EPCOR WATER SERVICES INC.

2022-2024
Performance Based Regulation
Wastewater Treatment Application

February 16, 2021

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1.0 APPLICATION OVERVIEW

1.1 Introduction

1. EPCOR Water Services Inc. ("EWSI") has prepared this Wastewater Treatment Rate Application (herein referred to as the "Application") for EWSI's regulated wastewater treatment operations to permit an in-depth review by its regulator, Edmonton City Council, of the wastewater rates applied-for under the proposed *EPCOR Drainage Services and Wastewater Treatment Bylaw No. 19627*. To better align wastewater collection and wastewater treatment from both the ratepayer and regulator perspectives, this Application includes amendments to both the *Water Services and Wastewater Treatment Bylaw 17698* and the *Drainage Services Bylaw 18100* to include the wastewater treatment rates together with the sanitary and stormwater rates in the *Drainage Services and Wastewater Treatment Bylaw 19627* (the "Bylaw") effective April 1, 2022.

2. This Application describes how the forecast revenue requirement and proposed wastewater treatment rates are determined for the Performance Based Regulation (PBR) rates for the period April 1, 2022 to March 31, 2025 ("2022-2024"). This is the third PBR term for EWSI's wastewater treatment operations ("Wastewater Treatment" or "Wastewater") following the City of Edmonton's transfer of the operations, assets and liabilities of the Gold Bar wastewater treatment plant (WWTP) to EWSI on April 1, 2009. Following the transfer of the Drainage Services operations from the City to EPCOR in 2017, EWSI identified an opportunity to transfer the Biosolids Management Program from EWSI's Drainage Services business unit ("Drainage Services" or "Drainage") to its Wastewater Treatment business unit. The Biosolids Management Program (which includes the processing of digested sludge from the wastewater treatment process, storage and recycling of biosolids) is closely aligned with the wastewater treatment process. This transition is reflected in EWSI's applied-for sanitary rates and wastewater treatment rates beginning with the 2022-2024 PBR term. For the purpose of this Application, EWSI's Wastewater Treatment operations includes both the Gold Bar WWTP and the Clover Bar Biosolids Recycling Facility.

3. EWSI treats wastewater from both the sanitary and combined sewer systems for the residents of the city of Edmonton. Its prime objective is to safely and reliably treat wastewater in compliance with environmental regulations. The wastewater treatment process involves handling of hazardous gases including methane and hydrogen sulphide (H_2S), which can be lethal at high concentrations, and the handling of wastewater which is a biological hazard which, if not

properly managed, can put employees at risk of being infected from pathogens. Failure to maintain the wastewater treatment infrastructure may lead to increased health and safety risks or unplanned failures. An unplanned failure could result in a discharge of untreated or partially treated water to the North Saskatchewan River. If this should occur, not only would the environment be harmed, it would also be a contravention of EWSI's Approval to Operate (issued by Alberta Environment and Parks under the *Environmental Protection and Enhancement Act*[1] and updated in 2019) and may subject EWSI to fines of up to $1 million per day or other enforcement actions by the Government of Alberta.

4. Good capital management necessitates a good asset management program that has an appropriate level of maintenance capital and life cycle replacement spending. EWSI has a robust asset management program, which assesses asset condition regularly and recommends an appropriate amount of capital investment be directed towards maintenance and life cycle replacement ensuring that assets are maintained and replaced before dangerous deterioration and failures occur. The revenue requirement for EWSI's Wastewater Treatment operations, as further detailed in this Application, reflects the reasonable and prudent costs required to provide safe and reliable wastewater treatment services to meet the environmental and operational requirements set out under EWSI's Approval to Operate.

5. EWSI is planning to spend $172 million in capital expenditures for wastewater treatment infrastructure projects during 2022-2024 PBR which is contributing to the need for Special Rate Adjustments above inflation. Over 80% of EWSI's planned $172 million investment in the wastewater treatment infrastructure over the 2022-2024 period will be in projects to rehabilitate or replace existing assets that have deteriorated or are at the end of their useful life, to improve reliability and to ensure acceptable levels of risk are maintained. Some of these investments include upgrades to Digester 4 to ensure the digester can operate reliably and to prevent uncontrolled releases of biogas into the atmosphere; several electrical reliability projects to upgrade assets which are at or near the end of life; and structural rehabilitation of concrete effluent channels to address corrosion of these channels caused by hydrogen sulphide gases.

6. The most significant capital project planned for the upcoming PBR term is the new Dewatering Facility Project ($38.4 million) which be constructed at the site of the Clover Bar Biosolids Recycling Facility and will allow EWSI to process biosolids produced from the wastewater treatment process. The Dewatering Facility Project is required to replace the City's

[1] RSA 2000, cE-12

existing dewatering facility which will be decommissioned by the end of 2023. Other key projects planned for the 2022-2024 PBR include addition of scrubbers to address odourous emissions from sources emitting the highest odour at the Gold Bar WWTP; installation of a new technology (inDENSE™ system) to increase WWTP capacity within the existing footprint; expansion of flare capacity to ensure the Gold Bar WWTP can safely process all potential biogases and avoid biogas being released to the environment; and consolidation of the wastewater treatment laboratory with the water laboratory to provide synergistic processes and savings across the two teams and free up the existing lab building at Gold Bar WWTP for alternative use.

1.2 Applied-For Wastewater Treatment Rates

7. Wastewater Treatment has been operating under a PBR framework since 2012. The current PBR term ends on March 31, 2022. EWSI is hereby applying to the Edmonton City Council for approval of an extension of the PBR for a three-year period commencing April 1, 2022 to March 31, 2025 (the "2022-2024 PBR term"). As well, EWSI is applying for approval of the Schedules to the Bylaw which provide the applied-for wastewater treatment rates charged to city of Edmonton customers for 2022-2024. In order to stagger the PBR terms and future regulatory proceedings, the Wastewater Treatment and Drainage PBR Applications are aligned under a three year PBR term 2022-2024 (with subsequent PBR Applications proposed for five year terms) and the Water PBR Application is a five year PBR term 2022-2026.

8. In this Application, EWSI is proposing adjustments to its PBR rates for the 2022-2024 PBR term from those currently approved for 2021. In accordance with the calculations in the Bylaw (Schedule 3), these adjustments include annual inflation plus Special Rate Adjustments. Relative to the current wastewater treatment rates, EWSI's rates for the 2022-2024 period are based on the following components: (i) a continuation of the existing PBR formula described in the Bylaw to set rates based on routine and non-routine adjustments; (ii) Special Rate Adjustments to the fixed charges and variable charges for 2022 to re-base the revenue requirement for the 2022-2024 PBR to pass on to customers any cost savings achieved in the prior PBR term and to reflect the costs associated with continuing to provide safe and reliable wastewater treatment services to its customers; (iii) Special Rate Adjustments to the fixed charges for 2022 to recover costs incurred in 2020 associated with the 90-Day Utility Bill Deferral Program (iii) continuation of the 0.25% efficiency factor; and (iv) reduction in the rate of return on equity from 10.175% to 9.95%.

9. In 2019, EWSI engaged HDR Engineering Inc. (HDR) to provide technical assistance in development of a wastewater treatment cost of service study to support EWSI's practice of setting cost based rates. The results of the cost of service study are presented in section 11.0 of

the Application and is based on financial information for 2021. With the transition of the Biosolids Management Program from Drainage Services to Wastewater Treatment in and addition of the new Dewatering Facility in the 2022-2024 PBR term, further analysis is required to assess the impacts on the cost of service. As such, EWSI is not proposing to make any interclass adjustments to wastewater treatment rates or overstrength charges at this time. EWSI will update the cost of service analysis during the 2022-2024 PBR term with the overall objective of implementing refinements to rate structure and rate design in the 2025-2029 PBR term to ensure that revenues from each class of service fall into reasonable ranges of their cost of service.

10. EWSI has prepared this Wastewater Treatment Rate Application to provide its regulator, Edmonton City Council, with a comprehensive understanding of the basis for EWSI's proposed wastewater treatment rates, associated revenue requirement and proposed performance measures for the 2022-2024 PBR term. This application is prepared in accordance with Minimum Filing Requirements ("MFR") approved by Edmonton City Council in March 2013. In addition to implementing the MFR, EWSI has also complied with other motions passed by the City's Utility Committee which are addressed in this Application. A listing of these motions and explanation of how EWSI has addressed them is provided in Appendix B to this Application.

11. The following evidence provided in this Application will provide Edmonton City Council with greater visibility and transparency of EWSI's forecast revenue requirement and proposed rates:

- detailed financial schedules underlying the revenue requirement calculations;
- detailed business cases providing supporting rationale for capital projects for projects over $5 million in total capital expenditures and for programs over $5 million in capital expenditures during the 2022-2024 PBR term;
- historical cost variance explanation relative to the amounts approved in the 2017-2021 PBR term including capital cost variances, post-implementation reviews for major capital projects which exceeded forecast costs by more than 20% or underwent a major scope change, and operating cost variance explanations;
- forecast assumptions and methodologies for wastewater volumes, operating and capital costs; and
- support for EWSI's proposed cost of capital, capital structure and efficiency factor.

12. EWSI has also included PBR Progress Reports for 2017, 2018 and 2019 which are provided annually to the City to review EWSI's operational and financial performance for the prior year. Refer to Appendices E-1 to E-3 for these PBR Progress Reports. EWSI is confident that on the

basis of the information provided, the Edmonton City Council will conclude that EWSI's applied-for wastewater treatment rates are just, reasonable, prudent and in the public interest.

1.3 Applied-For Performance Measures

13. For the 2022-2024 PBR term, operational performance of EWSI will continue to be assessed under the following four categories: (i) water quality and environment; (ii) customer service; (iii) system reliability and optimization; and (iv) safety. Each of these categories contains individual performance measures that represent the more specific performance standards (or targets) expected. The performance standards are based on historic trending and targeted future performance and where available, aligned with industry benchmarks.

14. With each PBR renewal, EWSI typically revises the PBR performance metrics through updating the standards of performance, where reasonable, and introducing new metrics to better align with operational priorities and strategic goals. For the 2022-2024 PBR term, EWSI is proposing to limit the number of changes to the overall metrics program. Given the focus on moderating rate increases through reductions in capital programs and other means, maintaining a relatively consistent metrics program from the current term will enable stakeholders to be assured that service levels are being maintained despite the reductions. Where feasible, the standards of performance have been updated to the most recent 10 year average of past performance. Detailed explanation of the PBR performance metrics and proposed changes is provided in section 13.0 to this Application.

1.4 EWSI Background and Corporate Structure

15. EWSI is the legal entity under which the three separate regulated business units operate: Water Services (or "Water"); Wastewater Treatment Services (or "Wastewater Treatment"); and Drainage Services (or "Drainage"). EWSI is a wholly owned subsidiary of EPCOR Utilities Inc. ("EUI" or "EPCOR"). Through this ownership, EWSI is affiliated with other corporations within the EUI group of companies.

16. EWSI receives services from and provides services to other EPCOR corporations. This structure allows EWSI to benefit from both the extensive experience that resides within the other corporations of EUI, and from economies of scale and scope that arise from the EPCOR group's inter-corporate services approach to its business operations. Inter-corporate services costs are determined on a cost-recovery basis in accordance with EPCOR's Inter-Affiliate Code of Conduct and are reflected in service level agreements between the parties. Each of the business units

operating under EWSI obtains corporate services from its parent corporation, EUI. Corporate services are comprised of activities that are centrally managed within the EPCOR group due to their nature and/or for the purpose of realizing economies of scale and greater effectiveness.

17. To the extent that technical or support staff services are provided from any of the regulated business units to any commercial or non-regulated business units, EWSI utilizes a time tracking system to facilitate appropriate cost recoveries in the regulated business units and to ensure no cross-subsidization occurs between any regulated services and any commercial services. Direct charges, such as consultants and contractors, are directly charged to the commercial services business.

1.5 Forecast Revenue Requirement

18. Table 1.5-1 provides a breakdown of the cost components comprising EWSI's revenue requirement for wastewater treatment operations based on the forecast costs for the 2022-2024 PBR term. Amounts approved for 2021 (the "2021 Decision") and EWSI's most recent forecast of amounts for 2021 (the "2021 Forecast") are provided for comparison. The forecast revenue requirement reflected on line 9 of Table 1.5-1 forms the basis for determining EWSI's PBR wastewater treatment rates for the 2022-2024 period.

Table 1.5-1
EWSI Forecast Revenue Requirement
Wastewater Treatment Operations
Financial Schedule 3-1
2021-2024
($ millions)

		A	B	C	D	E
	Cost Component	**2021D**	**2021F**	**2022F**	**2023F**	**2024F**
1	Operating Costs	50.6	46.8	60.8	67.2	66.5
2	Franchise Fee	9.8	8.9	10.0	10.7	10.9
3	Subtotal: Operating Costs	60.4	55.7	70.8	77.8	77.4
4	Depreciation and Amortization	20.0	20.7	23.2	23.8	26.4
5	Return on Rate Base Financed by Debt	14.5	12.4	12.7	12.6	14.0
6	Return on Rate Base Financed by Equity	21.7	22.9	21.7	21.9	23.9
7	**Revenue Requirement before Revenue Offsets**	**116.7**	**111.6**	**128.5**	**136.1**	**141.8**
8	Less: Revenue Offsets	(3.0)	(2.7)	(5.9)	(7.2)	(7.3)
9	**Revenue Requirement**	**113.7**	**108.9**	**122.6**	**128.9**	**134.5**

19. EWSI is proposing to re-base the revenue requirement based on the forecast costs for 2022-2024. The re-basing is primarily driven by the following factors: (i) the transfer of the biosolids management program from Drainage Services; (ii) lower than forecast revenue

requirement in the 2017-2021 PBR term; (iii) continued impacts of long-term declines in consumption per customer, partially offset by customer growth; (iv) higher franchise fees beginning in 2022 based on higher revenues; and (v) capital additions to rate base planned for 2022-2024. These impacts on rates are explained in section 12.0.

20. Beginning in 2022, EWSI's Wastewater Treatment operating costs (including franchise fees) are forecast to increase by $15.1 million over the 2021 forecast amounts. This is largely a result of the transfer of biosolids management to Wastewater Treatment in 2022 ($12.6 million). Beyond 2022, EWSI is forecasting relatively stable operating costs, with the only increases above inflation being those related to EWSI's proposed Green Power Initiative which is offset by decreases associated with lower metering costs allocated from EWSI's Water Services business unit as a result of the Advanced Metering Infrastructure (AMI) Project described in section 5.0 and in Appendix F-3 of the Application. EWSI's operating cost forecasts are detailed in section 5.0 of the Application.

21. For the upcoming 2022-2024 PBR term, EWSI proposes to invest $171.7 million in capital projects for its Wastewater Treatment operations. This reflects continuation of EWSI's various projects and programs to ensure that a high level of reliability and safety of its wastewater operations is maintained, so that the system can reliably meet conditions of its Approval to Operate. EWSI will continue to invest in projects and programs for reliability and life-cycle replacements (over 82% of planned expenditures).

22. The proposed level of investment in the following reliability programs and projects will remain at levels comparable to actual capital expenditures over the 2017-2021 PBR term and include the following key areas:

- $41.8 million in buildings and site reliability and life-cycle projects including construction of a new dewatering facility ($38.4 million) by 2024 at the Clover Bar Biosolids Recycling Facility to process biosolids produced in the wastewater treatment process. The new dewatering facility is necessary because the existing City of Edmonton dewatering facility is being demolished in the near future along with the City of Edmonton composter facility.

- $28.1 million in mechanical reliability and life-cycle projects including the Digester 4 Upgrades Project to ensure the digester can operate reliably and to prevent uncontrolled releases of biogas into the atmosphere;

- $25.6 million investment in electrical reliability and life-cycle rehabilitation including two large projects (Aux Control Room E-House (EB-1) Project and the 600V Electrical Building (EB-2) Project) to upgrade assets which are at or near the end of life;

- $21.5 million in structural rehabilitation of key process assets including major rehabilitation of primary effluent (PE) channels to address degraded concrete channels and to install a gate system to isolate channels to allow for upgrades and maintenance work in the rest of the PE channel system.

- $18.4 million in performance efficiency and improvements projects including the Secondary Aeration Blower Upgrades Project ($8.0 million) to install additional blowers to improve aeration which is a critical component of the biological nutrient removal process.

- other smaller investments in other key projects including those to address odour control improvements, flare capacity expansion, laboratory consolidation, capacity expansion and other health and safety improvements.

23. Refer to section 6.2 for more information on the 2022–2024 capital expenditures, Appendix G-1 which provides a listing of the Wastewater Treatment capital programs and projects planned for the 2022-2024 PBR term and Appendices G-2 to G-12 for capital business cases.

1.6 Proposed Cost of Capital

24. EWSI has determined its revenue requirement based on its best estimates of the prudently incurred costs to provide water service plus a fair return on its investment of 9.95% based on a 40% equity ratio (refer to Appendix D Return on Equity Memorandum. In previous applications, EWSI contracted an external industry expert to develop the proposed fair return rate (return on equity) who based their analysis on traditional financial approaches and current financial market conditions. EWSI determined that this approach is not viable for the 2022-2024 application given the market conditions resulting from the global COVID 19 pandemic. In late February/early March 2020, investors and share markets reacted negatively to announcements surrounding the pandemic. Many countries, including Canada, began to “lock down” their economies; and federal governments and central banks used fiscal and monetary policy initiatives to diminish the economic devastation of the lockdowns on citizens and businesses.

The resulting changes on market data used to estimate equity rates of return impacted the viability of the traditional approaches.

25. EWSI instead proposes that an update of Grant Thornton's 2016 analysis (used to set the 2017-2021 PBR term's common equity return) be used to establish the 2022 – 2024 PBR common equity rate of return. A formulaic extension of the previously approved method is seen as the most straightforward approach and best aligns with the City's desire to establish a risk premium to the Alberta Utility Commission's (AUC) generic cost of capital to derive the allowed rate of return on equity for EWSI. EWSI has also provided commentary in the Return on Equity Memorandum (Appendix D) to document the differences in the risk profile of EWSI's businesses in relation to those regulated by the AUC in order to justify the risk premium over the generic allowed return on equity

26. The proposed rate of return on equity of 9.95% reflects a 0.225% decrease from the 10.175% rate of return on equity approved by City Council for EWSI's 2017-2021 PBR, based on changes to the underlying long-term Government of Canada bonds. This rate of return, together with EWSI's proposed capital structure of 40% equity to 60% debt and proposed cost of new debt of 3.50% reflects a reasonable and conservative weighted average cost of capital of 6.29% which is fixed for the 3-year PBR term. The proposed cost of new debt of 3.50% is based on EWSI's stand-alone debt rating of A (low) as provided by Dominion Bond Rating Service in September 2020 (refer to Appendix C). Any changes in the cost of capital over the 3-year PBR term as a result of changes in market conditions and interest rates reflects a risk that is borne by EWSI and such changes are not passed onto EWSI's customers through rate increases during the term.

1.7 Annual Wastewater Treatment Rate Setting (2017-2021)

27. In accordance with Schedule 3 of the Bylaw, EWSI will submit annual rate filings. In general terms, the annual wastewater treatment rates by customer class will be determined by applying the rate adjustment mechanism to the prior year rates. The annual rate adjustment mechanism includes Routine Adjustments and Non-Routine Adjustments. The current bylaw determines that the rates in the first year of a given PBR term are a formulaic extension of the rates of the last year of the prior term. For the 2022-2024 PBR term, EWSI is proposing to set the rates for the first year (2022) based on the actual rates as defined in this application rather than

the formulaic adjustment of 2021 rates. All other years of the PBR term would follow the formulaic approach.

28. This proposed change in approach is based on two considerations. First, in order to accommodate the City of Edmonton's election cycle, this application is being submitted approximately 6 months earlier than was done of prior applications. This change has increased the forecast risk associated with determining the inflation rate that comprises the adjustment mechanism. Second, and perhaps most importantly, the turmoil in financial markets caused by the COVID 19 pandemic has compounded that forecast risk. By setting the first year rates at a defined rate, EWSI continues to bear the same risk within a PBR term as currently assumed, but is not exposed to the risk associated by factors beyond direct control.

29. Routine Adjustments include: (i) inflation factor; (ii) less an efficiency factor; and (iii) plus Special Rate Adjustments. The proposed inflation factor, efficiency factor and three Special Rate Adjustments for the 2022-2024 PBR term are discussed in the following sections.

30. Non-routine Adjustments are, by their nature, unusual, significant in size or nature and beyond the scope of control of EWSI. Non-Routine Adjustments are comprised of the following seven categories which are described in detail in Schedule 3 of the Bylaw:

- changes to legislation, regulation or taxes;
- consequences of force majeure;
- deterioration of drainage or wastewater treatment systems;
- customer-initiated or City-initiated system expansion;
- City-initiated relocations of drainage assets;
- franchise agreement amendments;
- City initiatives (i.e. environmental initiatives);
- flood mitigation; and
- grant funding.

31. For the 2022-2024 PBR term, EWSI is proposing two changes to the non-routine adjustment criteria. The first is intended to provide greater clarity to the existing clause regarding deterioration to the waterworks system by including unanticipated asset failures or deterioration requiring immediate repair or restoration in the definition. The second change is the addition of a new clause for negative non-routine adjustments related to the receipt of grants. This clause is intended for instances where grant funding is received for projects that are already included in

rates. A negative non-routine adjustment would allow a reduction to rates to eliminate duplicate funding of a single project.

1.7.1 Inflation Factor

32. In the 2017-2021 PBR term EWSI utilized an inflation factor based on a weighting of 65% non-labour component and 35% labour component. In the 2022-2024 PBR term, EWSI is proposing to continue using a weighting of 65% non-labour component and 35% labour component to represent EWSI's Wastewater Treatment internal cost structure. This weighting is based on the proportion of forecast labour costs within Wastewater Treatment operations relative to all other costs.

33. The non-labour component is measured based on the annual percentage increase in the Alberta Consumer Price Index (Alberta CPI); and the labour component is measured based on the annual percentage increase in the Average Hourly Earnings, Alberta, Industrial Aggregate (herein referred to as the "AHE index"). The labour escalator reflects a readily available and verifiable index provided by a third party (Statistics Canada).

1.7.2 Efficiency Factor

34. Under a PBR rate setting formula, an efficiency factor is generally applied as a reduction to the inflation factor to reduce rates to customers. It represents the minimum amount by which EWSI must improve operational efficiency to maintain its net income. For 2017-2021 PBR Application, EWSI provided evidence prepared by Kaufmann Consulting, a recognized expert in advising utilities and regulatory agencies on efficiency (productivity) factors. Kaufman recommended a negative 0.5% efficiency factor based on the clear evidence that comparable utility industry productivity levels have been less than 0%. In the 2017-2021 PBR Applications, EWSI proposed a 0% efficiency factor for the 5-year term in recognition of the continuing commitment to its customers to maintain operational efficiency while at the same time improving service levels to meet higher regulatory and safety standards and greater expectations for environmental performance. EWSI ultimately proposed to maintain the previous term's 0.25% efficiency factor in order to maintain alignment with City of Edmonton efficiency objectives.

35. EWSI has not contracted an external expert to develop an efficiency study for the 2022-2024 PBR application as it believes it would yield similar results to the previous Kaufmann Consulting report. The underlying industry parameters have not changed since that time. As an

alternative, EWSI is proposing to maintain the 0.25% efficiency factor. This will allow EWSI to remain in alignment with City of Edmonton goals.

1.8 Special Rate Adjustments to Wastewater Treatment Rates

36. EWSI will apply Special Rate Adjustments to wastewater treatment rates in 2022, 2023 and 2024 to (i) support re-basing of the revenue requirement, and (ii) provide for recovery of costs associated with the 90 Day Deferral Program in 2020. These Special Rate Adjustments are described in detail in Section 12 of this Application and Special Rate Adjustments by rate class are provided in section 2.4 of Schedule 3 to the Bylaw.

1.8.1 Special Rate Adjustments for Re-Basing

37. Special rate adjustments for re-basing are required in 2022, 2023 and 2024 because the total revenue requirement (as reflected in line 4 of Table 1.8.1-1) exceeds the forecast revenue that would be realized by simply applying the PBR annual inflation adjustment to the prior year's wastewater treatment rates for each year of the 2022-2024 period (as reflected in line 3 of Table 1.8.1-1. The result is a revenue shortfall for the 2022-2024 term as shown in line 5 of Table 1.8.1-1. This shortfall is collected through the Special Rate Adjustment for re-basing. The Special Rate Adjustments for re-basing will be applied to the fixed and variable charges.

Table 1.8.1-1
Revenue Shortfall Calculation
2022-2024
($ millions)

		A **2022F-2024F**
1	Revenue Collected at Prior Year's Rates	321.5
2	PBR Inflation Impact on Revenue	12.6
3	Revenue Collected at PBR Rates	334.2
4	Total Revenue Requirement	386.0
5	Revenue Shortfall to be recovered through Re-basing	(51.9)
6	Revenue Shortfall attributable to:	
7	Transfer of Biosolids Management Program from Drainage	(48.7)
8	Lower than Forecast Revenue Requirement in the 2017-2021 PBR Term	21.7
9	Increase in Revenue Requirement in the 2022 and 2024 PBR Term	(10.4)
10	Declining consumption over the over the 2022-2024 PBR Term	(14.5)
11	Revenue Shortfall to be recovered through Re-basing	(51.9)

38. The Special Rate Adjustments for re-basing are required in order to eliminate the forecast revenue shortfall of $51.9 million for the 2022-2024 period. This shortfall can be broken into the components shown in rows 7 through 10 of Table 1.8.1-1 including: (i) $48.7[2] million in additional revenue requirements resulting from the transfer of the Biosolids Management Program from Drainage Services (there is a corresponding decrease in Drainage Services 2022-2024 revenue requirements); (ii) a $21.7 million decrease due to lower than forecast revenue requirements in the 2017-2021 PBR term which includes some operating cost efficiencies which are passed on to ratepayers for the next PBR term; (iii) a $10.4 million increase in revenue requirements in the 2022-2024 PBR term primarily due to capital additions; and (iv) a $14.5 million net decrease in revenue related to long-term decline in consumption per customer ($19.3 million) that have been partially offset by additional revenues related to customer growth ($4.8 million).

1.8.2 Special Rate Adjustments for the 90 Day Deferral Program

39. In March 2020, EWSI implemented the 90 Day Deferral Program which allowed customers experiencing financial hardship directly related to the COVID-19 pandemic to have the option to defer water, wastewater treatment and drainage utility bill payments, without interest or penalty, for a 90-day period from March 18, 2020 to June 18, 2020. EWSI's program is aligned with the Government of Alberta's program for electricity and natural gas customers. EWSI summarized its plan for the 90 Day Deferral Program in a Report to Utility Committee dated October 2, 2020. In accordance with this plan, EWSI has established a deferral account to track and recover the costs for administering the deferral of customer payments, interest expenses and any incremental bad debts costs. In this PBR Application, EWSI is applying for a Special Rate Adjustment in 2022 to recover the forecast cost of $0.6 million for the incremental bad debt expense, administration, and carrying costs associated with the 90 Day Deferral Program. EWSI is proposing to adjust its final rates to reflect the actual costs incurred for this program as part of its 2022 Rate Filing and will submit to the City Manager for approval.

40. Table 1.8.2-1 summarizes the incremental bad debt expense, administration, and carrying costs associated with the 90 Day Deferral Program. EWSI is proposing to apply Special Rate Adjustments to the wastewater treatment rates in 2022 to recover the $0.6 million forecast cost

[2] The offsetting decrease in the Drainage revenue requirement is $47.5 million which reflects the lower return on equity for Drainage compared to Wastewater Treatment during the 2022-2024 PBR term.

of the 90 Day Deferral Program. These Special Rate Adjustments will add $0.15 to the average monthly residential bill in 2022 and will be removed from customer bills in 2023.

Table 1.8.2-1
90 Day Deferral Program
Forecast Revenue Requirement
(2020)
($ millions)

	Item	A Expense
1	Incremental Bad Debt Expense	0.4
2	Late Payment Charges	0.1
3	Carrying Costs	0.1
4	**Total Revenue Requirement**	**0.6**

1.9 Customer Bill Impact

41. The proposed annual wastewater rate increases for 2022-2024 will include routine rate adjustments for inflation less the efficiency factor, and Special Rate Adjustments for re-basing, and the 90 Day Deferral Program. As shown in Table 1.9-1, the impact of these rate increases on the average residential customer's monthly bill is $2.35 per month in 2022, primarily due to the transfer of the biosolids management function, followed by a decrease of $0.01 per month in 2023 and an increase of $0.14 per month in 2024. The average residential customer bill is determined based on the forecast average monthly residential water consumption volume which is assumed to continue to exhibit a declining trend. Residential wastewater treatment bills are forecast to increase at an average rate of 4.0% per year over the 2022-2024 PBR term based on the proposed rate increases and a declining trend in volumes.

42. Table 1.9-1 also provides the impact on the bill from: (i) annual rate adjustments for PBR inflation less efficiency factor (i-x); (ii) Special Rate Adjustments for re-basing, and (iii) the 90 Day Deferral Program. EWSI is proposing to implement the Special Rate Adjustments as follows:

- The portion of the Special Rate Adjustment for re-basing applicable to the transfer of biosolids from Drainage Services will be applied to 2022 rates. This adjustment will be offset by a corresponding adjustment to Drainage Services rates in 2022. The remainder of the re-basing adjustment will be spread equally over three years from 2022-2024; and
- A Special Rate Adjustment for the 90 Day Deferral Program will be applied to 2022 rates, then removed from 2023 rates.

Table 1.9-1
Residential Customer Bill Impact
2022-2024
($/month)

		A **2022F**	B **2023F**	C **2024F**	D **Total/ Average**
1	Monthly Consumption per Customer - m^3	13.4	13.2	12.9	
2	Prior Year's Bill	20.51	22.86	22.85	
3	Impact of Declining Consumption	(1.54)	(0.29)	(0.29)	
4	Monthly bill at prior year's rate	18.96	22.57	22.56	
5	PBR Inflation – Efficiency Factor (i-x)	0.38	0.45	0.45	
6	SRA – Re-basing	3.36	(0.02)	(0.02)	
7	SRA – 90 Day Deferral Program	0.15	(0.16)	-	
8	**Monthly Bill - $**	**22.86**	**22.85**	**23.00**	
9	Change in Bill - $	2.35	(0.01)	0.14	2.49
10	Change in Bill - %[3]	11.5%	0.0%	0.6%	4.0%

43. Tables 1.9-2 and 1.9-3 provide the bill impacts for a multi-residential customer and a commercial customer. Multi-residential wastewater bills are forecast to increase at an average rate of 5.5% per year over the 2022-2024 PBR term, with consumption declining through the period.

Table 1.9-2
Multi-Residential Customer Bill Impact
2022-2024
($/month)

		A **2022F**	B **2023F**	C **2024F**	D **Total**
1	Monthly Consumption per Customer - m^3	388.4	386.6	384.7	
2	Prior Year's Bill	429.43	487.51	494.46	
3	Impact of Declining Consumption	(22.40)	(2.29)	(2.33)	
4	Monthly bill at prior year's rate	407.04	485.22	492.13	
5	PBR Inflation – Efficiency Factor (i-x)	8.18	9.75	9.89	
6	SRA – Re-basing	72.14	(0.36)	(0.37)	
7	SRA – 90 Day Deferral Program	0.15	(0.16)	-	
8	**Monthly Bill - $**	**487.51**	**494.46**	**501.65**	
9	Change in Bill - $	58.08	6.94	7.20	72.22
10	Change in Bill - %[3]	13.5%	1.4%	1.5%	5.5%

[3] The Change in Bill - % Total (column D, row 10) is the **average** of the individual years (columns A- C, row 10).

44. Commercial customer wastewater treatment bills are forecast to increase at an average rate of 11.8% per year over the 2022-2024 PBR term with consumption assumed to increase through the period reflecting a projected economic recovery beginning in 2022 following the COVID-19 pandemic.

Table 1.9-3
Commercial Customer Bill Impact
2022-2024
($/month)

		A **2022F**	B **2023F**	C **2024F**	F **Total**
1	Monthly Consumption per Customer - m^3	91.9	95.8	97.7	
2	Prior Year's Bill	95.69	120.09	127.24	
3	Impact of Declining Consumption	4.48	4.89	2.42	
4	Monthly bill at prior year's rate	100.17	124.98	129.66	
5	PBR Inflation – Efficiency Factor (i-x)	2.01	2.51	2.61	
6	SRA – Re-basing	17.75	(0.09)	(0.10)	
7	SRA – 90 Day Deferral Program	0.15	(0.16)	-	
8	**Monthly Bill - $**	**120.09**	**127.24**	**132.17**	
9	Change in Bill - $	24.40	7.16	4.93	36.49
10	Change in Bill - %[3]	25.5%	6.0%	3.9%	11.8%

45. Generally, increases to wastewater treatment rates reflects EWSI's continued efforts to ensure safe and reliable wastewater treatment operations are maintained through upgrading and rehabilitation of aging wastewater treatment infrastructure in accordance with EWSI's asset management framework. In light of these pressures on wastewater treatment rates, EWSI is confident that the Edmonton City Council will find its proposed wastewater treatment rate increases for the 2022-2024 PBR term to be just and reasonable to continue provide Edmonton customers with safe and reliable wastewater treatment services while improving EWSI's environmental performance.

1.10 Stakeholder Consultation

46. EWSI completed a stakeholder engagement process as part of the PBR development to ensure that programs and initiatives remained aligned with stakeholder expectations. The approach taken was consistent with the City's public engagement policy and was reviewed with the Utility Committee. The public engagement process was designed to identifying stakeholders' perspectives and preferences related to: Values, Performance Priorities and Rate and Investment level sensitivity. EWSI also incorporated stakeholder feedback gained over the last three years

when public engagement was conducted on several larger initiatives: Drainage Corrosion and Odour Reduction Strategy, the Stormwater Integrated Resource Plan (SIRP) and Gold Bar Integrated Resource Plan (IRP).

47. The stakeholder engagement results (see Appendix K) support continuation of the current practices and approaches that place a great deal of emphasis on water quality, safety, customer service and responsiveness as well as the protection of the environment. Further, EWSI believes its planned capital programs are aligned with stakeholder priorities and the proposed rate increases are below the level stakeholder view as acceptable. A summary of the stakeholder engagement results includes the following:

Values

48. For Wastewater Treatment, customers view the top priority as reduction of contaminants entering the North Saskatchewan River. Residential customers are concerned with public and employee safety, where commercial customers are highly concerned with managing wastewater treatment volumes and reducing odour which could impact their business (and, ultimately, impact the public through the impact to their business). Overall, across Water, Wastewater Treatment and Drainage, customers confirmed that EWSI has identified the main issues of importance in their performance measures.

Performance Priorities

49. Customers are satisfied overall with EWSI services. EWSI is described as reliable & consistent, safe & responsible, trustworthy, and is a company they like – although commercial customers are slightly more critical, with more moderate opinions than their residential counterparts. EWSI is given the most credit for reliability, and criticism for cost among both residential and commercial customers.

50. EWSI is generally seen as a trusted operator who is meeting customer expectations. Safe/quality water is so valued by Edmontonians it is seen as worth protecting above all else.

Rate and Investment Levels

51. The infrastructure risks EWSI is managing are viewed to be increasing. Although the nature and source of risk varied by group, the consensus among stakeholders is that the cost associated with failure will in fact be greater with a negative social consequence than spending now to avoid it.

52. To avoid risk, stakeholders support EWSI investing in these services for longer-term benefits and efficiencies. At minimum, they want to maintain status quo; however, many stakeholder groups lean toward smart investment with protecting water, protecting the river, and elevating Drainage renewal as top priorities for investment. Based on price modelling, the acceptable average monthly price increase for utility services is between $7 and $11, with $8 being optimal.

1.11 Organization of EWSI's Wastewater Treatment Rate Application

53. Part A of this Wastewater Treatment Rate Application describes the methodology and assumptions used to determine the forecast revenue requirement and explains the forecast revenue requirement by each component (operating costs, capital costs, depreciation expenses, rate base and return on rate base, revenue offsets). In Part B of this Application, EWSI describes the cost of service and calculation of wastewater treatment rates for each customer class (residential, multi-residential and commercial) for 2022-2024. Part C of this Wastewater Treatment Application summarizes EWSI's performance measures for 2022-2024.

54. Organization of this Wastewater Treatment Application is summarized in Table 1.11-1.

Table 1.11-1
Organization of Wastewater Treatment Rate Application

	A **Section**	B **Topic**
1	1.0	Application Overview
2	2.0	System Overview and Future Expectations
3	**Part A**	**Revenue Requirement**
4	3.0	Revenue Requirement Summary
5	4.0	Methodology and Key Assumptions
6	5.0	Operating Costs
7	6.0	Capital Expenditures
8	7.0	Depreciation and Amortization
9	8.0	Rate Base
10	9.0	Return on Rate Base
11	10.0	Revenue Offsets
12	**Part B**	**Cost of Service and PBR Rates**
13	11.0	Cost of Service
14	12.0	PBR Rates
15	**Part C**	**Performance Measures**
16	13.0	Performance Measures

2.0 SYSTEM OVERVIEW AND FUTURE EXPECTATIONS

55. During the 2017–2021 PBR term, EWSI made significant progress in identifying and rehabilitating deteriorating facilities and improving process performance and reliability at EWSI's wastewater treatment operations. Notwithstanding these successes, many operational and asset management challenges remain such as controlling odours, correcting deteriorating asset condition, and optimizing process performance, stability and reliability. EWSI plans to address these challenges in its capital and operating plans for the upcoming 2022-2024 PBR term.

56. In the sections that follow, EWSI provides: (i) an overview of the wastewater system in Edmonton and the connection to the Gold Bar WWTP in section 2.1; (ii) a description of the wastewater treatment operations by its various processes and components in section 2.2; (iii) a summary of wastewater treatment operations performance during the 2017-2021 PBR term including operational and financial performance in section 2.3; and lastly (iv) a discussion of EWSI's expectations for the 2022-2024 PBR term and beyond in section 2.4.

2.1 Wastewater System Overview

57. Edmonton's regional wastewater System consists of the Edmonton Wastewater Collection System, the Alberta Capital Region Wastewater Collection System, the Gold Bar WWTP, and the Alberta Capital Region WWTP. These systems provide wastewater services to domestic, commercial and industrial customers in Edmonton and a wide geographic area surrounding Edmonton (the "Alberta Capital Region").

58. Edmonton's wastewater collection system (sanitary system), operated by Drainage Services, includes over 3,600 km of sewers spread throughout the city. Edmonton's wastewater collection system comprises two types of sewers – sanitary and combined sewers. Nearly one third of the sewers are combined sewers which are typically located in older areas of the city and collect and convey sanitary and stormwater in a single pipe. In newer areas, sanitary sewers collect and convey wastewater in a system separate from the stormwater. With the transfer of Drainage Services to EPCOR in September 2017, both the wastewater collection and treatment systems are under EWSI's umbrella. This will allow EWSI to enhance integration of strategic planning and project delivery to address operational and long term needs for this critical wastewater infrastructure.

59. The configuration of the wastewater collection systems determine how wastewater generated within the region is distributed between the two treatment plants. Currently Gold Bar

WWTP receives the majority of the wastewater from within Edmonton and the Alberta Capital Region WWTP receives the majority from the surrounding areas. Both the Gold Bar WWTP and the Alberta Capital Region WWTP provide treatment of wastewater, and treated effluent from these plants is returned to the North Saskatchewan River. The treated effluent is required to meet environmental requirements established by Alberta Environment and Parks and set out in each facility's Approval to Operate.

60. The Gold Bar WWTP, located at 10977 – 50 Street on the south bank of the North Saskatchewan River, treats most of the wastewater from Edmonton but also from communities south of the city including Leduc, County of Leduc, the Town of Beaumont and the Edmonton International Airport. The plant is owned and operated by EWSI.

61. The Alberta Capital Region WWTP, located northeast of Edmonton adjacent to the North Saskatchewan River, treats a small volume of wastewater from the northeast sector of Edmonton and from other municipalities surrounding Edmonton except those to the south. These municipalities include: St. Albert, Fort Saskatchewan, Morinville, Gibbons, Stony Plain, Spruce Grove, County of Parkland, Strathcona County (Sherwood Park) and Sturgeon County. The plant is owned and operated by the Alberta Capital Region Wastewater Commission.

62. Currently the volume of wastewater from the areas south of Edmonton that goes to the Gold Bar WWTP is similar to the volume of wastewater from northeast Edmonton that goes to the Alberta Capital Region WWTP. In essence, Gold Bar WWTP treats the equivalent of all wastewater within Edmonton and the Alberta Capital Regional Commission treats the equivalent of the surrounding area. There is a contractual agreement between the two parties to reconcile these flows.

EWSI's Biosolids Management Program

63. The Clover Bar Biosolids Recycling Facility (CBBRF) is located at the Edmonton Waste Management Centre approximately 10 km northeast of the Gold Bar WWTP. At the CBBRF, over 27,000 dry tonnes of digested sludge from both the Gold Bar WWTP and Alberta Capital Region WWTP are processed each year. After a period of settling at the Clover Bar lagoons, the liquid fraction of the digested sludge (referred to as the "Clover Bar Supernatant Return") is returned to Gold Bar WWTP and Alberta Capital Region WWTP for further processing. The solid fraction, the biosolids, is stored for eventual application on agricultural land, composting or other means of disposal. Since 1978, the thickened biosolids from the lagoons has been applied on surrounding agricultural lands. From 2000 to 2020, some of the thickened biosolids has been

integrated with the solid waste into compost at the Edmonton Composting Facility. In 2017, the City temporarily shut down the Edmonton Composting Facility and in early 2020 it was permanently closed. These processes, which occur at the CBBRF, are referred to as the Biosolids Management Program.

