program is cancelled, it will lead to increased levels of customer dissatisfaction. By targeting inspections of the highest risk local sewers, EWS will have the knowledge and ability to rehabilitate or replace sections of pipe that are at risk of failure. This

will result in prolonging the useful life of the pipes, improving the overall physical condition and reducing the risk in the sewer system.

5.2 Alternative 2 – Increase Scope Relative to this Proposal

16. A second alternative is to increase the length of pipe that would be addressed under this program. While an increase in small trunk renewal would provide a greater risk reduction, it would require a higher capital investment which would directly impact the rate payer. Although increased risk reduction is a favourable outcome, it is essential to balance the funding needs of the local sewer assets with the overall system needs. Considering the impact to the rate payer, capital funds must be optimized across the needs and requirements of all assets, ensuring the longevity and reliability of our entire system. By evaluating factors such as local sewer asset condition and risk levels, resource availability, and budget constraints, it is not recommended to increase the scope for this program at this time. The projection of 60-70 km of renewal over the PBR term will allow EWS to target the highest risk local sewers in the Intervention 1 grouping as well as about 40% of the Medium-High risk pipes in Intervention 2, significantly reducing risk in the system. In future PBR terms, the remaining pipes in Intervention 2 will be targeted.

5.3 Alternative 3 – Reduce Scope Relative to this Proposal

17. Similarly, a third alternative is to decrease the length of pipe that would be addressed under this program. While a decrease in local sewer renewal would reduce the impact to the rate payer in the short term, a decrease in scope would reduce the risk reduction that can be achieved over the PBR term. This could result in a higher number of costly and disruptive emergency repairs, impacting the rate payer in the long term. In order to target the highest risk pipes and reduce the risk of pipes in Intervention 1 and 2, it is important to maintain 60-70 km of renewal over the PBR term.

6.0 COST FORECAST

18. The project cost estimates are based on historical information such as average annual lengths of inspections required, average annual reline and open cut lengths, and unit costs from design and construction of past local sewer projects. Assumptions and approach are as follows based on EWS's experience and learnings from past years:

- All CCTV inspections will be completed internally.

- Approximately 50 km of local sewers will be inspected.
- Design for rehabilitation repairs will be completed internally.
- Relining will be completed by external resources.
- Open cut will be completed by internal resources and external resources.

19. Table 6.0-1 provides the forecast capital expenditures for this program for the 2025-2027 PBR term.

Table 6.0-1
Local System Rehabilitation Program Capital Expenditure Forecast 2025-2027 ($ millions)

	2025	2026	2027	Total
Total Capital Expenditures	20.2	19.7	20.2	60.1

20. In addition to the table above, Table 6.0-2 provides the estimated capital expenditure for the Local System Rehabilitation by sub-program during the 2025-2027 PBR term.

Table 6.0-2
Local System Rehabilitation Program Capital Expenditure Forecast by Project 2025-2027 ($ millions)

Project	Capital Expenditure Forecast
1. Proactive Local Sewer	53.6
2. Reactive Local Sewer	6.5
3. Total Capital Expenditures	60.1

7.0 KEY RISKS AND MITIGATION PLANS

21. Table 7.0-1 provides the key risks and mitigation associated with executing this program.

Table 7.0-1
Key Risks and Mitigation Plans

Risk	Mitigation Plan
1. Health and Safety Risks - There is a risk of local drainage asset failure such as main lines and services that could result in sewer backup which is a potential health risk to the public.	Replacing or rehabilitating local infrastructure would extend the life of the assets and lower the risks of asset failure.
2. Execution Risks - The program is subject to such execution risks including utility conflicts, unexpected scope increases, poor soil conditions, new road restoration requirements, increase in overall construction prices, and section conflicts with other construction projects in the area.	EWS will circulate all projects through the Utility Line Assignment (ULA) system, deal with force accounts on an individual basis. To manage program schedules, EWS will ensure inspectors are recording all delays and force accounts. EWS will work with the COE to identify and clarify new requirements and or changes to the project and will coordinate construction with other utilities and COE.

	EWS's internal resources will undertake all project related activities including any required inspection, project management, design, construction coordination and survey as well as-built recording. EWS will employ pre-qualified external contractors for additional CCTV inspection required due to lack of internal resources availability, open cut and relining works to complete construction.
3. Traffic Disruption Risks - The COE's commitment to prevent significant traffic impacts from construction, especially downtown, may impact EWS's ability to get OSCAM permits or restrict our work to off-peak hours.	EWS will advise the COE's Traffic Operations Group of all projects where roads are affected well in advance of construction.
4. Customer Impacts - There is a risk of sewer failure that could result in service interruption affecting the residents in the neighbourhoods for a few weeks.	The proposed rehabilitation would lower the risks of sewer failure and service interruption in the neighbourhoods.
4. Financial - The potential sewer main failure could result in more costly emergency replacement. Materials and skilled labour are subject to market variability. There are also project unknowns that may affect costing.	The proposed renewal program would lower the risks of sewer failure in the and therefore reduce emergency replacement costs. The activities in this program have been previously carried out, and a general understanding of the tasks and costs have been developed. Project costing is typically reviewed to ensure it aligns with assumptions and expectations. To mitigate cost escalations, thorough planning and proactive measures are essential. This can include detailed cost estimates during the planning phase, contingency budgets, and a comprehensive risk identification and analysis. Contracts should be clear with provisions for addressing unforeseen cost increases. Regular monitoring, strong relationships with contractors and suppliers, and experienced project managers are important to reduce the likelihood of cost increases. Value engineering to evaluate alternative materials, construction methods, or design modifications can also help to mitigate price increases.

8.0 RESOURCES

22. All activities related to project management, inspections, assessment, design, and open cut construction will be undertaken by internal EPCOR resources. EPCOR will employ pre-qualified external contractors to complete the relining scope.

EPCOR WATER SERVICES

Appendix G-12

Business Case

MAINTENANCE HOLE AND CATCH BASIN REPLACEMENT PROGRAM

May 31, 2024

Table of Contents

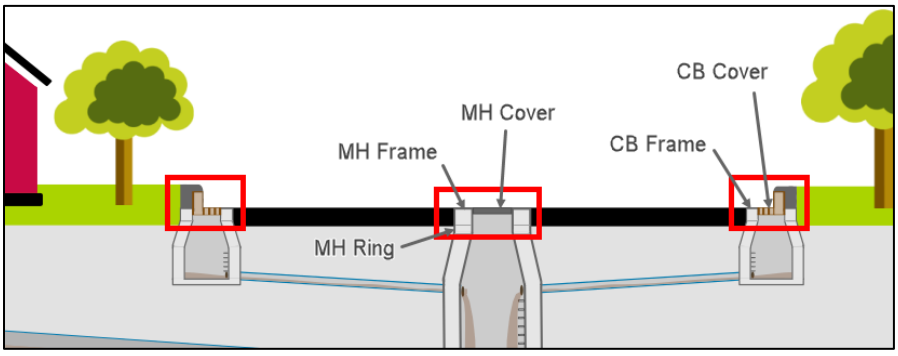
1.0 OVERVIEW

1. The Maintenance Hole (MH) and Catch Basin (CB) Replacement Program is to assess and replace the shallow portion of MHs and CBs before end of life. These replacements will be done in coordination with EPCOR Water Services (EWS) rehabilitation programs and City of Edmonton roadway rehabilitation programs. The total estimated cost for this program for the 2025-2027 PBR term is $11.8 million.

2.0 BACKGROUND

2. The wastewater collection system comprises of over 100,000 MHs and 70,000 CBs. To address the challenge of failing or failed MHs and CBs, an ongoing replacement program has been implemented. A failed asset refers to infrastructure that can no longer perform its function as intended or has become a hazard to the public, while a failing asset is deficient in some capacity but is still able to perform its function. This program replaces the shallow portion of MHs and CBs including the frame, cover, and rings, which are typically the components with the shortest lifespan. This ensures the continued functionality and reliability of the wastewater collection infrastructure. Figure 2.0-1 outlines the portion of the MHs and CBs that are covered by this program.