64. Effective April 1, 2022, the Biosolids Management Program will be transferred to Wastewater Treatment from Drainage Services. This transfer recognizes that biosolids management is an essential component of wastewater treatment processes. Integrating the Biosolids Management Program into EWSI's Wastewater Treatment operations ensures that accountability for all aspects of wastewater treatment and biosolids management, including planning, capital project execution and operations and maintenance, resides within a single business. Moving the biosolids management function to Wastewater Treatment in 2022 will increase the net book value of plant in service by approximately $24 million and increase annual operating expenses of approximately $17 million for Wastewater Treatment, with offsetting decreases reflected in the Drainage Services PBR.

Combined Sewers and EWSI's Combined Sewer Overflow Strategy

65. The combined sewer system presents significant challenges for wastewater collection and treatment. During heavy wet weather periods the combined sewers often capture more stormwater runoff than they can handle, resulting in wastewater overflows to the river. Without such overflows there would be no way of preventing untreated wastewater in those areas from backing-up into household basements or from spilling out of maintenance access holes and flooding roadways. To meet commitments set out by Alberta Environment and Parks, the Combined Sewer Overflow (CSO) Control Strategy[4] was developed and approved for implementation in 1999 to reduce the environmental impacts of Edmonton's combined sewer system.

66. The goals for the CSO Control Strategy were to increase the average annual capture and treatment of wet weather flows in the sewer system to over 86%, and a reduction in average annual CSO occurrences (spills of untreated runoff and sewage to the North Saskatchewan River). The CSO Control Strategy includes temporary storage of sanitary flows in the collection system to prevent mixing with stormwater flows, diversion of CSO to Gold Bar WWTP for primary

[4] http://www.edmonton.ca/city_government/urban_planning_and_design/combined-sewer-overflow-control-strategy.aspx

treatment, and opportunistic separation of the combined sewer into separate sanitary and storm collection systems. Gold Bar WWTP is required to treat CSO events to the flow specified in its Approval to Operate. Upgrades were performed at the Gold Bar WWTP to meet the anticipated increase in CSO flows that would be directed to the plant during wet weather flow events. With the upgrades at Gold Bar WWTP and in the collection system the amount of untreated overflow entering the river is greatly diminished. With the successful implementation of the CSO Control Strategy, the management of CSO has been updated with the Total Loadings Plan and the Combined Sewer Discharge (CSD) Strategy. The focus of the CSD Strategy is on creating capacity in the existing combined system by slowing surface runoff inflow through storage (dry ponds) and Low Impact Development (LID) installations. Other components of CSD include monitoring, operational improvements with controls and may include building new storm trunks all to allow for more wet weather flow to be conveyed to Gold Bar WWTP to reduce the environmental impact on the river. The CSD strategy is implemented through EWSI's Stormwater Integrated Resource Plan (SIRP) Strategy.

67. Under its One Water Planning approach, EWSI is also initiating the Sanitary Integrated Resource Plan (SanIRP). Under the Sanitary IRP, EWSI will continue to develop strategies to maximize the capture of wet weather flow and diversion to Gold Bar WWTP for enhanced primary treatment and to reduce loadings of bacteria and solids to the North Saskatchewan River. The development of SanIRP will incorporate many synergy opportunities with other EWSI initiatives including SIRP. One of SIRP's initiatives is to promote the wide spread installation of LID features. Installation of LID will reduce stormwater flows to the storm and combined sewer networks, and decrease the combined sewer flow to Gold Bar WWTP and the environment. A city wide performance matrix called Green Hectares has been adopted to track the installation of LID in Edmonton.

2.1.1 Sources of Wastewater

68. Sources of wastewater within the geographical region serviced by the Gold Bar WWTP include the typical domestic, commercial and industrial sources. Stormwater entering the combined sewer system and inflow/infiltration sources are also components of the wastewater stream conveyed to Gold Bar WWTP. A unique source of wastewater within the region is the Clover Bar supernatant return. Each of these sources and components is described below.

Domestic - This category of wastewater is generated from residential units. As with most municipal wastewater systems, domestic wastewater is the largest source of wastewater in the

contributing area and represents approximately 75% of wastewater treated at Gold Bar during dry conditions.

Commercial and Industrial - This category of wastewater is generated from commercial, industrial and institutional establishments within the contributing area. Commercial and industrial sourced wastewater forms a significant portion of the wastewater generated within the wastewater system and represents approximately 24% of wastewater treated at Gold Bar during dry conditions.

Stormwater - This contributor to the wastewater system is generated from rain events, and enters the wastewater system via combined sewers during wet weather conditions. Stormwater is an important component to consider due to the combined sewer systems located in the older central core area of Edmonton.

Inflow/Infiltration - This category of the wastewater flow is generated from extraneous means such as discharges from roof leaders, weeping tiles, maintenance access covers, cross connections from storm and combined sewers, groundwater flow from defective pipes, pipe joints, connections and maintenance access hole walls. The historical volume of inflow/infiltration flows varies significantly. Peak flows occurred at the beginning of the 1980s with a steady decline to the present time, likely due to the City of Edmonton program to disconnect roof leaders from the collection system and to grade residential lots so that stormwater does not charge the soil in the vicinity of weeping tile systems.

Clover Bar Supernatant Returns - The liquid component that is pumped back to the sewer system and conveyed to Gold Bar WWTP for treatment from the CBBRF is called supernatant. A portion of the supernatant is also pumped to the Alberta Capital Region WWTP. While comprising less than 1% of the flow that enters Gold Bar WWTP, the supernatant contains significant concentrations of nitrogen and phosphorus.

2.2 Gold Bar Wastewater Treatment Plant

69. The Gold Bar WWTP was commissioned in 1956 with initial wastewater treatment capacity of 91 ML/d. At this time the plant included primary and secondary wastewater treatment processes and solids handling processes through four digesters. In 1969, to meet the growth of the city of Edmonton, Gold Bar WWTP was expanded to increase its secondary treatment capacity to 195 ML/d average dry weather flow. Gold Bar WWTP's primary and

secondary treatment capacities were expanded again in 1981 along with additional solids handling capacity. The new secondary treatment capacity was 350 ML/d.

70. In 1996, to address regulatory limits for phosphorous and nitrogen, Secondary Clarifiers 1 to 5 were physically extended in size and two new bioreactors were constructed for a total of 10. In 1998, to meet new regulatory requirements under Gold Bar WWTP's Approval to Operate, which reduced fecal coliform limits, Tertiary Treatment – Ultra-Violet ("UV") disinfection was added.

71. In 2005 membrane filtration treatment was added to the Gold Bar WWTP to provide Suncor and Air Products with approximately 10 ML/d of recycled wastewater to support industrial processes on a commercial basis. These services between EWSI and Suncor are provided under a commercial agreement whereby Suncor funds the capital and operating costs associated with these wastewater treatment services to ensure regulated operations at the Gold Bar WWTP do not incur any additional costs or otherwise subsidize this commercial service.

72. In 2015, the Ostara nutrient recovery facility was commissioned, and removes phosphorus from the supernatant returns from the CBBRF. Ostara uses the phosphorus to produce eco-friendly, slow-release fertilizer. Removal of phosphorus from the supernatant return is beneficial for improving performance of the wastewater treatment processes.

73. Today Gold Bar WWTP is one of the largest wastewater treatment plants in Canada. Gold Bar WWTP handles both dry weather flows and also provides primary treatment to CSO flows during storm and spring melt events. The plant is currently capable of fully treating 310 ML/d of wastewater on a sustained basis, and peaks of 420 ML/d. The plant is also capable of providing at least primary treatment to a maximum of 1,200 ML/d during wet weather events. In a typical year, approximately 100,000 ML of wastewater receives full treatment at Gold Bar WWTP.

74. Gold Bar WWTP operates under a Government of Alberta issued Environmental Protection and Enhancement Act approval, Approval To Operate No. 639-03-06. The plant regularly produces effluent that meets or exceeds regulatory quality requirements established by Alberta Environment and Parks. The final effluent that receives full treatment and is discharged to the river is virtually always better than the requirements in Gold Bar WWTP's Approval to Operate. This has a significant benefit to the environment.

75. Wastewater plants have some unique operating challenges that are less common in comparison to drinking water treatment plants. In Edmonton, there are two water treatment

plants (E. L. Smith and Rossdale), both of which have sufficient capacity to satisfy the demand for drinking water for short durations. As a result, either of the plants can be shut down for needed inspections, maintenance or modifications. As well, most drinking water systems have storage reservoirs for the treated water which allow the plants to do complete shutdowns, whether planned or during an emergency. Finally, each water treatment plant has partially or fully duplicate treatment trains providing another level of redundancy. For wastewater, the flow never stops and is not stored, which makes isolations, inspections and shutdowns far more challenging.

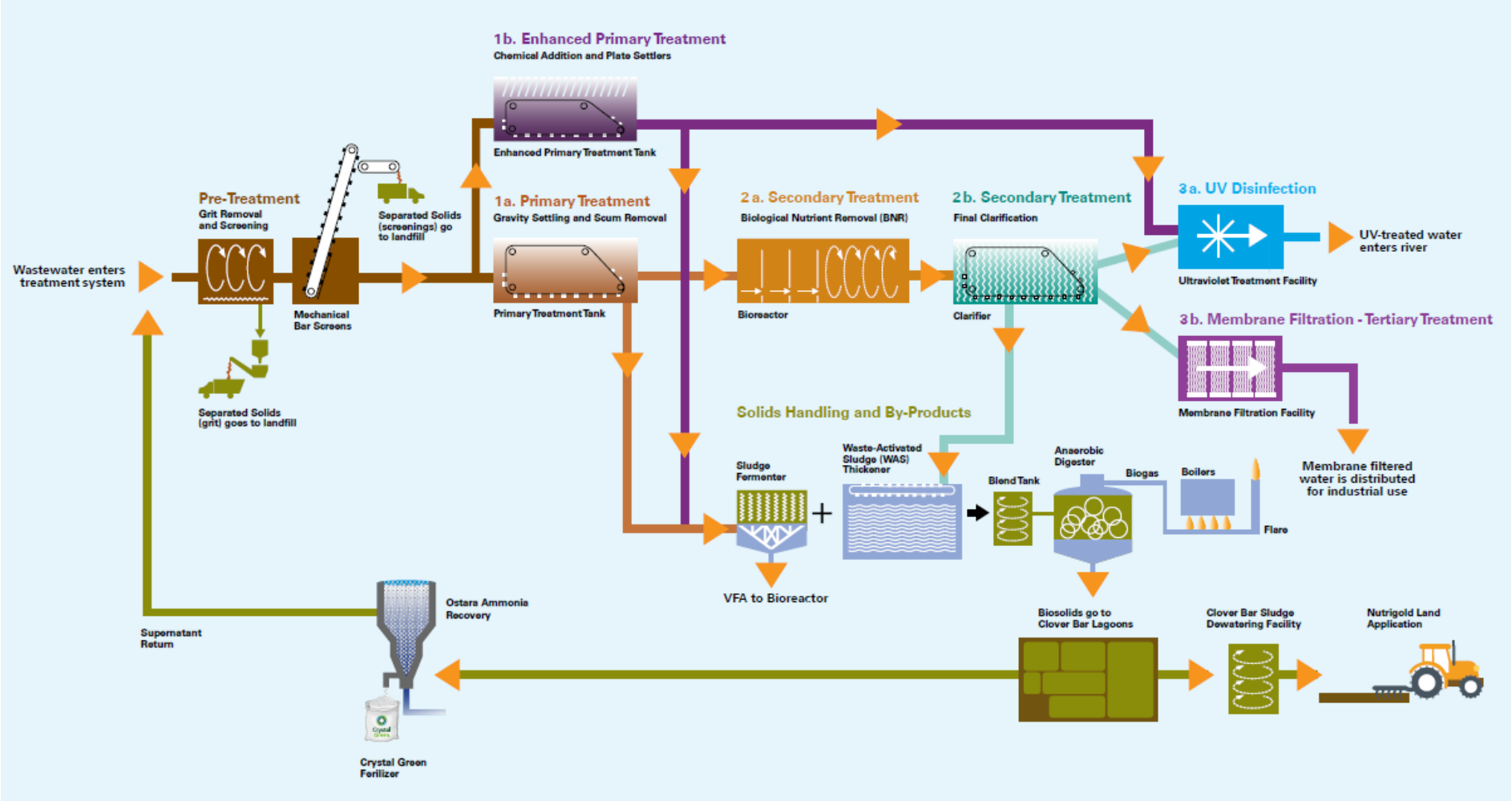
76. Since Gold Bar WWTP is Edmonton's only wastewater treatment plant, it must be in operation at all times. Gold Bar WWTP has some redundancy, but has areas that lack redundancy like the conveyance channels between process units. These single points of failure can impact EWSI's ability to manage/maintain the plant and meet conditions of its Approval to Operate to ensure that wastewater is sufficiently treated before discharging back to the North Saskatchewan River. Planning of shutdowns for inspection, maintenance or upgrading is much more complicated, challenging and expensive compared to plants with sufficient redundancy to take systems offline for maintenance as service must be maintained during these activities. At Gold Bar WWTP, the least disruptive time to perform major construction is during the winter as capacity does not have to be guaranteed for wet weather events. Unfortunately, this also results in higher construction costs due to hoarding, heating and lower productivity.

77. The major treatment process units and key components at the Gold Bar WWTP are as follows:

1. Hydraulic System;
2. Pre-Treatment;
3. Primary Treatment;
4. Enhanced Primary Treatment;
5. Secondary Treatment – Biological Nutrient Removal (BNR)
6. Secondary Treatment – Final Clarification;
7. Tertiary Treatment - UV Disinfection;
8. Membrane Filtration for Industrial Process Water; and
9. Solids Handling and By-Products.

78. The organization of these major treatment process units at Gold Bar WWTP is illustrated in Figure 2.2-1.

Figure 2.2-1
Gold Bar WWTP and CBBRF Simplified Processes



79. The following sections describe each of these major treatment processes and the key assets used at each stage of the process.

2.2.1 Hydraulic System

80. The Hydraulic System at Gold Bar WWTP receives wastewater from the EPCOR Drainage Services' sanitary and combined sewer systems, and conveys the wastewater throughout the plant and between the various treatment processes. The hydraulic system consists of a large number of concrete channels, pipes, gates and chambers, and is represented in Figure 2.2-1 by the lines and arrows connecting the various treatment stages.

81. The flows of wastewater into the Gold Bar WWTP come through two major sewer trunks, one sewer pipe and a small force main carrying industrial waste. Three parallel influent channels connect to pre-treatment facilities and are the main hydraulic conduits from which EWSI distributes wastewater within the plant. Channel 1 is connected to a separate treatment train which includes pre-treatment and primary treatment facilities. The Channel 1 treatment train consists of the original 1957 headworks, pre-treatment and primary treatment assets. Channel 2 and Channel 3 are connected to the balance of the treatment units.

2.2.2 Pre-Treatment

82. As incoming raw wastewater flows through Gold Bar WWTP's seven aerated grit tanks, heavy material (sand, rocks) drops to the bottom while large, lighter material (plastics, paper, rags, wood, etc.) is trapped by large bar screens at the ends of the tanks. Removing this material is necessary to prevent damage to downstream equipment, and allow for the next treatment processes to focus on removing organic matter and pollutants. Once the large inorganic solid matter and grit is removed from the raw wastewater, it is trucked in bins to the Ryley Landfill. Key assets used in the pre-treatment process include: aerated grit tanks, flow control gates and bar screens.

83. EWSI constructed a Grit Recovery Facility (GRF) in the 2017-2021 PBR. The facility recovers sanitary grit from the sludge removed during activities to clean the drainage collection system. These activities produce sanitary residual debris and wastewater contaminated soils which require disposal. The GRF separates this waste into a liquid stream that is treated by Gold Bar, and a solids stream for ultimate disposal or reuse.

2.2.3 Primary Treatment

84. During dry weather periods, wastewater effluent flows directly from the pre-treatment stage to the regular primary treatment clarifiers where approximately 50% of the wastewater's impurities are removed. In the deep clarifier tanks, the heavier solids (sludge) settle to the bottom while the lighter solids (scum) rise to the top. Both sludge and scum are then scraped or skimmed off and piped away for solids handling, while the primary effluent (as it is referred to following this stage) travels on to the secondary treatment phase. From this point forward in the treatment process, the solids and liquids are dealt with separately for the most part. Key assets used in the primary treatment process include: primary tanks, clarifier rakes and chains, sludge pumping and scum collection. Gold Bar WWTP currently has a total of four operating conventional primary treatment clarifiers.

85. Gold Bar WWTP's Approval to Operate specifies that EWSI must provide at least 1,200 ML/d of primary treatment during the wet weather season. Channels 2 and 3, and their related primary treatment facilities, have a capacity of 1,200 ML/d. Channel 1 and its associated primary treatment facilities (primary clarifiers 3 and 4) are therefore only required to meet the regulated treatment capacity during maintenance activities and outages.

2.2.4 Enhanced Primary Treatment

86. As noted above, during heavy wet weather periods, the combined sewers often capture more runoff than they can handle, resulting in combined sewer overflows to the river. Gold Bar WWTP's Enhanced Primary Treatment clarifiers were installed in 2006, to treat this overflow from the combined sewer system to greatly reduce the amount of untreated overflow entering the river. These overflows are instead directed to Gold Bar's Enhanced Primary Treatment clarifiers, after the pre-treatment step, which allows the plant to take in and treat more peak seasonal flows (e.g. summer storms and spring snowmelt). The Enhanced Primary Treatment clarifiers are also used during dry weather treatment to improve the overall effluent quality.

87. Key assets used in the enhanced primary treatment process include: enhanced primary tanks, inclined plates, clarifier rakes and chains, sludge pumping, scum collection and the building that covers the tanks.

2.2.5 Secondary Treatment – Biological Nutrient Removal (BNR)

88. The remaining organic matter in the primary effluent are dissolved solids that will not settle out by gravity alone and therefore cannot simply be scraped out by rakes or machines.

Gold Bar WWTP harnesses the wastewater's biological properties, namely the microorganisms (bacteria, fungi, protozoa) and organic matter, to further clean the effluent.

89. At this stage, microorganisms feed on the dissolved organic matter and other pollutants, breaking them down. The microorganisms multiply in large bioreactor tanks, and their appetite for waste materials is further stimulated by mixing in large volumes of air. Microorganisms in the secondary bioreactors pull the nutrients phosphorus and ammonia, which can be harmful if released to the river in high concentrations, from the liquid. Once these nutrients have removed, the secondary effluent is sent for final clarification.

90. Key assets used in the secondary treatment – BNR process include: bioreactor tanks, air diffusers, and sludge pumping (return activated sludge). Gold Bar WWTP has a total of eleven bioreactors that provide biological nutrient removal.

2.2.6 Secondary Treatment – Final Clarification

91. Upon leaving the bioreactor, effluent enters the secondary clarifiers which function much like the primary clarifiers. In this case, the well-fed microorganisms bind together as 'flocs', settle to the bottom and from there are removed by mechanical rakes. By this stage almost all the impurities have been removed. Most of this settled floc is channeled back into the bioreactors, while a small portion is removed, thickened and pumped to the digesters for solids treatment. Following the final clarification stage, clear effluent goes to the Tertiary Treatment – UV Disinfection process.

92. Key assets used in the secondary treatment – final clarification process include: secondary clarifier tanks, clarifier rakes and chains, and sludge pumping (return activated sludge and waste activated sludge). Gold Bar WWTP has a total of eleven secondary clarifiers providing final clarification.

2.2.7 Tertiary Treatment – UV Disinfection

93. Before being returned to the North Saskatchewan River after almost 18 hours of treatment, the cleaned wastewater effluent is disinfected using high intensity ultra-violet light. In less than a minute, this chemical-free process inactivates most of the harmful bacteria that remain in the effluent and renders the treated wastewater safe for contact during recreational activities (e.g. boating, wading and fishing) further downstream from the plant. Following disinfection, the wastewater, having been treated in accordance with regulatory standards, can now be safely returned to the North Saskatchewan River via the plant's main outfall.

94. Key assets used in the Tertiary Treatment - UV Disinfection process include: prescreens, disinfection channels and the UV lamp system itself.

2.2.8 Membrane Filtration for Industrial Process Water

95. About 5% of the final treated effluent bypasses UV disinfection and goes straight to membrane filtration, producing high-grade process water for industry. Membrane filters are a series of porous synthetic strands containing millions of microscopic pore openings that allow water to pass through but act as a barrier to even the smallest bacteria. This filtering process is referred to as 'effluent polishing', and following this chlorine is added before it is piped to the Suncor Refinery in Strathcona County. The costs associated with Gold Bar WWTP's membrane filtration operation are charged directly to Suncor and are not included in EWSI's applied for costs for regulated wastewater treatment operations.

96. Key assets used in the membrane filtration tertiary treatment process include: membrane system, chemical systems.

2.2.9 Solids Handling and By Products

97. Almost half the infrastructure at the Gold Bar WWTP is required for managing the solids that enter the plant. Solids are removed from the primary clarifiers and the secondary clarifiers, and go through the solids handling processes described below. Key assets used in the solids handling process include: thickener/fermenters, dissolved air flotation, blend tanks, digesters and various mechanical pumping and pipeline systems.

Sludge Thickeners/Fermenters

98. The Gold Bar WWTP fermenters include four unheated, anaerobic (no oxygen) vessels. After 3-7 days in the fermenters, the thickened primary sludge is sent first to a blend tank, to be mixed with secondary sludge from the secondary treatment - final clarification process. Liquid from the fermenters, which has become enriched by what are known as volatile fatty acids (VFAs), is used in the secondary treatment process and is an essential ingredient in the BNR process. Not all four tanks are needed as fermenters at any one time, so they can also be used as thickeners. Thickeners allow short (less than 3 days) storage of primary sludge prior to it being pumped to the blend tanks. This storage helps manage solids during rain events.

Waste Activated Sludge Thickeners

99. Waste activated sludge is removed from the secondary clarifiers and pumped to a thickening facility. Dissolved air flotation is used to thicken the sludge before it is pumped to the blend tanks.

Blend Tanks

100. Blend tanks are used to mix the two different streams of solids: primary and waste activated sludge. Blending is needed to reduce the risk of digester upsets. The two sludge streams contain significantly different levels of volatile fatty acids. If the streams are not well mixed, pockets of sludge containing high levels of volatile fatty acids can enter the digesters which can lead to digester upset, foaming and possibly digester venting.

Anaerobic Digestion

101. Anaerobic digesters, which are maintained at 37°C, serve in breaking down and stabilizing the massive amounts of organic sludge removed during the treatment processes. The digesters do in weeks what in nature would take many months. Gold Bar WWTP has eight digesters that are used to stabilize the biosolids.

Biosolids Removal and Clover Bar Supernatant Returns

102. Digested sludge (biosolids) produced from Gold Bar WWTP digesters is pumped to the CBBRF. Biosolids contain significant concentrations of nitrogen and phosphorus and have been used for decades as a fertilizer and a soil amendment. The biosolids are stored in lagoons at the CBBRF, thicken over time and gradually separate into liquid and solid components. The liquid component, Clover Bar Supernatant Returns, is pumped back to the Gold Bar WWTP (with a portion returning to the Alberta Capital Region WWTP) for treatment. The solid component is removed each year from May to October and applied on agricultural lands as fertilizer.

103. Sludge that is generated at Gold Bar WWTP is pumped to Cell #5 of the Clover Bar lagoons (the sludge at this point is commonly referred to as “biosolids”). The biosolids are settled in this lagoon to a solids content of 7-8%. A floating barge then pumps this thickened biosolids stream to a dewatering facility located in the Edmonton Waste Management Centre, west of the lagoons site. There, the biosolids are dewatered in centrifuges to achieve a solids content of 22-24%. The liquid portion of this separation process is sent to Cell #2 and blended with supernatant from Cells 3E and 3W. The blended stream is then processed through the Ostara Nutrient Recovery

Facility. The dewatered solids are hauled to sites for direct land application as a soil amendment, and historically in compost while the Edmonton Composter was operational.

104. The Ostara Nutrient Recovery Facility is also located at the Clover Bar site. This nutrient recovery facility provides a beneficial use for biosolids by reclaiming phosphorus from the biosolids to produce granular fertilizer. The fertilizer is then sold for use under the Crystal Green product name for crop production, providing an environmental benefit by diverting these nutrients from the wastewater treatment process and local waterways. The remaining water from the Ostara process is returned to Gold Bar WWTP for full treatment. The Ostara process also helps to prevent struvite (a phosphorus based scale) formation in Gold Bar WWTP's equipment.

Biogas Compression and Handling – Gas Room

105. Some of the biogas (65-70% methane) produced by the sludge digesting or breaking down is captured and used to heat the Gold Bar WWTP buildings and digesters. Biogas compression and handling systems are contained in three Gas Rooms.

Boilers/Flares

106. Some of the biogas produced by the sludge digesting or breaking down is captured and burned in hot water boilers to provide heat for many of the Gold Bar WWTP buildings and digesters. Any biogas that is not needed by the boilers is flared.

2.2.10 Support Systems, Buildings, etc.

107. Supporting these various treatment processes are numerous buildings, piping systems and other utilities. Some of the key support systems and buildings that require upgrades during this PBR term include the electrical system, utility hot water systems, odour control system, and ventilation and heating systems.

108. The control room is a key building within the Gold Bar WWTP, as it serves as the "brain" of the plant. Due to concerns with the current building's hygiene facilities, and limited space, a key project proposed in the 2017-2021 PBR plan was to construct a new Operations Centre near the existing lab facility at the southern midpoint of the plant (the Operations Centre at Mid-Point Entrance project), to house both a new control room and maintenance facilities, including

hygienically appropriate locker rooms, showers and food preparation areas[5]. To resolve the hygiene issues and facilitate future capacity expansion, EWSI had planned to construct the new Operations Centre beside lands to be swapped with the City of Edmonton. However, following extensive stakeholder consultation in relation to the Gold Bar IRP and this project, EWSI committed to contain the Gold Bar WWTP footprint within the existing fence line. This resulted in a significant scope adjustment to this project which is planned to be replaced by two separate hygiene related projects. Instead of a new building, the existing Centre of Excellence Building will be renovated to accommodate the new control room and new hygiene facilities. Another separate project to develop hygiene facilities for maintenance workers, the Maintenance Hygiene Project, is also being implemented.

2.3 Gold Bar WWTP Long Range Planning and Asset Management

2.3.1 Integrated Resource Plan

109. EWSI's Edmonton Wastewater Treatment Integrated Resource Plan (the "IRP") documents the long term planning process for its wastewater treatment system over a 40-year planning horizon. The IRP is a dynamic document that provides a strategic framework to guide development of Gold Bar WWTP's asset management plans and capital programs. The current version of the IRP covers the period from 2017 – 2061.

110. Through the IRP, EWSI considers scenarios for managing future wastewater flows considering: regulatory changes; technological advancements; changes in volume and characteristics of wastewater and stormwater flows; lifecycle replacement requirements for assets at Gold Bar WWTP and at the CBBRF; climate change impacts; and EWSI's commitments made to stakeholders as a result of public engagement activities. EWSI identifies the investments and operational activities that would be required under each of these scenarios, through evaluation of environmental and social impacts, operational, planning and infrastructure responses, risk assessment and management, financial analysis and community impacts.

111. EWSI conducted extensive public engagement from 2017 to 2019 to solicit input from the public to inform development of the IRP. Through a participatory process, including a series of workshops with a Citizen Planning Committee in 2019, five shared outcome statements were

[5] This project was referred to as the Operations Centre at Mid-Point Entrance (Phase 1) Project and a business case was included in Appendix I-08 of EWSI's 2017-2021 PBR Application.

established. These shared outcomes define goal for the Gold Bar WWTP that are shared by EWSI and the community. The five shared outcomes are:

- **Quality of Life** – Ensuring Gold Bar WWTP will be operated, maintained and updated in a way that reduces impacts to, and improves quality of life for, the community and stakeholders. Aspects to consider include odour, noise, and enjoyment of parks and recreation amenities.
- **Safety** – Ensuring community, public and worker safety and health are protected.
- **Relationship** – Working with stakeholders to establish an honest, transparent, trusting and respectful long term relationship.
- **Environment** – Ensuring pollution is prevented and the impact of the Gold Bar WWTP on air, land, water, climate and ecosystems is reduced.
- **Reliable, Responsible and Sustainable** – Ensuring that Gold Bar WWTP is designed, operated and maintained in a prudent and responsible manner.

112. Each project proposed in the IRP is tested against these shared outcomes, and in some cases, shared outcomes can drive the pace of implementation of projects. An additional twenty design principles were also established with stakeholders to support these shared outcomes. These principles will guide design and execution of projects and operations.

2.3.2 IRP Implementation

113. The IRP outlines the general timing and costs of major projects and programs planned for Gold Bar WWTP and the CBBRF. The IRP is a dynamic process that incorporates new information over time. Five year capital and operating plans (or three-years in the case of the 2022-2024 PBR) are developed based on the IRP to align with PBR terms. Gold Bar WWTP's capital program in the PBR is organized into five categories: Regulatory, Growth/Customer Requirements, Health, Safety & Environment (HSE), Life Cycle Reliability, and Performance Efficiency Improvement. The Reliability/Lifecycle category is further divided into 18 annual rehabilitation programs that ensure assets at Gold Bar and the CBBRF remain in good working order.

2.4 2017-2027 Performance Overview – Accomplishments and Challenges

2.4.1 Operational Performance and Metrics Review for 2017-2019

114. Wastewater Treatment service quality is measured by the results of five indices prescribed in the Bylaw. The tracking of these indices is intended to ensure that system service

quality is maintained within the PBR regulatory environment. Each index contains individual performance measures that represent the more specific performance standards expected. A detailed description of the performance metrics is available in Schedule 3 of the Bylaw. The performance standards or targets are based on industry benchmarks, and where benchmarks are not available, on historic trending and targeted future performance.

115. Under provisions of the Bylaw (Service Quality and Wastewater Treatment Service Quality), EWSI reports on its actual performance results on each of the performance measures as part of it water rate filing and also as part of the annual PBR Progress Report. The overall performance is determined on a point basis with 100 base points available if the standards for all five performance indices are achieved. Total points are determined by the summation of points available for each performance measure. Bonus points are also available for performance above standards and financial penalties are applied if EWSI does not meet the 100 base point standard (note: on an individual indices basis, with some performance measures, such as environmental incidents, a lower-than-standard score represents performance above standards while for other measures a higher score indicates better performance).

116. With each PBR renewal, EWSI typically revises the PBR performance metrics through updating the standards of performance (where possible) and introducing new metrics to better align with operational priorities and strategic goals. For the 2022-2024 PBR term, EWSI is proposing to limit the number of changes to the overall metrics program. Maintaining a relatively consistent metrics program from the current term will enable stakeholders to be assured that service levels are being maintained despite the reductions. Where feasible, the standards of performance have been updated to the most recent 10 year average of past performance.

117. The Total Points Earned from 2017 to 2019 are detailed in Table 2.4.1-1. The detailed results for these indices are further described in the sections below.

Table 2.4.1-1
Total Points Earned 2017-2019

	Performance Measure	A Standard Points	B Bonus Points	C Total Points	D 2017 Actual	E 2018 Actual	F 2019 Actual
1	Water Quality & Environment Index	55.0	5.5	60.5	60.5	60.5	60.5
2	Customer Service Index	15.0	1.5	16.5	16.5	16.5	16.5
3	System Reliability and Optimization Index	15.0	1.5	16.5	16.5	16.5	16.5
4	Environmental Index	15.0	1.5	16.5	16.5	16.5	16.5
5	**Total Points Earned**	**100.0**	**10.0**	**110.0**	**110.0**	**110.0**	**110.0**

118. As noted, EWSI has exceed the 100 point standard in each year of the PBR. The detailed results for the underlying measures are detailed in Table 2.4.1-2.

Table 2.4.1-2
Performance Measure Results – 2017-2019

	Performance Measure	A Standard	B 2017 Actual	C 2018 Actual	D 2019 Actual	E Average 2017-19
	Water Quality & Environment Index					
1	Wastewater Quality	28.0%	22.0%	27.2%	25.3%	24.8%
2	Environmental Incidents	10	3	2	3	2.7
	Customer Service Index					
3	H_2S – 1-hour Exceedances	6	1	0	0	0.3
4	H_2S – 24-hour Exceedances	2	0	0	0	0
5	Scrubber Uptime	90.0%	97.4%	90.8%	98.8%	95.6%
	System Reliability and Optimization Index					
6	Enhanced Primary Treatment	80.0%	100.0%	98.7%	100.0%	99.6
7	Biogas Utilization	60.0%	84.2%	75.6%	84.2%	81.3
8	Energy Efficiency	514.0	497.1	503.6	500	500
	Safety Index					
9	Near Miss Reporting	220	327	241	241	270
10	Work Site Inspections / Observations	919	1,088	971	1,061	1,040
11	Lost Time Frequency Rate	0.75	0.00	0.00	0.00	0.00
12	All Injury Frequency Rate	1.50	1.92	0.00	0.63	0.85

119. The Annual PBR progress reports (Appendices E-1 to E-3) provide the specific annual results for each metric. The selection of metrics and the accompanying standard being proposed for the 2022-2024 PBR are detailed in Section 13 to the Application.

2.4.2 Financial Performance Review for 2017-2021

120. A summary of the financial performance of EWSI Wastewater over the 2017-2021 period is detailed in Table 2.4.2-1. More detailed financial results and variance explanations are available in the annual PBR performance reports (Appendices E-1 to E-3).

Table 2.4.2-1
Financial Performance 2017-2021
Financial Schedule 3-1
($ millions)

	A	B	C	D	E	F	G	H	I	J
	2017D	**2017A**	**2018D**	**2018A**	**2019D**	**2019A**	**2020D**	**2020F**	**2021D**	**2021F**
1 Revenue	94.0	90.8	100.6	96.0	106.3	99.1	112.6	104.6	116.8	111.6
2 Operating Costs	(54.0)	(47.1)	(55.6)	(49.1)	(57.1)	(50.4)	(59.6)	(54.6)	(60.4)	(55.7)
3 Depreciation	(13.9)	(14.4)	(15.7)	(16.0)	(17.4)	(18.0)	(19.0)	(19.3)	(20.0)	(20.7)
4 Interest Expense	(10.0)	(10.2)	(11.5)	(10.9)	(12.6)	(11.5)	(13.4)	(11.9)	(14.5)	(12.4)
5 **Net Income**	16.1	19.2	17.8	20.0	19.2	19.2	20.6	18.9	21.7	22.9
6 Capex	54.5	46.8	57.9	52.5	53.3	49.3	47.7	42.0	22.1	54.5
7 Rate Base	395.1	379.6	437.3	412.8	470.8	442.5	506.2	475.5	534.1	514.0
8 RoE (%)	10.17%	12.63%	10.17%	12.14%	10.17%	10.86%	10.17%	9.93%	10.17%	11.13%

121. In each year of the 2017-2021 PBR term, Wastewater Treatment revenues have been well below the PBR forecast. In aggregate, EWSI expects revenues to be $28.0 million less than the approved amounts over the 2017-2021 PBR term. This decrease is largely attributable to three factors: (i) lower than forecast inflation adjustments, in particular the labour component, which reflects Alberta's slower than forecast economic growth; (ii) lower per customer consumption, in particular the residential customer class, resulting from three consecutive years of unusually wet summers; and (iii) a negative non-routine adjustment to account for the reductions in corporate shared service cost allocations following the transfer of Drainage Services to EPCOR in the fall of 2017.

122. In response to the revenue shortfall, EWSI implemented cost controls and efficiency initiatives across all areas of its operations, achieving savings in chemical costs from dosing optimization, in contractor costs following the dissolution of the Centre of Excellence, and in engineering costs by reducing the number of engineering studies. EWSI also found opportunities to utilize more internal personnel in certain capital maintenance and repair programs in place of contractors. These adjustments reduced operating expenses by increasing capitalization of internal labour costs and additional capitalized overheads. Finally, as noted above, corporate shared service cost allocations were reduced following the Drainage Services transfer. The effect of these changes was that operating expenses were $29.9 million less than approved amounts over the 2017-2021 PBR term.

123. Besides operating cost savings, historically low interest rates resulted in lower than forecast interest expense. In total, interest expenses were $5.3 million less than the approved amounts over the 2017-2021 PBR term.

124. The combination of these costs savings from operating activities and interest expenses more than offset the declines in revenues and resulted in total net income which was $4.8 million greater than the approved amount for the 2017-2021 PBR term. Correspondingly, the average return on equity over the 5-year period for EWSI's regulated wastewater treatment operations was 11.34%, or 1.16% greater than the 10.175% allowed return approved for 2017-2021.

125. The level of the return on equity is also partially attributable to the shifts in the timing of completion of capital projects such that some projects were completed later than forecast. The net results of these timing shifts mean that, even with capital expenditures expected to exceed approved amounts by $9.7 million over the 2017-2021 PBR term, the rate base (row 7 of Table 2.4.2-1) is lower than forecast throughout the 2017-2021 PBR term. This lower rate base reduces the level of equity, thereby increasing the return on equity percentage.

2.5 Future Expectations

126. EWSI consistently exceeds the regulatory standards for wastewater treatment set by federal and provincial governments. EWSI keeps track of potential regulatory changes and proactively works to ensure its operations are meeting current and expected future environmental regulations. A discussion of environmental regulations potentially impacting Gold Bar is included in section 2.5.1.

127. Section 2.5.2 provides EWSI's view of future wastewater volumes compared to Gold Bar WWTP capacity. In summary, Gold Bar WWTP is able to safely treat anticipated demand until at least 2060 while remaining within its existing footprint and fence line, mitigating potential impacts to the community, and without requiring an expansion of its hydraulic or solids treatment capacity. Increases in secondary treatment capacity are anticipated to be required starting in 2027 to meet nutrient removal regulatory requirements.

128. Looking forward, EWSI has a number of initiatives to improve energy efficiency and mitigate potential risks associated with climate change and flooding, which are discussed in sections 2.5.3 and 2.5.4. For the 2022-2024 PBR term, EWSI is placing increased focus on environmental initiatives to mitigate future risks. EWSI is also investigating potential new technologies for application at Gold Bar WWTP which may provide significant benefits in terms

of improved environmental performance and lower operating costs. These new technologies are discussed in section 2.5.5. Section 2.5.6 includes discussion of plans to incorporate the CBBRF into EWSI's Wastewater Treatment operations.

2.5.1 Environmental Regulations

129. For its wastewater treatment operations, EWSI must comply with municipal bylaws, provincial and federal environmental acts, regulations, standards and guidelines related to wastewater conveyance, treatment, discharges to watercourses and biosolids. EWSI is committed to providing wastewater treatment that meets and/or exceeds wastewater compliance requirements and industry standards for watershed protection. EWSI works closely with Alberta Environment & Parks (AEP), the provincial regulatory agency, to fulfill its compliance requirements under the Environmental Protection and Enhancement Act for the Province of Alberta. As required under the Act, AEP issued a renewed Approval to Operate for Gold Bar WWTP in May 2015. This Approval to Operate (#639-03-06) sets the operational and planning expectations for the facility for the ten year period expiring May 31, 2025. This approval was also updated in 2018 with the transfer of Drainage Services to EWSI, to amalgamate the collection system with Gold Bar WWTP into a single approval. This Approval includes a number of requirements for facility and collection system operations such as monitoring and reporting, but also environmental planning requirements such as a Pollution Minimization Study to be completed prior to the approval period ending in 2025.

130. AEP is the main regulatory agency in Alberta that oversees the construction and operation of municipal wastewater treatment plants. In 2002, the government of Alberta published Standards and Guidelines for wastewater infrastructure and process treatment that provide design and operations criteria for wastewater treatment plants in Alberta. These provincial Standards and Guidelines are the basis for setting facility performance expectations. EWSI's Gold Bar WWTP Approval to Operate and its supporting operations plan align with AEP's performance expectations to meet environmental compliance obligations for the protection of air, soil and water.

131. In addition to the traditional approach of setting end-of-pipe concentration limits, the cumulative effects management approach taken under the Approval to Operate for Gold Bar WWTP includes measurement of total pollutant loadings discharged to the North Saskatchewan River. This directly links wastewater treatment plant performance to in-stream water quality objectives and watershed health. Effluent from end-of-pipe is measured for pollutant concentrations, various parameters including total suspended solids, and volumes discharged to

the river are measured to calculate total loadings over a calendar year period which is reported to AEP.

132. Over the next five to ten years, AEP is expected to move forward to set total loading performance targets, followed by enforcement of total loadings limits. Under the cumulative effects management approach, total loading limits would likely be set for not only total suspended solids but also nutrients such as phosphorous, bacteria (E.coli), and perhaps other parameters. Various emerging contaminants have been detected at trace levels in wastewater effluents (including Gold Bar WWTP) such as synthetic organic pollutants, pharmaceutical and personal body care products, and endocrine disrupting compounds. Aquatic health impacts from these contaminants at trace concentrations is uncertain. Until such time that the aquatic impacts are better understood, it is not expected that Canada or Alberta will put forth any new regulatory requirements or limits for these contaminants.

133. Environmental regulatory requirements and compliance obligations for EWSI's wastewater treatment operations are actively tracked and managed using an accredited ISO 14001:2015 Environmental Management System (EMS).