Figure 2.0-1
Maintenance Hole and Catch Basin Schematic

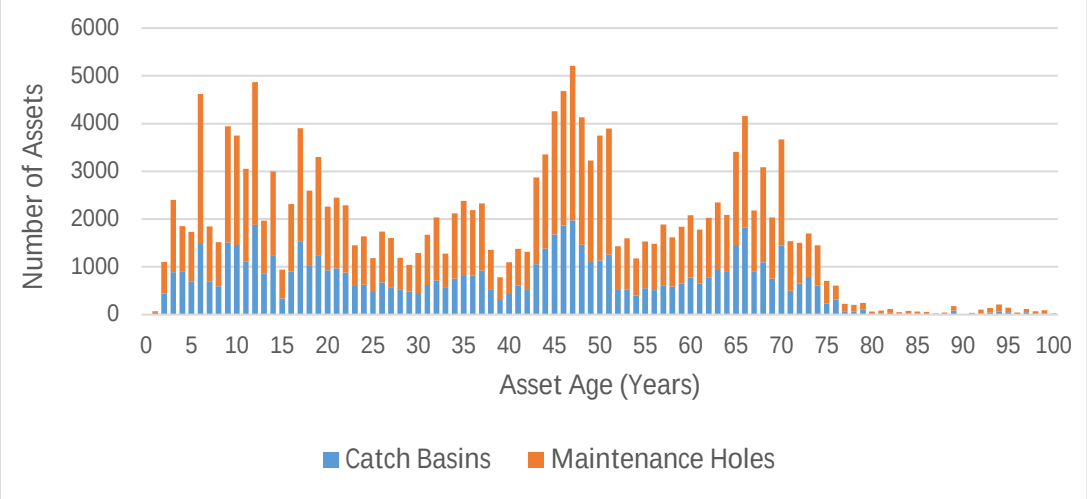


- Portion of Assets covered by the MH and CB Replacement Program

3. MH and CB replacements under this program are primarily a result of aging infrastructure and the wearing down of these highly visible assets. Figure 2.0-2 depicts the age distribution of MHs and CBs and as shown in the figure, over 50% of these assets are over 40 years of age. With an expected lifespan of 75 years, these aging assets are expected to contribute to future waves

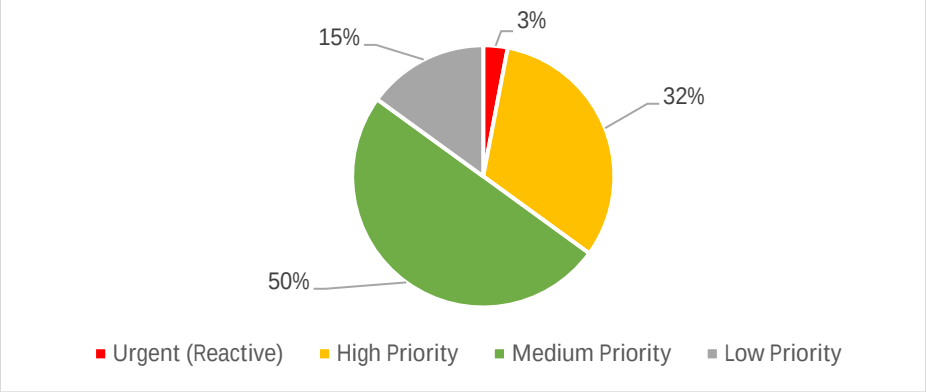
of shallow asset replacements conducted under this program. In addition to age, the wearing down of the shallow portion of MHs and CBs is highly dependent on asset location. Assets in high traffic locations such as arterial roadways usually wear down more quickly which impacts the lifespan of the assets. Therefore, the lifespan of these assets can vary greatly.

Figure 2.0-2
Number of MHs and CBs by Asset Age



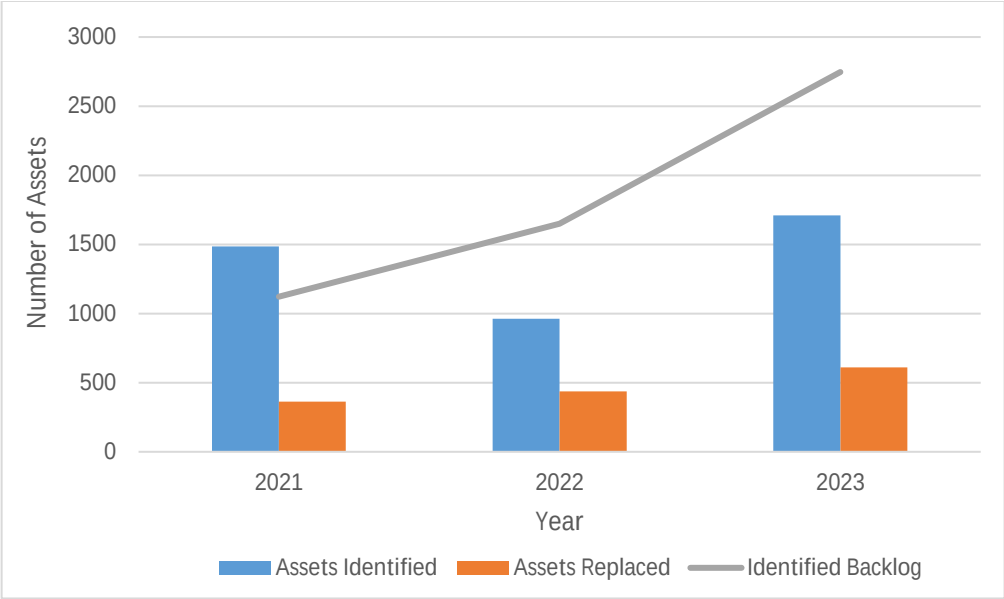
4. MHs and CBs are inspected on an ongoing basis. These inspections are conducted in response to field crews and/or customers identifying facility issues, and by proactively targeting areas around the city. During this process, assets with issues are categorized by field crews as urgent, or prioritized as high, medium, or low priority. Classification is based on the extent of issues, safety concerns, and impact on the public. Assets categorized as urgent pose an imminent safety hazard to the public and require immediate repair, while assets categorized as high priority also pose a hazard to the public but the risk can be temporarily mitigated with barricades until a replacement can be scheduled. Medium and low priority assets do not pose a hazard to the public or require barricades. Between 2021 and 2023, an average of 1400 new assets were identified to have issues each year. Figure 2.0-3 depicts the average breakdown of priority classification for assets identified to have issues under this program.

Figure 2.0-3
Average Priority Classification of Assets Identified to have Issues



5. Based on inspection data, by the end of 2023 approximately 2700 assets had been identified to have existing issues, with roughly a third being CBs and the remaining being MHs. Figure 2.0-4 depicts the number of assets identified to have issues and replaced each year from 2021-2023, and the corresponding changes to the identified backlog. The backlog is continuously updated as new assets are identified to have issues through inspections and assets previously identified to have issues are replaced and removed from the backlog. The tracking of assets with identified issues and their subsequent replacements began in 2020, thus data for the identified backlog begins in 2021. As supported by the figure, the identified backlog of assets is increasing over time and is expected to continue increasing year-over-year as more facilities are inspected.

Figure 2.0-4
MH and CB Replacement Program by Year



6. This program works to address the existing identified backlog and perform the replacements required for MHs and CBs. The historical number of assets replaced under this program from 2020-2023 are shown in Table 2.0-1.

Table 2.0-1
MH and CB Asset Replacements 2020-2023

Year	Assets Replaced		
	Maintenance Holes	Catch Basins	Total
2020	422	82	504
2021	194	170	364
2022	289	147	436
2023	447	164	611

7. The MH and CB replacement program utilizes proactive and reactive strategies to prioritize the replacement of the shallow portion of MHs and CBs. These strategies include proactively replacing high, medium, and low priority assets in the identified backlog that are expected to fail in the near future, and reactively replacing failed assets that have been identified as urgent and require immediate repair. Reactive replacements can include situations in which there is active subsidence around a failed facility, or any other circumstances in which a damaged or failed facility will cause a hazard for the public if not replaced. Proactive work is conducted on facilities with notable wear and/or aging that require non-urgent replacement, such as MHs or CBs with worn-out frames and covers. The non-urgent nature of this work allows for the coordination of these replacements to optimize time and resources. Proactive replacement is the preferred approach to asset replacement as, compared to reactive replacement, it is more effective at reducing risk to public safety and can minimize traffic disruptions and replacement costs. Currently, approximately 90% of work completed is proactive and the remaining 10% is reactive. This program aims to reduce the quantity of reactive replacements required through utilizing proactive approaches to monitor and rehabilitate facilities prior to their end of life. This program will work in collaboration with the Inflow and Infiltration Relining Program developed in with the Stormwater Integrated Resource Plan (SIRP) and will utilize the planning done under SIRP to prioritize some of the MH replacement work.