134. In addition to the EWSI's Approval to Operate, there are numerous acts, regulations, and standards from all three levels of government in Canada that apply to Gold Bar. Some examples include: Canadian Environmental Protection Act for various priority listed substances such as ammonia in the receiving watercourse; Navigation Protection Act (under Transport Canada) for effluent outfall structures; and the Fisheries Act to protect against deleterious substances and habitat degradation.

135. At the federal level, one of the key compliance obligations comes from the Wastewater Systems Effluent Regulation administered by Environment Canada. EWSI monitors and reports its effluent discharges as per federal requirements and submits quarterly reports to Environment Canada. EWSI also submits each year to Environment Canada a CSO Wastewater Systems Effluent Regulations (WSER) report that includes discharges from the combined sewer collection system. Gold Bar effluent readily complies with the National Effluent Performance Standards. In addition, EWSI also reports each year to the National Pollutant Registry for various substances released to air and water from treatment processes and effluent discharges.

136. Regulatory requirements will continue to evolve and beyond 2025 it can be expected that in addition to a total loading limit for total suspended solids there may be more stringent requirements for nutrients and bacteria, after appropriate consultation.

137. Regarding re-use of municipal wastewater effluent, Gold Bar WWTP will continue to provide membrane filtration treatment for a portion of its effluent provided to the Suncor refinery and Air Products plant for industrial process water applications. Costs associated with this commercial arrangement with Suncor are excluded from EWSI's regulated wastewater treatment operations. Alberta regulations for wastewater reuse as well as household domestic 'black' and 'grey' water potential re-use applications are not well defined at this time. EWSI will continue to stay engaged with provincial agencies and ministries working to evolve the water re-use regulations.

2.5.2 Demand Projections versus Plant Capacity – Long-Range Outlook and Strategic Alternatives

138. Population growth will lead to increased wastewater loads on Gold Bar WWTP in the future. The steady drop in per capita water consumption reduces the rate at which the dry weather flow to Gold Bar WWTP increases. However, the wastewater pollutant load is proportional to the population increase and is forecast to keep rising. Combined, it means the dry weather wastewater strength will get more concentrated over time.

139. Based on forecasts of population growth in the Edmonton region, Gold Bar WWTP is expected to have sufficient secondary treatment capacity to meet forecast demands until at least 2027. The population in the Alberta Capital Region is forecast to increase from the current 972,000 to 1,600,000 by 2050. This growth along with increased commercial and industrial activity will increase the demand for wastewater collection and treatment. To realize this increased capacity significant investments will be needed for new technologies (membrane bioreactors and sludge hydrolysis), rehabilitation of existing facilities and finally reconfiguration and upgrading of many of the existing facilities.

140. The current Gold Bar WWTP capacity is presented in Table 2.5.2-1.

Table 2.5.2-1
Gold Bar Wastewater Treatment Plant Capacity

	A **Category**	B **Capacity**
1	Pre-Treatment Capacity	2,200 ML/d
2	Primary Treatment Capacity	1,200 ML/d
	Secondary Treatment Capacity	
3	Sustained	310 ML/d
4	Peak	420 ML/d
	Solids Handling Capacity	
5	Peak Digester Feed-rate	245,000 kg/d*
6	Solids Inventory (Maximum)	506,000 kg[6]

*Available capacity decreases over time as process vessels foul, and increases with cleaning and upgrades.

141. Studies completed by EWSI since 2012 determined that the ultimate capacity of Gold Bar WWTP can be significantly greater than the current 420 ML/d peak. With technologies commonly in use today (e.g. membrane bioreactors) the sustained secondary treatment capacity of Gold Bar WWTP within the existing footprint could be as high as 600 ML/d with peaks reaching 1,200 ML/d. This higher capacity prompted a change in the long range plans for development of the Edmonton Region Wastewater System, with the potential to direct flows to Gold Bar for treatment at a significant reduction in cost. Discussions are currently ongoing to review this plan with the City of Edmonton and key stakeholders to determine a strategy for directing future wastewater flows. Increasing Gold Bar WWTP's capacity will require careful planning and execution to uphold commitments to the community for the plant to remain within the existing fence line at least until 2060. With new technology, treatment capacity increases while remaining within the existing plant footprint in the future will be possible.

142. With increased capacity demands, coupled with expected stringent requirements for nutrient removal, additional secondary treatment capacity is expected to be required by 2027. EWSI has assessed various treatment technologies to increase nutrient removal within the existing secondary treatment facility footprint. One advantage for most of these technologies is that they can be applied to one of the eleven bioreactors / secondary clarifiers at a time. This allows the plant to incrementally expand with population (and solids loading) growth. Two technologies considered for future implementation at Gold Bar WWTP are inDENSE™ and Membrane Bioreactors (MBR).

[6] These quantities reflect the maximum possible storage levels for primary solids under wet weather conditions.

143. MBR uses membrane filtration to physically separate solids and liquids in wastewater. The technology allows for more effective removal of nutrients through removal of the solids, and achieves this through a smaller footprint compared to the more traditional gravity separation systems currently used at Gold Bar WWTP, by eliminating the need for secondary clarifiers. However, MBR is expensive to implement, has higher energy costs, and adds operating and maintenance complexity.

144. Due to the high cost of MBR, EWSI is investigating the inDENSE™ technology, and is proposing to implement an inDENSE™ unit in one of the secondary clarifier in the 2022-2024 PBR to prove its effectiveness for Gold Bar WWTP conditions. inDENSE™ employs hydrocyclone technology to force separation of heavier solids from liquids. This effectively densifies the solids, enhancing settling rates and thereby increasing nutrient removal. inDENSE™ is less expensive than MBR and may enable EWSI to defer conversion of the secondary treatment trains to MBR technology by an estimated 16 years or longer. Additional information on the inDENSE™ project can be found in the Secondary inDENSE™ Upgrade Project business case included in Appendix G-12 to the Application.

145. Digester rehabilitation and upgrades completed between 2012 and 2021, in addition to other process optimizations, increased solids treatment capacity at Gold Bar WWTP significantly. Continuing the upgrading and rehabilitation of the existing digesters is a key means of preparing Gold Bar for handling greater wastewater loadings.

2.5.3 GHG Emissions Reduction Plan

146. Treatment of wastewater is an energy intensive process that produces greenhouse gases like carbon dioxide, either directly or indirectly. As part of good environmental stewardship, utilities need to look at both how to minimize their greenhouse gas footprint through application of technology and efficient operation. EWSI strives to reduce its environmental footprint in a sustainable and economically viable way while maintaining the same quality services. Specific optimization activities include:

- development of strategies to reduce power use from blowers which are the highest power consumers at the Gold Bar WWTP;
- development of a strategy for energy optimization for lower-consumption assets (smaller pumps, facility lighting); and
- determination of replacement criteria for high energy consumption assets.

147. **Green Energy Initiative** – In addition to these optimization initiatives, EWSI will benefit from EPCOR's plans to purchase green energy on behalf of its subsidiaries. EPCOR Utilities Inc. has signed an agreement with Renewable Energy Systems Canada to develop and construct a new wind farm in southern Alberta. EPCOR will acquire the renewable energy certificates (RECs) from the project for a 20 year term. Permitting activities are currently underway and the wind farm is expected to be constructed in summer 2022 with operations commencing in Q4 2022. Beginning in 2023, EWSI's power costs will also include costs for green power RECs procured by EUI the corporate level and allocated to EWSI's Wastewater Treatment operations.

148. Increasingly, wastewater treatment plants are being reconsidered as energy and resource recovery centers. Wastewater sludge has significant amounts of energy which can be captured and utilized. Biogas generated in the digestion process presents one of the most obvious opportunities to recover energy. On a commercial basis, EPCOR is developing a Renewable Natural Gas (RNG) Project that would upgrade the raw biogas produced in Gold Bar WWTP's anaerobic digesters to create pipeline quality RNG to be injected into the natural gas distribution grid in Edmonton. Currently, approximately 65% of the produced biogas is flared on site. The RNG project would ensure that all of the biogas at Gold Bar WWTP is utilized and will result in offsetting an equivalent volume of conventional natural gas. EPCOR has entered a 20-year offtake agreement with FortisBC to sell the RNG inclusive of all environmental attributes. This offtake agreement was approved by the British Columbia Utilities Commission ("BCUC") in October 2020. The facility is expected to be constructed in 2021 with commercial operations commencing by 2022. The RNG facility will have additional benefits to Gold Bar WWTP by allowing boilers to burn cleaner natural gas as a fuel (decreasing maintenance and rehabilitation requirements and frequency). As this project is a commercial venture owned and to be constructed by EPCOR, a service level agreement will be signed between EPCOR and EWSI to ensure EWSI's regulated operations at the Gold Bar WWTP do not incur any additional costs or otherwise subsidize the RNG project.

2.5.4 Climate Change Strategy and Flood Plan

149. Water and wastewater utilities both contribute to climate change, as greenhouse gas producers and emitters, and are also potentially impacted by the effects of climate change. Global climate change will have a long term impact on both availability and quality of source water, such as the North Saskatchewan River, and may result in more extreme weather conditions including increased frequency and magnitude for drought conditions and floods. With the combined sewers in Edmonton, the risk of more frequent, intense rainfall events, and early winter melting can make operations more challenging at Gold Bar WWTP.

150. As part of long term risk management, utilities need to mitigate the range of possible impacts of climate change on their operations. EWSI is pursuing strategies to address the risks of climate change including:

- Development of a flood protection plan for the facilities in Edmonton to identify the likelihood of flooding and address the need for any infrastructure modifications and improvements to emergency response procedures. It is anticipated that the water and wastewater treatment facilities (Rossdale and E. L. Smith water treatment plants and Gold Bar WWTP) will be identified as high risk based on a provincially led study on flood resiliency and will require protection;
- A separate study initiated to determine what changes should be made to Gold Bar WWTP to minimize damage that would result if the North Saskatchewan River should flood;
- Programs to reduce carbon footprint of EWSI's WWTP operations as discussed above;
- Collection of data on EWSI's emissions in anticipation of meeting future reporting requirements; and
- Assessment of the need for any future research studies to close any knowledge gaps and to better determine potential future climate change scenarios on the river.

2.5.5 Technology Changes

151. Numerous technology changes are being considered for use in EWSI's wastewater treatment operations. The following sections describe the most notable technologies being considered for various process areas of the plant.

Membrane and inDENSE™ Technology

152. EWSI is considering inDENSE™ and MBR technology for use in the secondary treatment – final clarification portion of the plant. These technologies are applied to improve suspended and some dissolved solids separation including biological oxygen demand[7] and micro-organism removals. The membrane can be applied as a polisher downstream of the secondary clarifier or by retrofitting the bioreactor/clarifier process train (option preferred for Gold Bar). inDENSE™ can be placed between existing secondary clarifiers and bioreactors. Both technologies have the potential to significantly increase the rate of secondary treatment without increasing the physical footprint of the secondary system.

[7] Biochemical oxygen demand is a measure of the organic strength of wastewater

Side Stream Treatment

153. Supernatant flow recycled from the CBBRF represents approximately 25% of the total ammonia load received at Gold Bar WWTP. This additional ammonia load places a large oxygen demand on the nitrification process at Gold Bar WWTP and impacts the biological treatment capacity. The implementation of supernatant side stream treatment will reduce the air demand at Gold Bar WWTP and could potentially extend the total treatment capacity. EWSI is evaluating various technologies.

Sludge Hydrolysis

154. EWSI is looking into sludge hydrolysis for use in treating the primary and secondary sludge. A number of new technologies have been evaluated to accelerate digestion of sludge including; thermal hydrolysis, ultrasound hydrolysis, enzymatic hydrolysis and other variants. All of these technologies offer the following benefits:

- Increased treatment capacity using existing digesters;
- Increased production of biogas;
- Improved de-waterability of digested sludge;
- Improved quality of digested sludge; and
- Hydraulic System – Influent Flow Rates.

2.5.6 Clover Bar Biosolids Recycling Facility

155. With the transfer of Drainage Services to EWSI, EWSI has also taken over the ownership, operation and maintenance of the CBBRF. In the 2022-2024 PBR term, EWSI will be updating its Wastewater Treatment operations IRP to incorporate considerations for the CBBRF. In addition to the proposed construction of a new dewatering facility south of the OSTARA facility, the existing biosolids lagoons will likely require rehabilitation beginning in the 2025-2029 PBR term, as the lagoons were built to legacy standards that do not meet the containment standards required of lagoons designed to modern standards. EWSI rehabilitated Cell 3E in the 2017-2021 PBR term in response to increasing contaminant levels measured in adjacent groundwater monitoring wells that are shared with the City's Waste Management Centre. The Cell 3E rehabilitation scope included installing a new compacted clay liner and improving sludge handling and transfer facilities. The project also installed additional groundwater monitoring wells near the rehabilitated lagoon.

156. During the 2022-2024 PBR term, EWSI will monitor the impact of the rehabilitation project on contaminant levels in the groundwater in the area. Considering that the construction and age of Cell 3W is the same as the original Cell 3E, EWSI expects that rehabilitation of Cell 3W will be required in the 2025-2029 PBR term. EWSI will assess the condition of the remaining lagoons prior to developing rehabilitation scopes and plans and develop an asset management plan for these assets.

157. While the lagoons currently have ample capacity for storage of biosolids, diversifying the end uses for biosolids will enable EWSI to accommodate future growth while supporting its environmental goals. Dewatering is generally considered the first step towards other potential options for beneficial use of the biosolids.

3.0 REVENUE REQUIREMENT SUMMARY

158. EWSI has determined its revenue requirement forecast based on its best estimates of the costs to provide wastewater treatment service plus a fair return on its investment. Table 3.0-1 provides a breakdown of the cost components comprising EWSI's revenue requirement based on the forecast costs for the 2022-2024 term. Approved amounts for 2021 (2021D) and the latest forecast amounts for 2021 (2021F) are provided for comparison.

Table 3.0-1
Financial Schedule 3-1
Revenue Requirement
2021-2024
($ millions)

	Cost Component	A 2021D	B 2021F	C 2022F	D 2023F	E 2024F
1	Operations and Maintenance Costs	50.6	46.8	60.8	67.2	66.5
2	Franchise Fees and Property Taxes	9.8	8.9	10.0	10.7	10.9
3	Depreciation and Amortization	20.0	20.7	23.2	23.8	26.4
4	Return on Rate Base Financed by Debt	14.5	12.4	12.7	12.6	14.0
5	Return on Rate Base Financed by Equity	21.7	22.9	21.7	21.9	23.9
6	Revenue Requirement before Revenue Offsets	116.7	111.6	128.5	136.1	141.8
7	Less: Revenue Offsets	(3.0)	(2.7)	(5.9)	(7.2)	(7.3)
8	**Revenue Requirement**	**113.7**	**108.9**	**122.6**	**128.9**	**134.5**

159. As explained in Section 2.0, wastewater treatment processes at the Gold Bar WWTP ensure that treated wastewater released to the North Saskatchewan River meets or exceeds all environmental requirements from Alberta Environment and Parks. Digested sludge (biosolids) from the Gold Bar WWTP is sent to Wastewater Treatment's Clover Bar sludge lagoons, where Wastewater Treatment also provides biosolids management and disposal services for sludge delivered by the Alberta Capital Region Wastewater Commission. As such, the total revenue requirement for regulated wastewater treatment operations is based on the operating and capital cost components associated with supporting both its Gold Bar WWTP and Clover Bar Biosolids Lagoons facilities, less any revenue offsets related to the provision of biosolids management services, byproduct sales and other miscellaneous revenue.

160. The forecast revenue requirement reflected on line 8 of Table 3.0-1 forms the basis for determining EWSI's PBR wastewater rates for the 2022-2024 period.

161. The methodology and assumptions used to determine the forecast revenue requirement are described in Section 4.0 of this Application. The forecast revenue requirement by component for EWSI's regulated wastewater treatment operations is presented in Sections 5.0 (Operations and Maintenance), 6.0 (Capital Expenditures), 7.0 (Depreciation and Amortization), 8.0 (Rate Base), 9.0 (Return on Rate Base) and 10.0 (Revenue Offsets).

4.0 METHODOLOGY AND KEY ASSUMPTIONS

162. The following is an overview of the methods and key assumptions used in deriving EWSI's 2022-2024 revenue requirement. Section 4.1 provides an overview of accounting policies. Section 4.2 describes EWSI's cost forecasting process. Section 4.3 describes the methodology for determining the cost of capital. Section 4.4 describes the methodology for determining depreciation and amortization. Section 4.5 provides the capital overhead methodology. Section 4.6 summarizes EWSI's inter-affiliate transactions. Finally, Section 4.7 provides the consumption volume and customer count forecast methodology.

4.1 Accounting Policies

163. Since January 1, 2011, EUI has prepared its corporate financial information in accordance with International Financial Reporting Standards (IFRS) as required for Canadian publicly accountable enterprises. While EWSI has implemented IFRS to support the public external financial reporting requirements of its parent company, EUI, there are certain IFRS requirements which are not consistent with the accounting treatment historically applied for rate-making and rate-regulated reporting requirements (referred to herein as "regulatory accounting").

164. In 2009, the AUC issued Rule 026 "Rule Regarding Regulatory Account Procedures Pertaining to the Implementation of the International Financial Reporting Standards" (AUC Rule 026) to provide guidance to AUC-regulated utilities transitioning to IFRS. In preparing its regulatory applications, EWSI has looked to existing regulatory accounting practices as well as guidance from AUC Rule 026 to assess IFRS requirements that may be applied for rate-making purposes. Although EWSI's wastewater treatment rates are not regulated by the AUC, EWSI considers AUC Rule 026 as a source for guidance on IFRS requirements for two reasons: 1) to ensure relative consistency in practice with other regulated utilities in Alberta and 2) to promote administrative efficiency and effectiveness by minimizing the differences between regulatory accounting for both In-City and regional water customers which are regulated by the AUC on a complaint basis.

165. For EWSI, the most significant differences between IFRS and regulatory accounting relate to property, plant and equipment and associated accounts. Key differences between IFRS and regulatory accounting for EWSI are described in Table 4.1-1.

Table 4.1-1
Regulatory vs. IFRS Accounting Treatment

	A **Accounting Policy Item**	B **IFRS Accounting Treatment**	C **Regulatory Accounting Treatment used by EWSI**
1	**Capitalized Interest** – this item relates to financing related charges which are included in the capital cost for projects during construction.	For IFRS accounting, EWSI uses Interest During Construction (IDC). IDC is charged to capital projects lasting longer than 6 months and only has a debt component to the charge.	For regulatory accounting EWSI uses Allowance for Funds Used During Construction (AFUDC). AFUDC is charged to capital projects lasting longer than 12 months and has both debt and equity components to the charge.
2	**Abandonments** – this item relates to the treatment of expenses incurred to abandon, demolish, or decommission an asset which is no longer in use.	For IFRS accounting, EWSI expenses abandonments as incurred.	For regulatory accounting, EWSI charges abandonment costs to capital as incurred.
3	**Retirements** – this relates to losses incurred when an asset with remaining net book value is taken out of service and proceeds when assets are sold.	For IFRS accounting, EWSI records gains and losses on retirement as net expense in the period the retirement occurs.	For regulatory accounting, depending on the nature of the transaction, EWSI may charge gains and losses on retirement to capital and amortize the gain/loss over the remaining life of the asset at the time of disposal.
4	**Leases** – this item relates to the use of assets held under rental or lease agreements where control of the asset for the lease term resides with the lessee	For IFRS accounting, unless the lease is a short term rental, EWSI records a right of use asset and a related obligation to the lessor and depreciates the right over the period of the lease term	For regulatory accounting, no right of use asset or obligation is recognized and the lease cost continues to be treated as an operating expense.

4.2 Cost Forecasting Process

166. To determine rates for the 2022-2024 PBR term under EWSI's PBR structure, EWSI first develops a forecast of its revenue requirement for 2022-2024 for the total regulated Wastewater Treatment operations, excluding costs related to any of EWSI's commercial operations. The revenue requirement is based on bottom-up forecasts of operating costs and capital expenditures prepared by managers in each of EWSI's operating areas for 2022, 2023, and 2024. These forecasts are initially prepared in 2022 dollars. The operating cost and capital expenditure forecasts are then escalated at "i-x" (weighted average inflation factor of 2.26% less the productivity factor of 0.25%) to arrive at the forecast costs in nominal dollars for 2022 to 2024.

Refer to Financial Schedules 5.2 and 15.5 for a summary of EWSI's annual operating and capital cost forecasts.

167. As part of its operating cost forecast process, EWSI initially prepares a bottom-up forecast of its operating costs for 2022 based on the best available information in respect of expected work activity and cost levels for 2022. To develop its operating cost forecast for 2023 and 2024, operating cost variances from 2022 amounts are limited to inflation less the efficiency factor (2.01% per year) with the following exceptions:

- forecast cost increases or decreases that are largely outside EWSI's control including customer growth (customer billing and metering), the carbon levy increase, regulatory costs charged by the City of Edmonton, franchise fees (calculated as a percentage of revenues) and electricity distribution and transmission charges;
- forecast operating cost savings associated with new capital projects including the Dewatering Facility and EWSI's Advanced Metering Infrastructure Project which will reduce meter cost allocations to Wastewater Treatment Operations; and
- forecast costs associated initiatives to align City's goals and objectives including EUI's Green Power Initiative.

168. EWSI forecasts capital expenditures for each of 2022, 2023 and 2024 based on its planned capital projects and programs for each year. Capital planning is normally completed on a five year horizon to align with PBR renewals and is completed under a comprehensive and well defined capital management process described below. A three year capital plan was developed for the 2022-2024 PBR term.

169. EWSI then calculates the forecast revenue requirement for 2022 to 2024 based on (i) forecast operating costs, (ii) calculated depreciation expenses related to both existing assets and forecast capital additions, and (iii) financing costs (cost of debt and equity). EWSI's financing costs (cost of capital) are based on its forecast of the cost of debt (interest rates) and cost of equity (or return on equity). Forecast interest rates and return on equity for the 2022-2024 PBR term are based on EWSI's forecast rate base (cost of utility assets) multiplied by its proposed capital structure (proportion of debt and equity), weighted average cost of debt and proposed return on equity respectively. EWSI's interest rate on new debt issuances is fixed over the 3-year PBR term. Similarly, EWSI's return on equity is fixed for the 3-year PBR term.

170. By setting rates in this manner, it ensures that EWSI will collect sufficient revenues to support its capital infrastructure investment for the upcoming PBR period. Other than the

exceptions to operating cost increases noted above, EWSI bears the risk of any other cost increases above inflation such as those related to power, natural gas, chemicals, labour and materials and other input price increases. Similarly, fixing interest rates on new debt issuances at 2022 rates and by fixing its return on equity at 9.95% for the 2022-2024 PBR term, ensures that EWSI bears the risk of variations in its cost of debt and equity during the three year period. Customers benefit from having stable rates and are shielded from rate impacts associated with higher input prices (above inflation) and any increases in EWSI's cost of debt and equity.

171. Section 4.2.1 provides the inflation factor methodology and forecast. Section 4.2.2 summarizes EWSI's operating cost forecasts process. Section 4.2.3 summarizes EWSI's capital cost forecast process.

4.2.1 Inflation Factor Forecast

172. Consistent with the approved approach in the 2017-2021 PBR, the inflation factor is calculated as a composite between two Statistics Canada series:

- CANSIM Series V1808689: Annual Growth in Average Hourly Earnings (AHE), Alberta, Industrial Aggregate (excluding unclassified businesses).
- CANSIM Series V41694625: Annual Growth in Consumer Price Index (CPI), All Items, Alberta.

173. For the 2022-2024 PBR term, EWSI has not proposed a change to the weighting of 65% CPI (non-labour component) and 35% AHE (labour component), as it remains consistent with Wastewater Treatment Services' forecast cost structure. Weightings of 65% CPI and 35% AHE have been applied since EWSI's 2012-2016 PBR Applications for Water Services and Wastewater Treatment Services. For the 2022-2024 and 2022-2026 PBR Applications EWSI has applied separate weight factors for Water Services, Wastewater Treatment, and Drainage Services, based on each operations proportion of labour costs relative to all other costs over the PBR term.

174. EWSI purchased a forecast for the two data series from the Conference Board of Canada in November 2020. The values and calculations are shown below in Table 4.2.1-1. As the Wastewater Treatment Application covers the 2022-2024 period, EWSI has used the Conference Board's 2022-2024 forecast to calculate the Wastewater Treatment forecast escalator.

Table 4.2.1-1
Wastewater Treatment Inflation Factor Forecast
(%)

		A **CPI**	B **AHE**	C **Total**
1	2022	2.3	1.5	
2	2023	2.0	2.8	
3	2024	2.2	3.0	
4	Average	2.2	2.4	
5	Weighting	0.65	0.35	
6	Result	1.4	0.8	**2.26**

175. Consequently, EWSI has used 2.26% for the forecast escalator for each year in the Wastewater Treatment 2022-2024 PBR Application.

176. In accordance with Schedule 3 of the *EPCOR Drainage Services and Wastewater Treatment Bylaw*, each year, the inflation factor will be updated based upon a forecast of the rate of inflation supported by the Conference Board of Canada's forecast inflation for the upcoming year. Once the calendar year is complete and the actual rate of inflation is known, the charges for the subsequent year will include an adjustment to correct for the difference between the forecast and actual rate of inflation for the calendar year. As the index utilized for the actual Labour Cost component may not be available for the complete calendar year, the consecutive 12 month period for which the index utilized for the Labour Cost component is most recently available is used as a substitute for the calendar year for purposes of the Labour Cost component inflation adjustment.

4.2.2 Operating Cost Forecast Process

177. The following summarizes the operating forecast process for some of EWSI's major operating cost categories:

Staff Costs and Employee Benefits

178. This category represents approximately 25% of EWSI's total operating costs and is comprised of direct salaries, employee benefits, overtime and incentive partially offset by labour recoveries for employee time spent on capital and commercial projects. EWSI's structure for compensating its management employees includes a base level of compensation (including benefits) and an incentive component which is paid when specified financial, safety, customer, operational and individual performance targets are met. Salaries for non-bargaining unit staff are reviewed annually and adjusted based on market assessments. Wages for union staff are determined based on the provisions of current collective bargaining agreements.

179. EWSI developed its 2022 salaries and benefits cost forecast initially in 2022 dollars based on its best estimates of work levels in 2020. Beyond 2022, there are no increases in operating costs related to additional staff. EWSI then applies the inflation factor to obtain a forecast of salaries and benefits costs in nominal dollars for 2023-2024.

180. Under the 2022-2024 PBR structure, EWSI bears the risk of staff costs and employee benefits increasing at a rate higher than the inflation factor. For example, salaries and wages for EWSI union staff are determined based on negotiated collective bargaining agreements with the International Brotherhood of Electrical Workers Local 1007 employees, Civic Service Union 52 and Canadian Union of Public Employees Local 30 employees with two agreements set to expire on December 19, 2020 and the third agreement set to expire December 18, 2021. EWSI will bear the risk if the new collective agreements contain salary and wage increases higher than the rate of inflation.

Power, Other Utilities and Chemicals

181. This cost category represents approximately 11% of EWSI's total operating costs and is comprised of power, natural gas, water, and chemicals used in wastewater treatment and nutrient removal processes.

182. Power costs represent approximately 70% of the power, other utilities and chemicals category and are generally based on the amount of power consumed multiplied by the power price per unit consumed.

183. EWSI developed its 2021 power cost forecast based on indicative pricing from potential suppliers into its competitive procurement process. Beyond 2021, EWSI has assumed no increase

in power volumes due to relatively stable consumption levels. EWSI applies the inflation factor to 2021 power prices to obtain a power price forecast in nominal dollars for 2022-2024.

184. As discussed in Section 2.3.6, under its Green Energy Initiative, EUI will be purchasing green RECs starting in 2022. The costs will be allocated to each business unit based on that business unit's electricity consumption. A forecast of the green REC costs has been included in EWSI's power cost forecast.

185. Natural gas and water costs represent approximately 6% and 5%, respectively, of the power and other utilities category. Natural gas costs are generally based on the amount of natural gas consumed multiplied by the price per unit consumed. EWSI developed its 2022 natural gas cost based on consultant forecast expectations and its best estimates of natural gas volumes required in 2022**.** Water costs are based on the volume of water consumed multiplied by the rate per cubic metre. EWSI developed its 2022 water costs based on preliminary forecast water rates multiplied by its best estimates of water consumption. Beyond 2022, EWSI has assumed increase in natural gas and water costs at the inflation factor for 2022-2024.

186. Chemicals represents approximately 19% of EWSI's total operating costs. Similar to Water, Wastewater Treatment developed its 2022 chemical cost forecast based on its best estimates of chemical prices for 2022 factoring in increases due to foreign exchange rates and its estimates of 2022 chemical volumes based on an average of the past 5 years of historical data. Beyond 2022, no increase is applied to chemical volumes due to relatively stable consumption levels. The inflation factor is applied to 2022 chemical prices to obtain a chemical cost forecast in nominal dollars for 2023 and 2024.

Contractors and Consultants

187. This cost category represents approximately 24% of EWSI's total operating costs for Wastewater Treatment. Over the 2022-2024 PBR term, over 80% of the costs in this category relate to the Biosolids Management Program. For this program, EWSI uses contracted services for composting and dewatering, land application, monitoring and related services. The remainder of the costs in this category relate to contractors and consultants used by Wastewater Treatment when the resident expertise is not present or when specialized equipment is required. Contractor and consultant costs for 2022 were estimated by each functional area on the basis of the scope of work required and the estimated unit rates of the specific specialists or equipment.

188. Beyond 2022, EWSI has assumed contractor and consultant costs increase at the inflation factor for 2023 and 2024 with the exception of contractor and consultant costs for biosolids management which are forecast to decrease in 2024 when the new Dewatering Facility is placed into service. Under the 2022-2024 PBR structure, EWSI bears the risk of contractor and consultants and materials and supplies increasing at a rate higher than the inflation factor.

4.2.3 Capital Cost Forecast Process

189. EWSI's 2022-2024 capital cost forecasts are established based on a capital management process which governs the identification, evaluation, approval, execution and monitoring of capital projects. EWSI's Capital Steering Committee, the Project Management Office, and the Financial Review Council, consisting of EPCOR executive leadership, provides ongoing capital management oversight.

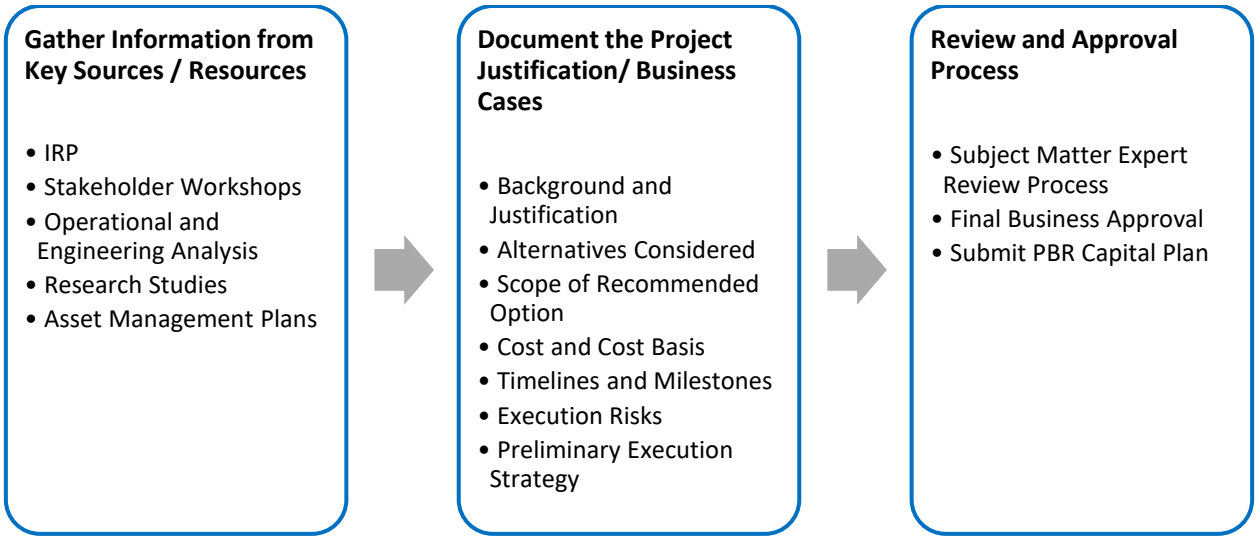
190. An organizational project management initiative with representatives of each EPCOR business unit was also started to help align, develop and share project management best practices across the organization. One of the results of this initiative was the design and implementation of a standardized Capital Delivery Model. Adjustments to EWSI mapped processes were made to align with the developed Model. At a high level, the Capital Delivery Model is a standardized yet flexible model that clarifies how Capital Projects and Programs are delivered at EPCOR. Aligned with industry best practices, it divides projects and programs into four major phases: initiate, plan, execute and closeout, that are further broken down into up to 7 stages, such as Investment Justification, Detailed Design or Construction, depending on a project scope complexity and requirements. Accordingly, through a project lifecycle, projects will move through Stage Gates by completing defined requirements to demonstrate operational readiness before moving to the next stage. The model was developed with scalability in mind to ensure that the appropriate level of governance is applied to different project types. Therefore, although minimum gate requirements have been established, not all projects and programs will need to complete the same (or any) requirements at each stage gate. Through this initiative, tools and templates are also being developed or improved. For example, once a standardized structure is established to manage standard project documents, forms and workflows can then be used to automate the creation or dissemination of information. Similarly, by using standardized Work and Cost Breakdown Structures, performance data can then be compared and analyzed to identify additional efficiency opportunities. Other tools are also being aligned and improved to support scheduling, estimating, cost control and reporting. Together, the objective of these initiatives are to improve clarity, efficiency and risk reduction for the delivery of capital projects, while also improving predictability, resources management and reducing project costs.

191. The sections below describe the following processes: (i) PBR capital plan development process and (ii) the internal capital governance and management processes used to manage to the PBR capital plan.

4.2.3.1 PBR Capital Plan Development Process

192. EWSI utilizes a three step approach for the preparation of the capital program for the five year PBR period. This approach is illustrated in the process diagram in Figure 4.2.3.1-1 and discussed further below.

Figure 4.2.3.1-1
PBR Capital Plan Development Process



Step 1: Gather Information from Key Information Sources

193. While PBR submissions generally occur only once every five years, EWSI continually assesses its operations and assets, maintaining a detailed understanding of its upcoming priorities and challenges. The following external processes and sources of information help form the foundation of this work:

- **City of Edmonton** - EWSI collaborates with the City of Edmonton at the working level on an ongoing basis, including through the City of Edmonton / EPCOR Capital Working Committee. Strategic documents from the City of Edmonton, including the City Plan, the Reimagine plan and ConnectEdmonton are monitored to ensure alignment with the City of Edmonton's growth projections and strategic objectives.

- **External expert resources** – External engagements such as engineering studies, risk mitigation analyses and inspections are performed on EWSI's assets and incorporated into EWSI's capital plans.
- **Industry** – EWSI monitors trends occurring within the industry and collaborates frequently with other Canadian municipalities to address common challenges through research projects and active industry working group participation. EWSI is represented on the Board of the Canadian Water Network and is an active participant in the Canadian Water Network municipal consortium leadership group that meets regularly to collaborate on programs to improve the operation of the major utilities across Canada. Recent examples include the COVID-19 response initiatives and the multiple research programs conducted jointly with the Insurance Bureau of Canada and CWN to address the risks of flooding due to Climate Change. Through the SIRP initiative EWSI has also been an active participant and case study on numerous reports from the Intact Center on Climate Adaptation and the National Research Council of Canada, highlighting best practices in flood water management. EWSI is also a member of the Water Research Foundation where it collaborates with other municipalities to share best practices and participate in research initiatives for the water, wastewater and drainage systems. EWSI is also an active participant with the Canadian and American Water Works Association (CWWA/AWWA) with one employee serving as President of CWWA in 2020. EWSI also participates in the Canadian National Benchmarking initiative across the water, wastewater and drainage system as do many other municipalities across Canada.

194. Internally, EWSI regularly engages its staff from all areas to participate and contribute towards the development of the PBR capital plan through its Capital Planning Workshops. Through these workshops, EWSI staff collectively review each project's goals, rate its priority based on risk and justification, help determine viable alternatives, and recommend optimum timing for the project's execution.

195. EWSI documents the new priorities and challenges identified through a number of reports and plans, including the following:

- **Integrated Resource Plan (IRP) –** EWSI prepares a summary document, the EWSI Integrated Resource Plan, which looks forward at least 10 years to determine the longer term capital infrastructure requirements for the water utility. The IRP goes beyond the planning review to include supply side, demand side and external issues. EWSI acknowledges that society, economy and environment interact constantly.

Therefore, in addition to the traditional factors of plant capacities, rainfall and wastewater discharge characteristics of the customers, external factors such as changing regulatory requirements, corporate goals and new technologies are also examined to assist in identifying factors that can change what have traditionally been the "known's" in the planning process. Scenario Planning has been utilized as an enhancement to the IRP process to better account for the wide range of future situations that may arise for the wastewater collection system

- **Operational and Engineering Analysis –** Operational analysis includes conducting system analysis and performance evaluation. Modeling tools are also utilized in the analysis to help identify any significant deficiencies as well as opportunities for improving efficiency. Much of the capital work is also related to life-cycle replacement or rehabilitation of aging assets such as electrical, mechanical, structural, chemical, and controls systems. Aging assets are assessed through inspection or engineering analysis to determine the optimum timing of rehabilitation or replacement work.
- **Asset Management Approach and Plans** – EWSI's asset management planning approach is a systematic process to:
  - structure and document asset inventory;
  - measure, monitor and maintain asset performance;
  - minimize exposure to risk;
  - guide and optimize the sustainable investment of funds.

196. The general asset management methodology, developed by the United States Environmental Protection Agency consists of five core questions:

1. What is the current state of my assets?
2. What is my required level of service?
3. Which assets are critical to sustained performance?
4. What are my best operating and capital improvement plan investment strategies?
5. What is my best long-term funding strategy?

197. The asset management approach is the mechanism that can address and answer these questions.

198. The overall objective of asset management is to optimize whole life costs of the asset while minimizing asset related risks that have the potential to impact business objectives. In essence, asset management imposes a risk based approach to determining the cost and benefits

of extending an asset's life through continued maintenance versus replacing that asset. Each asset is assessed to determine its potential to impact operating permit requirements, health and safety of employees, public health, environment, capacity requirements and finances. This approach has led to the identification and ranking of the most critical assets. These critical assets are given higher priority in projects/programs so that sustained performance can be maintained at all times (an example is the Digester Tanks). This asset management approach has also identified systems that upon failure would create significant downtime and loss of service for an extended period.

199. EWSI pursues continual improvement to its asset management approach. Relative to the 2017-2021 PBR capital plan, there has been an improvement to the ability to deliver on the objectives of the asset management approach. This includes an enhanced focus on the creation of Asset Management Plans, which enables better anticipation of required spending and timelines, better understanding of the risks associated with asset failures in order to determine the best mitigation strategies, and the focusing of maintenance time on higher-criticality assets. Moreover, EWSI will continue to seek improvements to its asset management approach by identifying new tools and processes to support the capital decision making process.

200. These many sources of information, supplemental additional PBR specific assessments as well as internal and external expert resources, are brought together when a PBR submission for capital is prepared. This approach facilitates a consolidated perspective of the entire system's requirements.

Step 2: Project and Program Categorization and Business Case Preparation

201. EWSI categorizes each project to assist with the prioritization, justification and analysis process. In the 2022-2024 PBR term, five categories are used to classify projects:

- **Regulatory** – projects specifically identified to address current and upcoming regulatory requirements from operational regulatory bodies such as Alberta Environment.
- **Health, Safety and Environment** – projects specifically identified to address health, safety and environmental considerations of employees and the public.
- **Growth / Customer Requirements** – projects specifically identified to address growth in franchise area, increased customer requirements, specific requests from customers (e.g. City of Edmonton), or to meet required service level standards.

- **Reliability / Life-Cycle** – projects specifically identified to replace assets at the end of their life or otherwise ensuring asset reliability.
- **Efficiency/Performance Improvement** – projects which result in operational efficiency.

202. Following the extensive review, analysis, and establishment of capital priorities as described above, every proposed resulting project is documented using a project charter. For projects that exceed $5.0 million in total or for programs that exceed $5.0 million in the PBR term, a formal business case is also prepared. EWSI applies a rigorous and consistent approach to the documentation of each project, which is underpinned with various tools and guidelines to support cost estimation and other critical components of project justification. Wastewater Services project and program business cases are provided in Appendix G.

203. The key components of the business cases include (i) project/program background and justification; (ii) project/program description; (iii) project justification; (iv) alternatives analysis, where applicable; (v) cost forecast; and (vi) risk mitigation.

i. Project/Program Background and Justification

- History and background, including identification of the problem
- Justification based on how the project or program addresses key risks

ii. Project/Program Description

- problem or opportunity identification
- proposed project/program scope and out of scope items
- goals - anticipated outcomes and benefits

iii. Alternatives Analysis

- analysis of viable alternatives
- rationale behind the proposed solution
- discussion of costs and benefits of each alternative
- financial analysis (net present value analysis) where cost is the major factor to decide between alternatives

iv. Cost Forecast

- annual capital expenditure forecasts including direct and indirect cost and contingency;
- costing assumptions;

v. Risk Mitigation

- Identification of the risks associated with project or program execution
- Steps EWSI will take to mitigate the risks that have been identified

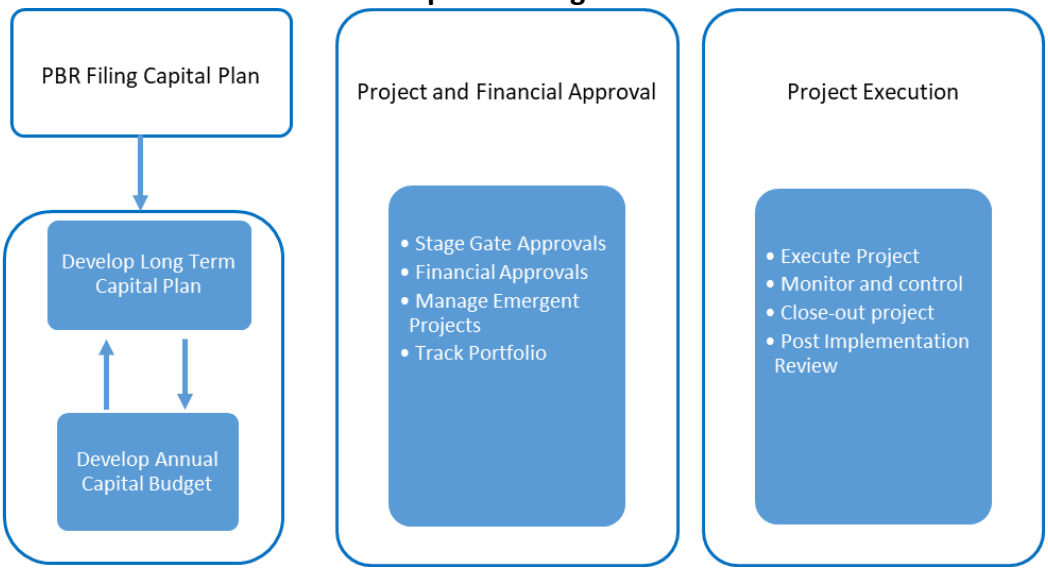
Step 3: Review and Approval Process

204. A prioritized review of the project charter, detailed costing spreadsheet and risk matrix (for projects) is performed by operations, finance and regulatory staff to ensure accuracy, provide guidance on the application of corporate contingency guidelines and to identify any impacts between interdependent projects and programs. Senior reviews occur on a prioritized basis at the project and program level, as well as at the consolidated level to ensure a consistent risk-based approach is applied across operational areas. Final approval of the PBR capital plan is given by EWSI Executive leadership based on review and discussion with operations, finance and regulatory. The review ensures a clear understanding of the risks associated both with delivering the project or program, and mitigated by its delivery.

4.2.3.2 Capital Management and Governance Processes (Managing to the PBR Plan)

205. EWSI's capital management processes provide the governance and gating (approval) stages through which project execution occurs. These processes also include the annual budgeting of capital projects. The capital management processes are well-established and are illustrated in Figure 4.2.3.2-1.

Figure 4.2.3.2-1
EWSI Internal Capital Management Processes



- **PBR Plan –** EWSI prepares a capital plan for the five year PBR term, as detailed above. This plan is ultimately approved by EWSI's regulator, Edmonton City Council, and, as a result, it establishes the baseline against which all capital activities are determined and measured.
- **Annual Capital Budget -–** The PBR capital plan provides the starting point for the annual capital budget. An extensive process is undertaken where all projects identified for that year are reviewed, project justifications updated, and each project is vetted and prioritized by the Capital Steering Committee before inclusion in the annual budget. Prior to any project identified in the PBR plan commencing, the cost estimate is updated using the most current understanding of the scope and work breakdown and using the most current labor and material costs. The project is also assessed to ensure it remains viable from both technical and priority perspectives. Once approved by the executive, the annual capital budget is then reviewed by EUI executives (Financial Review Council). Once approved by EUI executive, the annual budget is submitted for approval to EUI's Board of Directors. Any projects that were not identified in the PBR plan (referred to as unbudgeted projects) are occasionally required due to unforeseen circumstances or occurrences such as equipment failures, emergencies, safety hazards or process changes. These projects are identified through the annual capital budget process where the need for the project is evaluated and considered for approval. Unbudgeted projects over $2 million require additional review and approval at EUI executive level.

- **Long Term Plan –** EWSI prepares a 10-year plan for capital expenditures on an annual basis and part of EUI's Long Term Plan development. The Long Term Plan provides a longer term review of the PBR Capital Plan and takes into account any major changes from that original plan. It also forms some of the basis for capital expenditures to be considered for inclusion in the next PBR renewal application.
- **Project and Financial Approvals –** In this process, the projects are approved through the stage gate process. The project justification prepared during the annual budget are updated for any new information and a formal request is sent to approvers to review for financial approval to execute the projects. The approvers include members of the Capital Steering Committee.
- **Project Execution and Monitoring –** At this stage, it is the project manager's responsibility to execute the project. Monitoring, control, quality and safety are critical aspects of this phase. Oversight of the execution is maintained by both the Project Management Office and the Capital Steering Committee. The Capital Steering Committee meets monthly to review the status of projects, including review of budget variances. The Controller, Water Services Finance, is responsible for ensuring appropriate internal controls around capital financial accounting and reporting. Project close-out includes formal approval from asset owners and operations that the assets can be turned over to Operations to run and maintain. Depreciation of the assets commences. PIRs are undertaken for projects over $5 million where the variance between the final completion costs and the originally approved budget is more than 20%. The reviews will focus on and, at a minimum, the documentation will include:
  - Actual Capital Expenditures versus the original budget
  - Preliminary scope versus final scope
  - Timing of completion
  - Actual financial returns versus forecast
  - Actual benefits realized versus expected
  - Process improvements/corrective action identified during the project that may be incorporated in future capital projects (i.e. learnings from the project)

4.3 Capital Structure and Cost of Capital

206. The cost of capital is comprised of EWSI's cost of debt, cost of equity (return on equity) and its capital structure or proportion of debt and equity financing. EWSI is applying for a deemed capital structure of 60% debt and 40% equity for the 2022-2024 term. This is consistent with EWSI's historical actual capital structure. EWSI's methodologies for determining its return on equity and cost of debt are described below. Calculations of EWSI's weighted average cost of capital and return on rate base are provided in Section 9.0.

4.3.1 Rate of Return on Equity

207. To establish its proposed return on equity, EWSI recommends that an update of Grant Thornton's 2016 analysis (used to set the 2017-2021 PBR term's common equity return) be used to establish the 2022 – 2024 PBR common equity rate of return. A formulaic extension of this prior methodology is seen as the most straightforward approach under current economic conditions. The current turmoil in financial markets resulting from the COVID 19 global pandemic and the resulting fiscal and monetary policy initiatives used by governments and central banks to diminish economic devastation has impacted the viability of traditional approaches to determine equity rates of return. A formulaic extension eliminates these concerns and also best aligns with the City's desire to determine a risk premium to the AUC's generic cost of capital to derive the allowed rate of return on equity for EWSI.

208. EWSI has prepared a Memorandum with the assistance of an industry recognized expert to provide a detailed review of the proposed methodology and the specific adjustments required to update the Grant Thornton 2016 approach. This analysis, entitled the Return on Equity Memorandum is provided in Appendix D. In Section 9.2 to the Application, EWSI provides a summary of the specific updates required to adjust the Grant Thornton approach as well as commentary on the differences in the risk profile of EWSI's businesses in relation to those regulated by the AUC in order to justify the risk premium over the generic allowed return on equity. Based that analysis, EWSI is proposing a rate of return on common equity of 9.95 % for the 2022-2024 PBR term. The analysis also proposes the continuation of the current capital structure of 60% debt and 40% equity.

209. As shown in Table 4.3.1-1, a proposed rate of return of 9.95% on common equity for the 2022-2024 PBR term reflects a 0.225% decline from EWSI's approved rate of return on equity of 10.175% in the 2017-2021 PBR term.

Table 4.3.1-1
EWSI Forecast Return on Equity
2021-2024

		A **2021D**	B **2022F**	C **2023F**	D **2024F**
1	Return on Equity	10.175%	9.95%	9.95%	9.95%

4.3.2 Cost of Debt

210. EWSI reflects new debt issuances from its parent company, EUI, through deemed inter-company loans. Consistent with regulated business units within the EUI group of companies, debt rates on long-term inter-corporate loans issued by EUI to EWSI are based on EWSI's regulated services on a stand-alone basis. On September 3, 2020, Dominion Bond Rating Service issued a one-time private rating advising EWSI that its private rating is A (low) (equivalent to S&P rating of A-). EUI currently has an A (low) rating from DBRS and A- rating from S&P.

211. EWSI forecasts its cost of new issues of inter-company debt based on published Government of Canada long-term bond yield forecasts and indicative credit spreads from major Canadian banks. For the 2022-2024 PBR term, EWSI is proposing to fix the forecast cost of new debt issuances at the 2022 forecast cost of debt for EWSI of 3.50% as shown in Table 4.3.2-1. This reflects a 1.32% decline in EWSI's approved cost of debt of 4.2% in the 2017-2021 PBR term.

212. Under EWSI's PBR Framework, the risk of interest rate fluctuations is entirely borne by EWSI and is not passed on to its customers. Acceptance of the interest rate risk is another significant risk factor that differentiates EWSI's PBR approach from the AUC PBR approach. Under the AUC PBR, Alberta electric and gas utilities pass on interest rate risk to their customers through rate adjustments. As such, this risk factor represents another component of the EWSI risk premium above the AUC's Generic Cost of Capital as further discussed in Section 9.2 to the Application.

Table 4.3.2-1
EWSI Forecast Cost of New Debt Issues
2021-2024

		A **2021D**	B **2022F**	C **2023F**	D **2024F**
1	Cost of Debt for New Debt Issues	4.82%	3.50%	3.50%	3.50%

213. This 2022 forecast cost of debt for EWSI is determined as follows:

- the 2022 average yield on 30-year[8] Government of Canada bonds of 1.83% based on the average forecasts from three Canadian banks published in October 2020; plus
- EUI's indicative 30-year credit spread of 1.62% based on the average forecasts from six Canadian banks published Q4 2020; plus
- a 0% risk premium for EWSI over EUI's cost of debt reflecting that EWSI and EUI have the same credit rating; plus
- a transaction cost of 0.05%.

214. EWSI also reviewed the Consensus Economics Forecasts (October 2020 Report) to confirm its proposed stand-alone cost of new debt issuances. This report confirmed the reasonability of the proposed 3.5% cost of debt for EWSI.

4.4 Depreciation and Amortization

215. Utility assets are depreciated over the shorter of the assets' physical, technological, commercial or legal lives. Depreciation and amortization of EWSI's capital assets are determined on a straight-line basis over the estimated service lives. When the asset is no longer used or useful, the assets are retired. Assets that are similar in the way they function and have similar useful lives are grouped together and depreciated (referred to as "group asset"). When a group asset is retired or disposed of, its original costs are charged to accumulated depreciation with no loss or gain reflected in income. Gains or losses on the retirement of other assets such as buildings and vehicles are reflected in income.

[8] Historically EWSI's cost of new debt calculation relied on 20-year Government of Canada bond yields and 20-year EUI credit spreads. For this PBR term, EWSI has adjusted the methodology to use the 30-year yields to calculate the stand-alone cost of debt which is more appropriate given that its long-term debt is used to fund assets with lives that generally far exceed 30 years. As indicated in Table 4.4-1, the composite average asset life for all of EWSI's Drainage assets is 53 years.

216. For the 2022-2024 Application, EWSI is using the same asset service lives as approved in the 2017-2021 Application. There have been no significant or wholesale changes in accounting policy or attributed useful lives across the plant in service since the previous 2017-2021 PBR. However there have been some minor changes to asset lives for new circumstances moving forward as described in the following paragraphs.

217. After experiencing a premature chain failure in one of Gold Bar WWTP's secondary clarifiers, and subsequent failures related to the stainless steel chain installed in 2014, EWSI completed several investigations relating to the chain used in the primary and secondary clarifiers. Based on experiences and investigation at Gold Bar WWTP, other wastewater treatment plants, and chain manufacturers, Management recommended adjusting the useful life of chains to 10 years from 20 years. For this application, this change has been made for new assets only and as a result does not result in a material change to the average life of the asset group in which it resides.

218. EWSI has added major inspection costs of critical assets to its asset base. These inspections vary in frequency and are amortized based upon the frequency of the required inspection rather than on the depreciation rate of the underlying asset. EWSI feels that amortizing inspections over the time period between required inspections is a reasonable and logical way to amortize these costs. These assets have an average life of 10.0 years.

219. The Biosolids Management Program (BMP) was transferred from Drainage Services to Wastewater Treatment Services at the beginning of the 2022-2024 PBR term. The associated Clover Bar Biosolids Recycling Facility assets transferred from Drainage Services have an average life of 21.0 years.

220. Average depreciation rates for EWSI's asset categories as well as the overall composite depreciation expense rate are provided in Table 4.4-1. EWSI's depreciation expense for 2022-2024 is provided in detail in section 7.0 of the Application.

Table 4.4-1
Annual Depreciation Rates
Financial Schedule 12-2

		A	B	C	D
		2017-2021		2022-2024	
	Asset Category	Annual Depreciation Rate	Service Life (years)	Annual Depreciation Rate	Service Life (years)
1	Computer Equipment	25.00%	4.0	25.00%	4.0
2	Laboratory Equipment	10.00%	10.0	10.00%	10.0
3	Machinery & Equipment	10.00%	10.0	10.00%	10.0
4	Office Furniture & Equipment	12.50%	8.0	12.50%	8.0
5	Process Control Systems	10.00%	10.0	10.00%	10.0
6	Software Intangibles	10.00%	10.0	10.00%	10.0
7	Vehicles	10.00%	10.0	10.00%	10.0
8	Wastewater Treatment Plant	2.77%	36.1	2.79%	35.8
	Wastewater Treatment Plant Includes:				
9	Pre-Treatment	2.94%	34.0	3.15%	31.8
10	Primary Treatment	2.62%	38.2	2.70%	37.1
11	Secondary Treatment	2.67%	37.5	2.76%	36.3
12	Disinfection	2.67%	37.5	2.67%	37.5
	Solids Handling:				
13	• Fermentation	3.47%	28.8	3.57%	28.0
14	• Waste Activated Sludge	3.57%	28.0	3.54%	28.3
15	• Digester	2.72%	36.7	2.86%	35.0
16	• Clover Bar	3.00%	33.3	3.00%	33.3
17	• Sludge Supernatant Pumping	3.18%	31.4	3.24%	30.8
18	Buildings	2.22%	45.0	2.22%	45.0
19	Site Work	3.33%	30.0	3.33%	30.0
20	Utilities	2.70%	37.1	2.89%	34.6
21	Chemical Systems	3.75%	26.7	3.72%	26.9
22	Odour Control	2.94%	34.0	2.80%	35.7
23	Inspections	-	-	10.00%	10.0
24	Clover Bar Biosolids Recycling Facility	-	-	4.76%	21.0
25	Sanitary Grit Facility	2.50%	40.0	2.50%	40.0
26	**EWSI Composite Rate**	**2.74%**	**36.6**	**3.04%**	**32.9**

4.5 Capitalized Overhead Methodology

221. Capitalized overhead includes the cost of certain supporting functions which are charged to capital projects (capitalized). These functions include, among others, senior management oversight, supervision, project governance, accounting, supply chain and dedicated health and safety resources. Capitalized overhead reflects a transfer from EWSI's operating expenses to

capital projects as indirect costs. The methodology for charging Capital overhead is to apply a percentage rate to the direct regular labour costs charged to a project. The rate is determined annually based on estimated total capital overhead costs as a ratio of the estimated total capitalized labour costs.

4.6 Inter-Affiliate Transactions Summary

222. As a member of the EPCOR group of corporations, EWSI obtains corporate services from its parent corporation, EUI. Corporate Shared Services are comprised of activities that are centrally managed within the EPCOR group due to their nature and/or for the purpose of realizing economies of scale and scope. EWSI receives certain services from, and provides certain services to, other members of the EPCOR group.

223. For ease of reference, EWSI refers to the services provided by EUI to EWSI as "Corporate Shared Services", and the services provided by EWSI to other affiliates and services provided by other affiliates to EWSI as "Affiliate Services". Revenues received by EWSI for Affiliate Services provided by EWSI are included in the cost recoveries in EWSI's regulated operating costs. Costs charged to EWSI for Affiliate Services provided by EWSI's affiliates are also included in EWSI's regulated operating costs and certain regulated capital projects. Table 4.6-1 highlights all Affiliate transactions for EWSI.

224. Corporate Shared Services costs are recovered by EUI from EWSI through either the direct assignment of the costs to EWSI or through an allocation process. The direct assignment or allocation of these costs from EUI is with each of the regulated and non-regulated operations within EWSI. Appendix L-1 provides a detailed description of the Corporate Shared Service costs methodology used to allocate Corporate Shared Services costs to EUI's business units including EWSI.

225. The costs associated with Affiliate Services provided by EWSI to other corporations are recovered by EWSI through either the direct assignment or invoicing of the costs to the affiliate or using an appropriate cost allocation method. Included in the Affiliate Services is EWSI Shared Services which allocates costs to the three regulated business units operating within the legal entity EWSI: Water Services, Wastewater Treatment Services and Drainage Services. These EWSI Shared Services include financial, administrative and other services provided on a shared basis in order to achieve cost efficiencies within the businesses supported by EWSI. Appendix L-2 provides a detailed description of the EWSI Shared Service costs methodology used to EWSI

Shared Services costs to the three regulated business units operating under EWSI: Water Services, Wastewater Treatment Services and Drainage Services.

226. The allocated costs for Corporate Shared Services provided by EUI to EWSI have been approved for recovery in EWSI's revenue requirement over the years by EWSI's regulator, Edmonton City Council. Tariff Applications filed by AUC-regulated members of the EPCOR group (including EDTI and EEA) over the past decade have provided detailed explanations of the Corporate Shared Services provided by EUI, their associated costs and the allocation methods used to determine the charges for those services to each EUI subsidiary. In that context, the scope of the Corporate Shared Services, EUI's cost allocation methods and the resulting charges have been carefully scrutinized by the AUC. With only a few exceptions over the years, the AUC has approved the recovery of Corporate Shared Services charges as applied-for in the forecast revenue requirements of EPCOR's AUC-regulated entities. Each year, EUI undertakes a rigorous cost allocation process to ensure that the charges for Corporate Shared Services to its subsidiaries are reasonable.

227. Table 4.6-1 provides a summary of EWSI's transactions with the City of Edmonton and EWSI's affiliates including EUI, EPCOR Energy Services Inc. (EEA), EWSI Water Services, EWSI Drainage Services and EPCOR Technologies Inc. (ETECH).

Table 4.6-1
Financial Schedule 18-1
Forecast Affiliate Transactions
($ millions)

	Affiliate and Service	A 2021F	B 2022F	C 2023F	D 2024F
	Revenues from the provision of services to the City of Edmonton				
1	Wastewater treatment	1.4	1.4	1.4	1.5
2	Other Services	0.0	0.0	0.0	0.0
3	**Total**	**1.4**	**1.4**	**1.4**	**1.5**
	Services provided by (recovered from):				
4	City of Edmonton				
5	Franchise fee	8.3	9.3	9.9	10.2
6	Property taxes	0.6	0.7	0.7	0.7
7	Biosolids contractor costs	0.4	0.4	0.4	0.4
8	Regulatory services	-	0.2	0.1	0.2
9	Other services	0.2	0.2	0.2	0.2
10	**Total**	**9.6**	**10.7**	**11.3**	**11.6**
	EPCOR Utilities Inc.				
11	Corporate shared service costs	5.2	5.2	5.3	5.4
12	Interest on intercompany loans	11.9	12.2	13.1	14.2
13	Interest on short-term debt	0.8	0.9	0.9	0.9
14	Other services	0.1	0.1	0.1	0.1
15	**Total**	**17.9**	**18.5**	**19.4**	**20.6**
	EPCOR Water Services Inc.				
16	EWSI shared services	3.1	3.3	3.3	3.4
17	Meter reading services provided by Water Services	2.5	2.8	2.7	2.4
18	Water purchases provided by Water Services	0.4	0.4	0.4	0.5
19	Regulatory services provided by Drainage Services	1.7	1.7	1.7	1.8
20	Laboratory services cost recoveries from Drainage Services	(0.4)	(0.4)	(0.4)	(0.4)
21	**Total**	**7.4**	**7.9**	**7.8**	**7.6**
	EPCOR Energy Alberta LP				
22	Billing and collection services	2.9	3.0	3.0	3.1
	Total	**2.9**	**3.0**	**3.0**	**3.1**
	Expenditures on capital projects arising from services provided by:				
23	City of Edmonton	0.0	0.0	0.0	0.0
24	EPCOR Technologies Inc.	0.1	0.1	0.1	0.1
25	EPCOR Corporate IT	0.1	0.1	0.1	0.1
26	Other EPCOR Business Units	0.0	0.0	0.0	0.0
27	**Total**	**0.3**	**0.3**	**0.3**	**0.3**

4.7 Wastewater Volume and Customer Count Forecast Methodology

228. EWSI forecasts its revenues for the 2022-2024 PBR term based on its forecast of water consumption and customer counts for the next four year period from 2021 to 2024. EWSI's wastewater rates structure includes both monthly charges per cubic metre of metered water

consumption ("variable" or "consumption" charge) and a flat monthly service charge per customer ("fixed" charge). .

229. Assumptions regarding customer growth and consumption per customer are described further below.

4.7.1 Impacts of the COVID-19 Pandemic

230. EWSI's forecast anticipates a general return to pre-pandemic trends by 2023, as supported by external forecasts. The City of Edmonton predicts a return to pre-pandemic levels of output by 2022[9] or 2023, while the Government of Alberta and ATB Financial predict a return to pre-pandemic levels of output by 2023[10].

231. As further described in the sections below, EWSI is forecasting a return to long term trends in customer count and consumption per customer for all rate classes by 2023. The exception is commercial consumption per customer, which is forecast to return to the long term trend line by 2024.

4.7.2 Customer Count Forecasting Process

232. EWSI prepares its forecasts of customer growth separately for its residential, multi-residential and commercial customer classes. The wastewater volumes are related to the water consumption volumes and follow the customer count and consumption per customer forecast assumptions established for water.

233. **Residential Customer Count Forecast** – The residential customer category accounts for the 55% of total consumption, 62% of revenues and 93% of total customer accounts.

234. Customer growth rate assumptions in the 2017-2021 PBR Application were based on a review of historical customer growth trends, review of third party forecasts of Edmonton population growth and judgement. With the objective of improving the accuracy of the forecast and ensuring alignment across EPCOR, EWSI has adopted a new forecast methodology for residential customer count. This methodology is based on the approach approved by the AUC for Energy Services' 2016-2017 Regulated Rate Application.

[9] https://www.edmonton.ca/business_economy/documents/Fall_2020_Forecast_Update.pdf

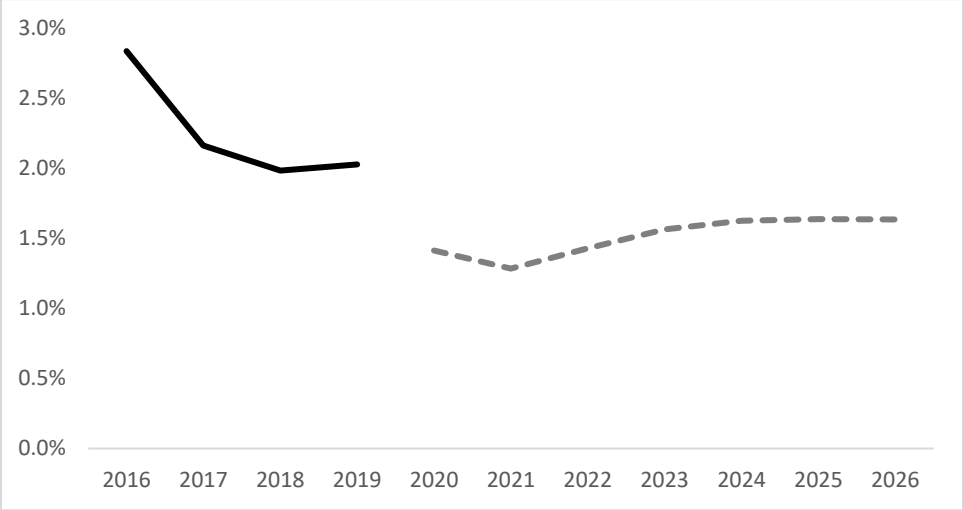
[10] https://www.atb.com/siteassets/pdf/company/insights/outlook/alberta-economic-outlook-october-2020.pdf https://www.alberta.ca/economic-outlook.aspx (retrieved February 12, 2021)

235. The revised methodology utilizes forecasts of housing starts from three independent sources: the City of Edmonton, The Conference Board of Canada and the Canada Mortgage and Housing Corporation (CMHC). The City of Edmonton provides a housing starts forecast for the Edmonton census subdivision, while CMHC and the Conference Board of Canada provide housing starts forecasts for the Edmonton census metropolitan area. Thus, the City of Edmonton forecast data is adjusted upward based on the observed historical percentage difference.

236. Figure 4.7.2-1 displays the historical annual growth in Edmonton housing starts from 2016-2019, as well as the average forecast across the three external sources. Slower population growth is anticipated due to the combined impacts of the COVID-19 pandemic and depressed energy prices.

Figure 4.7.2-1

Actual Housing Starts (2016-2019) and Average Forecast Growth Rate (2020-2026)



237. The results are based on a regression, with the monthly change in EWSI residential Active Customer Counts as the dependent variable and monthly housing starts as the explanatory variable. The constant is set equal to zero. The results of the t-test for significance of the explanatory variable and the results of the F-test for overall significance of the model are all significant at the 99% confidence level. The R-squared of 0.7356 is reasonably high for a model with a single explanatory variable. The coefficient on the explanatory variable is 0.408.

238. The average of the three housing starts forecasts is calculated for each future month, and multiplied by the coefficient of 0.408 to develop the forecast of growth in EWSI's residential site count.

239. **Multi-Residential Customer Count Forecast** – Generally multi-residential customer counts are forecast based on historical trending. However, EWSI anticipates that the economic trends dampening growth of residential sites over the next few years will extend to growth in multi-residential sites as well. Over the 2018-2019 period, growth in this customer class averaged 0.36%. A slow start to the recovery is forecast for 2021 and 2022, with 0.20% growth annually. Growth in the years 2023 and beyond is expected to return to near-historical levels, forecast at 0.30%

240. **Commercial Customer Count Forecast** – Two major changes to the forecast methodology for commercial customers have been incorporated. First, separate forecasts were developed for regular commercial customers and for the University of Alberta. The University of Alberta functions as an In-City bulk water customer, similar to regional water customers and, besides accounting for approximately 11% of commercial consumption, has consumption characteristics that differ from all other commercial customers. Therefore, developing separate forecasts leads to more consistent and reliable trending.

241. The second change to the methodology for the Commercial class forecast relates specifically to incorporating expectations of the COVID-19 pandemic impact, which resulted in the need for more weight placed on judgement about the future rather than historical trending.

242. Historically Commercial Growth has been increasing at a rate of 1.14% annually. EWSI is forecasting 0.03% growth in Commercial Customer Count for 2021 and 0.47% increase for 2022. From 2023 and beyond, EWSI is forecasting 0.91% growth in Commercial Customer Count, which is slightly lower than the 1.14% historical average due to global economic uncertainty and a decline in the energy sector in Alberta.

243. During the implementation of its new billing system in 2020, EWSI identified a difference in the determination of average monthly customer counts between the old and new billing systems. This difference relates to customer moves. When a customer moves out and another customer moves into the same premises during the month, the old billing system counts two customers for that month, whereas the new billing system correctly counts one customer in that month. The new billing system correctly bases the number of customers on the number of sites. Implementation testing showed that EWSI calculated that the difference in the determination of customer counts meant that customer counts in the old billing system were inflated by approximately 1,000 customers per year. Beginning with the 2020 forecast, EWSI has applied an adjustment to its forecast customer counts for each of the three rate classes.

244. Table 4.7.2-1 provides EWSI's forecast of customer count by class for 2022 to 2024. Please note that since 2018 and 2019 customer counts are based on the old billing system's methodology, whereas 2020 and 2021 are based on the new billing system's methodology. EWSI estimates that, had the new methodology been used, average monthly customer counts in Column A, would be approximately 1,000 less than shown.

Table 4.7.2-1
Financial Schedule 4-1
Average Monthly Customer Count
(2012-2024)

		A **2012-2016 Average**	B **2017-2021F Average**	C **2022F**	D **2023F**	E **2024F**
1	Residential	233,718	267,947	278,868	283,230	287,839
2	% annual avg. growth	2.68%	2.02%	1.43%	1.56%	1.63%
3	Multi-Residential	3,527	3,770	3,789	3,800	3,811
4	% annual avg. growth	1.94%	0.62%	0.20%	0.30%	0.30%
5	Commercial	15,630	16,901	17,069	17,240	17,412
6	% annual avg. growth	1.50%	1.09%	0.50%	1.00%	1.00%
7	Total Customers	252,876	288,618	299,725	304,270	309,063

4.7.3 Volume Per Customer Forecasting Process

245. **Residential Consumption per Customer Forecast** A declining trend in residential consumption is prevalent across North America, as validated in the 2016 Water Research Foundation Residential End Uses of Water, Version 2 (DeOreo, B. & Mayer, P., 2016). As indicated by the study, the reductions per residential customer have primarily been due to water savings as customers have installed water efficient appliances and fixtures (primarily toilets and washing machines) that require no behavioral changes to reduce water consumption.

246. A declining trend of water consumption per residential customer is observed in Edmonton over the past four decades. Residential per service consumption in Edmonton reached a high in 2002 of 21.4 m^3/month. Since this time, this number has fallen to 13.8 m^3/month in 2019 (a reduction of 36%). Water reductions per customer are anticipated to continue into the future due to passive water savings.

247. Prior to 2017, EWSI aggregated all Edmonton-wide residential users into one per-service consumption forecast value and multiplied by an aggregate city growth value for PBR renewal

terms. Beginning in 2017, in an effort to more accurately forecast residential consumption, EWSI started using a disaggregated geographic-based approach. This approach recognizes that per-service consumption trends are different for different neighbourhoods. Through its analysis, EWSI has determined that the age of neighbourhood tends to correlate with extent of installation of water efficient fixtures. EWSI's methodology uses age of the home as a proxy for the presence of water efficient appliances and fixtures and the predicted rate of future renovations.

248. The revised residential consumption per customer forecast methodology provided a three-year forecast for each of the core, mature, established, and developing neighbourhood classification areas. The forecast accuracy of this revised consumption per customer forecast demonstrated significant improvement over the 2017-2021 period. Over this period, the mean percentage error of the forecast was -2.63% compared to -5.77% over the 2012-2016 period. This reduced to just -0.9% over the 2017-2019 period. Based on the performance of the new methodology, EWSI decided to utilize the same approach to forecast residential consumption per customer for the 2022-2024 PBR Application. The disaggregated forecasts for the four classification areas are broken out into base and seasonal consumption, then aggregated to obtain a total consumption per customer forecast. As a validation, a theoretically low base consumption is estimated as described in Appendix M. The results of that validation analysis confirm the validity of this approach.

249. Although residential consumption per customer is higher during the COVID-19 pandemic as Edmontonians spend more time in their residences, EWSI is predicting a return to normal once the restrictions are lifted. As EWSI expects the pandemic restrictions to be fully lifted by April 2022, no COVID-19 impacts were incorporated into the forecast of residential consumption per customer.

250. **Multi-Residential Consumption per Customer Forecast** - Due to differences in the different sizes of multi-residential properties, it has been determined that a more appropriate approach is to forecast multi-residential consumption based on historical trending for the entire rate class. As a result, the forecast is developed based on historical trending of total consumption for this rate class. Historically over the years 2014-2019 total consumption has declined 0.18% for this customer class. As a result, EWSI is forecasting a decline of 0.18% from 2023 and beyond. The validation study presented in Appendix M provides similar results, thus improving EWSI's confidence in this forecast. Consumption per customer for the multi-residential rate class is thus calculated by dividing the total consumption forecast by the customer count forecast.

251. **Commercial Consumption per Customer Forecast** – Historically over the years 2009-2019 commercial consumption per customer has been declining at a rate of 3.10% annually. Based on observations of the impact of the COVID-19 pandemic on EWSI's commercial customer base, EWSI's forecast reflects a decline in 2020 of 24.05% in commercial consumption per customer.

252. EWSI is forecasting 0% change in commercial consumption per customer for 2021, 5.00% increase for 2022 and 5.00% increase for 2023. From 2024 and beyond, EWSI is forecasting a return to the long term trend line for commercial consumption per customer. EWSI has forecast an extended recovery for commercial consumption per customer due to the macroeconomic challenges in Alberta that existed prior to the pandemic, including low energy prices. EWSI forecasts total consumption for the University of Alberta to decline by 11.00% in 2020, with activity beginning to slowly resume in 2021 at 3.00%. An additional recovery of 5.00% is forecast for 2022, with total consumption generally returning to the historically observed 1.00% decline thereafter.

253. Table 4.7.3-1 provides EWSI's forecast monthly consumption per customer for each customer class for 2022-2024 compared to historical trends since 2012.

Table 4.7.3-1
Average Monthly Consumption per Customer
2012-2024
(m^3 per customer per month)

		A **2012-2016 (average)**	B **2017-2021F (average)**	C **2022F**	D **2023F**	E **2024F**
1	Residential	15.2	14.5	13.4	13.2	12.9
2	% change	(1.6%)	0.6%	(10.0%)	(1.7%)	(1.8%)
3	Multi-Residential	414.9	399.7	388.4	386.6	384.7
4	% change	0.0%	0.1%	(5.3%)	(0.5%)	(0.5%)
5	Commercial	133.5	100.5	91.9	95.8	97.7
6	% change	(2.3%)	(6.5%)	4.9%	4.3%	2.0%

4.7.4 Consumption Volume Forecast

254. The consumption volume forecast is a product of the forecast customer count and the forecast consumption per customer for the residential and commercial customer classes. EWSI has developed the consumption forecast for the multi-residential customer class on a total consumption basis.

255. EWSI's consumption volume forecast is provided in Table 4.7.4-1, which shows forecasted volumes for the full three year PBR period based on the consumption per customer and customer count forecasts. Consumption for the PBR term is expected to decrease moderately as customer growth is insufficient to fully offset the trend of declining consumption per customer.

Table 4.7.4-1
Total Volume by Customer Class
2021-2024
(ML)

		A **2021F**	B **2022F**	C **2023F**	D **2024F**
1	Residential	49,140.9	44,852.6	44,766.4	44,694.4
2	Multi-Residential	18,604.9	17,658.3	17,626.8	17,595.3
3	Commercial				
4	0 m^3 – 10,000 m^3	14,964.8	15,783.4	16,626.7	17,128.7
5	10,000.1 m^3 – 100,000.0 m^3	2,131.2	2,247.7	2,367.8	2,439.3
6	Over 100,000 m^3	747.1	788.0	830.1	855.1
7	Subtotal Commercial	17,843.1	18,819.1	19,824.6	20,423.1
8	**Total Consumption**	**85,588.9**	**81,330.0**	**82,217.8**	**82,712.9**
9	% Change		5.0%	-1.1%	-0.6%

5.0 OPERATING COSTS

256. This section describes total regulated operating costs for EWSI's Wastewater Treatment operations for the 2022-2024 forecast period. The 2021 approved (decision) and 2021 forecast operating costs are provided for comparison. This section provides two different views of regulated operating costs for purposes of explaining year-over-year variances: (i) by cost category (section 5.1) and (ii) by operational function (section 5.2).

257. In section 5.1, total regulated operating costs are categorized and explained based on the following eleven cost categories:

1. Staff Costs and Employee Benefits;
2. Power, Other Utilities and Chemicals;
3. Contractors and Consultants;
4. Materials and Supplies;
5. Vehicles;
6. Customer Billing and Collections;
7. Meter Reading Services;
8. EWSI Shared Services Allocation;
9. Corporate Shared Services;
10. Other; and
11. Franchise Fee and Property Taxes.

258. Section 5.1 provides total regulated operating costs by cost category, a discussion of the proportion of total operating costs represented by each cost category and the cost drivers unique to each cost category which explain the annual variations.

259. In section 5.2, total regulated operating costs are categorized and explained based on the following eight operational functions:

1. Power, Other Utilities and Chemicals;
2. Operations;
3. Operational Support Services;
4. Capitalized Overhead;
5. Billing, Meters and Regulatory Service;
6. EWSI Shared Services;
7. Corporate Shared Services; and
8. Franchise Fee and Property Taxes.

260. These eight operational functions can be further broken down into responsibility centres. It is at the responsibility centre level where authority and accountability for the management of costs takes place and is overseen at the senior manager level or higher. While the operations of the wastewater treatment system are managed through several responsibility centres and cost forecasts are developed at this level, for purposes of this section, certain responsibility centres have been grouped together based on the operational function.

261. Section 5.2 provides a description of each of the responsibility centres within each operational function and year-over-year variance explanations. Forecast operating costs by operational function are provided for 2022-2024 and 2021 approved amounts. In addition, 2021 forecast amounts are provided for comparison. EWSI's wastewater treatment operating cost forecasts are prepared according to the methodologies described in section 4.2.1. For additional information on actual operating costs for wastewater treatment operations for the years 2017 through 2019, refer to the Annual PBR Progress Reports attached in Appendices E-1 to E-3 to the Application.

5.1 Operating Costs by Cost Category

262. Table 5.1-1 provides total regulated operating costs by cost category forecast for 2022-2024. The 2021 approved and 2021 forecast amounts are provided for comparison.

Table 5.1-1
Financial Schedule 5-2
Operating Costs by Cost Category
2021-2024
($ millions)

	Cost Category	A 2021D	B 2021F	C 2022F	D 2023F	E 2024F
1	Staff Costs and Employee Benefits	19.9	17.5	18.3	18.8	19.6
2	Contractors and Consultants	5.3	4.5	16.0	20.2	17.4
3	Power, Other Utilities and Chemicals	7.4	6.9	7.2	8.2	8.4
4	Customer Billing and Collections	3.7	3.3	3.4	3.5	3.5
5	Meter Reading Services	2.5	2.5	2.8	2.7	2.4
6	EWSI Shared Services	3.3	3.1	3.3	3.3	3.4
7	Corporate Shared Services	5.2	5.2	5.2	5.3	5.4
8	Materials and Supplies	2.1	2.1	2.1	2.2	2.3
9	Vehicles	0.2	0.1	0.1	0.1	0.1
10	Other	1.0	1.6	2.3	2.9	4.0
11	**Operations and Maintenance Costs**	50.6	46.8	60.8	67.2	66.5
12	Franchise Fee and Property Taxes	9.8	8.9	10.0	10.7	10.9
13	**Total Regulated Operating Costs**	**60.4**	**55.7**	**70.8**	**77.8**	**77.4**

263. Staff costs and employee benefits reflect wages, salaries and benefits including incentive compensation and overtime for EWSI's employees. These costs represent approximately 25% of total regulated operating costs over the 2022-2024 PBR term. The staff costs and employee benefit amounts above are reported net of salary recoveries for the employee time spent on capital projects and non-regulated activities, as well as capitalized overhead. Time spent for work on capital projects is directly charged to the capital project and time spent for work on non-regulated activities is directly charged to the non-regulated activity. Capitalized overhead represents the cost of certain functions required to support capital projects such as senior management oversight and project governance. Capitalized overhead recoveries vary from year to year based on the amount of capital expenditures and the direct labour charged to capital projects.

264. EWSI has two broad categories of employees: unionized and non-unionized. In Wastewater Treatment, the unionized employees make up approximately 74% of the total workforce while non-unionized employees make up the remaining 26%. For both unionized and non-unionized employees, EWSI's compensation structure includes a base level of compensation, including benefits, and an incentive component which is paid when performance targets are met. Salaries and wages for union staff are determined based on negotiated collective bargaining agreements with the International Brotherhood of Electrical Workers Local 1007 employees,

Civic Service Union 52 and Canadian Union of Public Employees Local 30 employees. Salaries for non-union staff are determined based on job-related skills, experience and market competitiveness.

265. Year over year changes to staff costs and employee benefits (net of labour recoveries) are primarily influenced by annual salary and wage escalations and the changes in the number of employees depending on workload. Variations from year to year in staff costs and employee benefits are also influenced by overtime requirements related to fluctuations in operational activities resulting from factors such as amount and nature of capital projects and succession planning. Occasionally, internal organizational changes may also influence changes in staff costs and employee benefits.

266. Contractor and consultant cost represent approximately 24% of EWSI's total regulated Wastewater Treatment operating costs over the 2022-2024 PBR term. The majority of the contractor costs is the contracted disposal of bio-solids through the CBBRF. External contractors and consultants are only utilized when it is the most cost effective manner to carry out required work or where in-house resources are unavailable or do not have the full expertise to carry out the required work. Materials and supplies vary year to year based on the level of maintenance work required at the Gold Bar WWTP and the CBBRF.

267. Power, other utilities and chemicals represent approximately 11% of EWSI's total regulated Wastewater Treatment operating costs over the 2022-2024 PBR term. The category consists of power (electricity), natural gas, water and chemical costs with power comprising 71% of the total costs in this category over the 2022-2024 PBR term.