8. Replacement work under this program also considers asset replacement and road restoration work planned under City of Edmonton roadway rehabilitation programs. As part of their roadway rehabilitation programs such as Neighbourhood Renewal or Arterial and Collector Roadway Renewal, MHs and CBs can be replaced through their work, further reducing the number of assets needing to be replaced.

3.0 JUSTIFICATION

9. Failed MHs and CBs present a public safety risk, and timely replacement of these assets is critical. By implementing this program, the potential for injury resulting from failed drainage infrastructure is significantly reduced, enhancing overall safety for the community.

10. Without this program, the failed MHs and CBs would remain in place, increasing the public safety risk to customers associated with the potential for personal injury and damage to vehicles. Figure 3.0-1 depicts an example of an active subsidence surrounding a failed MH. Having a quick turn around on failed and failing infrastructure ensures the risks posed to customer safety are mitigated.

Figure 3.0-1
Active Subsidence around a Failed MH

11. In decreasing risk to public safety, this program also reduces the number of insurance claims against EPCOR and reduces liability. In 2023 there were 37 claims made against EPCOR related to MH and CB deficiencies, while in 2022 there were 57 claims made. Historically, these claims typically consist of tire/wheel damage, but there have been claims that have included personal injuries. In these cases, if EPCOR is aware that these assets were deficient prior to their failure, it can open EPCOR to being liable for damages caused by these facilities. Therefore, it is important that the backlog be proactively addressed.

12. By addressing infrastructure issues before they lead to failures, EWS also aims to minimize disruptions to customers, particularly on major roadways. By coordinating the replacement of these assets prior to failure, traffic disruptions will be less frequent and less disruptive. Work on

major roadways can be scheduled during low traffic periods, and with enough anticipated work, EWS will engage an external contractor for roadway restoration to ensure the road closures are minimized. Coordination of replacement work with EWS rehabilitation programs and City of Edmonton roadway rehabilitation programs also ensures traffic disruptions are minimized while allowing for a more efficient allocation of resources.

4.0 PROGRAM SCOPE

13. The MH and CB Replacement Program identifies, inspects, and replaces the shallow portion of MHs and CBs (up to 1.2m from grade) including frames, covers, and rings. For MHs, ring replacement will be completed to a depth of up to 1.1 m below the ground surface, while for CBs, ring replacement will be completed at a depth of up to 0.75 m, as per design standards.

14. MHs and CBs are replaced on a proactive and reactive basis. Proactive replacement refers to replacement work conducted on MHs and CBs that are approaching failure likely within a few months, but do not require immediate replacement. This includes the replacement of high, medium, and low priority assets that have been identified to have issues. Reactive replacement refers to work on failed MHs and CBs that have been identified as urgent and require immediate replacement. Assets that are proactively replaced can be scheduled in advance, allowing for an optimization of resources as nearby assets can be replaced together. In the case of reactive replacements, due to the pressing and expedited nature of the work, crews conducting these replacements commonly replace one asset at a time. The goal is to complete asset replacements proactively before assets fail and become public safety hazards. Reducing the quantity of reactive replacements mitigates risk to public safety and minimizes the burden and cost implications of having to plan and coordinate emergency replacement work.

15. Identification of replacement projects under this program occurs in several ways, including:

- Field crews identifying worn out or broken MHs and CBs through their regular work activities.
- Customer notification of failed or failing MHs or CBs.
- Examination of MH and CB condition in locations where other rehabilitation work is planned to create opportunities for coordination between rehabilitation programs.
- City road programs identifying and replacing deficient MHs and CBs in their activities.
- Proactive inspections targeting areas where no recent inspection data is available, prioritizing high traffic locations and areas with older facilities.

16. Prioritization of work is dependent on several factors, including asset condition, age, location, and likelihood of failure. Assets that have failed or are failing and are in high-risk locations are given priority. High-risk locations include areas within the wheel path of vehicles on major roadways, where infrastructure is expected to wear down more quickly and asset failure is at increased risk of injuring the public and causing damages to vehicles. In these areas, emergency repairs would cause major traffic interruptions. Additionally, this program will work in collaboration with the Inflow and Infiltration Relining program to assess MHs located in localized sag areas of high-risk sub-basins and identify high priority MHs that can be included in this program.

17. Approximately 1,200-1,600 MHs are expected to be replaced in the 2025-2027 PBR term. These replacements include reactive replacements which will be completed as required, and proactive replacements which will be conducted on an ongoing basis. Replacement work is conducted to address the highest priority assets. For proactive replacement work this generally includes prioritizing assets that have been categorized as high priority and utilizing remaining resources for medium priority asset replacements. Scheduling of this work will optimize resources by batching together nearby previously identified repairs. In addition, the work will be coordinated with other rehabilitation programs such as Local Sewer Rehabilitation and Inflow and Infiltration Relining as well as City of Edmonton roadway rehabilitation projects such as the Arterial and Collector Roadway Renewal Program. In cases where the City of Edmonton is renewing a roadway but does not plan to replace the drainage infrastructure, this program will proactively inspect and replace MHs and CBs that require replacement.

18. This program focuses only on the top portion of MHs and CBs. These portions of the assets generally have a shorter life span when compared to deeper components of the asset, requiring them to be replaced at a higher frequency. Replacement of the deeper components of MHs and CBs are out of scope for this program and would require different equipment, material, and procedures than shallow infrastructure replacements. Full depth MH and CB replacements will be included in other program scopes such as Local Sewer Rehabilitation and High Priority Repair.

5.0 ALTERNATIVES CONSIDERED

5.1 Alternative 1 – Do Not Implement this Program (Rely on Other Programs)

19. This alternative would involve not implementing the MH and CB Replacement Program. This would leave all MH and CB replacements to the Local Sewer Rehabilitation and High Priority Repair Programs. While these other programs work on MHs and CBs, they focus on deeper sections of these assets, therefore shallow replacement work would not be prioritized. Thus, not undertaking this program would result in the shallow portions of these assets failing at an increased rate as these portions of the assets commonly require replacement at a higher frequency than allowed by the Local Sewer Rehabilitation and High Priority Repair programs. This alternative would insufficiently address the risk failing infrastructure poses to public safety and would result in an increased number of urgent replacements which are more costly and disruptive. This option is not recommended.

5.2 Alternative 2 - Increase Scope

20. This alternative involves conducting reactive replacements and an increased quantity of proactive replacements on MHs and CBs to completely address the existing backlog and maintain this backlog at zero. With implementation of this option, EWS would expect to see a decrease in the quantity of reactive replacements required over time as more of these assets are replaced prior to failure. This would allow for increased risk reduction but would call for increased capital investment, impacting the rate payer. In the 2025-2027 PBR term, this approach would require an estimated 3000+ replacements to address the pre-existing backlog and an additional estimated 1400 replacements per year (based on historical inspection data) to replace the assets identified to have issues through ongoing inspections. To complete these replacements, additional labourers, vehicles, and replacement equipment would be required to supplement current internal resources and an external contractor would likely need to be hired to conduct replacement work. This would require a budget of approximately $50 million for the 2025-2027 PBR term. Furthermore, although this alternative would decrease the risk of MH and CB failure, it is not feasible to anticipate all MH and CB failures, thereby making it unlikely that reactive replacements can be completely avoided. This is not a recommended option.

5.3 Alternative 3 - Reduce Scope - Conduct Reactive Replacements Only

21. This alternative would only replace completely failed infrastructure and would conduct no proactive replacement work. While this would reduce the program's budget requirement to approximately $1.0 million dollars for the 2025-2027 PBR term, this approach fails to mitigate the heightened risk to public safety posed by infrastructure that is near failure. It is essential to address these potential risks, particularly in high-risk locations such as major roadways, through proactive measures rather than waiting for failures to occur. Not only do proactive replacements reduce the risk to the public, planned work is typically less costly and less disruptive to the public. Additionally, there are liability risks for EPCOR if failing assets are not addressed. Although implementation of this approach would be less costly initially, this would push back asset replacements and result in a greater number of reactive replacements in the future. Conducting only reactive replacements is a more costly approach in the long term and would negatively impact EPCOR's reputation. This option is not recommended.