268. The total power costs are formed by two components: cost of energy and cost of delivery. EWSI procures its power and gas contracts through a competitive process. The contract cost is minimized by combining consumption requirements across EWSI's Water, Wastewater Treatment, and Drainage operations into a single portfolio order to reduce total variability and increase buying power. The current long term power contract is set to expire at the end of 2021 and EWSI has entered into a new contract with a load following price structure in which the supplier bears hourly volume risk. The electricity delivery charges are independent of the service provider and EWSI has minimal control over their growth. Delivery charges have increased at a greater rate than energy charges through the term of the current PBR and are projected at their historical rate of growth. The amount charged is based on the energy used, therefore operating in an energy efficient manner will reduce the delivery charge.

269. To determine the price forecast for the 2022-2024 PBR term, EWSI forecasts power prices for 2021 based on indicative pricing from potential suppliers into its competitive procurement process and inflation is added to determine the 2022-2024 power prices. Forecast power consumption is assumed to remain similar to 2021 levels. For the 2022-2024 PBR term, EWSI's power costs will also include costs starting in 2023 for REC's procured by EUI under its Green Power Initiative and allocated to EWSI's Wastewater Treatment operations.

270. Chemicals comprise approximately 2% of EWSI's total regulated Wastewater Treatment operating costs over the 2022-2024 PBR term. Chemical costs used in the wastewater treatment process vary year to year depending on influent sewage strength and the impact of combined sewer flows and solids directed to the Gold Bar WWTP during wet weather. As well, approximately 50% of the forecast chemical costs are directly related to the treatment of supernatant at the CBBRF.

271. Customer billing and collections services costs represent approximately 5% of EWSI's total regulated operating costs. These costs are comprised of services provided by EWSI's affiliate, EPCOR Energy Alberta Limited Partnership ("EEA"), as well as bad debt expense. EEA provides EWSI's Wastewater Treatment operations with billing and customer care services, including:

- Customer service management;
- Call centre;
- Billing;
- Collections; and
- Information systems.

272. EEA charges EWSI's Wastewater Treatment operations for these services based on a unit price applied to the number of site counts (customers) served by EEA. These costs and the allocation methodologies are approved by the Alberta Utilities Commission (AUC) through EEA's rate filings to the AUC.

273. Meter reading services represents inter-affiliate charges to Wastewater Treatment for water meter reading services provided by Water Services and represent approximately 4% of total regulated Wastewater Treatment operating costs.

274. EWSI Shared Services Allocation represents approximately 4% of total Wastewater Treatment regulated operating costs.

275. Corporate Shared Services represent approximately 7% of total regulated Wastewater Treatment operating costs and are comprised of costs associated with corporate shared services provided to EWSI's regulated operations by its parent company, EUI.

276. Franchise fee and property taxes represent approximately 14% of total regulated Wastewater Treatment operating costs. EWSI pays the City of Edmonton a franchise fee for the exclusive rights to provide wastewater treatment services within the City of Edmonton boundaries, based on 8.0% of total revenues from these services.

277. Other costs represent approximately 7% of EWSI's total regulated Wastewater Treatment operating costs and are comprised of materials and supplies, insurance, vehicles, hardware and software, telecommunication charges and other miscellaneous items.

5.2 Operating Costs by Function

278. Table 5.2-1 provides an overview of EWSI's total regulated Wastewater Treatment operating costs by operational function for 2022-2024. The 2021 approved (Decision) amounts and 2021 forecast amounts are provided for comparison.

Table 5.2-1
Financial Schedule 5-1
Operating Costs by Function
2021-2024
($ millions)

	Operational Function	A 2021D	B 2021F	C 2022F	D 2023F	E 2024F
1	Power, Other Utilities and Chemicals	7.4	6.9	7.2	8.2	8.4
2	Operations	22.1	19.4	32.4	37.8	36.6
3	Operational Support Services	6.5	6.2	6.2	6.4	6.5
4	Capital Overhead	(2.5)	(3.2)	(3.3)	(3.3)	(3.4)
5	Billing, Meters and Regulatory Service	7.3	7.5	7.9	7.9	7.7
6	EWSI Shared Services	4.8	4.8	5.0	5.0	5.3
7	Corporate Shared Services	5.2	5.2	5.2	5.3	5.4
8	**Operations and Maintenance Costs**	50.7	46.8	60.8	67.2	66.5
9	Franchise Fee and Property Taxes	9.8	8.9	10.0	10.7	10.9
10	**Total Wastewater Treatment Operating Costs**	**60.4**	**55.7**	**70.8**	**77.8**	**77.4**

279. For the 2021 approved to 2021 forecast, the operating cost decrease is approximately $4.7 million. This decrease is primarily due to:

- A $0.5 million decrease in utilities and chemicals due to lower than forecast power prices and chemical process and efficiencies obtained from dosing optimization;
- A net $2.7 million decrease in operations costs primarily due to a $1.9 million decrease in salary and benefit costs mainly due to higher capitalized internal labour costs and a $0.5 million decrease in project engineering costs related to decreased use of contractors;
- A $0.3 million decrease in Operational Support Services primarily due to a decrease in Centre of Excellence related costs following the absorption of the Centre of Excellence group into Quality Assurance and Environment ;
- A $0.9 million decrease in franchise fee and property taxes due to lower than forecast property tax assessments, lower water consumption and lower inflation adjustments leading to lower forecast regulated Wastewater Treatment revenues and franchise fees collected as explained in section 5.2.8.

280. These decreases are partially offset by:

- A $0.7 million increase in capitalized overhead recoveries as a result of higher capitalization rates and adding supply chain and health and safety costs to the overhead pool as explained in section 5.2.4; and
- A $0.2 million increase in Billing, Meters and Regulatory Service costs due to increased level of service by Drainage Services' Monitoring and Compliance department for operation of the source control and overstrength surcharge programs, partially offset by a decrease in Customer Billing Service costs due to lower than forecast unit price charged by EEA for billing and customer care services.

281. For 2021 forecast to 2022 forecast, the cost increase is approximately $15.1 million. The cost increase is primarily due to:

- A $12.6 million increase in operations costs related to the transfer of the Biosolids Management Program from Drainage Services effective April 1, 2022;
- A $1.1 million increase in franchise fee due to increases in regulated Wastewater Treatment revenues;
- A $0.9 million increase due to inflation;

- A $0.3 million increase in Power, Other Utilities and Chemicals primarily due to an increase in the cost of distribution and transmission of power; and
- A $0.2 million increase in Billing, Meters and Regulatory Service costs due to an increase in Customer Billing Service costs from EEA and an increase in Meter Services costs allocated from Water Services, as explained below in section 5.2.5.

282. For the 2022-2024 forecast period, in most cases, year over year cost increases are based on the inflation factor provided in Section 4.2.1. However, there are a few exceptions described below:

- A net $3.3 million increase in Biosolids Management Program costs, which primarily includes a $4.9 million increase related to the full year impact of including this program in Wastewater Treatment operations in 2023, partially offset by $1.9 million in operating savings associated with the new Dewatering Facility expected to go into service in 2024;
- A $0.8 million increase in power costs in 2023 due to incorporating EWSI's proposed Green Power initiative as described in section 2.5.3, along with an annual 10% increase in distribution and transmission charges;
- A $0.2 million decrease in Billing, Meters and Regulatory Service costs primarily due to lower Advanced Metering Infrastructure costs allocated from Water Services as explained below in section 5.2.5; and
- A $0.5 million average annual increase in franchise fee due to increases in regulated Wastewater Treatment revenues.

283. For purposes of explaining the regulated operating costs and the year-over-year variances, operating costs have been grouped into the eight operational functions shown in Table 5.2-1, consistent with the organization structure in which Wastewater Treatment operates. Each operational function is subsequently broken down by responsibility centre (where applicable) and their costs are described in greater detail in the following sections.

5.2.1 Power, Other Utilities and Chemicals

284. Power, Other Utilities and Chemicals includes all power, chemical, natural gas and water costs required to operate and maintain Wastewater Treatment operations:

- Power costs are one of the single largest operating costs incurred by EWSI in the treatment of wastewater. The majority of power costs are incurred in the operation of the secondary treatment process where removal of as much as possible of the

wastewater's remaining dissolved organic pollutants takes place that were not removed in the primary treatment process, as well as nutrient removal. Actual power consumption is generally consistent from year to year with cost fluctuations in line with the current power contract which is set in line with EWSI's long-term power contract.

- Chemical costs used in the wastewater treatment process vary year to year primarily due to the volume of wastewater flows and the solids loading associated with the flows, and due to chemical price fluctuations as determined by market and foreign exchange rates. Approximately 50% of the forecast chemical costs are directly related to the treatment of liquid (Clover Bar Supernatant Returns) from the CBBRF through the Ostara nutrient recovery facility ("Ostara facility"). This facility removes phosphorus and ammonia from the Clover Bar Supernatant Returns. Supernatant is the liquid that separates from the biosolids as digested sludge settles by gravity while stored in the lagoons at Clover Bar. The treatment process removes the phosphorus and ammonia from the supernatant and converts them to an eco-friendly, slow-release fertilizer. The treated supernatant is then returned to the wastewater collection system. This fertilizer is then sold back to Ostara Nutrient Recovery Technologies Inc. as described in section 10.
- The major treatment agents used at the Gold Bar WWTP for the treatment of wastewater are alum, polymer, sodium hypochlorite (bleach) and sodium hydroxide (caustic soda). These chemicals are used for sludge thickening, chemical flocculation/coagulation, and odour control. Chemical treatment is used to supplement the predominantly biological wastewater treatment processes at Gold Bar WWTP.
- Other utilities costs includes natural gas costs which are associated with maintaining heat for the wastewater treatment facilities including all buildings, and potable water which is used in the operations and maintenance of facilities and for drinking water on the Wastewater Treatment site.

285. The Power, Other Utilities and Chemicals operating costs forecast for 2022-2024 are provided in Table 5.2.1-1. The 2021 approved amounts and 2021 forecast amounts are provided for comparison.

Table 5.2.1-1
Financial Schedule 6-1
Power, Other Utilities and Chemicals
2021-2024
($ millions)

	Category	A 2021D	B 2021F	C 2022F	D 2023F	E 2024F
1	Power	4.9	4.7	5.0	5.8	5.9
2	Water	0.4	0.4	0.4	0.4	0.5
3	Natural Gas	0.4	0.3	0.4	0.4	0.5
4	Chemicals	1.7	1.4	1.5	1.5	1.5
5	**Total**	**7.4**	**6.9**	**7.2**	**8.2**	**8.4**

2021 Approved to 2021 Forecast

286. The $0.5 million decrease in Power, Other Utilities and Chemicals costs from 2021 approved to 2021 forecast is due to a $0.3 million decrease in chemical costs primarily due to efficiencies achieved in process and dosing optimization, a $0.2 million decrease in power due to lower than forecast power prices and a $0.1 million decrease in natural gas costs.

2021 Forecast to 2022 Forecast

287. The $0.3 million increase in Power, Other Utilities and Chemicals costs from 2021 forecast to 2022 forecast is primarily due to a $0.2 million increase cost of distribution and transmission power and increases based on the inflation factor.

2022 Forecast to 2024 Forecast

288. For the 2022 to 2024 forecast period, year over year cost increases are based on the forecast inflation factor. The one exception is a $0.8 million increase in power costs in 2023 incorporating the proposed Green Power Initiative as described in section 2.5.3, along with an annual 10% distribution and transmission charges increase.

5.2.2 Wastewater Treatment

289. Wastewater Treatment is organized into five functional groups:

1. Wastewater Treatment Plant Operations;
2. Biosolids Management;
3. Maintenance;
4. Plant Engineering and Plant Controls and Automation; and
5. Project Engineering.

Wastewater Treatment Plant Operations

290. Wastewater Treatment Plant Operations is primarily responsible for the treatment of sanitary and combined sewer wastewater obtained directly from EWSI's Drainage Services' sanitary and combined sewer systems that discharge to the Gold Bar WWTP. Gold Bar WWTP carries out the treatment function utilizing internal resources comprised of operators and process/production engineers to monitor the flows of wastewater, adjust biological and chemical rates, monitor and adjust pressures, flows and settling tank levels in the treatment system. As well, Wastewater Treatment Operations is responsible for integrating new treatment facilities into the overall wastewater treatment process to optimize wastewater system operations and ensure regulatory requirements are met.

291. The operating costs for Gold Bar WWTP are primarily comprised of staff costs and employee benefits and contractor costs are primarily related to the disposal of inorganic waste from Gold Bar WWTP. Staff costs and employee benefits are for Gold Bar WWTP operators and process engineers to operate and monitor wastewater treatment at Gold Bar WWTP as well as the Ostara nutrient recovery facility at the Clover Bar site.

Biosolids Management Program

292. For the 2022-2024 PBR Application, transfer of the biosolids management program has been reflected in full in EWSI's financial submission. This includes the transfer of Clover Bar biosolids management assets with a net book value of $24.0 million and annual operating costs of approximately $17 million from Drainage Services to Wastewater Treatment Services. The operating costs for Biosolids Management are primarily comprised of staff costs and employee benefits, contractor costs and power. Staff costs and employee benefits are for operators and engineers to manage the biosolids program at the Clover Bar site and to operate the new dewatering facility when it is placed into service in 2024. Contractor costs are related to the

disposal of biosolids, and operation of the existing dewatering facility. Power costs are primarily incurred for the operation of the dewatering facility.

Maintenance

293. Maintenance is responsible for the maintenance and repairs at the Gold Bar WWTP and CBBRF. The Maintenance group carries out these functions primarily using internal resources comprised of mechanical and electrical/instrumentation trades people. Within Maintenance, the Utility Crew is comprised of labourers primarily responsible for cleaning process equipment (tanks, vessels and channels) and they supplement the labour needed for the annual major maintenance program, including inspections, and mechanical equipment repair and refurbishment.

294. The operating costs for Maintenance include staff costs and employee benefits, materials and supplies, vehicle and equipment costs and contractors. Costs in this area vary from year to year with changes in the level of maintenance and repair work required and with changes in contractor, equipment and materials costs.

Plant Engineering and Plant Controls and Automation

295. Plant Engineering is responsible for engineering work, including engineering designs, studies, asset management and process safety (including plant integrity, management of change and hazardous energy isolation systems). Plant Engineering includes the development and maintenance of site engineering standards, the development and maintenance of engineering drawings and the development and maintenance of the technical library. Engineering provides engineering support to the operations and maintenance areas of wastewater treatment.

296. Plant Controls and Automation (PC&A) is a specialized engineering group responsible for the design, operation and asset management of the instrumentation, process control communication networks, cybersecurity and the control system computers required for the reporting, monitoring and automation of wastewater treatment by Operations. As well, this group establishes and maintains design practices and standards while providing support to operational and capital projects as required.

Project Engineering

297. Project Engineering is responsible for the project management, design, construction and coordination of capital projects for the Gold Bar WWTP and CBBRF. Project Engineering manages

the capital portfolio delivery for these two sites and also provides long term facility planning, bridging between the collection system sewer infrastructure and Gold Bar WWTP to ensure coordinated capital planning and overall system operation.

298. EWSI's Wastewater Treatment operating costs forecasts for 2022-2024 are summarized in Table 5.2.2-1. The 2021 approved and 2021 forecast amounts are provided for comparison.

Table 5.2.2-1
Financial Schedule 7-1
Wastewater Treatment Operating Costs
2021-2024
($ millions)

		A **2021D**	B **2021F**	C **2022F**	D **2023F**	E **2024F**
1	Gold Bar WWTP Operations	4.7	4.7	4.8	4.9	5.0
2	Biosolids Management	-	-	12.6	17.5	15.9
3	Maintenance	11.0	9.9	10.1	10.3	10.6
4	Plant Engineering and PC&A	4.3	4.0	4.0	4.1	4.2
5	Project Engineering	2.1	0.8	0.9	0.9	0.9
6	**Total**	**22.1**	**19.4**	**32.4**	**37.8**	**36.6**

2021 Approved to 2021 Forecast

299. The $2.7 million decrease in Wastewater Treatment Operating costs from 2021 approved to 2021 forecast is primarily due to:

- A net $0.3 million decrease in Plant Engineering and PC&A primarily due to $0.5 million in lower salary and benefit costs partially offset by an increase of $0.2 million in contractors and IT software;
- A $0.6 million increase in capitalized internal labour costs primarily due to Wastewater maintenance personnel devoting more time to capital projects;
- A $0.5 million decrease in contractor, materials and supplies costs in Maintenance primarily due to less preventative maintenance activities as a result of refined asset management process;
- A $0.8 million decrease in Project Engineering staff costs and employee benefits primarily due to higher capitalized internal labour costs; and
- A $0.5 million decrease in Project Engineering contractor costs due to adjustments to the capital program, where projects with a high component of contractor costs have

been replaced by capital maintenance and repair projects completed by Wastewater personnel.

2021 Forecast to 2022 Forecast

300. The $13.0 million increase in Wastewater Treatment Operations costs from 2021 forecast to 2022 forecast is primarily due to:

- A $12.6 million increase in the Biosolids Management costs following the transfer of this function from Drainage Services on April 1, 2022.
- A $0.4 million increase in the cost of other functions based on the inflation factor provided in Section 4.2.1.

2022 Forecast to 2024 Forecast

301. For the 2022 to 2024 forecast period, year over year cost increases are based on the inflation factor provided in Section 4.2.1. The one exception is a net $1.9 million decrease in Biosolids Management Program costs in 2024 related to operating savings associated with the new dewatering facility going into service in 2024.

5.2.3 Operational Support Services

302. Operational Support Services is organized into three functional groups:

- Quality Assurance and Environment;
- Gold Bar Administration; and
- Supply Chain Management & Security.

Quality Assurance and Environment

303. Quality Assurance and Environment is responsible for:

- Monitoring and testing treated wastewater to ensure that effluent standards are maintained;
- Quality assurance and auditing of operational wastewater quality data;
- Environmental services that include monitoring, tracking and reporting of environmental and public health incidents within Water and Wastewater and providing support to operation for incident management,
- Supporting Water and Wastewater Treatment Environmental Management Systems;

- Management of EWSI's watershed programs ;
- Monitoring of and tracking developing regulations and industry concerns to determine impact on Water and Wastewater Treatment strategies and plans;
- Maintaining a wastewater treatment process optimization program;
- Working with environmental regulators and ensuring Wastewater Treatment reporting requirements are met;
- Managing process optimization activities within the Centre of Excellence's pilot laboratory and pilot plant as well as providing technical support to Operations and Engineering teams; and
- Providing foresight on emerging trends and wastewater research activities as well as supporting a networking function that links pilot- and operational-scale issues to outside subject matter experts such as consultants, academics and government agencies/departments.

304. Quality Assurance and Environment operates Gold Bar WWTP's wastewater laboratory. Gold Bar WWTP's laboratory is certified to ISO/IEC 17025 General *Requirements for the Competence of Testing and Calibration Laboratories.* The laboratory is approved by Alberta Environment and Parks and is subject to bi-annual audits by the Canadian Association for Laboratory Accreditation.

305. Under EWSI's watershed program, Quality Assurance and Environment staff work with stakeholders in the watershed. EWSI is a founding member and current board member of the North Saskatchewan Watershed Alliance, which has formally been appointed as a watershed protection council by Alberta Environment and Parks. The Watershed program includes determining the impacts of all EWSI operations in Edmonton on the aquatic health of the North Saskatchewan River. This includes assessing discharges from the Gold Bar WWTP, Drainage storm and sewers, and the Edmonton Water Treatment plants as part of the an Integrated Watershed Management Strategy for EWSI.

306. As part of its reporting requirements, Gold Bar WWTP prepares monthly reporting for internal use and annual reports for submission to AEP. EPCOR works closely with regulators including AEP on the development of new approaches to management of wastewater discharges to the river. Specifically, EWSI participates on the Advisory Committee for the AEP lead Capital Region-Industrial Heartland Water Management Framework that is developing a cumulative effects/total loadings based management water quality framework for the Devon to Pakan

stretch of the River. The City of Edmonton also participates on this committee along with other wastewater discharges in the region.

307. The process optimization program is led by a wastewater treatment specialist who plans pilot plant and other studies, including studies carried out together with university researchers, that are aimed at improving the operation of the existing Gold Bar WWTP or evaluating of new treatment technologies that may be used in the future to improve performance and/or capacity of the plant.

Gold Bar WWTP Administration

308. Gold Bar WWTP Administration provides support services to ensure that Wastewater Treatment can efficiently and effectively handle operations and maintenance functions. Gold Bar WWTP Administration is comprised of the following three responsibility centres:

- Director, Edmonton WWTP – provides general wastewater operations leadership from the Director of the Wastewater Treatment Plants and includes costs for insurance;
- Operations Communications - includes costs associated with programming such as outage notifications, stakeholder education on wastewater issues, stakeholder relations and customer satisfaction research;
- Legal Services – includes costs to provide external legal advice and services to Wastewater Treatment Services.

Supply Chain Management & Security

309. Supply Chain Management (SCM) and Security is responsible for the following functions:

- Management and support of the warehousing, inventory and reverse logistics functions;
- management of the purchasing function for the acquisition of goods or services from outside vendors; and
- maintenance of onsite safety and security.

310. The Operational Support Services costs forecast for 2022-2024 are summarized in Table 5.2.3-1. The 2021 approved and 2021 forecast amounts are provided for comparison.

Table 5.2.3-1
Financial Schedule 7-1
Operational Support Services Costs
2021-2024
($ millions)

		A **2021D**	B **2021F**	C **2022F**	D **2023F**	E **2024F**
1	Quality Assurance & Environment	4.6	4.3	4.3	4.4	4.5
2	Gold Bar WWTP Administration	1.4	1.3	1.4	1.4	1.5
3	Supply Chain Management & Security	0.5	0.5	0.5	0.5	0.5
4	**Total**	**6.5**	**6.2**	**6.2**	**6.4**	**6.5**

2021 Approved to 2021 Forecast

311. The $0.3 million decrease in Operational Support Services costs from 2021 approved to 2021 forecast is primarily due to cost savings in contractor costs and subscription costs following the absorption of the Centre of Excellence group into Quality Assurance and Environment.

2021 Forecast to 2022 Forecast

312. The less than $0.1 million increase in Operational Support Services costs from 2021 forecast to 2022 forecast is primarily due to inflation.

2022 Forecast to 2024 Forecast

313. For the 2022 to 2024 forecast period, year over year cost increases are based on inflation.

5.2.4 Capitalized Overhead

314. Capitalized overhead recoveries represents labour and labour-related expenses of capital support functions such as senior management oversight, supervision, project governance, capital accounting, supply chain and health and safety resources that are directly attributable to capital expenditures. For further details on how EWSI determines capital overheads, refer to section 4.5 of the Application.

315. The Capitalized Overhead cost recoveries forecast for 2021-2024 are summarized in Table 5.2.4-1. The 2021 approved and 2021 forecast amounts are provided for comparison.

Table 5.2.4-1
Financial Schedule 7-1
Capitalized Overhead Costs
2021-2024
($ millions)

	A **2021D**	B **2021F**	C **2022F**	D **2023F**	E **2024F**
1 Capitalized Overhead	(2.5)	(3.2)	(3.3)	(3.3)	(3.4)

2021 Approved to 2021 Forecast

316. The $0.7 million increase in Capitalized Overhead recoveries from 2021 approved to 2021 forecast was primarily due to:

- A $0.5 million increase due to an increase in both workforce headcount and proportion of workforce time spent on capital work resulting in more management time in labour costs to support the labour pool; and
- A $0.2 million increase due to the addition of supply chain and health and safety resources to the overhead pool.

2021 Forecast to 2022 Forecast

317. The increase in Capitalized Overhead recoveries from the 2021 forecast to 2022 forecast is primarily due to annual inflation.

2022 Forecast to 2024 Forecast

318. For the 2022 to 2024 forecast period, year over year cost increases reflect inflation.

5.2.5 Billing, Meters and Regulatory Service

319. Billing, meters and regulatory service is comprised of the following three functional groups:

- Customer Billing Services;
- Meter Services; and
- Regulatory Services.

320. Customer Billing Services is comprised of costs for billing services, which are regulated by the AUC, provided by EWSI's affiliate EEA pursuant to a service level agreement.

321. Metering Services is comprised of inter-affiliate charges to Wastewater Treatment Services for water meter operations, meter reading and customer services provided by Water Services.

322. Regulatory Services are comprised of charges from Drainage Services pursuant to the Regulatory Services Agreement. The charges represent costs paid to Drainage Services' Monitoring and Compliance department to support regulatory compliance in the operation of the source control and overstrength surcharge programs.

323. The Billing, Meters and Regulatory Service costs forecast for 2022-2024 are summarized in Table 5.2.5-1. The 2021 approved and 2021 forecast amounts are provided for comparison.

Table 5.2.5-1
Financial Schedule 8-1
Billing, Meters and Regulatory Service Costs
2021-2024
($ millions)

	Category	A 2021D	B 2021F	C 2022F	D 2023F	E 2024F
1	Customer Billing Services	3.7	3.3	3.4	3.5	3.5
2	Meter Services	2.5	2.5	2.8	2.7	2.4
3	Regulatory Services	1.1	1.7	1.7	1.7	1.8
4	**Total**	**7.3**	**7.5**	**7.9**	**7.9**	**7.7**

2021 Approved to 2021 Forecast

324. The $0.2 million increase in Billing, Meters and Regulatory Service costs from 2021 approved to 2021 forecast was primarily due to:

- A $0.6 million increase in charges from Drainage Services' Monitoring and Compliance department due to higher overall costs for increased level of service for operation of the source control and overstrength surcharge programs. This increased level of service included additional testing and opportunities to educate customers and ensure compliance by proactively visiting businesses.

325. This increase is partially offset by a decrease in operating costs primarily due to:

- A $0.4 million decrease in Customer Billing Service costs due to lower than forecast unit price charged by EEA to Gold Bar WWTP for billing and customer care services

pursuant to the Service Level Agreement between the parties. This reduction in charges from EEA followed a review of EEA's cost allocations.

2021 Forecast to 2022 Forecast

326. The $0.4 million increase in Billing, Meters and Regulatory Service costs from 2021 forecast to 2022 forecast is primarily due to:

- A $0.1 million increase in Customer Billing Service costs due to an increase in charges from EEA primarily due to annual inflation; and
- A $0.3 million increase in Meter Services costs primarily due to actual costs increasing resulting in higher costs being allocated to Wastewater Treatment from Water Services primarily associated with the AMI Deployment Project, and annual inflation.

2022 Forecast to 2024 Forecast

327. For the 2022 to 2024 forecast period, the majority of year over year cost increases are rising at the rate of inflation. However, there the one exception is a $0.3 million decrease in Meter Services in 2024 relating to lower costs allocated from Water Services as the result of the Advanced Metering Infrastructure project.

5.2.6 EWSI Shared Services

328. EWSI Shared Services are comprised of allocated charges to Wastewater Treatment for shared services provided by EWSI and direct charges for specific functional areas partially embedded in Wastewater Treatment operations. The services provided and the allocation methods used to determine the shared service charges to Wastewater Treatment are described in Appendix L-2. The services provided through direct charges from specific functional areas include Finance, Public and Government Affairs, and Health, Safety and Environment and also includes Incentive costs directly related to Wastewater Treatment employees.

329. EWSI Shared Services charges forecast for 2022-2024 are summarized in Table 5.2.6-1. The 2021 approved and 2021 forecast amounts are provided for comparison.

Table 5.2.6-1
Financial Schedule 9-1
EWSI Shared Services Costs
2021-2024
($ millions)

	Category	A 2021D	B 2021F	C 2022F	D 2023F	E 2024F
1	EWSI Shared Services	4.8	4.8	5.0	5.0	5.3

2021 Approved to 2021 Forecast

330. There was no change in the total EWSI Shared Services charges from the 2021 approved to 2021 forecast, however the following two variances are noted:

- A $0.2 million increase in Controller Water Services primarily due to higher than forecasted costs for City PBR consultation and audit fees.

331. This increase is offset by:

- A $0.2 million decrease in Technical Training as a result of a reorganization of the group from EWSI to Corporate.

2021 Forecast to 2022 Forecast

332. There was no change in the EWSI Shared Services charges from 2021 forecast to 2022 forecast. The increase in costs due to annual inflation of $0.1 million was offset by decreases in several EWSI Shared Services groups.

2022 Forecast to 2024 Forecast

333. For the 2022 to 2024 forecast period, year over year cost increases are based on the inflation factor.

5.2.7 Corporate Shared Services

334. Corporate Shared Services are comprised of allocated charges to Wastewater Treatment for corporate services provided by EUI. The services provided and the allocation methods used to determine the corporate service charges to Wastewater Treatment are described in Appendix L-01.

335. The Corporate Shared Services charges forecast for 2022-2024 are summarized in Table 5.2.7-1. The 2021 approved and 2021 forecast amounts are provided for comparison.

Table 5.2.7-1
Financial Schedule 10-1
Corporate Shared Services Costs
2021-2024
($ millions)

	Shared Service Unit	A 2021D	B 2021F	C 2022F	D 2023F	E 2024F
1	Board and Executive	0.3	0.3	0.3	0.3	0.3
2	Corporate Finance	0.4	0.2	0.2	0.2	0.2
3	Treasury	0.3	0.2	0.2	0.2	0.2
4	Risk Assurance & Advisory Services	0.1	0.1	0.1	0.1	0.2
5	Human Resources	0.6	0.6	0.7	0.7	0.7
6	Information Services	0.6	0.5	0.6	0.6	0.6
7	Supply Chain Management	0.7	0.5	0.5	0.5	0.5
8	Public and Government Affairs	0.4	0.4	0.4	0.4	0.4
9	Legal Services	0.2	0.1	0.1	0.1	0.1
10	Health, Safety & Environment	0.1	0.1	0.1	0.1	0.1
11	At-Risk Compensation	0.4	0.3	0.4	0.4	0.4
12	Other Corporate Services	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
13	**Sub-total**	**4.1**	**3.3**	**3.4**	**3.5**	**3.6**
14	Asset Usage Fees	1.1	1.8	1.8	1.8	1.9
15	**Total Corporate Shared Services Costs**	**5.2**	**5.2**	**5.2**	**5.3**	**5.4**

2021 Approved to 2021 Forecast

336. There was no change in Corporate Shared Services charges from the 2021 approved to 2021 forecast, however the following offsetting variances are noted. A decrease in costs due to the reduction in cost allocations resulting from the transfer of Drainage from the City of Edmonton to EPCOR. This decrease is offset by an increase in asset usage fees related to a new billing system placed into service by EEA in November 2020 and an increase in charges for Human Resources as a result of a reorganization of the Technical Training group from EWSI to Corporate.

2021 Forecast to 2022 Forecast

337. There was no change in Corporate Shared Services charges from 2021 forecast to 2022 forecast.

2022 Forecast to 2024 Forecast

338. For the 2022 to 2024 forecast period, year over year cost increases are based on the inflation factor.

5.2.8 Franchise Fee and Property Taxes

339. In accordance with the Franchise Fee Agreement and associated amendments, Wastewater Treatment pays the City of Edmonton a franchise fee for the exclusive rights to distribute water within the City boundaries, based on 8.0% of total wastewater sales revenues and overstrength revenues (net of non-rate revenues) from In-City customers, less the municipal portion of property taxes.

340. Property taxes include property and business taxes assessed by, and payable to the City of Edmonton with respect to the various properties owned by EWSI for Wastewater Treatment operations.

341. The Franchise Fee and Property Taxes cost forecasts for 2022-2024 are summarized in Table 5.2.8-1. The 2021 approved amounts and 2021 forecast amounts are provided for comparison.

Table 5.2.8-1
Financial Schedule 11-1
Franchise Fee and Property Taxes
2021-2024
($ millions)

	Category	A 2021D	B 2021F	C 2022F	D 2023F	E 2024F
1	Franchise Fee	8.5	8.3	9.3	9.9	10.2
2	Property Taxes	1.3	0.6	0.7	0.7	0.7
3	Total	**9.8**	**8.9**	**10.0**	**10.7**	**10.9**

2021 Approved to 2021 Forecast

342. A $0.7 million decrease in Property Taxes from 2021 approved to 2021 forecast due to lower property tax assessments than forecast and a change in scope of the Operations Centre Mid-Point Entrance project as explained in section 6.1. A $0.2 million decrease in Franchise Fee from 2021 approved to 2021 forecast is due to lower than forecast water consumption, resulting

in lower than forecast revenues which more than offset a lower than forecast deduction of the municipal portion of property taxes, leading to a lower franchise fee collected in 2021.

2021 Forecast to 2022 Forecast

343. The $1.1 million increase in Franchise Fee and Property Taxes from 2021 forecast to 2022 forecast is primarily due to:

- A $1.0 million increase in Franchise Fee due to forecast increases in revenues from Wastewater Treatment's regulated operations primarily due to wastewater rate increases and customer growth; and
- A $0.1 million increase in Property Taxes primarily due to inflation.

2022 Forecast to 2024 Forecast

344. For the 2022 to 2024 forecast period, the year over year increases in Franchise Fee are due to forecast increases in revenues from Wastewater Treatment's regulated wastewater operations primarily due to wastewater rate increases and customer growth and partially offset by the deduction of the municipal portion of the property taxes.

6.0 CAPITAL EXPENDITURES

345. Capital expenditures for EWSI's wastewater treatment operations reflect both capital projects and programs to support ongoing operations reliability, safety and efficiency, and to meet customer growth and regulatory requirements. Details regarding EWSI's capital planning process are provided in Section 4.2.2. Section 6.1 provides an explanation of EWSI's capital expenditures over the 2017-2021 PBR term compared to the approved amounts. Section 6.2 provides EWSI's capital plan for wastewater treatment operations for the 2022-2024 PBR term.

6.1 Capital Expenditures for the 2017-2022 PBR Term

346. EWSI prepares a five year plan of capital expenditures for the wastewater treatment operations at the beginning of each PBR term. Over the PBR term, actual capital expenditures, both on individual projects and in aggregate, may differ from the PBR forecasts as projects are advanced, delayed, or changed. In some circumstances, projects will be added to or removed from capital programs to address the challenges of aging infrastructure, to better respond to growth, or to meet City requirements.

347. Accordingly, over the PBR term, differences will arise between actual and approved capital expenditures. These are communicated annually to the City through Annual PBR Progress Reports attached to this Application in Appendices E-1 to E-3 for the years 2017-2021. This section provides an overview of the major capital projects and programs completed during 2017-2021 and a comparison of the actual capital expenditures to the approved amounts.

348. Table 6.1-1 provides a comparison of EWSI's total actual/forecast capital expenditures for 2017-2021 PBR compared to the approved amounts. The projects and programs are separated into five categories: (i) regulatory; (ii) growth/customer requirements; (iii) health safety and environment; (iv) reliability and life-cycle improvements; and (v) performance/efficiency improvements.

Table 6.1-1
Financial Schedule 15.5
Total Capital Expenditures by Regulatory Category Net of Contributions
Actual/Forecast compared to PBR Approved
2017-2021
($ millions)

	Category	A 2017-2021 Approved Total	B 2017-2021 Actual/ Forecast Total	C 2017-2021 Variance
	Regulatory			
1	Projects < $5 million	-	1.9	1.9
2	**Sub-total: Regulatory**	**-**	**1.9**	**1.9**
	Growth/Customer Requirements			
3	Hydrovac Sanitary Grit Treatment Facility Project	8.4	7.4	(1.0)
4	Projects < $5 million	1.5	2.4	0.9
5	**Sub-total: Growth/Customer Requirements**	**9.9**	**9.8**	**(0.2)**
	Health, Safety and Environment			
6	Projects < $5 million	4.5	3.8	(0.8)
7	**Sub-total: Health, Safety and Environment**	**4.5**	**3.8**	**(0.8)**
	Reliability and Life Cycle Improvements			
	Mechanical			
8	Build Pipe Racks Project	-	9.7	9.7
9	Replace 2.5km of Sludge Line Project	-	7.5	7.5
10	Clarifier Chain Replacement Program	4.1	9.9	5.8
11	Sludge Line Upgrades Project	3.4	8.5	5.2
12	Mechanical Rehabilitation Program	15.6	20.7	5.1
13	Digester 3 Upgrades Project	11.3	14.0	2.7
14	Digester 4 Upgrades Project	12.0	1.3	(10.7)
15	Headworks and Primary Aeration System Upgrades Project	6.7	1.4	(5.3)
16	Square 1 Gas Room Replacement Project	15.6	10.6	(5.0)
17	Projects < $5 million	8.3	5.7	(2.6)
18	**Sub-total: Mechanical**	**76.9**	**89.3**	**12.4**
	Structural			
19	Structural Rehabilitation Program	7.7	13.0	5.3
20	Structural Rehabilitation Secondaries 1-8 Program	17.6	21.6	4.0
21	Distribution Chamber Reconstruction Project	3.8	6.8	3.0
22	Projects < $5 million	3.2	2.0	(1.2)
23	**Sub-total: Structural**	**32.2**	**43.3**	**11.1**

	Category	A 2017-2021 Approved Total	B 2017-2021 Actual/ Forecast Total	C 2017-2021 Variance
	Electrical			
24	Electrical Rehabilitation Program	7.2	8.6	1.5
25	Projects < $5 million	0.5	2.7	2.2
26	**Sub-total: Electrical**	**7.7**	**11.3**	**3.6**
	Instruments / Other Equipment			
27	Projects < $5 million	3.3	5.1	1.8
28	**Sub-total: Instruments / Other Equipment**	**3.3**	**5.1**	**1.8**
	Buildings and Site			
29	Operations Center at Mid-Point Entrance Project	19.4	6.9	(12.5)
30	Buildings and Site Rehabilitation Program	12.8	9.3	(3.5)
31	Projects < $5 million	0.2	3.9	3.6
32	**Sub-total: Buildings and Site**	**32.4**	**20.0**	**(12.3)**
	HVAC			
33	Utility Hot Water System Rehabilitation Program	13.9	9.0	(4.9)
34	Site HVAC Rehabilitation Program	31.5	28.1	(3.3)
35	Projects < $5 million	-	-	-
36	**Sub-total: HVAC**	**45.3**	**37.2**	**(8.2)**
	Process Controls / IT			
37	Projects < $5 million	5.6	5.5	(0.1)
38	**Sub-total: Process Controls / IT**	**5.6**	**5.5**	**(0.1)**
39	**Sub-total: Reliability and Life Cycle Improvements**	**203.4**	**211.8**	**8.4**
	Performance Efficiency and Improvement			
40	Plant Improvements Program	2.9	9.2	6.3
41	Projects < $5 million	14.7	8.6	(6.1)
42	**Sub-total: Performance Efficiency and Improvement**	**17.6**	**17.8**	**0.2**
43	**Total Capital Expenditures**	**235.4**	**245.0**	**9.6**

349. Over the 2017-2021 PBR term, EWSI forecasts that capital expenditures for the Edmonton regulated wastewater treatment operations will exceed the PBR forecast by $9.6 million (4.1%). A break-down of the variance as shown in Table 6.1-1 indicates that the capital expenditure increases above forecast amounts lies mostly in the Reliability and Life Cycle Improvements category ($8.4 million) which accounts for 86% of the total approved wastewater treatment capital expenditures for the 2017-2021 PBR term. As indicated in Table 6.1-1, the Reliability and Life Cycle Improvements category is further broken down into the following seven sub-categories: (i) Mechanical; (ii) Structural; (iii) Buildings and Site; (iv) Electrical; (v) Heating

Ventilation and Air Conditioning (HVAC); (vi) Process Controls / IT; and (vii) Instruments/Other Equipment.

350. The $8.4 million increase in Reliability and Life Cycle Improvement capital expenditures above the 2017-2021 PBR forecast is primarily attributable to the following:

- a $12.4 million increase in Mechanical projects and program capital expenditures primarily related to two unplanned projects: (i) the $9.7 million Build Pipe Racks Project to construct the first portion of an above-ground pipe rack network to address the safety risks associated with the location of the existing natural gas piping; and (ii) the $7.5 million Replace 2.5 km of Sludge Lines Project required due to the poor condition of the existing pipeline and the associated risk of an underground leak and/or spill into the ground and into the North Saskatchewan River. Further explanation of the need for this unplanned sludge lines project and the additional sludge lines costs is provided in the Sludge Line Upgrades Report to Utility Committee dated December 6, 2019 attached as Appendix G-16 to the Application.

- In addition to these two unplanned projects, there were a number of other increases and decreases in capital expenditures for other planned Mechanical projects and programs which are explained below.

- An $11.1 million increase in Structural projects and programs capital expenditures primarily due to the combination of increased costs associated with addressing severe concrete deterioration at the diversion structure and higher-than-estimated costs to rehabilitate Gold Bar WWTP Secondaries 1 and 4.

351. These increases in capital expenditures are offset by decreases in capital expenditures primarily related to:

- a $12.3 million decrease in Buildings and Site costs associated with reduced costs for the Operations Centre at Mid-Point Entrance Project due to a change in the scope for this project. The initial concept for this project had been to build a new multi-story facility to house operations and maintenance facilities, complete with a new surface parking lot outside the existing fence line. However, following public engagement and community opposition to extending the plant footprint beyond the fence line, the scope of this project was modified to renovation of the existing Centre of Excellence to house new operations facilities; and

- an $8.2 million decrease in HVAC costs primarily associated with a $5.0 million decrease in the Utility Hot Water System Rehabilitation Program due to a re-assessment of operational risks that allowed deferral of heating system upgrades to a future PBR term and a $3.3 million decrease in the Site HVAC Rehabilitation Program.

352. For each capital category identified in Table 6.1-1, more detailed capital expenditure variances are provided in the tables and explanations below. In addition, on a project by project basis, EWSI has completed post implementation reviews (PIRs) of all major projects exceeding 20% of their originally approved budget or programs that underwent a major change in scope. These PIRs are provided for the following projects:

- Digester 3 Upgrade Project PIR (Appendix G-13);
- Headworks and Primary Aeration Upgrades Project PIR (Appendix G-14); and
- Hydrovac Sanitary Grit Facility Project PIR (Appendix G-15).

6.1.1 Regulatory Category Capital Projects

353. EWSI expects the aggregate capital cost of the unbudgeted expenditures within the Regulatory projects category, all of which individually are less than $5 million, to be $1.9 million for the 2017-2021 PBR. This forecasted increase in capital expenditures is primarily due to the following:

- $1.5 million in unbudgeted capital expenditures for the Air Quality Monitoring Station project which includes the installation of an air quality monitoring station between the Gold Bar WWTP and communities to the south of the plant. The monitoring station is a requirement of Gold Bar WWTP's Approval to Operate, and must be operational by the end of the 2017-2021 PBR. This requirement was added during an amendment to Gold Bar WWTP's Approval to Operate effective July 1, 2019 following collaborative discussions with AEP on reducing air quality impacts of the wastewater treatment process. The approval amendment served to formalize EWSI's ongoing proactive efforts and commitment to monitor, assess and manage these impacts.

6.1.2 Growth/Customer Requirements Capital Projects

354. The Growth/Customer Requirements capital expenditures are expected to be $0.2 million lower than the approved amount of $9.9 million for the 2017-2021 PBR. This forecasted decrease in capital expenditures is due to the following:

- a $1.0 million decrease in capital expenditures for the Hydrovac Sanitary Grit Treatment Facility project relative to the approved amount of $8.4 million for the 2017-2021 PBR. This decrease is primarily due to effective collaboration between the design team, construction manager and EWSI, as well as the use of the construction management at risk delivery approach. This approach resulted in lower than forecast construction costs because as the construction contractor was directly involved in completing the facility design ensuring constructability concerns were addressed in the final engineering design. The Hydrovac Sanitary Grit Facility project was initiated during the 2012-2016 PBR and costs were included in the 2017-2021 PBR. The project provided Drainage Services with a lower odour option for disposing of sanitary grit materials at the Gold Bar WWTP. Previously, this highly odorous residual waste removed from the sanitary system was disposed of at Clover Bar lagoons. Although this previous practice was not contrary to any environmental regulation, Drainage Services deemed this disposal method unsustainable and undesirable as it: impacted the quality of the biosolids potentially limiting future land application; may have resulted in an enforcement order in the future, and disturbed the water cap on the lagoons increasing the likelihood of odour releases. EWSI completed a PIR for this Project which is provided in Appendix G-15 to the Application.

- $0.9 million in unbudgeted capital expenditures related to conceptual design for the Membrane Biological Reactor (MBR) Upgrade - Secondary 11 project (the "MBR Project") and commencement of the conceptual and preliminary design of the inDENSE™ Project. EWSI's IRP predicts that improved nutrient removal will be necessary by 2027 based on its population growth forecasts for Edmonton and anticipated stricter regulatory limits for phosphorus and ammonia from Alberta Environment and Parks. The inDENSE™ and MBR technologies were discussed in detail in Section 2.5.2 and in the inDENSE™ project business case in Appendix G-12. These two projects are intended to increase nutrient removal within the existing Gold Bar WWTP footprint. Failure to begin one of these projects during the 2017-2021 PBR may have resulted in the secondary treatment capacity for Biological Nutrient Removal (BNR) to be exceeded after 2027. EWSI completed a concept design for MBR which determined that the technology was very expensive and would require significant investment to convert up to seven of the existing secondary treatment trains to MBR technology over the next 40 years. Based on these findings, EWSI is now looking at the viability of inDENSE™ technology as another option which could allow it to defer by as much as 16 years or more the much more costly MBR upgrades that

would otherwise be required to meet nutrient discharge limits by 2027. The inDENSE™ Project is a small scale application of the technology in one of the eleven BNR process trains by the end of 2024 at a forecast cost of $5.0 million. Once completed, this project is expected to provide a 20% increase in capacity (6 MLD) in the sustained average flow rate to this single BNR process train.

6.1.3 Health, Safety and Environment Capital Projects

355. The Health, Safety and Environment category expenditures, all of which individually are less than $5.0 million, are expected to be $0.8 million lower than the approved amount of $4.5 million for the 2017-2021 PBR. This forecasted decrease in capital expenditures is primarily due to the following:

- a $0.7 million decrease in capital expenditures for the Isolation Improvements Program relative to the approved amount of $2.8 million. This Program provides funding to isolation projects outside the scope of EWSI's established rehabilitation programs, support compliance with the Occupational Health and Safety Code (OH&S) requirements for isolation of hazardous substances and meet internal isolation standards. As the highest priority locations have been addressed, the program focus moved to lower priority items and the overall decrease in program expenditures reflect EWSI's reprioritization of other higher priority WWTP projects to address more significant health, safety, environmental and/or reliability risks identified during the 2017-2021 PBR term.

6.1.4 Reliability and Life Cycle Improvement Capital Projects

356. The Reliability and Life Cycle Improvement category expenditures are expected to be $8.4 million higher than the approved amount of $203.4 million for the 2017-2021 PBR term. In aggregate, the variance is due to a combination of higher than forecast expenditures for the replacement or rehabilitation of various aging plant systems and process units. As there are numerous projects in this area with varied costs, they have been classified into subcategories as show in Table 6.1.4-1.

Table 6.1.4-1
Reliability Capital Expenditures by Subcategory
Actual/Forecast compared to PBR Approved
2017-2021
($ millions)

	Category	A 2017-2021 PBR Plan	B 2017-2021 Actual/ Forecast	C Variance
1	Mechanical	76.9	89.3	12.4
2	Structural	32.2	43.3	11.1
3	Electrical	7.7	11.3	3.6
4	Instrumentation / Other Equipment	3.3	5.1	1.8
5	Buildings and Site	32.4	20.0	(12.3)
6	Heating, Ventilation, and Air Conditioning (HVAC)	45.3	37.2	(8.2)
7	Process Controls / IT	5.6	5.5	(0.1)
8	**Total Reliability Projects**	**203.4**	**211.8**	**8.4**

357. EWSI adjusted its capital plans in the 2017-2021 PBR term to address the immediate concerns while developing plans for prudent capital investment to manage assets in the 2022-2024 PBR term and beyond. The variance of each major area for the 2017-2021 PBR term is further discussed below.

Mechanical Reliability

358. The mechanical reliability subcategory expenditures are expected to be $12.4 million higher than the approved amount of $76.9 million for the 2017-2021 PBR. This forecasted increase in capital expenditures is primarily due to the following:

- A $12.7 million increase in capital expenditures related to two projects to provide upgrades and replacement of pipelines (sludge lines) used to transfer digested sludge produced as a by-product from the Gold Bar WWTP to the Clover Bar Biosolids Recycling Facility (CBBRF). EWSI completed inspections during 2016 and 2017 which indicated significant deterioration in the sludge lines had occurred. In May 2017, there was a release of digested sludge in Hermitage Park from a failed pipeline which resulted in three pipeline segments being removed from service leaving the Gold Bar WWTP with reduced operational flexibility and no redundancy. The increases in

capital expenditures related to sludge lines included $7.5 million to complete the Replace 2.5km Sludge Lines Project, which was not included in the approved 2017-2021 PBR capital expenditure forecast, and a $5.2 million increase in capital expenditures for the Sludge Line Upgrades Project relative to the approved amount of $3.4 million. The Replace 2.5 km Sludge Lines Project was required to replace a 2.5 km section of the sludge line which was found to be in such poor condition that repairs and/or rehabilitation was not financially viable. Initially, this program included only the costs of cleaning and inspecting the sludge lines and did not include any repairs or replacement within the project scope. However, following inspections, EWSI determined that these sludge lines were in poor condition and required significant expenditures to ensure that they could continue to operate with minimal risk of leakage. Sludge leakages would be considered violations of EWSI's operating permit. Further explanation of the need for these two projects are provided in the Sludge Line Upgrades Report to Utility Committee dated December 6, 2019 attached as Appendix G-16 to the Application.

- A $9.7 million increase in capital expenditures to complete the Build Pipe Racks Project which was not included in the 2017-2021 PBR forecast. The Build Pipe Racks Project is required to construct the first portion of an above-ground pipe rack network at the Gold Bar WWTP, primarily intended to improve site safety by relocating natural gas and other utilities from the underground tunnels, which was not planned for the 2017-2021 PBR term. Implementation of an above ground pipe rack, with relocation of gas piping, reduces the safety risks and ventilation requirements of the tunnels, while enabling future expansion of the plant. This project allows avoidance of capital investments to improve ventilation systems to meet Fire Code requirements in the tunnels. Acceleration of the pipe rack construction period into the 2017-2021 PBR also achieved a secondary benefit of accommodating the new biogas piping that is required for the new commercial RNG facility being constructed at the center of the Gold Bar WWTP. As the RNG project is a commercial venture owned and to be constructed by EPCOR, a service level agreement will be signed between EPCOR and EWSI to ensure EWSI's regulated operations at the Gold Bar WWTP do not incur any additional costs or otherwise subsidize the RNG project.

- A $5.8 million increase in capital expenditures for the Clarifier Chain Replacement Program over the approved amount of $4.1 million. The increase relates entirely to EWSI identifying severe corrosion of the stainless steel chain within several primary

and secondary clarifiers at the Gold Bar WWTP in 2017, which resulted in premature chain failures in late 2017 and early 2018. Continuously running the clarifiers is crucial to meeting stakeholder and regulatory requirements for final effluent quality from the Gold Bar WWTP. These particular chains required earlier than scheduled rehabilitation given the criticality of continuously running the primary and secondary clarifiers. These clarifiers contain mechanical scraper mechanisms, consisting of a series of chains and flights that transport scum and sludge to collection points within each clarifier. When the scraper mechanisms on these clarifiers fail, the clarifier must be taken out of service, drained, and cleaned, to allow repair. This results in a substantial capacity reduction which has the greatest impact during summer operating conditions, and leads to difficult work conditions during winter operating conditions (freeze hazards and material embrittlement). The increased costs for the Clarifier Chain Replacement Program are the direct result of the adoption of an accelerated chain replacement schedule that will replace all stainless steel chain in the primary and secondary clarifiers with a combination of plastic and loop chain. Stainless steel chains had initially been selected as a corrosion resistant option commonly used in similar facilities, with an expected life of 15 years. However, the stainless chain was found to prematurely fail (in some cases with less than a year of service), resulting in the requirement to accelerate replacement timelines. Based on the experiences and investigation, EWSI has adjusted the useful lives of chains from 20 years to 10 years for new assets. The accelerated chain replacement schedule was developed based on reduced service lives for clarifier chains considering material type, service conditions and other factors, and is continually updated and adjusted based on observed asset conditions and lessons learned from previous experiences. The current chain replacement plan assumes all stainless steel chain installed will be run to failure.

- A $5.1 million increase in the Mechanical Rehabilitation program over the approved amount of $15.6 million. This program provides the capital funding necessary to implement the maintenance and asset management programs for mechanical equipment supporting the treatment process at the Gold Bar WWTP. The objectives of this program are to minimize scheduled and unscheduled downtime of the mechanical components of the treatment process and ensure that the average ages of this equipment are maintained near industry averages. The increased costs were primarily due to adding mechanical rehabilitation of the secondaries into the 2017-2021 PBR term. The rehabilitation of mechanical components of secondaries 2-8 was

not included in the 2017-2021 PBR forecast because they were expected to last through this time period. As EWSI completed subsequent inspections of the clarifiers, it determined that the condition of the mechanical components was worse than originally anticipated. Further, adding the mechanical rehabilitation of the secondaries 2-8 to this program in 2017-2021 at the same time as structural work was being performed on secondaries 2-8 has reduced the number of shutdowns required of the secondary treatment system.

- A $2.7 million increase in the Digester 3 Upgrades Project relative to the approved amount of $11.3 million. This project includes the upgrading of Digester 3 to ensure that the digester is capable of handling increased future solids loading and to implement new linear motion mixing technology. The increased project costs are primarily due to the costs associated with addressing unanticipated structural integrity issues identified during construction subsequent to the planned digester upgrades. The original scope of the digester upgrades involved only digester cleaning, upgrades to the mixer system and associated piping, upgrades to digester related piping and equipment, and upgrades to the digester roof. Based on its original visual inspections of the digester conditions, EWSI had not identified structural rehabilitation as a required component of the original project plan developed in 2016. During commissioning of the project in 2019**,** various leaks in the concrete floor and walls became apparent. The digester was subsequently shut down, and a high density polyethylene (plastic) liner added to the digester floor and walls to seal the leaks and protect from future corrosion issues. Additional details are provided in the Post Implementation Review for this Project provided in Appendix G-13 to the Application.

359. These increased capital expenditures are partially offset by decreases primarily due to the following:

- A $10.7 million reduction in the Digester 4 Upgrades Project from the approved amount of $12.0 million as a result of this project being postponed until the 2022-2024 PBR term. EWSI initially expected to rehabilitate and upgrade Digester 4. In 2017, Digester 4 was taken out of service and cleaned to allow for the completion of an interior condition assessment as the first stage of upgrading the Digester. The $1.3 million capital expenditure during the 2017-2021 PBR term reflects the cost associated with this cleaning and condition assessment. When structural issues were identified with Digester 3 in 2019 requiring Digester 3 to remain out of service, EWSI

completed an overall assessment of the solids loading to the Gold Bar WWTP. The assessment determined that Digester 4 was not required in the short term to meet treatment requirements. As such, EWSI was able to defer this project to the 2022-2024 PBR term to allow for the structural issues in Digester 3 to be addressed, and allow for reprioritization of other higher priority wastewater plant projects that were required during the 2017-2021 PBR term.

- A $5.3 million decrease in the Headworks and Primary Aeration System Upgrades Project relative to the approved amount of $6.7 million. This project was intended to resolve air supply capacity constraints associated with the blowers that supply air to the grit tanks, pretreatment channel aeration systems and aeration equipment. Increased aeration to the channels is intended to reduce deposition of solids in these channels. The decrease in project costs relates to the reduction in the scope of this project. Following its engineering assessment of the channel operation, EWSI determined that channel aeration was not recommended because solids deposition rates in the primary influent channels at the Gold Bar WWTP had decreased due to recent upgrades of Grit Tanks 4/5 and Screens 7/8, and currently observed solids accumulation rates in the channels did not present operations and maintenance problems.

- A $5.0 million decrease in capital expenditures for the Square 1 Gas Room Replacement project relative to the approved amount of $15.6 million. This project was initially expected to include the construction of a new Gas Room as part of the overall upgrades to Digester Square 1. Instead of building a single larger new gas room, EWSI's revised engineering solution will relocate new gas mixing compressors to separate individual enclosures. EWSI determined the revised solution would better minimize explosion risks by installing the new equipment within small volume skids located outside the existing Square 1 Gas Room.

- A $2.6 million decrease in capital expenditures for the remaining projects in the mechanical reliability subcategory, each of which are less than $5 million, primarily due to a $3.2 million decrease in capital expenditures for the Gas Compressors Replacement ($1.1 million), Fermenter TPS Pumps ($1.0 million) and Blower 6 Overhaul ($1.1 million) projects due to cancellation of the projects and the reallocation of capital funding to higher priority projects. The Gas Compressor Replacement project was cancelled as other small improvement projects, biogas

system safety improvements and maintenance activities were able to achieve the desired safety and reliability outcomes of the project without this significant capital investment. The Blower 6 Overhaul project scope will be incorporated into the Secondary Aeration Blower Upgrades Project proposed in the 2022-2024 PBR term. This decision was made following an assessment of the aeration blowers and air demand requirements at the plant, to align with a broader strategy for the plant blowers.

Structural Reliability

360. The structural reliability subcategory expenditures are expected to be $11.1 million higher than the approved amount of $32.2 million for the 2017-2021 PBR. This forecasted increase in capital expenditures is primarily due to the following:

- A $5.3 million increase in the Structural Rehabilitation Program is expected relative to the approved amount of $7.7 million. The purpose of this program is to rehabilitate the Gold Bar WWTP's secondary treatment concrete structures. The overall increase in program spending primarily relates to the costs of addressing severe concrete deterioration at the diversion structure caused by long-term H_2S gas exposure. The diversion structure consists of large channels that transport raw wastewater from the drainage collection system to the Gold Bar WWTP influent channels. EWSI's investigations conducted in the spring of 2017 found that the diversion structure was in poor structural condition due to extensive corrosion. EWSI discovered moderate to severe concrete deterioration throughout the structure walls, beams, ceilings, aluminum handrails, and access ladders. Since there is no backup for this structure, rehabilitation was required immediately to prevent a worsening of conditions that could ultimately lead to a structural failure. The project is being completed in three phases, during low flow winter conditions, to avoid multiple channels being down at the same time so the plant can continue to provide treatment service.

- A $4.0 million increase in the Structural Rehabilitation Secondaries 1-8 Program relative to the approved amount of $17.6 million. The purpose of this program is to complete the structural rehabilitation of the secondary clarifiers and bioreactors 1-5 and 7 at the rate of one clarifier and bioreactor rehabilitation per year. The increase in program spending is primarily due to the rehabilitation work performed to date (Secondaries 1 and 4), combined with updated cost estimates and a better understanding of the condition of the clarifiers, including the repairs required. The

condition of equipment often is unknown until the facilities can be shut down, cleaned and inspected. EWSI's work completed under this program in the earlier years of the 2017-2021 PBR term provided additional information previously unavailable, allowing a better definition of the rehabilitation scope for the subsequent secondaries. In the first secondary taken out of service for rehabilitation, Secondary 1, additional scope to address faulty mechanical equipment was added after the secondary was cleaned and equipment could be inspected, contributing to higher costs. Subsequently, a separate mechanical rehabilitation program for the secondaries was established for the later secondary work (as noted in the section on mechanical rehabilitation programs above). In addition, EWSI delayed the start of the Secondary 4 rehabilitation work due to unexpected clarifier chain failures in another secondary that had to be addressed, to avoid simultaneous shutdown of multiple secondary treatment trains. The Gold Bar WWTP cannot accommodate shutdowns of multiple secondaries without impacting its treatment capability. As a result of these situations, construction of the secondaries rehabilitation project extended into the winter season for Secondaries 1 and 4, incurring additional costs for heating and hoarding to complete the work. EWSI has incorporated these learnings into plans for the current and upcoming secondary rehabilitation projects in this program. The program is expected to be fully completed by the end of the 2017-2021 PBR.

- A $3.0 million increase in the Distribution Chamber Reconstruction Project costs relative to the approved amount of $3.8 million. This project includes the construct of a new distribution chamber facility and the replacement of the existing 400 mm diameter side-stream recycle line. The increase in the forecast cost for this project results from higher than expected competitive bids from contractors, as well as higher than expected costs to demolish the distribution chamber and to construct the lift station tie-ins.

361. These increased capital expenditures are partially offset by decreases primarily due to the following:

- A $0.9 million decrease in the Channel 3 Rehabilitation Project costs relative to the approved amount of $2.2 million. The purpose of this project is to isolate the channel, remove damaged concrete, rebuild the concrete surface and apply a protective coating to minimize future H_2S-related corrosion. The decrease in the forecast cost for this project is due to the channel being in better condition than anticipated, resulting

in lower-than-expected costs to complete the necessary structural rehabilitation of the channel.

- A $0.8 million decrease in the West Primary Effluent Channel Rehabilitation Project costs relative to the approved amount of $1.0 million. The project includes the removal and replacement of deteriorated concrete in the West Primary Effluent Channel, along with the installation of protective lining on all non-wetted surfaces to prevent future deterioration. The decrease in the forecast cost for this project is due to the deferral of certain lower-risk channel rehabilitation work to the 2025-2029 PBR term to allow for the completion of other higher priority projects within the 2017-2021 and 2022-2024 PBR terms.

Electrical Reliability

362. The electrical reliability subcategory expenditures are expected to be $3.6 million higher than the approved amount of $7.7 million. This forecasted increase in capital expenditures is primarily due to the following:

- A $2.0 million increase in capital expenditures for the Standby Generation Upgrades project relative to the approved amount of $0.5 million. The purpose of this project was to ensure that adequate emergency power is available to the Gold Bar WWTP site. The increase in project spending was due to a combination of higher than expected contractor estimates and unanticipated infrastructure upgrades to Blower Building 1, which were required to accommodate the installation of the new generator. The project was to have been completed in the 2012-2016 PBR term, but due to delays attributable to establishing a firm scope for the required work, the bulk of the work was completed in the 2017-2021 PBR term which accounts for a majority of the costs increases compared to the original forecast.

- A $1.5 million increase in capital expenditures for the Electrical Rehabilitation Program relative to the approved amount of $7.2 million. The program includes the completion of ongoing electrical upgrades to ensure that the wastewater treatment plant can continue to operate safely and reliably into the future by upgrading or replacing end-of-life, poor condition, or obsolete equipment. The increase in program spending is due to a combination of unforeseen construction difficulties and the replacement of more electrical equipment than was initially estimated for the 2017-2021 PBR term.

Instruments / Other Equipment

363. The instruments / other equipment subcategory expenditures, all of which individually are less than $5.0 million, are expected to be $1.8 million higher than the approved amount of $3.3 million for the 2017-2021 PBR. This forecasted increase in capital expenditures is primarily due to the following:

- A $1.3 million increase in Instrumentation Rehabilitation Project relative to the approved amount of $0.7 million. The overall capital expenditure increase primarily relates to the unanticipated replacement of critical plant instrumentation which are no longer supported by vendors (spare parts no longer available).

Buildings and Site

364. The Buildings and Site reliability subcategory expenditures are expected to be $12.3 million lower than the approved amount of $32.4 million for the 2017-2021 PBR. This forecasted decrease in capital expenditures is primarily due to the following:

- A $12.5 million decrease in the Operations Centre at Mid-Point Entrance Project relative to the approved amount of $19.4 million. Initially, this project was expected to expand the Gold Bar WWTP site footprint and include the construction of new off-site parking facilities; a new secure pedestrian access point and security office; and, the first phase of a new Operations Center housing a control room, locker rooms and lunch rooms for operations and maintenance staff. The reduction in project spending is reflective of design and scope adjustments that incorporate the results of public consultation, as well as Gold Bar's recent commitment to complete all future construction within the existing footprint of the Gold Bar WWTP. This decrease is partially offset by EWSI's revised plan for the Gold Bar WWTP which will achieve the intended outcomes of this project while respecting public consultation outcomes. To provide a new upgraded control room and the hygiene facilities necessary for maintenance workers within the existing footprint of the Gold Bar WWTP, there will be a renovation of the existing Centre of Excellence Building to house new control and hygiene facilities (Mid-Point Entrance Project) and the Maintenance Hygiene Project.

- A $3.5 million decrease in the Buildings and Site Rehabilitation program relative to the approved amount of $12.8 million. The purpose of this program is to ensure buildings and infrastructure at the Gold Bar WWTP continue to: remain functional over their expected useful life; support efficient and safe WWTP operations; and provide a safe

and comfortable work environment for EWSI's employees. EWSI reduced the scope of this program following an internal review of the program in early 2020, which concluded that certain non-critical sub-projects could be safely deferred to future PBR periods, allowing resources to be re-allocated to unanticipated, higher-priority projects.

365. These decreases are partially offset by a $3.6 million increase in capital expenditures for the Dewatering Facility project planned to be in service by the end of 2024. The Dewatering Facility Project is required to construct a new dewatering facility at the Clover Bar site to replace the City's existing dewatering facility which will be decommissioned by the end of 2023. The City's existing dewatering facility is in poor condition and is co-located with the City's Waste Management Composting Facility at the Edmonton Waste Management Centre. Due to the imminent timing of the Composting Facility closure and decommissioning of the existing dewatering facility, engineering work on the new dewatering facility was initiated in the 2017-2021 PBR term. The $3.6 million increase to costs in this category includes EWSI's costs for engineering work completed to confirm the new facility concept design and scope, to refine the cost estimate based on similar projects recently completed in other jurisdictions, and to develop the facility detailed design to enable procurement and construction to immediately commence in the 2022-2024 PBR term.

HVAC

366. The HVAC reliability subcategory expenditures are expected to be $8.2 million lower than the approved amount of $45.3 million for the 2017-2021 PBR. This forecasted decrease in capital expenditures is primarily due to the following:

- A $4.9 million decrease in the Utility Hot Water System Rehabilitation project relative to the approved amount of $13.9 million. The purpose of this project is to replace hot water heating system equipment in poor condition, replace undersized pumps and heat exchangers and replace piping with deficient flow capacity. The decrease in project spending is primarily due to the deferral of certain non-critical upgrades to a future PBR period, allowing these upgrades to be better coordinated with related upgrades of other components of the heating system.

- A $3.3 million decrease in the Site HVAC Rehabilitation program relative to the approved amount of $31.5 million. This program includes various sub-projects that will address Gold Bar WWTP spaces that have insufficient ventilation, improve or

replace deficient ventilation equipment, and/or upgrade existing ventilation systems. In late 2016, EWSI completed an assessment to establish the condition of ventilation systems across Gold Bar WWTP site and to identify projects to be completed within the 2017-2021 PBR term. One of these projects was the Enhanced Primary Treatment (EPT) Building ventilation project to rehabilitate and upgrade the ventilation systems within that building to ensure that enclosed spaces have adequate oxygen, do not contain excessive levels of harmful contaminants, and minimize odour emissions to the environment. The EPT Building was a significant source of odours and hazardous gases at Gold Bar WWTP. This project was completed lower than forecast due to changes in the original scope attributing to the majority of the cost savings for this program during the 2017-2021 PBR term.

Process Controls / IT

367. The process controls / IT subcategory expenditures, all of which individually are less than $5.0 million, are expected to be $0.1 million lower than the approved amount of $5.6 million for the 2017-2021 PBR, which relates to a number of small variances from the approved amounts.

6.1.5 Performance Efficiency and Improvement Capital Projects

368. The Performance Efficiency and Improvement category expenditures are expected to be $0.2 million higher than the approved amount of $17.6 million for the 2017-2021 PBR. This forecasted increase in capital expenditures is primarily due to the following:

- A $1.3 million increase due to unanticipated biogas system modification capital expenditures required to address a significant biogas release risk. In July 2017, the Hardisty utility feeder failed which resulted in a full power outage at Gold Bar WWTP. The power outage tripped the digester gas compressors and a biogas release occurred in Gas Room 1. Following the event, EWSI initiated an investigation to reduce the possibility of future events and improve the reliability of the biogas rooms. The investigation recommended upgrades to the digester biogas systems to be completed in the 2017-2021 PBR term, including modifications to piping, valves, instrumentation and controls in the biogas system.

- A $0.6 million increase in capital expenditures for the Laboratory Facility Consolidation Project which was not included in the 2017-2021 PBR. As a result of this project, EWSI is expecting improvements to the overall coordination of laboratory processes.

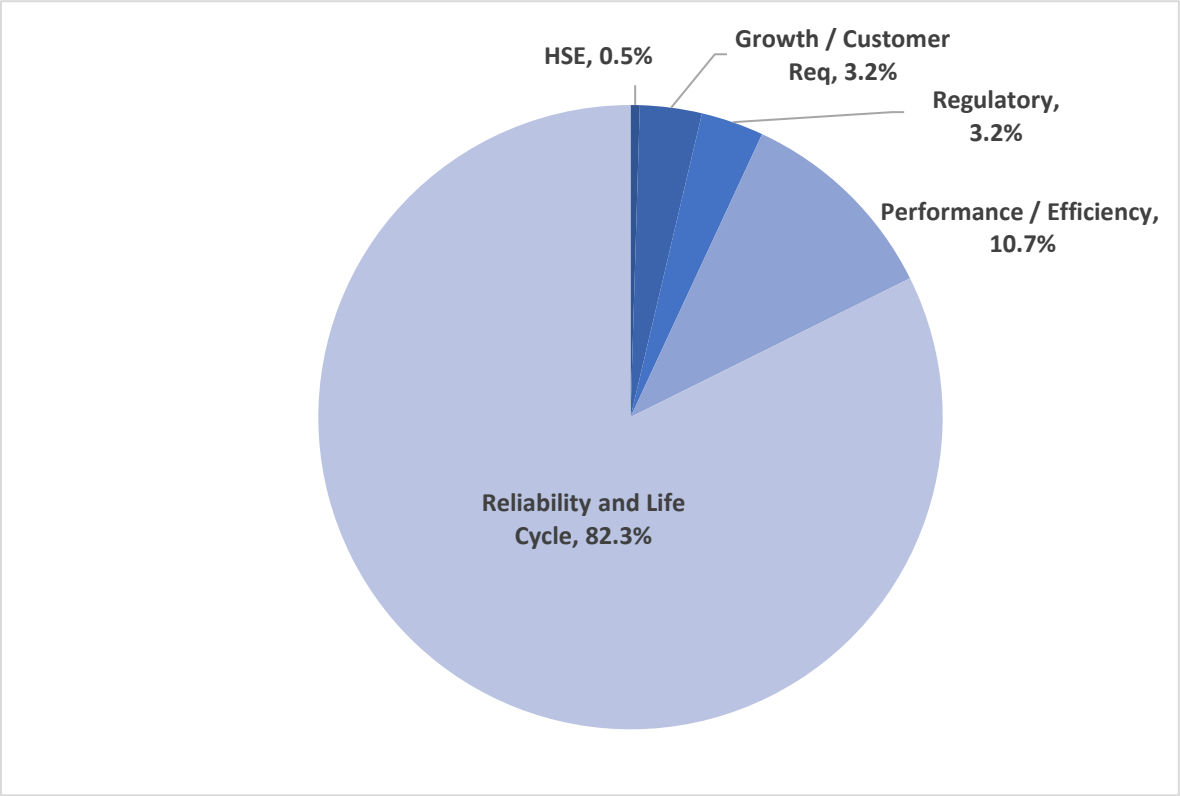
- These cost increases are partially offset by a $2.1 million decrease in capital expenditures for the Channel Access Improvements project due to cancellation of the project and the reallocation of capital funding to higher priority performance efficiency and improvement projects, including the biogas system improvements noted above.

6.2 Forecast Capital Expenditures 2022-2024 PBR Term

369. EWSI has developed its three-year plan for capital expenditures based on the methodologies described in section 4.2.3. Based on this capital plan for 2022-2024, the three-year total capital expenditure forecast (net of contributions) is $171.7 million. EWSI engages in rigorous capital planning, forecasting and management processes, and is constantly making improvements in these processes. Depending on priorities, it is expected that for certain projects and programs, EWSI's annual capital spending may be higher than forecast but will likely be offset by lower than forecast spending for other projects and programs.

370. EWSI has placed significant focus for the upcoming PBR term on projects and programs related to reliability and life cycle replacements which, as illustrated in Figure 6.2-1, represents 82% of planned spending over the 2022-2024 PBR term.

Figure 6.2-1
Total Capital Expenditure Percentages by Category
2022-2024



371. Table 6.2-1 provides the total forecast capital expenditures for the Edmonton regulated wastewater treatment system for 2022-2024 by PBR category and by major areas within the Reliability and Life-Cycle Replacement category. Within this table, specific programs and projects where business cases have been provided are separately identified. EWSI has provided business cases for programs with capital expenditures at or above $5.0 million over the PBR term and for projects with capital expenditures above $5.0 million in total for the project. Additional details for each of these projects are provided in wastewater treatment capital business cases in Appendices G-2 to G-12. The entire list of projects and programs with forecasted costs for the PBR term 2022-2024 is provided in Appendix G-1.

372. For additional insight into the changes in each of these categories, Table 6.2-1 also provides a comparison to the level of actual and forecasted capital expenditures over the final three years of the 2017-2021 PBR Term. It is evident from Table 6.2-1 that the Reliability and Life Cycle category as a whole has increased by $14.3 million, while the remaining four categories

have increased by $11.6 million for an overall increase of $25.9 million between the two three-year periods. This focus on reliability will continue into the 2022-2024 PBR term as EWSI will continue to deal with the poor condition of assets on site. Relative to the prior three-year period, increases in capital expenditures in the electrical, buildings and site, instruments and process controls/IT categories are offset by decreases in the mechanical, structural and HVAC categories. This shift is a reflects that infrastructure that was at highest risk of failure in the prior PBR term has been rehabilitated under certain programs and, as such, EWSI is able to shift its annual spending towards other programs with more critical needs.

Table 6.2-1
Total Forecast Capital Expenditures by PBR Category
2022-2024 Net of Contributions
($ millions)

	Category	A 2019-2021 Actual/ Forecast Total	B 2022-2024 PBR Plan	C Variance
	Regulatory			
1	Odour Control Improvements Project		5.6	
2	Projects < $5 million		-	
3	**Sub-total: Regulatory**	**1.9**	**5.6**	**3.7**
	Growth/Customer Requirements			
4	Secondary inDENSE™ Upgrade Project		4.5	
5	Projects < $5 million		1.0	
6	**Sub-total: Growth/Customer Requirements**	**2.4**	**5.5**	**3.1**
	Health, Safety and Environment			
7	Projects < $5 million		0.8	
8	**Sub-total: Health, Safety and Environment**	**2.6**	**0.8**	**(1.8)**
	Reliability and Life Cycle Improvements			
	Mechanical			
9	Digester 4 Upgrades Project		13.4	
10	Projects < $5 million		14.7	
11	**Sub-total: Mechanical**	**48.7**	**28.1**	**(20.6)**
	Structural			
12	PE Channel Upgrades – Bypass Chamber Project		17.0	
13	Diversion Structure Structural Rehabilitation Project		0.5	
14	Projects < $5 million		4.0	
15	**Sub-total: Structural**	**27.0**	**21.5**	**(5.6)**

	Category	A 2019-2021 Actual/ Forecast Total	B 2022-2024 PBR Plan	C Variance
	Electrical			
16	600V Electrical Building Project (EB-2)		11.8	
17	Aux Control Room Electrical Upgrade Project (EB-1)		11.2	
18	Projects < $5 million		2.5	
19	**Sub-total: Electrical**	**5.5**	**25.6**	**20.1**
	Instruments / Other Equipment			
20	Projects < $5 million		4.6	
21	**Sub-total: Instruments / Other Equipment**	**3.2**	**4.6**	**1.4**
	Buildings and Site			
22	Dewatering Facility Project		38.4	
23	Projects < $5 million		3.5	
24	**Sub-total: Buildings and Site**	**14.1**	**41.8**	**27.7**
	HVAC			
25	Projects < $5 million		9.1	
26	**Sub-total: HVAC**	**26.0**	**9.1**	**(16.9)**
	Process Controls / IT			
27	Expand Flare Capacity Project		8.0	
28	Projects < $5 million		2.7	
29	**Sub-total: Process Controls / IT**	**2.5**	**10.7**	**8.3**
30	**Sub-total: Reliability and Life Cycle Improvements**	**127.0**	**141.4**	**14.3**
	Performance Efficiency and Improvement			
31	Secondary Aeration Blower Upgrades Project		8.0	
32	Laboratory Facility Consolidation Project		5.9	
33	Projects < $5 million		4.5	
34	**Sub-total: Performance Efficiency and Improvement**	**11.8**	**18.4**	**6.6**
35	**Total Capital Expenditures**	**145.8**	**171.7**	**25.9**

373. The following sections provide a description of each of the PBR categories and the projects and programs included in each category for the 2022-2024 PBR term.

6.2.1 Regulatory

374. The Regulatory category includes projects and programs specifically necessary to address current and upcoming regulatory requirements from regulatory bodies such as Alberta Environment and Parks. Forecast capital expenditures for the Regulatory category are $5.6

million for the 2022-2024 PBR term, which related entirely to the planned Odour Control Improvements Project ($6.0 million in total capital expenditures) planned for completion in 2024. This project is required to address odourous emissions at the Gold Bar WWTP from sources emitting the highest odour based on an odour assessment EWSI completed in 2019. The Project will consider construction of a dedicated capture and treatment facility (scrubber) in either the diversion structure or the primary clarifiers. A business case for this project is provided in Appendix G-9.

6.2.2 Growth/Customer Requirements

375. The Growth/Customer Requirements category includes projects and programs necessary to accommodate growth in the City of Edmonton impacting demand increases and to meet any other requirement stipulated in the franchise agreement that EWSI has with the City of Edmonton. Forecast capital expenditures for the Growth/Customer Requirements category are $5.5 million for the 2022-2024 PBR term.

376. This category includes the Secondary InDENSE™ Upgrade Project ($5.0 million total project costs, $4.5 million in the 2022-2024 PBR term) which will include design and installation of an inDENSE™ system in one of the eleven BNR process trains at Gold Bar WWTP. This Project will increase wastewater treatment capacity and allow for deferment of the more costly implementation of Membrane Biological Reactors (MBR), which would otherwise have to be in place in at least one train by 2027 or earlier in order to remain compliant with regulated discharge limits. The business case for this project is included in Appendix G-12 to the Application.

6.2.3 Health, Safety and Environment (HSE)

377. The HSE category includes projects and programs specifically identified by EWSI to address health, safety and environmental considerations of employees and the public. Forecast capital expenditures for the HSE category are $0.8 million for the 2022-2024 PBR term, which related entirely to the newly-created Code Compliance Upgrades program. This program is less than $5.0 million as, as such, a business case is not included.

6.2.4 Reliability and Life Cycle

378. The Reliability and Life Cycle category includes programs and projects specifically identified to rehabilitate or replace existing assets at the end of their useful lives, to improve redundancy and to ensure risks are acceptable and maintained. Forecast capital expenditures for the Reliability and Life Cycle category are $141.4 million for the 2022-2024 PBR term. During the 2022-2024 PBR term, EWSI continues to focus on ensuring the reliability of its critical assets at

Gold Bar WWTP and, as such, has allocated 82% of its capital expenditures towards these types of projects. Major projects and programs within the Reliability and Life Cycle category for the 2022-2024 PBR term are discussed below based on the seven sub-categories.

Mechanical

379. EWSI is planning to spend $28.1 million in mechanical reliability programs and projects for 2022-2024 PBR term which reflects a $20.6 million decrease from the 2019-2021 period. Capital expenditures forecast for this category includes the Digester 4 Upgrades Project (total project capital expenditures of $14.6 million with $13.4 million in the 2022-2024 PBR term) to complete major rehabilitation and upgrades by 2024 along with replacement of systems and components that are end of life or have failed. The business case for this project is included in Appendix G-5 to the Application.

Structural

380. EWSI is planning to spend $21.5 million in the structural category for 2022-2024 PBR term which reflects a $5.6 million decrease from the 2019-2021 period. Forecast capital expenditures for this category includes the following key projects:

- The Primary Effluent (PE) Channel Upgrades – Bypass Chamber Project ($17.2 million) which is planned to be in service in 2024 and will provide major rehabilitation and upgrades to the Bypass Chamber part of the primary effluent channel system. The project will upgrade the degraded concrete in the bypass chamber and install a gate system to isolate channels within the PE system to allow for upgrades and maintenance work in the rest of the PE channel system. The business case for this project is included in Appendix G-10 to the Application.

- The Diversion Structure Structural Rehabilitation Project ($9.0 million in total of which $0.5 million is in the 2022-2024 PBR term) which will provide major rehabilitation to the concrete structural components of the diversion structure at the Gold Bar WWTP. This project will largely be completed during the 2017-2021 PBR term and is planned to go in service in 2022. The business case for this project is included in Appendix G-6 to the Application.

Electrical

381. EWSI is planning to spend $25.6 million in electrical reliability for the 2022-2024 PBR term which reflects a $20.1 million increase from the 2019-2021 period. Capital expenditures for the 2022-2024 PBR term include the following key projects:

- The 600V Electrical Building Project (EB-2) ($15.0 million in total of which $11.8 million is during the 2022-2024 PBR term) to relocate and replace the 600V electrical distribution equipment and control system interface from existing locations to a new dedicated electrical building at the Gold Bar WWTP. This project is planned to be in service in 2026 and will address asset lifecycle issues since many of the associated assets are at or near the end of expected life. The business case for this project is included in Appendix G-2 to the Application.

- The Aux Control Room Electrical Upgrade Project (EB-1) ($13.8 million in total of which $11.2 million is over the 2022-2024 PBR term) to relocate and replace the 600V electrical distribution and control system interface equipment from existing locations to a new dedicated electrical building at the Gold Bar WWTP by 2026. The project will address asset lifecycle issues since many of the associated assets are at or near end of expected life. The business case for this project is included in Appendix G-3 to the Application.

Instruments / Other Equipment

382. EWSI is planning to spend $4.6 million in the instruments and other equipment category for the 2022-2024 PBR term which reflects a $1.4 million increase from the 2019-2021 period. All of the programs and projects in this category are less than $5.0 million and therefore business cases are not included.

Buildings and Site

383. EWSI is planning to spend $41.8 million in buildings and site rehabilitation for 2022-2024 PBR term which reflects a $27.7 million increase from the 2019-2021 period.

384. The Dewatering Facility Project ($42.0 million in total of which $38.4 million is during the 2022-2024 PBR term) will construct a new dewatering facility at the Clover Bar site to process biosolids produced in the wastewater treatment process. Dewatering is an essential requirement for the management and disposal of biosolids. The new dewatering facility is necessary because

the existing City of Edmonton dewatering facility is being demolished in the near future along with the City of Edmonton composter facility. This closure requires EWSI to complete a new dewatering facility which is planned to be completed in 2024. The business case for this project is included in Appendix G-4 to the Application.