6.0 COST FORECAST

22. The cost estimates are based on replacements completed in 2022 using current replacement methodology of pre-saw cutting and utilizing in house backhoes and crews to conduct the replacement. The paving restoration of the work will be conducted by a private contractor.

23. Table 6.0-1 provides the cost forecast for this program for the 2025-2027 PBR term.

Table 6.0-1
MH and CB Replacement Program Capital Expenditure Forecast ($ millions)

	2025	2026	2027	Total
Total Capital Expenditures	3.4	4.0	4.4	11.8

24. The assumed yearly breakdown on costs between MH and CB replacements under this program based on historical data is provided in Table 6.0-2. This assumes that 60% and 40% of costs are allocated to MH replacements and CB replacements, respectively.

Table 6.0-2
MH and CB Replacement Program Capital Expenditure Forecast by Asset Type ($ millions)

Asset Type	2025	2026	2027	Total
1. Maintenance Holes	2.4	2.8	3.1	8.2
2. Catch Basins	1.0	1.2	1.3	3.5
3. Total	3.4	3.9	4.4	11.8

25. Table 6.0-3 shows the assumed cost allocation between proactive and reactive replacement approaches for the 2025-2027 PBR term. This assumes a cost breakdown of 90% and 10% between proactive replacements and reactive replacements, respectively, and is based on historical data.

Table 6.0-3
MH and CB Replacement Program Capital Expenditure Forecast by Replacement Approach ($ millions)

Replacement Approach	2025	2026	2027	Total
1. Proactive Replacement	3.1	3.6	4.0	10.6
2. Reactive Replacement	0.3	0.4	0.4	1.2
3. Total	3.4	3.9	4.4	11.8

26. Based on historical data, less than 2% of this program's budget is expected to be allocated to coordination with City of Edmonton roadway programs.

7.0 KEY RISKS AND MITIGATION PLANS

27. Table 7.0-1 provides the key risks and mitigations plans associated with the implementation of this program.

Table 7.0-1
Key Risks and Mitigation Plans

Risk	Mitigation Plan
1. Health and Safety Risk – There is a risk that the failure of MHs and CBs could result a safety risk to the public. Worn frame or cover assets can become serious tripping hazards for the public. It is possible for applied pressure on one side of a worn MH cover to cause it to flip open and expose the MH, which can result in a member of the public falling into the MH or driving into open MHs. The flipped MH can also contact the tires and/or underside of a vehicle causing extensive damage.	By maintaining the frame and cover of these assets through this replacement program, the possibility of such incidents occurring becomes smaller.

2. Execution Risk – Using equipment such as jackhammers when replacing MH structures may expose workers to silica dust, which over prolonged exposure can lead to silicosis. This condition is serious and can increase the individual's risk of developing cancer among other diseases. Additionally, there is risk associated with working on busy roadways.	Risk is mitigated by using the appropriate kind of respirator to filter out silica (and other) particles suspended in the air as well as using mechanized equipment so that workers are not directly exposed to the dust. Also moving to mechanized solutions in place of jackhammers to remove workers from the line of fire altogether. To mitigate the risks to work safety on high traffic roadways, work on high traffic roads will be scheduled during lower traffic periods.
3. Traffic Disruption Risk – emergency replacements could result in traffic interruptions.	This program will prioritize the proactive repair of assets in high traffic location, so that these assets are failed prior to failure, minimizing traffic disruptions during peak hours on high traffic roadways.
4. Financial Risk – Emergency replacements often result in more costly replacements. Materials and skilled labour are subject to market variability. There are also project unknowns that may affect costing. Further change orders or unknown conditions that cannot be foreseen.	Proactive replacement of assets under this program allows for the coordination of nearby assets to be replaced together, reducing mobilization costs. EWS manages financial risks by conducting preliminary design and obtaining manufacturer's quotes for establishing the project budget. The financial risks will become more evident as further design is completed. A competitive procurement strategy will also be implemented to ensure the best value is achieved.

8.0 RESOURCES

28. Internal resources will be used to complete the reactive and proactive replacements. External resources will be used to complete the restoration work.

EPCOR WATER SERVICES

Appendix G-13

Business Case

SMALL TRUNK REHABILITATION PROGRAM

May 31, 2024

TABLE OF CONTENTS

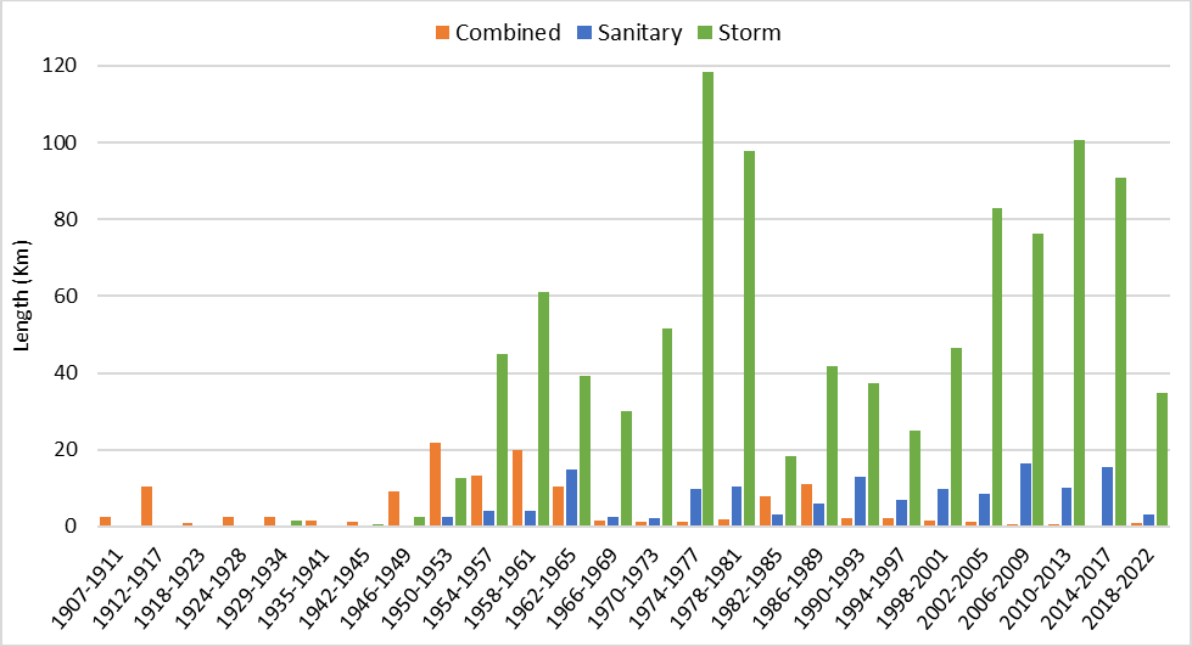
1.0 OVERVIEW

1. The Small Trunk Rehabilitation Program focuses on the rehabilitation of aging small trunks around the city of Edmonton. Small trunks are gravity fed and are used to convey sanitary, storm, and combined flows from local drainage pipes to larger trunks throughout the system. The scope of work includes targeted inspections, relining, and open cut repairs of small trunks at a total spend of $35.8 million over the 2025-2027 PBR term.

2.0 BACKGROUND

2. Small trunks range in diameter from 600 mm to less than 1200 mm, and include pipes on trestles across the city. Small trunks account for the second largest portion of underground pipe in the sewer system at approximately 1,310 km and have been constructed over the past 100 years to varying standards and specifications. Figure 2.0-1 shows the year of construction for small trunks, indicating that the majority were constructed since the 1950's. The average age of small trunks is 37 years. In general, the useful life of a small trunk is expected to be 75 years for all waste types, however many are failing and becoming high risk before their theoretical useful life.

Figure 2.0-1
Small Trunks Year of Construction



3. In 2023, a condition assessment study of the entire small trunk sewer network was completed using both observed defects and deterioration models based on age, material type, and waste type and produced a condition rating for each pipe. The resulting condition ratings were used to develop the Likelihood of Failure (LOF) for each pipe. Along with the LOF scores, Consequences of Failure (COF) were also completed across all six consequence categories using the EPCOR Risk Management Standards and Risk Matrix. The six consequence categories include Health and Safety, Environment, Regulatory, Reputation, Service Interruption, and Financial. A theoretical risk score was then calculated for each pipe and the results are shown on the matrix in Figure 2.0-2. Figure 2.0-3 below shows that of those small trunk sewers, the vast majority are made of concrete or clay tile pipe.

Figure 2.0-2
Small Trunk Risk Matrix

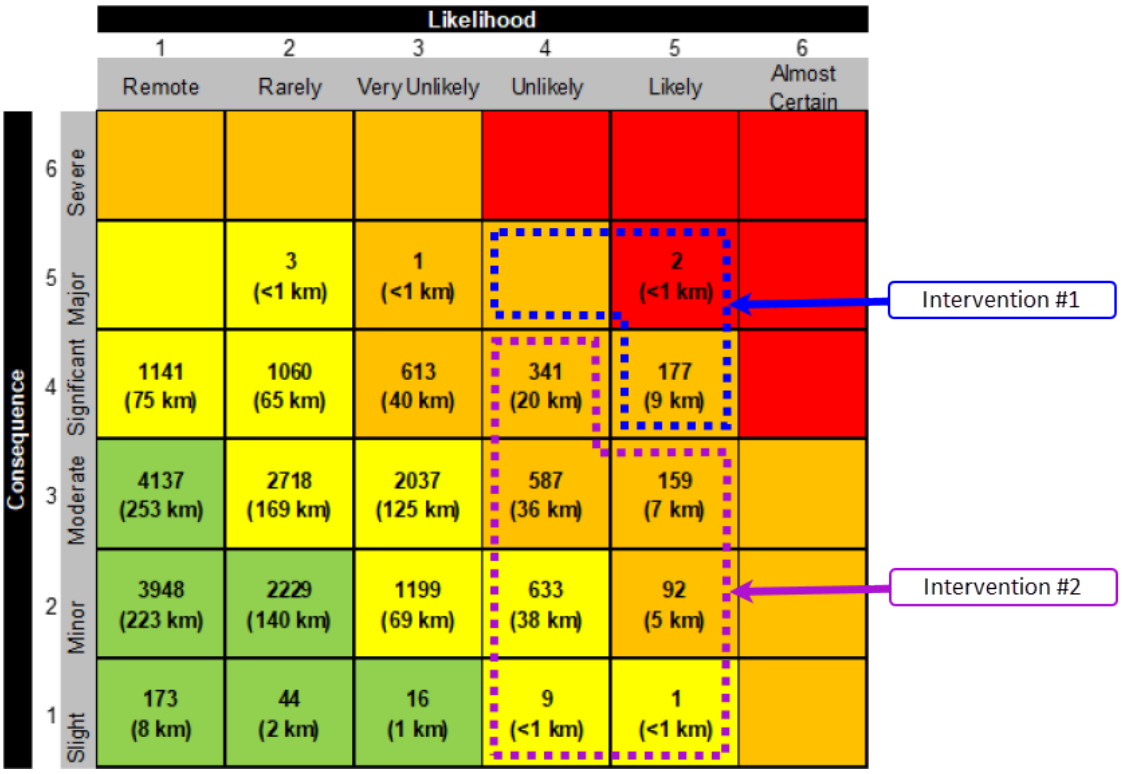
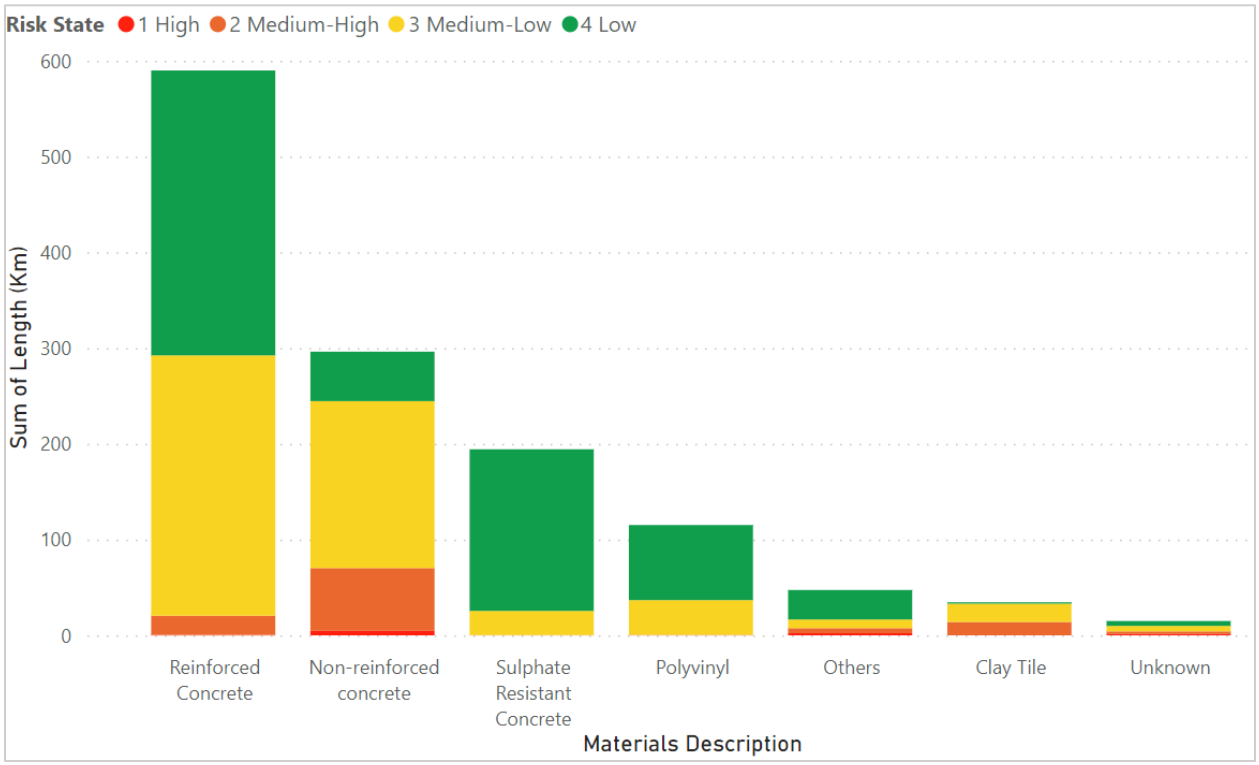


Figure 2.0-3
Condition Score by Material Type



4. The results show that about 115 km of small trunk sewers are considered Medium-High and High risk. As illustrated on the figure, the matrix can be divided into intervention actions for rehabilitation planning based on level of risk. The intervention boundaries were developed based on risk reduction, where assets with LOF scores of 4 or 5 are generally targeted first as they are critical assets that may have failed or are near end of life. Assets with high COF scores but lower LOF are typically in fair condition and can be monitored for any changes in their condition. There are about 10 km of pipes that fall into Intervention 1, while about 107 km fall into Intervention 2. Of the 107 km, about 65 km are considered Medium-High risk. This intervention breakdown can help to prioritize pipes for further investigation and/or rehabilitation.

5. Recognizing that small trunks have unique characteristics, inspection technique requirements, bypass needs, and methods of construction that differ from other linear assets, the Small Trunk Rehabilitation Program was initiated during the current 2022-2024 PBR term. Reactive projects are costly and disruptive, and this proactive program was established to focus on risk reduction within the small trunk asset class and to minimize major failures and emergency projects.

3.0 JUSTIFICATION

6. Assessing the condition of an aging sewer system and planning for rehabilitation is crucial for maintaining public health, environmental sustainability, and overall infrastructure resilience. As the system ages, it is prone to deterioration, leaks, and structural issues that can lead to contamination of water sources and pose health hazards. There are several key risk categories associated with the deterioration and failure of small trunk infrastructure:

- Health and Safety – Failure of a small trunk could cause a subsidence on roadways which poses a safety risk to the public. The release of hydrogen sulfide gas (H_2S) can also be a risk when working on sanitary or combined pipes.
- Environmental – Failure of a sanitary or combined small trunk could cause a sewage spill to the local environment or water bodies.
- Customer Disruptions – Failure of small trunks can cause disruption to large service areas impacting many customers and can also cause sewer back up into customer's basements. Failed trunks also lead to emergency repairs, which are more disruptive to high traffic roadways and therefore to the public.
- Financial – Emergency repairs of failed small trunks are more costly than proactive rehabilitation. Typically an emergency repair will require more open cut replacement, which is more expensive than relining. By completing the rehabilitation work proactively through relining there are significant cost savings.