Heating, Ventilation and Air-conditioning (HVAC)

385. EWSI is planning to spend $9.1 million in Heating, Ventilation and Air Conditioning rehabilitation for the 2022-2024 PBR term which reflects a $16.9 million decrease from the 2019-2021 period. All of the projects and programs in this category are less than $5.0 million and therefore business cases are not included.

Process Control / IT

386. EWSI is planning to spend $10.7 million in the process control and IT category for the 2022-2024 PBR term which reflects an $8.3 million increase from the 2019-2021 period.

387. The Expand Flare Capacity Project ($8.4 million of which $8.0 million is in the 2022-2024 PBR term) will construct a new building to house a new flare and associated equipment. The project is expected to be in service in 2024. It will provide the Gold Bar WWTP with redundancy capability since under the current setup, one flare alone cannot safely process all potential biogases produced in the wastewater treatment process. A failure in the flare system could result in biogas being released to the environment. The business case for this project is included in Appendix G-7 to the Application.

Performance / Efficiency Improvement

388. This category includes projects which result in operational efficiency and/or improvements that lower future costs. Forecast capital expenditures for the Performance / Efficiency Improvement category are $18.4 million for the 2022-2024 PBR term which is $6.6 million higher than the 2019-2021 period. Key projects included in this category include:

- The Secondary Aeration Blower Upgrades Project ($8.0 million) which will install an additional blower into Blower Building 2 on site, and replace the motor operating Blower 6 to increase efficiency. The Gold Bar WWTP currently has four aeration blowers to supply process air to the BNR system and the tertiary membrane plant. Aeration is a critical component of the BNR process. Without the appropriate level of aeration, there may be a loss of biology in the BNR process, resulting in a failure to remove nutrients from the wastewater and ultimately violation of environmental

regulations. This project is expected to be complete in 2024. The business case for this project is included in Appendix G-11 to the Application.

- The Laboratory Facility Consolidation project ($6.5 million in total of which $5.9 million is in the 2022-2024 PBR term) will co-locate EWSI's Quality Assurance and Environment wastewater and water laboratory functions into the Rossdale Water Treatment Plant Water Excellence Lab building. The project is expected to be completed in 2023. This will provide a platform for synergistic processes and savings across the two teams. Once the wastewater laboratory team has moved to Rossdale, the existing lab building at Gold Bar WWTP will be available for alternative use. The business case for this project is included in Appendix G-8 to the Application.

7.0 DEPRECIATION AND AMORTIZATION

7.1 Depreciation

389. EWSI's methodology and assumptions for determining depreciation and amortization of its capital assets are provided in section 4.4 of the Application. EWSI's forecast depreciation expenses and amortization of contributions for the period 2022-2024 are provided in Table 7.1-1. The 2021 approved amounts and 2021 forecast amounts are provided for comparison.

Table 7.1-1
Financial Schedule 12-1
Net Depreciation Expense
2021-2024
($ millions)

		A **2021D**	B **2021F**	C **2022F**	D **2023F**	E **2024F**
1	EWSI Depreciation Expense	21.0	21.6	24.2	24.7	27.4
2	Less: Amortization of Contributions	(0.9)	(0.9)	(0.9)	(0.9)	(0.9)
3	**Net EWSI Depreciation Expense**	**20.0**	**20.7**	**23.2**	**23.8**	**26.4**

390. For the 2021 approved to 2021 forecast, the $0.7 million increase in net depreciation expense is due to higher than forecasted capital additions, in large part due to higher than forecast capital required for reliability of plant operations through replacement of assets at end of its life cycle or based on condition assessments (see Section 6.0)

391. For the 2021 forecast to 2022 forecast, the $2.5 million increase in net depreciation expense is due to:

- A $2.0 million increase due to the transfer of Biosolids assets from Drainage Services;
- A $1.1 million increase due to a full year of depreciation on 2021 capital expenditures;
- A $0.5 million increase due to new capital expenditures in 2022; and
- A $0.9 million decrease as a result of assets becoming fully-depreciated partially offsets the increases above.

392. For the 2022 to 2024 forecast period, the annual increases in net depreciation expense is due to capital additions to rate base over the 2022-2024 period based on the capital expenditure forecast presented in section 6.2 of the Application.

8.0 RATE BASE

8.1 EWSI Rate Base

393. Table 8.1-1 provides EWSI's rate base for the Wastewater Treatment Services forecast for 2022-2024. The 2021 approved and 2021 forecast amounts are provided for comparison.

Table 8.1-1
Financial Schedule 15-1
EWSI Rate Base – Net of Contributions
2021-2024
($ millions)

		A **2021D**	B **2021F**	C **2022F**	D **2023F**	E **2024F**
1	Prior Year Property, Plant and Equipment	745.8	693.6	748.0	806.6	830.4
2	Biosolids Asset Transfer	-	-	37.5	-	-
3	Prior Year Property, Plant and Equipment, adjusted	745.8	693.6	785.5	806.6	830.4
4	Additions	34.9	54.4	21.1	23.8	131.1
5	Retirements	-	-	-	-	-
6	Current Year Property, Plant and Equipment	780.7	748.0	806.6	830.4	961.4
7	**Mid-Year Property, Plant and Equipment**	**763.3**	**720.8**	**796.1**	**818.5**	**895.9**
8	Prior Year Accumulated Depreciation	206.0	183.2	204.8	242.4	267.2
9	Biosolids Asset Transfer	-		13.5		
10	Prior Year Accumulated Depreciation, adjusted	206.0	183.2	218.3	242.4	267.2
11	Depreciation Expense	21.0	21.6	24.2	24.7	27.4
12	Retirements					
13	Current Year Accumulated Depreciation	227.0	204.8	242.4	267.2	294.5
14	**Mid-Year Accumulated Depreciation**	**216.5**	**194.0**	**230.4**	**254.8**	**280.8**
15	**Mid-Year Net Property**	**546.8**	**526.9**	**565.7**	**563.7**	**615.1**
16	Add: Working Capital	7.0	6.7	(0.7)	4.8	2.8
17	Add: Average Materials and Supplies	1.6	1.6	1.4	1.4	1.5
18	**Gross Mid-Year Rate Base**	**555.3**	**535.1**	**566.4**	**569.9**	**619.3**
19	Mid-Year Net Contributions	(21.2)	(21.2)	(20.3)	(19.3)	(18.4)
20	**EWSI Mid-Year Rate Base**	**534.1**	**514.0**	**546.2**	**550.6**	**600.9**

394. Effective January 1, 2022, as part of the alignment of Drainage Services and Wastewater Treatment operations, the assets associated with the Clover Bar Biosolids Recycling Facility were transferred from Drainage Services to Wastewater Treatment Services. This transfer has been accounted for as an adjustment to the 2022 prior year balances of property plant and equipment and accumulated depreciation, transferring the regulated rate base from one regulated utility to another on a non-discriminatory basis. The effect of this transfer is shown in Table 8.1-1 row 2.

395. Besides the Clover Bar Biosolids Recycling Facility transfer, the annual increases in EWSI's rate base over the 2022 to 2024 period reflect capital additions shown in row 4 of Table , less depreciation expense plus the change in working capital and average materials and supplies.

Details of the changes to the rate base components are provided in Financial Schedules 15-1 to 16-1. Section 6.0 provides discussion of EWSI's capital additions forecast for 2021-2024. The capital additions for projects over $5 million are provided in capital business cases attached as Appendices G-1 to G-12. Section 7.0 discusses EWSI's forecast depreciation expense for 2022.

8.2 Working Capital

396. The working capital component of EWSI's rate base is an allowance for the working capital needed to finance the lag between the time that EWSI provides a service and the time it is paid for the service (referred to as a "revenue lead"), and the timing differences between the time that expense is incurred and subsequently paid (referred to as an "expense lag").

397. EWSI has undertaken a lead-lag study (Appendix O-2) to support its working capital allowance. In this study, lags are derived from analysis of each revenue and expenses stream and are broken down into their individual components in order to more precisely determine the total lag. An overall operating expense lag is then calculated on a weighted average and netted against the appropriate revenues. Net lags are also calculated individual capital expenses including debt interest, retained earnings and depreciation. The working capital ratio (net lag/365) is then applied against the corresponding expense amount in order to determine the portion of necessary working capital related to each component (see Financial Schedule 16.1).

8.3 Average Materials and Supplies

398. The materials and supplies component of EWSI's rate base represents the three year average value of inventories used to maintain plant in service, as well as certain deposits and other prepaid expenses required for EWSI's utility operations.

9.0 RETURN ON RATE BASE

399. The following sections include a calculation of EWSI's forecast return on rate base (section 9.1), explanations of EWSI's proposed return on equity (section 9.2), cost of debt (section 9.3) and capital structure (section 9.4).

9.1 Return on Rate Base Calculation

400. Table 9.1-1 shows the forecast return on rate base for the years 2022-2024. The 2021 approved and 2021 forecast amounts are shown for comparison.

Table 9.1-1
Return on Rate Base
Financial Schedule 14-1
2021-2024
($ millions)

		A **2021D**	B **2021F**	C **2022F**	D **2023F**	E **2024F**
1	**Mid-Year Rate Base, net**	**534.1**	**514.0**	**546.2**	**550.6**	**600.9**
	Mid-Year Capital Structure					
2	Debt Capital	60.00%	60.00%	60.00%	60.00%	60.00%
3	Common Stock Equity	40.00%	40.00%	40.00%	40.00%	40.00%
	Cost Rates					
4	Debt Capital	4.53%	4.02%	3.88%	3.80%	3.89%
5	Common Stock Equity	10.18%	11.13%	9.95%	9.95%	9.95%
6	WACC	6.79%	6.86%	6.31%	6.26%	6.31%
	Return on Rate Base					
7	Debt Capital	14.5	12.4	12.7	12.6	14.0
8	Common Stock Equity	21.7	22.9	21.7	21.9	23.9
9	**Total Return**	**36.3**	**35.3**	**34.4**	**34.5**	**37.9**

401. The 2021 forecast return on equity in Table 9.1-1 reflects the difference between EWSI's forecast revenues less expenses in 2021.

402. The basis of EWSI's forecast of capital structure, rate of return on equity and cost of debt for the 2017-2021 PBR period is described below.

9.2 Rate of Return on Equity

403. The rate of return approved by EWSI's regulator, Edmonton City Council, must meet the fair return standard which states that the utility must be allowed to earn a fair return which is (i) sufficient to ensure its financial integrity; (ii) adequate to attract capital at reasonable terms; and

(iii) commensurate with returns on investments in enterprises having corresponding risks. Based on the fair return standard, EWSI recommends the return on equity and cost of capital as illustrated in Table 9.2-1 be approved for Wastewater Treatment for the 2022-2024 PBR term:

Table 9.2-1
Recommended Cost of Capital for
Wastewater Treatment 2022-2024 PBR

	Category	A Proportion	B Rate	C Weighted Rate
1	Long-Term Debt	60	3.50%	2.10%
2	Equity	40	9.95%	3.98%
3	**Total**	**100**		**6.08%**

404. EWSI is proposing a rate of return on common equity of 9.95% based on an extension of Grant Thornton's (GT) analysis presented in their *EPCOR Performance Based Regulation Filing Review* (GT Report) developed for the 2017-2021 PBR application for Water and Wastewater Services. A formulaic extension of this prior method is seen as the most straightforward approach under current economic conditions. The turmoil in financial markets resulting from the COVID 19 global pandemic and the resulting fiscal and monetary policy initiatives used by governments and central banks to diminish economic devastation has resulted in virtually no financial ratios, interest rates or other capital cost inputs or indicia remaining stable throughout 2020.

405. EWSI has not completed a Cost of Capital Study, as it has in the past, as reliance on these "roller coaster" 2020 data is problematic in applying traditional methods for estimating capital cost rates. The formulaic extension of a prior approach eliminates these concerns and best aligns with the City's desire to determine a risk premium to the Alberta Utility Commission's generic cost of capital to derive the allowed rate of return on equity for EWSI. EWSI has prepared a Return on Equity Memorandum (Appendix D) to provide the background and analysis that led to these conclusions.

406. In the 2017-2021 PBR application for Water and Wastewater, both EWSI and GT recognized that: 1) EWSI's business risks are greater than the average Alberta electric and gas utility, and 2) it is reasonable to add a risk premium to the Alberta Utility Commission's generic cost of capital to derive the allowed return on equity for EWSI. Risk in a regulated utility encompasses both operational risk and regulatory risk. In combination, these risks result is variability in both cash flow and earnings that impact the utility's ability to recover costs and earn

the awarded fair return. The following summarizes the major risk factors as detailed in Appendix D that contribute to EWSI being riskier than an electricity of gas utility regulated by the AUC:

- **Water is a Consumable Product Risk** - As water is ingested by the end user, it is incumbent upon EWSI to ensure that appropriate processes and procedures are maintained to establish proper treatment. Ensuring that the product remains safe and within strict regulatory guidelines represents considerably higher risk to EWSI than is seen in other utilities.

- **Health and Environmental Regulation Risk -** Increasingly stringent health and/or environmental standards necessitate additional capital investment to meet the new requirements in addition to process and reporting changes to ensure adherence to the standards. EWSI faces additional risk due to higher frequency of regulatory changes for both environmental and public health standards placing increased pressure to cash flow to fund new infrastructure as well as complete upgrades to existing assets to meet regulation changes.

- **Revenue Risk** – Demand for water is subject to considerable variation, particularly in the summer months. Additionally, water demand has declined on a per capita basis over a considerable period resulting in increased risk associated with recovering historic infrastructure costs. EWSI's rate structure is comprised of a very high portion of volumetric rates indicating that revenue fluctuates with changes in consumption. In contract, eclectic and gas utilities have a lower percentage of volumetric rates implying that their revenue fluctuates less for a given level of consumption change. Overall, EWSI experiences higher revenue volatility than is seen in a gas or electric utility.

- **Capital Recovery Risk - Depreciation** - Water and wastewater utility assets typically have longer lives than electric and gas utilities. The resulting lower depreciation rates means that reliance on depreciation as one of the sources of internal cash flow is lower. In addition, the longer capital recovery period results in water and wastewater utilities facing greater risks from inflation which results in a higher replacement cost per dollar of net plant.

- **Level of Contributed Assets Risk** – EWSI utilities, particularly drainage, have a greater percentage of contributes assets (or assets not paid for by ratepayers though rates). As EWSI does not earn a return on these assets yet is required to maintain and assume operational responsibility for the assets, this represents a risk not seen to the same level in electric and gas utilities.

- **Determination of Return on Equity Risk** - The City's PBR process is based on 5 year terms (with 3 year terms in this application as a one-time measure to stagger future application) with EWSI's rate of return on equity fixed for that entire period. In contrast, the AUC's rate of return is adjusted more frequently based on their generic cost of capital proceedings. As EWSI is effectively "locked in" to the established return on equity irrespective of changes to the underlying financial market drivers and conditions, this represents an additional risk to EWSI.

- **Debt Risk -** Under EWSI's PBR Framework, the risk of interest rate fluctuations is entirely borne by EWSI and is not passed on to its customers. Under the AUC PBR, Alberta electric and gas utilities pass on interest rate risk to their customers through rate adjustments. As such, this risk factor represents another component of the EWSI risk premium above the AUC's Generic Cost of Capital.

407. To develop the proposed 9.95% ROE, EWSI updated the GT 2016 Report to reflect the 2019 pre-pandemic generic cost of capital determined by the Alberta Utilities Commission and bond yield changes, having regard for the compression and expansion of risk premiums. In the 2017-2021 application, EWSI proposed an ROE of 10.5%[11]. GT noted that an ROE of 10.5% represented a risk premium of 2.20% above the AUC generic of 8.3% in place at that time. Their conclusions were that an appropriate risk premium would be in the range of .08% to 0.66% lower than the 2.20%[12]. This would result in a risk premium range of 1.54% to 2.12% with a mid-point of 1.83%. The Utility Committee ultimately determined a risk premium of 1.875% for the 2017-2021 PBR term, the same risk premium as was determined for the 2012-2016 PBR term.

[11] Three methods were applied to determine the rate of return include Capital Asset Pricing Model (CAPM), Discounted Cash Flow (DCF) and Risk Premium Model (RPM). The recommendations for EWSI's return on equity were derived from the results of applying each of these methods to both the US water utility proxy group and the Canadian utility proxy group.

[12] GT Report, page 145.

408. For the 2017-2021 update of the GT approach, EWSI has used a risk premium of 1.83% as it was based on three formal methods and is more supportable than carrying a single point estimate from a prior period forward. EWSI believes, however, that the risk of the overall business has increased since the 2017-2021 period and a 1.83% risk premium represents the low end of an acceptable range. The inclusion of the Drainage business in the 2022 - 2024 PBR period with the same 40% common equity ratio as the Water and Wastewater businesses implies that EWSI's investment risks are higher today than they were in 2016. Thus, the appropriate premium *vis-à-vis* the Commission's generic cost of capital is no less than 1.83% today.

409. In *Decision 22570-D01-2018*, the Commission found that an 8.5% common equity rate of return was reasonable for test years 2018, 2019 and 2020.[13] All things equal, the indicated common equity rate of return for EWSI based on the GT Report and the 8.5% for generic Alberta utilities is therefore 10.33% (= 8.5% + 1.83%). However, the Commission's 8.5% in *Decision 22570-D01-2018* was predicated on a 2.3% yield on long-term Government of Canada bonds.[14] In contrast, the 2019 pre-pandemic yield on long-term Government of Canada bonds is 1.8%.[15] The lower 2019 bond yield suggests that a downward adjustment of 0.38% should be made to the 10.33% common equity rate of return but with recognition given to the fact that risk premiums expand as bond yields decline. This adjustment then results in the proposed 9.95% ROE.

410. Given the economic situation faced by rate payers as a result of the pandemic and EWSI's desire to moderate rate increases, EWSI proposes that the common equity rate of return for "Base" Drainage operations be established at 5.50% for 2022 and "ramped up" to 9.95% in linear fashion over the 2022 – 2026 period. Based on this plan, the forecast five-year average common equity rate of return for EWSI's consolidated operations is 9.05%. The 9.05% is materially less than the 9.95% proposed common equity rate of return from the updated GT analyses and represents the forecast level at which EWSI will earn over the term. Table 9.2-2 illustrates the ROE across all three EWSI utilities:

[13] Alberta Utilities Commission, *Decision 22570-D01-2018*, August 2, 2018, Paragraph 500, page 104. In its recently-released *Decision 24110-D01-2020*, the Commission did not provide a detailed rate of return analysis. Nevertheless, the 8.5% common equity rate of return from *Decision 22570-D01-2018* was extended through 2021 on a final basis. See *Decision 24110-D01-2020*, Paragraphs 14 and 20.

[14] Alberta Utilities Commission, *Decision 22570-D01-2018*, August 2, 2018, Paragraph 299, page 65.

[15] The average of the daily 2019 yields reported by the Bank of Canada for Series V39056 is 1.80%.

Table 9.2-2
Business Unit and Consolidated
Rates of Return on Common Equity
2022 – 2026

	A Year	B Water	C Wastewater	D Drainage Base	E Drainage SIPR/CORe	F Drainage Consolidated	G Total Consolidated
1	2022	9.95%	9.95%	5.50%	9.95%	5.85%	7.97%
2	2023	9.95%	9.95%	6.61%	9.95%	7.09%	8.52%
3	2024	9.95%	9.95%	7.73%	9.95%	8.13%	9.01%
4	2025	9.95%	9.95%	8.84%	9.95%	9.07%	9.48%
5	2026	9.95%	9.95%	9.95%	9.95%	9.95%	9.95%
6	2022-2026	9.95%	9.95%	7.83%	9.95%	8.19%	9.05%

Note: Calculations are based on forecast 2022 – 2026 annual rate bases and Drainage rates of return calculated using the method described above.

411. Three conclusions are drawn from the data in Table 9.2-2. First, with the exception of the 2026 rate of return, each of the forecast consolidated rates of return in the final column are less than the 9.95% indicated common equity rates of return. Second, the average consolidated rate of return of 9.05% is materially less than the 9.95% and provides a premium above the Commission's 8.50% generic cost of capital of approximately 50 basis points, whereas the premium for EWSI's risks from the GT Report is 1.83%.

9.3 Cost of Debt

412. Consistent with regulated business units within the EUI group of companies, debt rates on long-term inter-corporate loans issued by EUI to EWSI are based on EWSI's regulated services on a stand-alone basis. EWSI is forecasting a cost of new debt issuances of 3.50% the 2022-2024 PBR term based on the methodology described in section 4.3.2. The new cost rate of 3.50% is based on an estimated stand-alone debt rating for EWSI of A (low) provided by Dominion Bond Rating Service as at September 3, 2020 (refer to Appendix C).

413. EWSI's weighted average cost of debt shown in Table 9.3-1 below reflects the weighted average of the cost of debt of prior years' long-term fixed rate debentures and long-term inter-corporate loans issued by EUI, the 2022 forecast cost of debt of 3.50% for new debt issues and a small component of short-term debt.

Table 9.3-1
EWSI Weighted Average Cost of Debt
2022-2024
Financial Schedule 14-1

		A **2022F**	B **2023F**	C **2024F**
1	Weighted Average Cost of Debt	3.88%	3.80%	3.89%

9.4 Capital Structure

414. EWSI is proposing a deemed capital structure of 60% debt and 40% equity for the 2022-2024 PBR term as supported by the Return on Equity Memorandum. This approach is consistent with EWSI's proposed method of updating the ROE as well as the historical capital structure.

10.0 REVENUE OFFSETS (NON-RATE REVENUES)

415. Table 10.0-1 provides the Revenue Offsets (or non-rate revenues) forecast for Wastewater Treatment Services for 2022-2024. The 2021 approved and 2021 forecast amounts are provided for comparison. Revenue Offsets include revenues for various service charges and fees, penalties and miscellaneous revenues. Revenue Offsets are deducted from expenses for purposes of determining the revenue requirement for regulated wastewater treatment operations. Consistent with EWSI's operating cost forecast methodology, revenue offsets are forecast for 2022-2024 based on its best estimate of 2022 amounts escalated based on the inflation factor.

Table 10.0-1
Financial Schedule 13-1
Revenue Offsets
2021-2024
($ millions)

		A **2021D**	B **2021F**	C **2022F**	D **2023F**	E **2024F**
1	Biosolids	-	-	3.5	4.7	4.8
2	ACRWC - SWAP	1.1	1.0	0.7	0.7	0.7
3	Late Payment Charges	0.2	0.2	0.2	0.3	0.3
4	Phosphate sales	0.9	0.5	0.5	0.5	0.5
5	Miscellaneous revenue	0.8	1.0	1.0	1.0	1.0
6	**Total**	**3.0**	**2.7**	**5.9**	**7.2**	**7.3**

416. Each of the categories of Revenue Offsets is described below.

417. Biosolids revenues are derived from management and disposal services for biosolids delivered to EWSI's Clover Bar Biosolids Recycling Facility by the Alberta Capital Region Wastewater Commission (ACRWC). These revenues are determined in accordance with a Biosolids Management Agreement between EWSI and the ACRWC. As explained in Section 5.2.2.2, the biosolids management function is transferred to Wastewater Treatment Services from Drainage Services effective April 1, 2022. Therefore, forecast revenues include nine months of revenue, with full year revenues commencing in 2023.

418. Under an agreement between EWSI and the ACRWC, the ACRWC directs a portion of the Capital Region's wastewater flows to the Gold Bar WWTP given the proximity of a portion of its customer service area to the Gold Bar WWTP. In turn, a portion of Edmonton's wastewater flows are sent to ACRWC treatment plant given the proximity of certain Edmonton service areas to the

ACRWC WWTP. The net exchange of wastewater volumes is billed by Drainage Services to the ACRWC. Drainage Services shares a portion of the revenues it collects from the ACRWC with Wastewater Treatment to compensate Wastewater Treatment for providing the wastewater treatment service applicable to these wastewater flows.

419. Late payment penalty revenues are charges applied to customer invoices for amounts unpaid beyond the prescribed customer payment terms.

420. Phosphate sales reflect the sale of fertilizer produced by the Ostara nutrient recovery facility located at the Clover Bar Biosolids Recycling Facility pursuant to an agreement between EWSI Wastewater Treatment and Ostara Nutrient Recovery Technologies Inc. The decrease of $0.4 million from 2021 decision to 2021 forecast is primarily due to lower than forecast phosphate production

421. Miscellaneous revenue includes Suburban and Laboratory revenue as described below:

- Suburban revenues reflects Wastewater Treatment's share of the amounts charged by the Drainage Services to customers outside of Edmonton for the collection and treatment of wastewater. This revenue is collected by Drainage Services and a portion of these revenues is provided by Drainage Services to Wastewater Treatment to compensate Wastewater Treatment for wastewater treatment service and wastewater overstrength surcharge; and
- Laboratory revenue from the provision of laboratory testing and analysis services provided mainly to the City of Edmonton as well as third party customers.

11.0 COST OF SERVICE

11.1 Cost of Service Methodology Review

422. A fundamental principle of rate-making is that the wastewater treatment rate structure should recover the costs of providing service to the customers using the wastewater treatment system in a manner which is both fair and equitable, ensuring that rates for each customer class reflect their demands on the system so that one customer class neither subsidizes, nor is subsidized by another customer class.

423. In the fall of 2019, EWSI engaged HDR Engineering, Inc. (HDR) to provide technical assistance in the development of a wastewater treatment cost of service analysis to support EWSI's historical practice of establishing cost-based rates. The objectives of this analysis included:

- Developing a wastewater treatment cost of service analysis consistent with the generally accepted wastewater rate-setting methodologies and principles established by the Water Environment Federation (WEF) and described Manual of Practice No. 27, Financing and Charges for Wastewater Systems;
- Developing a cost of service methodology to equitably distribute the cost of providing wastewater treatment to various customer classes of service;
- Reviewing the current wastewater treatment rate structure and providing alternatives for future consideration; and
- Providing EWSI with a cost of service model to use and evaluate the distribution of future wastewater treatment costs and rate impacts.

11.2 Revenue Requirement

424. Wastewater Treatment's revenue requirement is determined on a utility basis, where the annual revenue requirement, essentially Wastewater Treatment's overall financial needs, are determined by aggregating a test period's operations and maintenance expenses, depreciation and amortization and a fair return on investment.

425. The 2021 forecast revenue requirement used in HDR's cost of service analysis was developed by Wastewater Treatment, using the same accounting policies and cost forecasting methodologies described in Section 4 of this Application. This information was provided prior to the completion of the forecast in this Application. Because of differences in certain assumptions around cost escalation, customer growth and consumption per customer arising subsequent to the provision of this information to HDR, the 2021 test year revenue requirement analyzed by

HDR is $1.7 million greater than the 2021 forecast revenue requirement in Section 3. EWSI has reviewed the differences in the analysis and is satisfied that they would not have any significant impact on the conclusions in HDR's report entitled "EPCOR 2020 Wastewater Treatment Cost of Service Study" (referred to as the "HDR Cost of Service Study", Appendix N-1).

11.3 General Cost of Service Procedures

426. HDR used the 2021 test year revenue requirement as the starting point for the wastewater treatment Cost of Service Study. The first step in this study was to determine customer classes of service that have similar usage patterns and facility requirements. During the development of the Cost of Service Study, although various alternative customer classes of service were considered, HDR concluded that EWSI's current customer classes of service were reasonable and consistent with current wastewater utility industry approaches. These customer classes of service include:

- **Residential Wastewater Treatment Service -** EWSI provides wastewater treatment services to domestic services customers and multi-residential customers located in the city of Edmonton that are serviced by or connected to the Drainage Services sewerage system;
- **Commercial Wastewater Treatment Service -** EWSI provides wastewater treatment services to commercial, industrial and institutional customers located in the city of Edmonton that are service by or connected to the Drainage Services sewerage system; and
- **Surchargeable Matter -** EWSI wastewater treatment services provided to commercial, industrial, and institutional customers include additional monitoring, sampling and testing of wastewater potentially containing one or more constituents considered to be harmful to the environment. Overstrength Surcharges are applied to each kilogram of surchargeable matter per cubic metre of wastewater in excess of prescribed concentrations.

427. The next step in the study was to conduct a cost of service analysis to determine the cost to serve each customer class. This analysis utilized a three-step approach to equitably and proportionally distribute the revenue requirement. These steps included:

- **Functionalization**, which includes arranging expenses and asset data by major operating components and functions in wastewater treatment operations. Functionalization of cost data was already largely accomplished through Wastewater Treatment's accounting and asset records.

- **Allocation**, which determines why expenses are incurred or what type of need is being met. In the cost of service analysis, plant assets and revenues were allocated to four cost components:
    i. Volume Related Costs, which tend to vary with the total quantity or volumes of wastewater treated;
    ii. Strength-Related Costs, which vary with the process/cost associated with treating different contaminants and their concentration in the effluent. Higher strength discharges require additional treatment to meet discharge requirements, which generally equates to increased treatment costs;
    iii. Customer-Related Costs, which vary with the number of customers served. Customer related costs typically include the costs of billing, collections, and accounting; and
    iv. Revenue-Related Costs, which vary with the amount of revenue received by the utility. An example of a revenue related cost would be a utility tax, or franchise fee, which is based on gross utility revenue.

- **Distribution** to each customer class using the following distribution factors.
    i. Volume Distribution Factor: Volume-related costs are distributed on the basis of estimated class contributions to wastewater flows, using estimates based on recent historical flows at the treatment plant;
    ii. Strength-Distribution Factor: Strength-related costs are allocated between the wastewater constituents. The allocated costs are then distributed to each class of service based upon flow contributions and the assumed strength level for residential, multi-residential and commercial customer classes, and the actual strength levels for overstrength customer;
    iii. Customer Distribution Factor: Customer costs, within the cost of service analysis, are distributed to the various customer classes of service based upon their respective number of customer accounts; and
    iv. Revenue-Related Distribution Factor: The revenue related distribution factor was developed from the projected rate revenues for 2021 for each customer class of service.

11.4 Summary of the Cost of Service Results

428. EWSI has reviewed HDR's Cost of Service Study (Appendix N-1) and believes that the report, together with HDR's technical analyses, provides a sound basis for developing fair and equitable cost based rates. HDR's comprehensive study and analysis compared the distributed expenses for each customer class of service to the current revenues received from each customer class of service. This comparison provides a measure of the over or under collection of revenue by customer class, if the cost of service results were implemented. A summary of the detailed

cost responsibility developed for each class of service for 2021 is summarized below in Table 11.4-1.

Table 11.4-1
Appendix N-1, Table 3-5
Summary of the EPCOR 2021 Cost of Service Results
($ millions)

		A **Present Revenue**	B **Allocated Costs**	C **$ Difference**	D **% Difference**
1	Single Family	64.3	62.0	2.3	-3.6%
2	Multi-Family	18.7	18.1	0.6	-3.4%
3	Commercial	23.6	24.3	(0.6)	2.6%
4	Overstrength	4.1	6.5	(2.4)	57.3%
5	**Total**	**110.8**	**110.8**	**0.0**	**0.0%**

429. HDR typically reviews a cost of service to determine whether a class of service is within a "reasonable range of their cost of service", where reasonable is considered to be within +/- 5% of the overall required adjustment. Therefore, all but the overstrength customer class of service are within a reasonable range of their cost of service. Accordingly, HDR has recommended that EWSI should examine this more closely to better assure that these costs are the sole responsibility of the overstrength customers.

430. HDR's Cost of Service Study was based upon a specific time period (2021) and does not include costs associated with the Biosolids Management Program. With the transition of the Biosolids Management Program to Wastewater Treatment in 2022, further analysis is required to assess the impacts on the cost of service. Furthermore, the new Dewatering Facility will also have an impact of the cost of service. As such, EWSI is not proposing to make any interclass adjustments to the wastewater treatment rates or overstrength charges in the 2022-2024 PBR term to reflect the results of the HDR Cost of Service Study. Instead, EWSI plans to update the cost of service analysis over the 2022-2024 PBR term to incorporate the Biosolids Management Program and Dewatering Facility with the overall objective of implementing improvements and refinements to rate structure and rate design in the 2025-2029 PBR term to ensure that revenues from each class of service will fall within reasonable ranges of their cost of service.

12.0 PBR RATES

12.1 PBR Rate Structure by Customer Class

431. Wastewater treatment services are provided pursuant to a franchise agreement with the City of Edmonton and are regulated by City Council under a performance-based regulation framework. Wastewater treatment services customers are grouped into the same categories as water services customers, so a residential water services customer would also qualify as a residential wastewater treatment services customer, a multi-residential water services customer would also qualify as a multi-residential wastewater treatment services customer and a commercial water customer would also qualify as a commercial wastewater treatment services customer. The rate structure for these customer classes is described below.

12.1.1 Residential

432. Residential customers are charged a monthly service connection fee, plus a variable charge for wastewater treatment based on their water consumption. Wastewater treatment charges are based on a flat rate structure with a single wastewater treatment rate applied to each cubic meter of water consumed. EWSI believes that this rate structure is appropriate and is not proposing any changes for the 2022-2024 PBR term.

12.1.2 Multi-Residential

433. Multi-Residential customers are charged the same monthly services connection fee and variable charge for wastewater treatment as residential customers. Therefore, the multi-residential customer class simply provides for consistency in customer classification with Water Services and Drainage Services. EWSI believes that this rate structure is appropriate and is not proposing any changes for the 2022-2024 PBR term.

12.1.3 Commercial

434. Commercial customers are charged the same monthly connection fee as residential and multi-residential customers and commercial customers in the first consumption block, but unlike consumption charges for residential and multi-residential customers, the commercial customer class uses a declining rate structure with three consumption blocks. The first block is for customers consuming less than 10,000 m^3 of water per year (over 95% of commercial customers), the second is for those customers with 10,000.1 to 100,000 m^3 of water consumption per year and the third block is for those consuming over 100,000 m^3 per year. EWSI is not proposing any changes to this rate structure for the 2022-2024 PBR term.

12.1.4 Overstrength Surcharges

435. EWSI wastewater treatment services provided to commercial customers include additional monitoring, sampling and testing of wastewater potentially containing one or more constituents, such as oil and grease, phosphorus, and other compounds considered to be harmful to the environment. Customers who release wastewater into the sewer system that contains these compounds are billed overstrength surcharges for each kilogram of surchargeable matter per cubic metre of wastewater in excess of prescribed concentrations. EWSI Drainage Services provides Wastewater Treatment with the measurement and testing services for overstrength surcharges, as well as periodic reassessment of overstrength concentration. EWSI is not proposing any changes to this rate structure for the 2022-2024 PBR term.

12.2 2022-2024 Wastewater Treatment Rates and Special Rate Adjustments

436. Under the PBR framework, water rate increases are limited to PBR inflation plus Special Rate Adjustments. For the 2022-2024 PBR term, EWSI is applying for two Special Rate Adjustments for: (i) Re-Basing of the Revenue Requirement ("Re-basing"); and (ii) Recovery of costs related to the 90 Day Deferral Program.

12.2.1 Special Rate Adjustment for Re-basing

437. The Special Rate Adjustment for Re-basing accounts for the difference between EWSI's revenue requirement forecast for the 2022-2024 PBR term and the revenue that would be realized by limiting annual rate increases to PBR inflation. The resulting revenue shortfall and its major components are shown in Table 12.2.1-1 below:

Table 12.2.1-1
Revenue Shortfall Calculation
2022-2024
($ millions)

		A **2022F-2024F**
1	Revenue Collected at Prior Year's Rates	321.5
2	PBR Inflation Impact on Revenue	12.6
3	Revenue Collected at PBR Rates	334.2
4	Total Revenue Requirement	386.0
5	Revenue Shortfall to be recovered through Re-basing	(51.9)
6	Revenue Shortfall attributable to:	
7	Transfer of Biosolids from Drainage to Wastewater in 2022	(48.7)
8	Forecast Revenue Requirement for the 2022-2024 PBR Term	(10.4)
9	Lower than Forecast Revenue Requirement in the 2017-2021 PBR Term	21.7
10	Customer Growth over the 2022-2024 PBR Term	4.8
11	Declining Consumption over the 2022-2024 PBR Term	(19.3)
13	Revenue Shortfall to be recovered through Re-basing	(51.9)

438. The total revenue shortfall to be recovered through re-basing amounts to $51.9 million. This shortfall incorporates the impacts of: (i) the transfer of biosolids management program from Drainage Services in 2022; (ii) the forecast Revenue Requirement for the 2022-2024 PBR term; (iii) Lower than Forecast Revenue Requirement for the 2017-2021 PBR term (iv) customer growth over the 2022-2024 PBR term; and (iv) long-term declines in consumption per customer. These components are explained below.

12.2.1.1 Transfer of Biosolids Management from Drainage Services

439. Effective January 1, 2022, biosolids management program is transferred to Wastewater Treatment from Drainage Services. As shown in Table 12.2.1.1-1 below, this transfer increases Wastewater Treatment's 2022-2024 revenue shortfall by $48.7 million. This increase is offset by a corresponding reduction in Drainage Services revenue requirements over the same period.

Table 12.2.1.1-1
Components of the Special Rate Adjustment for Re-Basing
Attributable to the Transfer of Biosolids Management from Drainage Services
($ millions)

		A	B	C	D
		2022F	**2023F**	**2024F**	**2022-2024 Impact**
1	Operating expenses	12.6	17.5	17.8	(47.8)
2	Franchise fee	1.1	1.4	1.4	(3.9)
3	Depreciation and amortization	2.0	2.0	2.0	(5.9)
4	Return on rate base financed by debt	0.5	0.5	0.4	(1.5)
5	Return on rate base financed by equity	0.9	0.8	0.8	(2.5)
6	Revenue offsets	(3.5)	(4.7)	(4.8)	12.9
7	**Total revenue requirement**	**13.6**	**17.4**	**17.6**	**(48.7)**

12.2.1.2 Forecast Revenue Requirement for the 2022-2024 PBR Term

440. The effect of growth in revenue requirements between 2022 and 2024 and its impact on re-basing is summarized in Table 12.2.1.2-1 below. This amount is calculated as the difference between the 2022-2024 forecast revenue requirement, excluding biosolids, and the 2022 forecast revenue requirement, excluding biosolids, held constant over 2022-2024. As shown in Columns E and F of Table 12.2.1.2-1 below, growth is concentrated in depreciation and amortization, and returns on rate base, reflecting the impacts of capital additions in both the 2017-2021 PBR term, and the 2022-2024 PBR term.

Table 12.2.1.2-1
Components of the Special Rate Adjustment for Re-basing
Resulting from the 2022-2024 Revenue Requirement
($ millions)

		A	B	C	D	E
		2022F-2024F Revenue Requirement				
		Total	**Biosolids**	**Total, excluding Biosolids**	**2022F Constant until 2024**	**Difference**
1	Operating expenses	194.4	47.8	146.6	144.6	2.0
2	Franchise fee	31.6	3.9	27.7	26.8	0.9
3	Depreciation and amortization	73.5	5.9	67.6	63.8	3.8
4	Return on rate base financed by debt	39.3	1.5	37.8	36.5	1.3
5	Return on rate base financed by equity	67.6	2.5	65.0	62.5	2.6
6	Revenue offsets	(20.3)	(12.9)	(7.4)	(7.3)	(0.1)
7	**Total**	**386.0**	**48.7**	**337.4**	**327.0**	**10.4**

12.2.1.3 Lower than Forecast Revenue Requirement for the 2017-2021 PBR Term

441. The portion of the revenue shortfall attributable to lower than forecast revenue requirement for the 2017-2021 PBR term is calculated as the difference between the 2022 revenue requirement forecast excluding biosolids and the 2021 decision amount escalated at PBR inflation. The difference between these two amounts is summarized in Table 12.2.1.3-1 below.

Table 12.2.1.3-1
Components of the Special Rate Adjustment for Re-basing
Attributable to the Lower than Forecast Revenue Requirement in the 2017-2021 PBR Term
($ millions)

		A	B	C	D
		Revenue Requirement			
		2022F Adjusted	2021D (Escalated)	Difference	2022-2024 Impact
1	Operating expenses	48.2	51.7	(3.5)	
2	Franchise Fee	9.0	10.0	(1.0)	
3	Depreciation and amortization	21.3	20.5	0.8	
4	Return on rate base financed by debt	12.2	14.8	(2.7)	
5	Return on rate base financed by equity	20.8	22.2	(1.4)	
6	Revenue offsets	(2.4)	(3.1)	0.7	
7	**Total**	**109.0**	**116.0**	**(7.1)**	**(21.7)**

442. Table 12.2.1.3-1 shows that the 2022 forecast revenue requirement is $7.1 million less than the 2021 approved revenue requirement escalated at inflation. This table shows lower than forecast operating costs, which includes operating cost efficiencies realized in the areas of chemicals, reduced Centre of Excellence costs, increased use of internal labour for capital maintenance projects and lower corporate shared services costs (as explained in Section 5.0); lower than forecast capital additions (see Section 8); and lower interest costs (see Section 9). Over the 2017-2021 PBR term these items resulted in a $7.1 million reduction in revenue requirements. EWSI has calculated that this difference reduces 2022-2024 revenue requirements by $21.7 million in total for the three years.

12.2.1.4 Consumption per Customer and Customer Growth

443. As in the 2017-2021 PBR Application, the long-term decline in consumption per customer continues to affect Wastewater Treatment revenue, with declines in consumption more than offsetting customer growth. Table 12.2.1.4-1 summarizes the impact that both increased customer counts and declining consumption per customer have on the 2022-2024 rebasing adjustment.