7. Since much of the pipe material is concrete, several failure modes and defects would require attention, such as wall loss due to corrosion, joint separation, fractures, breaks and holes. Figure 3.0-1 below shows some typical deterioration found within small trunks such as visible steel reinforcement, corrosion, concrete wall loss, and a PVC material change which may indicate a past failure.

Figure 3.0-1
Deterioration of Small Trunks

8. Regular assessments of small trunk infrastructure helps to identify vulnerabilities and enable proactive rehabilitation measures, thereby mitigating the risks identified above. Capital investment should be aimed at reducing the LOF by improving asset condition and extending the life of the infrastructure. Proactive implementation with steady investment levels will ensure that high-cost emergency replacements are reduced.

4.0 PROGRAM SCOPE

9. Theoretical risk scores are used as the criteria for inspection of small trunks to build the scope of the program. Each year, the highest risk candidates are reviewed and considered for inspection to ensure the most risk reduction to the system. In addition to risk, several other factors such as operational issues or synergy with other projects will be considered when refining the prioritization of inspections. For this PBR term, the focus will be on the Intervention 1 pipes shown on the small trunk risk matrix.

10. Closed-circuit televising (CCTV) inspections or Multi-Sensor Inspections (MSI) of the prioritized highest risk pipes will be required in order to determine locations for renewal. The inspections will also be used to validate locations and confirm the extent of capital investments required for renewal. Inspections will be reviewed and given a grade based on the Pipe Assessment Certification Program (PACP) Ranking System. PACP is the North American standard for pipe defect identification and assessment, providing standardization and consistency to the methods in which pipe conditions are identified, evaluated, and managed. Once the

infrastructure has been reviewed and graded, a risk assessment and evaluation will be undertaken for each segment to determine a LOF and COF score. From this post-inspection rating, trunks classified as High risk will be prioritized for rehabilitation as they are considered to be in a condition where attention is required to address potential issues. Pipes classified as Medium-High will be evaluated to determine the necessity and timing of rehabilitation based on their individual scores, the type and severity of defects, and budget availability.

11. In addition, there are about 65 km of existing small trunk inspections with a risk level in Intervention 1 and 2. These existing inspections will be reviewed to determine capital needs and the highest risk locations will be considered as part of this program.

12. Over the course of the 2025-2027 PBR term, approximately 10.8 km of small trunk sewer will be renewed. This estimate assumes that 10 km will be through relining, and 800 m will be replaced through open cut. This work may also include rehabilitation of the Trestle #2 on the Clareview Sanitary Trunk (CST) as part of a broader rehabilitation of the entire CST line. Initial scope plans for this PBR term have been developed based on condition ratings, past inspection and repair data, projected conditions of this asset type over time and risk assessment.

5.0 ALTERNATIVES CONSIDERED

5.1 Alternative 1 – Do Nothing

13. An alternative to this program is to do nothing and not proactively rehabilitate any small trunks. If nothing is done, the infrastructure will be at risk of eventual failure, especially the sanitary and combined trunks made of concrete and steel, as they can be subject to significant corrosion from H_2S. Failure of storm trunks may result in subsidence, blockages, and flooding. Although the advantage of doing nothing may be short-term cost savings for the rate payer, more expensive emergency repairs will result from infrastructure failures, increasing future capital needs for the High Priority Repair emergency program. Customers will also experience loss of service. Due to aging and deterioration of drainage infrastructure, unexpected failures may occur that disrupt sewer services to homeowners, cause roadway subsidence, or accidental sewage releases to the ground or river. It is more expensive to fix an unexpected failure than to address it proactively. A typical planned relining is at a unit cost of about $3,000/m, while unplanned emergency replacements require open cut spot replacement which averages about $5,000/m.

5.2 Alternative 2 – Increase Scope Relative to this Proposal

14. A second alternative is to increase the length of pipe that would be addressed under this program. While an increase in small trunk renewal would provide a greater risk reduction, it would require a higher capital investment which would directly impact the rate payer. Although increased risk reduction is a favourable outcome, it is essential to balance the funding needs of the small trunk assets with the overall system needs. Considering the impact to the rate payer, capital funds must be optimized across the needs and requirements of all assets, ensuring the longevity and reliability of our entire system. By evaluating factors such as small trunk asset condition and risk levels, resource availability, and budget constraints, it is not recommended to increase the scope for this program at this time. Our projection of 10 km of renewal over the PBR term will allow EWS to target the highest risk small trunks in the Intervention 1 grouping, significantly reducing risk in the system. In future PBR terms, pipes in Intervention 2 will be targeted.

5.3 Alternative 3 – Reduce Scope Relative to this Proposal

15. Similarly, a third alternative is to decrease the length of pipe that would be addressed under this program. While a decrease in small trunk renewal would reduce the impact to the rate payer in the short term, a decrease in scope would reduce the risk reduction that can be achieved over the PBR term. This could result in a higher number of costly and disruptive emergency repairs, impacting the rate payer in the long term. In order to target the highest risk pipes and reduce the risk of pipes in Intervention 1, it is important to maintain the 10 km of renewal over the PBR term.

6.0 COST FORECAST

16. The program cost estimates for the 2025-2027 PBR term are shown in Table 6.0-1. They are based on historical information such as past inspection costs, past design costs and past construction costs of similar small trunk projects. Assumptions for the 2025-2027 PBR term are as follows:

- CCTV inspections will be completed by internal resources, while MSI will be completed by external resources
- 10 km of full relining will be completed
- 800 m of full replacement will be completed
- Relining will be completed by external contractors

- Replacements will be completed by internal resources
- Geotechnical investigations will be completed by external contractors

Table 6.0-1
Small Trunk Rehabilitation Program Capital Expenditure Forecast 2025-2027 ($ millions)

	2025	2026	2027	Total
Total Capital Expenditures	13.3	12.9	9.6	35.8

7.0 KEY RISKS AND MITIGATION PLANS

17. Table 7.0-1 provides key risks and mitigation plans associated with this program.

Table 7.0-1
Key Risks and Mitigation Plans

Risk	Mitigation Plan
1. Health and Safety Risks – Failed small trunks could result in sinkholes on busy roadways and a safety risk to pedestrians and motorists. Failed trestle pipes could result in collapse above public trails and result in danger to the public.	This program will reduce the risks of small trunk failures and the associated occurrence of sinkholes or trestle pipe collapse.
2. Environmental Risks – Failed small trunks can allow the release of untreated sewage into the environment which violates the Approval-to-Operate	This program will reduce the risks of small trunk failures and the associated environmental risks.
3. Execution Risks – Utility conflicts, unexpected scope increases, bad soil conditions, new road restoration requirements, and conflicts with other construction projects in the area.	EWS will circulate all projects through the Utility Line Application (authorization for utility installations within public road right of way) system. EWS will deal with force accounts (additional work not within the original scope in the contract) on an individual basis and ensure inspectors are recording all delays and force accounts
4. Financial Risks – Potential trunk failure could result in more costly emergency replacement. Increase to overall construction prices based on market conditions	This program will reduce the risks of trunk failure and the associated emergency replacement costs. EWS will include contractors early on in the process, clearly identify scope requirements and evaluate options such as bundling multiple project scope or using a design-build approach when efficiencies can be identified.

8.0 RESOURCES

18. All activities related to project management, inspections, assessment, design, and open cut construction will be undertaken by internal EPCOR resources. EPCOR will employ pre-qualified external contractors to complete the relining scope.

EPCOR WATER SERVICES

Appendix G-14

Business Case

SMART PONDS PROGRAM

May 31, 2024

TABLE OF CONTENTS

1.0 OVERVIEW

1. The Smart Ponds Program is a capital program that converts existing Stormwater Management Facilities into smart ponds for enhanced storm water management. Smart ponds use technology such as automatic gates, water level and flow sensors, and weather radar/precipitation data to create a system wide control system. This approach optimizes the utilization of existing capacity during a rainstorm event to reduce flooding risks in the community. Smart Ponds are a critical element of EPCOR Water Services' (EWS) Stormwater Integrated Resource Plan (SIRP) to mitigate flood risk across Edmonton through the SIRP-Predict component of the plan. During the 2025-2027 PBR term, this program is forecast to initiate 5 areas projects per year. The total capital spend is $18.9 million. Of that total cost, $6.7 million is estimated to be covered by grant funding, resulting in net capital expenditures of $12.2 million.

2.0 BACKGROUND

2. Smart Pond installations are part of the PREDICT theme of the SIRP strategy. SIRP is a system wide integrated approach to mitigate flood risk by reducing the health, safety, and social risk of flooding with lower overall capital investment than compared to traditional engineering approaches. SIRP recommended a five-theme strategy for flood mitigation (SLOW, MOVE, SECURE, PREDICT and RESPOND) that included a mix of grey infrastructure (trunks and tunnels) and green infrastructure (dry ponds, low impact development). The PREDICT theme focuses on predicting and managing the movement of stormwater through implementation of smart sensors and technologies that integrate into the existing collection system. Under the SIRP Predict theme, EWS has initiated a new program to install smart technology on all the existing 117 stormwater wet ponds. The proposed technology includes automated gates, flow and water level sensors, and the incorporation of weather radar/precipitation data as part of the overall control system.

3. Smart Ponds serve to reduce overland flooding by optimizing existing storage in the collection system during a rainstorm event. Utilizing the full potential of the storage within the system limits stress to downstream assets such as the Gold Bar Wastewater Treatment Plant (GBWWTP) and outfalls on the receiving creeks and the North Saskatchewan River (NSR) and improves the drainage capacity in neighbourhoods hit hardest by large storm events. Using this storage during storms will also reduce bed and shore erosion of receiving streams, particularly during short duration and high intensity storms.

4. The monitoring systems and real time data analytics platforms developed through this program will permit system wide flood optimization during large storms. Smart infrastructure

can leverage underutilized stormwater management assets to maximize city-wide stormwater storage capacity across the city.

5. Smart technology has been used in other community sewer systems throughout North America with much success, such as predicting and moving sanitary flows in combined sewer systems to reduce combined sewer overflows in South Bend, Indiana. EWS has implemented a partial system utilizing similar technology in its Kennedale sewershed several years ago and has built insight into best management practices for Edmonton's collection system. Under this application, EWS will begin system-wide implementation of smart technology across all stormwater management facilities in Edmonton, starting with wet ponds.

6. The Smart Ponds Program is partially funded by the federal Disaster Mitigation Adaption Fund (DMAF) with 40% of eligible funds being covered by the federal grant, significantly reducing the cost to ratepayers over the next decade. The estimated cost for each project will be site specific for each individual pond and is forecasted to range between $300,000 to $800,000 per location.

7. Most storms in Edmonton are small, with intense events affecting smaller areas over a short duration. Edmonton's storms are often localized and intense, surrounded by areas of less intense rainfall. Storm water management assets that are located along the storm's periphery can be underutilized while the pipes and ponds located a short distance away in the intense core of the storm can be exceeding their design capacity. Using sensors to identify capacity opportunities along a storms path to fill and store additional storm water in underutilized assets provides the means to provide capacity relief for the storm management assets operating within the more intense core of a storm.

8. Smart ponds enable widespread optimization of the existing stormwater management system infrastructure including not only the stormwater management facilities where automation is installed, but for all the interconnected storm sewers. The regulation of flows facilitated by the smart ponds will see the greatest benefit in areas of the sewershed that currently do not have a storm water management facility. The total area benefiting from the program is 26,000 ha or 47% of the total area of the city.

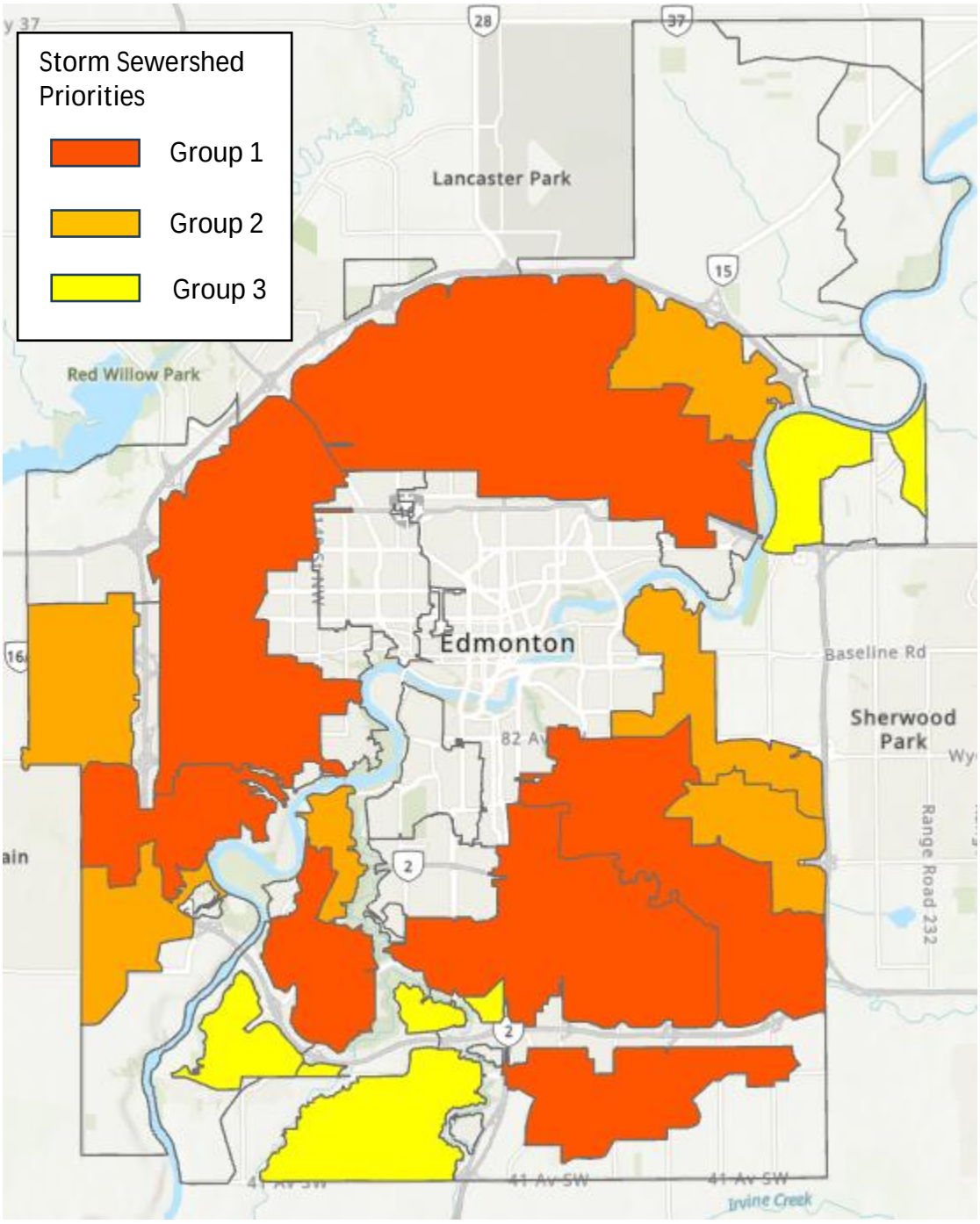
9. EWS has risk ranked each storm sewershed that contains a wet stormwater management facility based on the proportion of the sewershed which will benefit from the project, the overall population benefited, the presence of critical infrastructure within the sewershed and the presence of any known issues within the sewershed (i.e. hydraulic capacity of the sewer system,

stability of the receiving watercourse). This will allow EWS to prioritize installation based on the storm sewershed with the highest urban flood risk. This risk ranking is shown in Table 2.0-1 and Figure 2.0-1 shown below.

Table 2.0-1
Sewershed Profiles

Storm Sewershed	No. of Wet Ponds	Total Area (ha)	Population	% Area Benefited	Population Benefited	Priority	Stage
Kennedale	24	7,311	187,733	79	148,006	GROUP 1	Underway
30th Avenue	10	5,191	126,306	90	113,853	GROUP 1	Underway
Mill Creek	10	3,434	50,968	77	39,288	GROUP 1	Underway
Quesnell	12	6,957	8,121	79	6,434	GROUP 1	Underway
Blackmud Creek North	12	1,857	37,819	50	18,910	GROUP 1	Completed in 2025-2027
Wedgewood North	13	1,592	3,714	67	2,476	GROUP 1	Completed in 2025-2027
Clareview	6	1,343	31,923	61	19,566	GROUP 2	Completed in 2025-2027
Fulton Creek	1	1,128	5,383	76	4,084	GROUP 2	Completed in 2025-2027
Gold Bar	4	1,483	12,044	68	8,240	GROUP 2	Initiated in 2025-2027
Blackmud Creek South	7	1,090	27,113	60	16,268	GROUP 2	Initiated in 2025-2027
Riverbend	1	422	4,960	42	2,067	GROUP 2	Initiated in 2025-2027
Wedgewood South	2	1,145	380	82	311	GROUP 2	Initiated in 2025-2027
Bearspaw	1	92	2,738	80	2,191	GROUP 3	Initiated in 2025-2027
Whitemud Creek North	1	207	10,663	50	5,331	GROUP 3	Initiated in 2025-2027
Whitemud Creek South	3	590	14,012	60	8,407	GROUP 3	Initiated in 2025-2027
Windermere	4	682	2,270	82	1,857	GROUP 3	Initiated in 2025-2027
Aurum Road	1	238	0	33	0	GROUP 3	Initiated in 2025-2027
East Anthony Henday	2	853	0	50	0	GROUP 3	Initiated in 2025-2027
Glenridding	3	643	4,332	67	2,888	GROUP 3	Initiated in 2025-2027

Figure 2.0-1
Targeted Sewershed areas for Smart Pond Projects



3.0 JUSTIFICATION

10. By moving forward with this program, EWS will become more resilient to urban and riverine flood risks. Edmonton and surrounding communities will be better protected and experience minimal disruption to essential services during severe flood events.

11. An economic impact assessment completed for the federal DMAF grant application shows significant benefits from the smart ponds program, with estimated savings of $159.5 million in direct damages mitigated due to flooding. The projects completed in the 2025-2027 PBR period will account for $130.0 million of the $159.5 million in damage mitigation. Additionally, there is an anticipated economic impact reduction of $1.4 million from minimizing disruptions to business operations.

12. Smart ponds also provide mitigation benefits across a variety of risk categories:

- Health and Safety Risks – Basement flooding can put residents, contractors, and EWS employees at risk through contact with raw sewage and can affect the physical and mental health of the occupants. Surface flooding and street ponding increases risk of traffic accidents and injuries.
- Environmental Risks – Excessive combined flows can lead to floods, sewage spills and excessive erosion that damages and contaminates the natural environment. This can affect usage of facilities by the public, require substantial investment to restore the areas, and violate the Approval-to-Operate issued by Alberta Environment and Protected Areas (AEPA).
- Financial Risks – Surface flooding and basement backups from large storm events can be costly to manage and clean up and can lead to significant claims from customers.
- Reputational Risk – Surface ponding in localized sag areas during large storm events can cause water to access the sanitary pipes and/or foundation drains of properties without adequate flood proofing and enter the building, causing flooding and damage.

4.0 PROGRAM SCOPE

13. During the 2025-2027 PBR term, this program is forecast to initiate 5 areas projects per year, project. These projects include optimized flow control strategy including implementation, flow and water level sensors, and flow control structures. Each pond will have between three to four sensors installed at the pond and along its supporting pipe infrastructure with a total of 300 sensor installations in the 2025-2027 PBR term.

14. Project prioritization is driven by the estimated sewershed priority which is based on the estimated proportion of the sewershed that benefit from the project, affected population, the presence of critical infrastructure and any known issues in the sewershed area. Each sewershed is expected to have smart pond projects underway or initiated during the 2025-2027 PBR term.

15. The Kennedale, 30th Avenue, Mill Creek and Quesnell sewersheds are currently in progress during the current PBR and, except for Kennedale, will extend into the 2025-2027 PBR term for completion.

16. Blackmud Creek North, Wedgewood North, Clareview and Fulton Creek will all be initiated and completed during the 2025-2027 PBR term.

17. The remaining sewersheds will be initiated during the 2025-2027 PBR term and completed in the subsequent PBR term.

5.0 ALTERNATIVES CONSIDERED

5.1. Alternative 1 – Do Nothing

18. Not implementing smart pond projects would limit EWS's ability to minimize flooding and reduce impacts to the public. In a do-nothing scenario, residents and businesses would incur direct costs from flooding.

19. This program is partially funded by the federal DMAF grant based on scope of work and timelines committed to with the Federal Government. Not completing the projects would likely result in the withdrawal of $17.1 million in federal funding including $3.1 million that would be received for already completed work.

5.2. Alternative 2 – Accelerated Investment relative to this Proposal

20. Further accelerating investment in smart ponds would present resourcing and costing challenge that would be disproportionately larger than the resulting reduction in risk. The current rate of investment is based on the capabilities of existing internal and external resources to engineer and execute the work. The recommended pace aligns with the operational and capital capacity to execute on the work effectively.

5.3. Alternative 3 – Decelerated Investment relative to this Proposal

21. The overall capital investment during the 2025-2027 PBR term could be reduced by extending the timeframe to complete the smart pond infrastructure. Under this alternative, EWS would still complete all of the proposed ponds within a 20-30 year period, however, some of the ponds would be shifted beyond the next two PBR terms. The risk with this approach is that ongoing flooding risks within high-risk stormwater subbasins would continue, resulting in higher risk of property damage to residents. Additionally, there are financial risks associated with potentially not fully utilizing the DMAF grant funding if EWS is not able to complete the agreed scope of work prior to the agreed timelines committed with the Federal Government. This alternative was rejected based on this additional risk.

6.0 COST FORECAST

22. EWS has forecast total program capital expenditures during the 2025-2027 PBR term at $18.9 million. The program cost estimates are shown in Table 6.0-1 and are based on detailed project costing estimates provided in the DMAF funding application for federal approval of the grants and have the following assumptions:

- No significant utility conflicts.
- Standard construction methods and timelines will be applied.
- External consultants will be used during the extent of the project for design and construction support.
- External contractors will be used for construction.
- Contingencies are based on project phase and complexity and range from 30-50%

Table 6.0-1
Smart Ponds Program Capital Expenditure Forecast ($ millions)

	2025	2026	2027	Total
1. Total Capital Expenditures	5.5	5.9	7.5	18.9
2. Less Grant Funding	2.0	2.0	2.7	6.7
3. Net Project Costs	3.5	3.9	4.8	12.2

7.0 KEY RISKS AND MITIGATION PLANS

23. Table 7.0-1 provides a summary of key risks associated with executing the Smart Ponds Program.

Table 7.0-1
Key Risks and Mitigation Plans

Risk	Mitigation Plan
1. Execution Risks - Some smart pond project sites may have limitations due to being within environmentally sensitive areas or areas under the river valley bylaw.	EWS will ensure all procedures for working within environmentally sensitive areas are followed and will design and time the projects to minimize the impacts to water ways and minimize disruptions to existing vegetations. Designs will be optimized with the intent of minimizing the need to remove trees.
2. Financial Risks - Availability of DMAF funding. Actual contractor bids may vary from the estimates. Materials and skilled labour are subject to market variability. There are also project unknowns that may affect costing.	EWS has put together a Grant Funding Committee to assist with development and delivery of grant funding. If projects are undertaken within proposed program timelines, then funding should be available. EWS will include contractors early in the process, clearly identify scope requirements and evaluate options such as bundling multiple project scopes approach when efficiencies can be identified. EWS manages financial risks by conducting preliminary design and obtaining manufacturer's quotes for establishing the project budget. The financial risks will become more evident as further design is completed and scope will be adjusted accordingly.
3. Storm Event Risk – There is a risk of a severe storm event occurring during the construction phase.	EWS will make use of weather forecast tools to schedule construction projects and emergency response plans to enhance safety and prevent damages.

8.0 RESOURCES

24. An external consultant will be hired for the extent of the project. They will complete concept validation, preliminary and detailed design, as well as construction support. As an external cost, this will be applicable for DMAF reimbursement. EWS will handle delivery of the project and will outsource construction services as per requirements of grant funding. DMAF grant funding is contingent on use of external contractors for design and construction.