Table 12.2.1.4-1
Components of the Special Rate Adjustment for Re-basing
Arising from Changes to Customer Count and Consumption per Customer
($ millions)

		A **2017-2021 Decision**	B **2022-2024 Forecast**	C **Difference**	D **2022-2026 Rebasing Impact**
	Average Customer Counts				
1	Residential	261,089	283,312	22,223	
2	Multi-Residential	3,791	3,800	9	
3	Commercial	16,753	17,240	488	
4	Sub-Total	281,633	304,353	22,720	4.4
	Total Consumption (ML)				
5	Residential	45,114	44,771	(343)	
6	Multi-Residential	18,600	17,627	(973)	
7	Commercial	24,696	19,689	(5,007)	
8	Sub-Total	88,409	82,087	(6,323)	(19.3)
	Overstrength Surcharges ($)				
9	Revenue at Existing Rates	4.3	4.5	0.2	0.5
10	**Total**				**(14.5)**

444. The factors affecting both the forecast increase in 2022-2024 customer counts and the decrease in consumption per customer are explained in detail in Section 4.7. These factors increase the 2022-2024 revenue shortfall by $14.5 million.

445. EWSI will implement the rebasing adjustment as follows. First, the $48.7 million adjustment related to the Biosolids Management Program transfer will be made entirely in 2022. Although this adjustment results in a substantial increase to wastewater treatment rates, it is entirely offset by a corresponding reduction to Drainage Services rates. Second, consistent with the re-basing adjustments in the prior PBR term, the remainder of the re-basing adjustment will be spread equally over the 2022-2024 PBR term. The effects of these adjustments are summarized in Section 12.3.

12.2.2 Special Rate Adjustment for 90 Day Deferral Program

446. On March 18, 2020, Alberta announced “Albertans who are experiencing financial hardship directly related to the COVID-19 pandemic can work with their utility company to defer electricity and natural gas bills until June 19, 2020 without any late fees or added interest payments.” The option to defer payment applied to residential, farm and small commercial electricity consumers with sites that consume less than 250,000-kilowatt hours of electricity per year and to residential, farm and small commercial natural gas consumers with sites that

consume less than 2,500 gigajoules per year. This program for electricity and gas customers is known as the "Utility Payment Deferral Program".

447. The Government of Alberta requested that Alberta municipalities develop similar utility payment deferral programs for municipal utility bills. On March 20, 2020, Edmonton City Council approved a 90-day deferral program for deferral of waste utility bills for customers in need. On March 24, 2020, Mayor Don Iveson, in accordance with a City Council Motion[16], sent a letter to EPCOR requesting that EPCOR implement a program to allow customers to defer water, wastewater treatment and drainage utility bill payments, without interest or penalty, for a 90-day period from March 18, 2020 to June 18, 2020.

448. On May 12, 2020, Alberta's Utility Payment Deferral Program Act (the "Act"), received royal assent in the Legislative Assembly of Alberta. The Act sets out the Electricity Utility Payment Deferral Program (Part 1); the Gas Utility Payment Deferral Program (Part 2) and the powers granted to the AUC to implement these programs (Part 3).

449. The Act allows regulated rate service providers to establish a deferral account to track and recover the costs for administering the deferral of customer payments, interest expenses and any incremental bad debts costs. The Act allows carrying charges to be applied to the deferral account balances to be calculated at the regulated rate service provider's weighted average cost of capital. Regulated rate service providers are to apply to the Commission for approval of a rate rider to recover the prudently incurred costs accrued to the deferral account during the period June 19, 2021 to June 18, 2022.

450. EPCOR's utility payment deferral program was structured to be in compliance with the Utility Payment Deferral Program Act for its electricity and gas customers. EEA, as EPCOR's retail service provider, delivered and managed a consistent and coordinated program across all of the EPCOR utilities. As such, the utility payment deferral programs for EWSI's Water Services, Wastewater Treatment, and Drainage Services were aligned, to the extent possible, with Alberta's requirements for electricity and gas programs described above.

451. Table 12.2.2-1 summarizes the incremental bad debt expense, administration, and carrying costs associated with the 90 Day Deferral Program. In the 2022-2024 PBR Application EWSI is proposing a Special Rate Adjustment in 2022 to recover the $0.6 million cost of the 90 Day Deferral Program. This Special Rate Adjustment would add $0.15 to the average residential

[16] http://sirepub.edmonton.ca/sirepub/mtgviewer.aspx?meetid=2703&doctype=MINUTES

bill in 2022, and would be removed from customer bills in 2023. EWSI also proposes to adjust its final rate to reflect the actual costs incurred for this program as part of its 2022 Rates Filing which would be approved by the City Manager

Table 12.2.2-1
Components of 90 Day Deferral Program
Special Rate Adjustment
($ millions)

	Item	A Expense
1	Incremental Bad Debt Expense	0.4
2	Late Payment Charges	0.1
3	Carrying Costs	0.1
4	**Total Revenue Requirement**	**0.6**

12.3 Summary of Rate Impacts

452. Rate increases for wastewater treatment services are applied uniformly to connection charges and variable charges for all customer classes. These increases, which include the impacts of PBR inflation and the Special Rate Adjustments for re-basing, and the 90 Day Deferral program, are shown on Table 12.3-1, Table 12.3-2 and Table 12.3-3 below:

Table 12.3-1
Rate Increases for Wastewater Treatment Services
2022-2024

	Wastewater: Residential	A 2022F	B 2023F	C 2024F	D Total / Average
	Rate Increase over 2021 Decision:				
1	Normal Operations (i-x)	2.01%	2.01%	2.01%	
2	Special Rate Adjustment- Re-basing	17.72%	-0.07%	-0.07%	
3	Special Rate Adjustment- 90 Day Deferral program	0.82%	-0.69%		
4	**Total Annual Rate Increase**	**20.55%**	**1.25%**	**1.94%**	
	Average Bill Impact:				
5	Monthly Consumption per Customer - m^3	13.4	13.2	12.9	
6	**Average Monthly Bill - $**	**22.86**	**22.85**	**23.00**	
7	Change in Bill - $	2.35	(0.01)	0.14	2.49
8	Change in Bill - %[17]	11.5%	0.0%	0.6%	4.0%

[17] The Change in Bill - % Total (column D, row 8) is the **average** of the individual years (columns A- C, row 8).

Table 12.3-2
Rate Increases for Wastewater Treatment Services
2022-2024

	Wastewater: Multi-Residential	A 2022F	B 2023F	C 2024F	D Total / Average
	Rate Increase over 2021 Decision:				
1	Normal Operations (i-x)	2.01%	2.01%	2.01%	
2	Special Rate Adjustment- Re-basing	17.72%	-0.07%	-0.07%	
3	Special Rate Adjustment- 90 Day Deferral program	0.04%	-0.03%		
4	**Total Annual Rate Increase**	**19.77%**	**1.90%**	**1.94%**	
	Average Bill Impact:				
5	Monthly Consumption per Customer - m^3	388.4	386.6	384.7	
6	Average Monthly Bill - $	**487.51**	**494.46**	**501.65**	
7	Change in Bill - $	58.08	6.94	7.20	72.22
8	Change in Bill - %[2]	13.5%	1.4%	1.5%	5.5%

Table 12.3-3
Rate Increases for Wastewater Treatment Services
2022-2024

	Wastewater: Commercial	A 2022F	B 2023F	C 2024F	D Total / Average
	Rate Increase over 2021 Decision:				
1	Normal Operations (i-x)	2.01%	2.01%	2.01%	
2	Special Rate Adjustment- Re-basing	17.72%	-0.07%	-0.07%	
3	Special Rate Adjustment- 90 Day Deferral program	0.15%	-0.12%		
4	**Total Annual Rate Increase**	**19.89%**	**1.81%**	**1.94%**	
	Average Bill Impact:				
5	Monthly Consumption per Customer - m^3	91.9	95.8	97.7	
6	Average Monthly Bill - $	**120.09**	**127.24**	**132.17**	
7	Change in Bill - $	24.40	7.16	4.93	36.49
8	Change in Bill - %[2]	25.5%	6.0%	3.9%	11.8%

13.0 PERFORMANCE MEASURES

13.1 Overview

453. EWSI has prepared the EPCOR Drainage Services and Wastewater Treatment Bylaw in accordance with the *EPCOR Rates Procedure Bylaw No. 12294*, as amended, (Rates Procedure Bylaw) Subsections 5(e) and 5(f), which state that "utility services are to be provided in a manner that reflects reasonable environmental management in comparison to industry benchmarks" and that "performance will be assessed by reference to industry benchmarks". The following defines these performance measures, the rationale for their selection and the performance level or standards at which Wastewater Treatment is expected to perform. Where possible, comparisons to other jurisdictions or to industry benchmarks are provided. The document also describes Wastewater Treatment's historic performance against the established standards since Wastewater was added to performance based regulation in 2012. The previous Wastewater Treatment PBR terms were: Term 1 from 2012-2016 and Term 2 from 2017-2021.

13.1.1 Framework for Performance Measures

454. A framework for the categorization of performance measures was originally established to define the critical areas of operational performance that EWSI's Water operations must meet. This framework was established at the inception of the water PBR in 2002 and has been maintained since that time in order to ensure comparability to previous PBR terms. Wastewater uses the same general framework as Water except that Wastewater's combines the Water Quality and Environment indexes into a single category. Given the nature of the Gold Bar WWTP facilities, the environment and the quality of water (or effluent) returned to the river are directly linked and the metrics are more appropriately grouped as one index.

455. For the 2022-2024 PBR, Wastewater operational performance of EWSI will be assessed under four categories:

- Water Quality and Environment;
- Customer Service;
- System Reliability and Optimization; and
- Safety.

456. Each of these categories contains individual performance measures that represent the more specific performance standards (or targets) expected. The performance standards are based on historic trending and targeted future performance and where available, aligned with

industry benchmarks. With each PBR renewal, EWSI typically revises the PBR performance metrics through updating the standards of performance, where reasonable, and introducing new metrics to better align with operational priorities and strategic goals. For the 2022-2024 PBR term, EWSI is proposing to limit the number of changes to the overall metrics program. Given the focus on moderating rate increases through reductions in capital programs and other means, maintaining a relatively consistent metrics program from the current term will enable stakeholders to be assured that service levels are being maintained despite the reductions. Where feasible, the standards of performance have been updated to the most recent 10 year average of past performance.

457. The selection of performance measures and their category weightings have been reviewed by customers as a component of the stakeholder engagement process completed by EWSI as part of PBR development activities. In particular, stakeholders have been asked to comment on the priority of the various performance categories to ensure their weightings are aligned with stakeholder expectations. This has resulted in these category weightings being updated from that used previously.

13.1.2 Assessment of Performance

458. Actual performance is assessed against the standard for each metric on an annual basis. An audit is conducted to provide assurance that all measurement and reporting is externally verified. For the 2022-2024 period, EWSI is proposing that EPCOR internal audit department conducts these audits. If EWSI does not meet the standard, financial penalties are applied to a maximum of $2,400,000 per annum ($400,000 for Wastewater, $1 million for Water and $1 million for Drainage). If a penalty amount is assessed, that amount is returned to the customers in the form of a rate rebate. The proposed weighting and penalty amounts applicable to each performance category for Wastewater are detailed in Table 13.1.2-1. The weightings of the performance categories have been updated from those used in the 2017-2021 term based on the stakeholder engagement surveys.

Table 13.1.2-1
Wastewater Performance Measures Indices and Penalties

	Performance Category	A 2017-2021	B 2022-2024	C 2022-2024
		Weighting	Weighting	Maximum Penalty
1	Water Quality Environmental Index	55%	45%	$180,000
2	Customer Service Index	15%	15%	$60,000
3	System Reliability/Optimization Index	15%	25%	$100,000
4	Safety Index	15%	15%	$60,000
5	**Total**	**100%**	**100%**	**$400,000**

459. The weightings and financial penalties of the indices are different between Water, Wastewater Treatment and Drainage Services in order to reflect the different nature of the operations and stakeholder input. There is no financial reward to EWSI for exceeding performance standards. The purpose of the standards are to ensure that the level of service provided to customers does not degrade over the PBR period. EWSI is already performing at a high level and wants to present rates that are stable and predictable. The addition of a financial reward for performance that exceeds the standards is inconsistent with that goal.

13.1.3 EWSI's Performance Experience

460. Under provisions of the proposed EPCOR Drainage Services and Wastewater Treatment Bylaw, EWSI reports on its actual performance results on each of the performance measures as part of its annual PBR Progress Report (presented to City of Edmonton Utility Committee) as well as part of the annual Wastewater Treatment rate filing. The overall performance is determined on a point basis with 100 base points available if the standards for all four performance indices are achieved. Water, Wastewater and Drainage individually have a 100 point benchmark. For each utility, total points are determined by the summation of points available for each performance measure. Bonus points are also available for performance above standards and financial penalties are applied if EWSI does not meet the 100 base point standard. On an individual indices basis, with some performance measures, such as WELPI Index factor, a lower-than-standard score represents performance above standards while for other measures a higher score indicates better performance.

461. As detailed in Table 13.1.3-1, EWSI Wastewater Treatment Service Quality audited results have exceeded the performance standards since 2012.

Table 13.1.3-1
Actual Wastewater Total Performance Measure Results

	A	B	C	D
	PBR #1 (2012-2016)		**PBR #2 (2017-2021)**	
	Year	**Points**	**Year**	**Points**
1	2012	109.3	2017	110.0
2	2013	107.3	2018	110.0
3	2014	110.0	2019	110.0
4	2015	110.0	2020	n/a
5	2016	110.0	2021	n/a
6	**PBR Average**	**109.3**	**PBR Average**	**110.0**
7	**8 Year Average**			**109.6**

13.1.4 Performance Benchmarks

462. In an effort to provide references to external benchmarks when establishing the standards for the proposed PBR performance measures, EWSI has investigated the metrics used by other communities as well as benchmarking studies conducted by various water and wastewater associations. This latter group included: the American Water Works Association (AWWA), the leading North American drinking water industry association, the Water Environment Federation (WEF), the leading wastewater industry association and the Office of Water Services (Ofwat), the primary water regulators in the United Kingdom. Despite these efforts, it has proven challenging to find either other utilities that use an approach similar to EWSI's score card or specific, broad based industry benchmarks for the majority of the individual performance measurements proposed. While some utilities tend to use some of the individual measures similar to EWSI, benchmark comparisons with these utilities have proven to be not directly comparable due to factors such as plant and distribution system configuration, operating conditions, regulatory requirements, environmental factors, raw water and wastewater conditions and weather. Where available, comparable benchmarks are detailed in the subsequent sections describing the individual metrics. Where there are no external benchmarks, performance trends over a considerable period of time or the established level of performance as reviewed by external stakeholders are the basis upon which the proposed standards are established.

13.2 Wastewater Treatment Performance Benchmarks

463. Table 13.2-1 details the proposed 2022-2024 Wastewater System Performance Measures, the accompanying expected standards that are to be achieved and applicable points. The base points available are earned by achieving performance that meets the standard.

Table 13.2-1
Wastewater Service Quality Measures

	Index Measures	A Measure	B 2017-21 Standard	C 2022-24 Standard	D Points Avail.	E Points Bonus	F Points Total
1	**Water Quality/Environmental Index**				**45.00**	**4.50**	**49.50**
2	WELPI Factor	% below limits	28.0%	26.0%	22.5		
3	Environmental Incident Factor	# of Incidents	10	5	22.5		
4	**Customer Service Index**				**15.00**	**1.50**	**16.50**
5	H_2S – 1 Hour Exceedances Factor	# of exceedances	6	4	5.00		
6	H_2S – 24 Hour Exceedances Factor	# of exceedances	2	1	5.00		
7	Scrubber Uptime % Factor	% uptime	90%	96%	5.00		
8	**Reliability & Optimization Index**				**25.00**	**2.50**	**27.50**
9	Enhanced Primary Treatment Factor	% in use	80%	94%	8.33		
10	Bio-solids Inventory Reduction	Relative Reduction	1.10	1.05	8.33		
11	Energy Efficiency Factor	kWh/ML of effluent	534	508	8.33		
12	**Safety Index**				**15.00**	**1.50**	**16.50**
13	Near Miss Reporting Factor	# of Reports	220	220	3.75		
14	Worksite Inspections/Observations	# completed	919	919	3.75		
15	Lost Time Frequency Factor	Freq./exposure	0.75	0.75	3.75		
16	All Injury Frequency Factor	Freq./exposure	1.5	1.00	3.75		
17	**Total Point To Be Earned**				**100.00**	**10.00**	**110.00**

13.2.1 Water Quality and Environmental Index

464. The Water Quality and Environmental index is a composite measure intended to assess EWSI's impact on the environment through the quality of the wastewater effluent returned back to the North Saskatchewan River and the effectiveness of environmental management programs. This index is comprised of two equally weighed factors:

- Wastewater Effluent Limit Performance (Water Quality); and
- Environmental Incident Factor.

13.2.1.1 Wastewater Effluent Limit Performance

465. In the 2012-2016 PBR, EWSI first introduced a Wastewater Effluent Limit Performance Index (WELPI) as its water quality index measure and proposes to continue its use in the 2022-2024 term. The WELPI is intended to demonstrate the overall effectiveness of the wastewater

treatment processes. The index calculates a value that represents the percentage of the approval discharge limit for each parameter measured in the final effluent. Each value is given equal weighting in the calculation of the index. The WELPI has been established as an internal method to measure and track the quality of final effluent being returned to the North Saskatchewan River. There are five different discharge parameters monitored in the final effluent from Gold Bar as shown in Table 13.2.1.1-1 and each is included in the WELPI.

Table 13.2.1.1-1
Gold Bar WWTP Approval to Operate Discharge Parameters

	Parameter	A Unit	B Average Monthly Discharge Limit
1	Total Suspended Solids (TSS)	mg/L	20
2	Biochemical Oxygen Demand (BOD)	mg/L	20
3	E. coli (measured as the geometric mean)	Cfu/100 mL	126
4	Total Phosphorus	mg/L	1.0
5	Ammonia – Summer (June 1 – November 30)	mg/L	5
6	Ammonia – Winter (December 1 – May 31)	mg/L	10

466. The target value for this index is based on plant performance relative to the Alberta Environment discharge Approval-to-Operate limits. EWSI establishes more stringent internal targets as well. The WELPI targets reflect the percentage of the Approval to Operate limits that will be achieved at the Gold Bar WWTP final effluent concentrations. The annual WELPI is established by the following method for each year:

- For each parameter, the annual mean concentration is calculated from the 12 monthly average values[18].
- The target concentration values are then calculated as a percentage of the Approval to Operate discharge limit of each parameter.
- The overall annual WELPI target for the PBR period is calculated by taking the arithmetic mean of the percentage of discharge limit for all parameters.

467. The index calculation method also recognizes the inter-relationship among parameters. Often, certain parameters are affected in a similar way (e.g. increase in Total Suspended Solids produces increases in Total Phosphorus and E. coli values) while other parameters interact in opposing ways (e.g. reductions in Ammonia could result in increased Total Suspended Solids).

[18] Each monthly parameter limit is calculated as an arithmetic mean of each day's final effluent sample analysis for the parameter, except for *E. coli*. *E.coli* monthly discharge limit is based on the geometric mean. This is intended to reflect that microorganism concentrations in wastewater follow a log-normal distribution.

Thus, the index allows for some parameters to be over target as long as the parameters over target are compensated by other parameters being sufficiently below target. This requires plant operators to drive to the best possible treatment by balancing the overall quality of the effluent.

468. Testing of the discharge parameters is conducted in-house by EWSI. EWSI operates a wastewater quality laboratory that is approved by Alberta Environment and Parks and is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation (CALA). The water quality tests included in this index are done on daily composite final effluent samples discharged by Gold Bar WWTP to the North Saskatchewan River, with the exception of *E. coli* which is a daily grab sample.

469. This index is intended to describe the performance of the biological process during dry weather operation. On days during the PBR period where the secondary bypass and enhanced primary effluent are blending, WELPI will be based on final effluent water quality data and not the combined final effluent water quality data. Details of calculation for the final effluent water quality data, during such days, are included in the Gold Bar WWTP Operations Plan that is provided to AEP annually as part of the Approval to Operate.

470. Historically, Gold Bar WWTP has experienced only one final effluent violation for one parameter in the period from April 1994 to present. Effluent quality normally operates between 10% and 80% of each parameter. The WELPI calculation methodology adjusts these results to allow for more accurate comparison between parameters and to provide equal weighting of parameters in the index.

471. The historic WELPI results are detailed in Table 13.2.1.1-2. The results show excellent performance in meeting regulatory limits and the stricter EWSI internal limits.

Table 13.2.1.1-2
Wastewater Quality (WELPI) Factor

	A	B	C	D	E	F	G	H
		Prior to PBR			PBR #1 (2012-2016)		PBR #2 (2017-2021)	
	Year	%	Year	%	Year	%	Year	%
1	2002	n/a	2007	31.0%	2012	22.9%	2017	22.0%
2	2003	n/a	2008	25.0%	2013	20.7%	2018	27.2%
3	2004	n/a	2009	25.0%	2014	22.9%	2019	25.3%
4	2005	29.0%	2010	22.0%	2015	23.0%	2020	n/a
5	2006	30.0%	2011	28.0%	2016	17.5%	2021	n/a
6	Average	29.5%	Average	26.2%	Average	21.4%	Average	24.8%
7	Standard	n/a	Standard	n/a	Standard	46.0%	Standard	28.0%
8	**10 Year Average**							**23.2%**

472. For the 2022-2024 PBR, EWSI is proposing to set the WELPI standard at 26.0%. This target demonstrates increasing levels of performance over past standards while recognizing that continued improvements in plant operations become more difficult to achieve due to factors outside of EWSI's control. Specifically, increases in wastewater strength, which are directly proportional to population growth, lead to increasing challenges in maintaining historic WELPI performance. There is also a lot of year to year variability, as seen in past performance data, which is influenced by weather. As a result, EWSI is proposing a target below the 10 year average.

13.2.1.2 Environment Incidents Factor

473. EWSI is committed to improvement in environmental performance and to reducing the number of incidents that are **reportable** to the provincial or federal regulator and that were considered **preventable**. The Environmental Incident Factor tracks those incidents that are deemed to have been both preventable and reportable.

474. Reportable incidents are determined as per the Guidance Document for Reportable Environment and Public Health Incidents for EPCOR Water Canada Facilities – April 6, 2015. This includes:

- contraventions of a facility regulatory approval/permit/code of practice;
- any contravention of any Federal or Provincial Act, Regulation or Municipal Bylaw or statute;
- a spill or release (including untreated or partially treated wastewater) of material to the environment that is not fully contained;

- a release of chlorinated water (potable or superchlorinated) directly into a watercourse; and
- water main breaks that cause natural area site erosion, sediment transport or habitat destruction.

475. Preventable incidents are those incidents that involve a failure to meet performance limits, or failure to take reasonable measures to prevent an incident. Examples are incidents involving:

- administrative contravention (missed or failed tests, failure to report on time or meet an administrative requirement);
- failure to follow procedure;
- inadequate or no procedure;
- equipment failure;
- lack of training/awareness; and
- lack of appropriate change management.

476. Non-preventable incidents are those incidents where the root cause is not within EWSI's control. Examples include:

- incidents caused by extreme weather events;
- incidents cause by 3rd parties (members of the public, organizations not contracted by EWSI); and
- incidents where root cause is related to 3rd party's infrastructure.

477. A **preventable reportable** incident is one that is both reportable and preventable according to the above criteria. It is a government reportable incident that could have been prevented if reasonable diligence had been exercised by EWSI. If it can be demonstrated that EWSI took all reasonable measures to prevent the incident from occurring, the incident will not be considered preventable. Mitigating circumstances and external factors (i.e. unpredictable equipment failure, unusual weather conditions, the actions of external parties that are not controllable by EWSI) will be considered in determining if the incident was preventable.

478. Given the nature and complexity of EWSI's operations, some level of reportable incidents that are determined to be preventable do occur and will likely continue to occur. EWSI is committed to reducing the frequency of these incidents in the long term. The historical results for preventable recordable environmental incidents are detailed in Table 13.2.1.2-1.

Table 13.2.1.2-1
Environmental Incident Results

	A	B	C	D
	PBR #1 (2012-2016)		**PBR #2 (2017-2021)**	
	Year	**# of Incidents**	**Year**	**# of Incidents**
1	2012	7	2017	3
2	2013	8	2018	2
3	2014	6	2019	3
4	2015	4	2020	n/a
5	2016	4	2021	n/a
6	Average	6	Average	3
7	Standard	18	Standard	10
8	**8 Year Average**			**5**

479. In establishing a standard for environmental incidents, it has been determined that the number of incidents at any particular utility is highly dependent upon that utility's operational parameters and procedures, complexity of the operation, regulatory approval requirements and other factors. This makes it difficult to compare performance of other utilities to EWSI operations. Therefore, an external benchmark for this metric has not been determined. For the 2022-2024 PBR term, EWSI is proposing to set the performance standard for the Environmental Incident Factor at 5 incidents per year. This number of incidents is based on the 8 year average of historic performance and demonstrates a continued increase in performance.

13.2.2 Customer Service Index

480. Gold Bar WWTP is an operational site that, by its nature, has little direct interaction with the public. The interaction that does occur is typically with the immediate surrounding community. The majority of these customer service interactions, particularly those initiated by customers, involve concerns regarding odours. In 2017-2021 PBR, EWSI introduced formal odour metrics as odours represent the highest impacted customers' perception of satisfaction. EWSI is proposing to maintain these measures for the 2022-2024 term. The Customer Service Index is comprised of three equally weighed factors:

- Number of H_2S Exceedances – for 1 hour exceedances;
- Number of H_2S Exceedances – for 24 hour exceedances; and
- Scrubbers Uptime.

13.2.2.1 Number of H_2S Exceedances at Gold Bar WWTP and Beverly Air Quality Monitoring (AQM) Stations Factor

481. The main contributor to the odour generation at Gold Bar WWTP is Hydrogen Sulfide (H_2S) which is produced by biological activity in wastewater (sewage). The long travel time in the collection system to the plant (which is even longer during dry weather) can cause the wastewater to be septic and extremely odorous on arrival at the plant. Keeping odours under control is a challenge for staff at Gold Bar WWTP, as millions of litres of wastewater are treated every day.

482. Customers around Gold Bar WWTP occasionally notice presence of H_2S odours and register a complaint through a complaint phone in line. Hydrogen Sulfide has a very low threshold for odour detection. Alberta Ambient Air Quality Objectives (AAAQO) for H_2S are based on the odour threshold and are 10 ppb (parts per billion) for hourly average and 3 ppb for a 24-hour average.

483. EWSI is an active member of Strathcona Industrial Association (SIA), an organization of local major industries dedicated to addressing common concerns like air quality. Membership in the SIA provides EWSI with access to the association's network of air quality monitoring (AQM) stations. Two of the stations are located in proximity of Gold Bar WWTP (each is approximately 1 km away):

- Gold Bar WWTP Monitoring Station: 105 A Avenue and 47 Street; and
- Beverly Monitoring Station: 114 Avenue and 38 Street.

484. The data from all AQM stations is managed by SIA and is reviewed regularly. In case of an exceedance to AAAQO, AEP is notified and provided with seven day letter report. Data from these AQM sites is available directly to the public through both the SIA and EPCOR websites.

485. The number of exceedances is calculated by counting the number of hourly average H_2S values above 10 ppb for 1 hour exceedances and number of daily average values above 3 ppb for 24 hour exceedances. Table 13.2.2.1-1 provides the number of 1 hour H_2S exceedances to the AAAQO during 2011 to 2019. Table 13.2.2.1-2 provides the number of 24 hour exceedances:

Table 13.2.2.1-1
Number of 1 Hour H_2S Exceedances at AQM Stations

	A	B	C	D	E	F	G	H	I	J	K	L
									PBR #2 (2017-2021)			
	Year	Gold Bar	Beverly	Avg*	Year	Gold Bar	Beverly	Avg*	Year	Gold Bar	Beverly	Avg*
1	2007	n/a	n/a	n/a	2012	1	6	4	2017	0	1	1
2	2008	n/a	n/a	n/a	2013	1	7	4	2018	0	2	1
3	2009	n/a	n/a	n/a	2014	1	7	4	2019	0	0	1
4	2010	n/a	n/a	n/a	2015	8	35	22	2020	n/a	n/a	n/a
5	2011	9	5	7	2016	2	6	4	2021	n/a	n/a	n/a
6	Avg*	9	5	7	Avg*	3	12	8	Avg*	0	2	1
7	Adj.Avg*	n/a	n/a	n/a	Adj.Avg*	3	7	5	Adj.Avg*	n/a	n/a	n/a
8	Standard	n/a	n/a	n/a	Standard	n/a	n/a	n/a	Standard	n/a	n/a	6
9	**9 Year Average**											4

* All averages have been rounded upward in order to recognize that a partial result is not possible.

* The adjusted average normalizes for the 35 one hour exceedances at the Beverly station in 2015. For the adjusted average, the 35 value has been replaced with seven, which is the highest value to that date. This was done in order to establish a standard that was not unreasonable high.

Table 13.2.2.1-2
Number of 24 Hour H_2S Exceedances at AQM Stations

	A	B	C	D	E	F	G	H	I	J	K	L
									PBR #2 (2017-2021)			
	Year	Gold Bar	Beverly	Average*	Year	Gold Bar	Beverly	Average*	Year	Gold Bar	Beverly	Average*
1	2007	n/a	n/a	n/a	2012	1	0	1	2017	0	0	0
2	2008	n/a	n/a	n/a	2013	0	2	2	2018	0	0	0
3	2009	n/a	n/a	n/a	2014	0	2	2	2019	0	0	0
4	2010	n/a	n/a	n/a	2015	1	7	4	2020	n/a	n/a	n/a
5	2011	1	0	1	2016	0	0	0	2021	n/a	n/a	n/a
6	Average*	1	0	1	Average*	1	2	2	Average*	0	0	0
7	Standard	n/a	n/a	n/a	Standard	n/a	n/a	n/a	Standard	n/a	n/a	2
8	**9 Year Average**											1

* All averages have been rounded upward in order to recognize that a partial result is not possible.

486. For the 2022-2024 PBR term, EWSI is proposing to maintain metrics for both one hour exceedances and 24 hour exceedances. The proposed standard for these measures is the adjusted average of the past nine years' results, or an average of 4 exceedances per year for one hour exceedances, and an average of 1 exceedances per year for 24 hour exceedances.

487. It is noted that while exceedances can reflect the odour control performance of Gold Bar WWTP, there is a possibility that H_2S could be exceeded due to a release from an industrial facility site or from the Drainage system. Any exceedance of the limits will consider the wind direction during the time of an exceedance in order to ascertain its source. If the wind direction during the exceedance is coming from Gold Bar WWTP, the plant H_2S monitors, as well as the Envirosuite air quality model will be used to assess if the AQM exceedance could be attributable to EPCOR.

488. A new AQM station is being constructed immediately South of the fence line at Gold Bar WWTP. The existing SIA Gold Bar AQM station is approximately one kilometer away. This new station is required as part of the AEP approval. It has not been determined whether it will become part of the SIA air quality monitoring network. It is also uncertain how often it will detect H_2S originating from Gold Bar WWTP due to its very close proximity. It is proposed that for the 2022-2024 PBR period, EPCOR closely monitors the station, but not include it in the metric.

13.2.2.2 Scrubbers Uptime (%) Factor

489. Gold Bar WWTP has four wet scrubbing towers equipped with large exhaust fans to collect and treat odourous air from plant zones known to be malodourous. Scrubber fans draw the foul air back from the headspace under the covers and from the enclosed buildings and up through the scrubbing towers. Travelling upward through a plastic media, the foul air is sprayed from above with a solution of sodium hypochlorite (16%) and sodium hydroxide (50%). Hydrogen sulfide and some other offending odour constituents are scrubbed from the air, producing a cleaner air that is released through the scrubber stack. The following are the four wet scrubbers:

- East Scrubber: Treats foul air from Grit tanks 1, 2 and 3; Primary clarifiers 1, 2, 3 and 4; and Primary effluent channels;
- EPT scrubber: Treats foul air from Enhanced Primary Treatment building;
- West scrubber: Treats foul air from Grit tanks 6 and 7; Primary clarifiers 5, 6, 7 and 8; East and West primary influent channel; and
- Fermenter scrubber: Treats foul air from the gas space of fermenters 1, 2, 3 and 4; and Grit tanks 4 and 5.

490. Performance of scrubbers has direct impact on presence of H_2S at site as well as outside the fence line. Un-scrubbed air through the stack can lead to odour complaints or exceedance of H_2S AAAQO at the Beverly or Gold Bar WWTP AQM stations

491. In the 2017-2021 PBR, EWSI introduced a scrubber uptime metric that assesses the percentage of time the scrubbers are operational. This metric is proposed to be maintained for the 2022-2024 term. A scrubber is considered online when both the exhaust fans and the chemical feed pumps are in operation (running). A scrubber is considered offline when either the blower or the related chemical feed pump is offline for more than an hour. Scrubber offline hours also include any downtime due to capital upgrades. The scrubber uptime metric assesses the number of uptime hours as a percentage of the total hours in a year. The uptime hours are determined by the total hours in a year less the total scrubber offline hours – which is the total of all four scrubber offline hours for any period greater than one hour offline.

492. As there was no historic record for this metric, EWSI established the standard at 90% for the 2017-2021 PBR term. The actual results achieved during that term are detailed in Table 13.2.2.2-1.

Table 13.2.2.2-1
Scrubber Uptime Factor

	A	B
	PBR #2 (2017-2021)	
	Year	**%#**
1	2017	97.4%
2	2018	90.8%
3	2019	98.8%
4	2020	n/a
5	2021	n/a
6	Standard	90.0%
7	**3 Year Average**	**95.7%**

493. For the 2022-2024 PBR term, EWSI is proposing to set the standard at 96% which is approximately the average of the last three years of actual performance. This represents a considerable increase in the performance from the previous PBR term.

13.2.3 System Reliability and Optimization Index

494. The system reliability and optimization index is a measure of the confidence that customers can place in the reliability of the wastewater system and the degree to which those systems are optimized to lessen their impact on the environment. This index is comprised of three equally weighed factors:

- Enhanced Primary Treatment;
- Bio-solids Inventory Reduction; and

- Energy Efficiency Index.

9.1.1.1 Enhanced Primary Treatment Factor

495. EWSI introduced an Enhanced Primary Treatment (EPT) Runtime Index as its system reliability measure in the 2012-2016 PBR and is proposing to maintain the measure in the 2022-2024 term. The EPT facility at Gold Bar WWTP operates during wet weather and snowmelt runoff events when flows exceed the maximum secondary treatment capacity of Gold Bar WWTP's main treatment facilities. When this occurs, the EPT Facility is activated and is intended to operate continuously during these events.

496. The EPT Runtime Index measures the ratio of the amount of time that the EPT facility runs during an EPT Event relative to the EPT Event duration. An EPT Event is defined as a continuous period of time when total influent flows exceed the EPT Event Flow Threshold. The EPT Event Flow Threshold is defined as 420 ML/day. The EPT-CED is the Cumulative Event Duration of all EPT Events within a specified reporting period. The duration of each EPT Event is calculated as the total time, measured in hours, that the influent flow rate was in excess of the EPT Event Threshold.

497. The EPT-CRT is the Cumulative Run Time of the EPT facility during EPT Events within a specified reporting period. The Run Time is defined as the total time, measured in hours that the EPT Facility was actually operating during each EPT Event. The EPT Facility is defined to be operating when influent flow is being directed through the EPT Facility during an EPT Event.

498. The results for the Enhanced Primary Treatment factor are detailed in Table 13.2.3.1-1.

Table 13.2.3.1-1
Enhanced Primary Treatment Factor

	A	B	C	D
	PBR #1 (2012-2016)		**PBR #2 (2017-2021)**	
	Year	**Measure**	**Year**	**Measure**
1	2012	91.8%	2017	100.0%
2	2013	89.2%	2018	98.7%
3	2014	84.3%	2019	100.0%
4	2015	89.0%	2020	n/a
5	2016	100.0%	2021	n/a
6	Average	90.9%	Average	99.6%
7	Standard	75.0%	Standard	80.0%
8	**8 Year Average**			**94.1%**

499. As the EPT facility at Gold Bar WWTP was new when the standards for the 2012-2016 PBR were established, no historical data or external industry benchmark data was available. As a result, EWSI proposed a target EPT Runtime of 75% for the 2012-2016 PBR period and then increased that to 80% for the 2017-2021 term based on actual performance that exceeded the standard by a considerable amount. For the 2022-2024 PBR, EWSI is proposing to establish the Enhanced Primary Treatment standard at 94% which is based on the 8 year average of historic performance. This performance level demonstrated increasing level of performance over successive PBR terms.

13.2.3.1 Bio-solids Inventory Reduction Factor

500. During the current PBR term, the responsibility for and management of Bio-solids was transferred from Drainage Services to Gold Bar WWTP within EWSI in order to align processes and drive efficiencies. Drainage will continue to report the Bio-solids Inventory Measure as part of their metrics reporting until the end of 2021 as formal inclusion in Gold Bar WWTP's reporting would have necessitated a bylaw amendment. Commencing in the 2022-2024 PBR term, the Bio-solids Inventory Reduction metric will formally become part of the Gold Bar WWTP performance metrics program.

501. The Bio-solid Inventory reduction metric provides a measure of the bio-solids inventory (dry tonnes) in the Clover Bar lagoons. Bio-solids are the nutrient-rich organic by-product of domestic wastewater treatment that contains essential plant nutrients and organic matter. When the bio-solids beneficial reused amount is greater than the amount of bio-solids generated, stored bio-solids are removed from the Clover Bar lagoons, which helps to reduce potential impacts on the environment.

502. This measure reflects EWSI's commitment to reducing its impact on water, land, and air through continuous improvement toward minimizing pollutants and contaminants. It also demonstrates efforts to protect the health of our people and our ecosystem and ensure the landscape in which we live can be enjoyed by all members of our community. The measure is also reflective of the efforts to improve odour control by increasing the tonnes of bio-solids that are beneficially disposed each year and reducing bio-solids stored in lagoons. EWSI remains committed to maintaining environmental leadership through innovative improvements to environmental programs.

503. The historic Bio-solids Inventory Reduction metric was determined by the net change in actual dry tonnes of bio-solids (dry tonnes out less dry tonnes in) divided by the total bio-solids

inventory. “Dry tonnes in” means the dry tonnes of bio-solids contained in sludge transfers from the Gold Bar WWTP and Capital Region wastewater treatment facilities to the sludge storage lagoons at the Clover Bar Bio-solids Recycling Facility. “Dry tonnes out” means, the dry tonnes of bio-solids transferred from the sludge storage lagoons at the Clover Bar Bio-solids Recycling Facility to compost or land application programs. The accuracy of the total bio-solids inventory has been questioned, so the validity of this approach to determining the metric has not been confirmed.

504. Commencing in 2020, EWSI changed the metric calculation to assess relative tonne reduction relative to the inflow. That is, the Bio-solids Inventory Reduction metric would be determined based on the ratio of dry tonnes out to dry tonnes in. The change in calculation method, while based on the same data set, is seen as providing a more informative perspective on the level of reduction as it takes into account the level of inflows.

505. The historic performance of the Bio-solids Inventory Reduction on a relative basis is summarized in Table 13.2.3.2-1 below

Table 13.2.3.2-1
Bio-Solids Inventory Reduction

	A **Year**	B **Total Dry Tonnes Out (From Lagoons)**	C **Total Dry Tonnes In (To Lagoons)**	D **Out vs In Ratio**
1	2014	28,165	23,097	1.22
2	2015	37,670	22,641	1.66
3	2016	34,784	24,301	1.43
4	2017	33,417	25,726	1.30
5	2018	27,184	25,785	1.05
6	2019	28,202	27,412	1.03
7	**6 Year Average**			1.28

1. For the 2022-2024 PBR Term, EWSI is proposing to set the performance standard for the Bio-solids Reduction metric at 1.05. Performance will be based on the average of the current year and the prior 2 years in order to compensate for year over year variability. Through this approach, a standard of 1.05 can be set rather than the higher 6 year average of historic performance. This is seen as a higher overall level of performance. Actual performance will be measured based on the 3 year rolling average of the current year and the prior two years. A rolling average will provide a degree of smoothing to the variability that that occurs in year over year results that is beyond EWSI’s control.

13.2.3.2 Energy Efficiency Factor (kWh/ML)

506. Gold Bar WWTP uses about 48 million kWh of electricity every year. Over 70% is consumed in the bioreactors, UV disinfection, and membrane filtration process. Although Gold Bar WWTP does not have control over the amount of wastewater coming to the plant, it is the operational strategy that determines whether energy is efficiently used to achieve the same level of treatment. Lower energy usage while ensuring high quality treated effluent helps minimize Gold Bar WWTP's environmental footprint. In order to drive improvements in optimizing energy consumption and process operational strategy at Gold Bar WWTP as well as to align with City of Edmonton goals, EWSI introduced an energy efficiency metric for the 2017-2021 PBR term.

507. This metric is proposed to be maintained in the 2022-2024 term. This metric assesses the energy used per million-litre (ML) of treated wastewater and will determine energy consumption per both UV treated effluent and membrane plant effluent. Table 13.2.3.3-1 details the historic results of the energy efficiency metric.

Table 13.2.3.3-1
Historic Energy Efficiency

	A	B	C	D	E	F
					PBR#2 2017-2021 PBR	
	Year	**#**	**Year**	**#**	**Year**	**#**
1	n/a	n/a	2012	515	2017	497
2	n/a	n/a	2013	499	2018	504
3	n/a	n/a	2014	515	2019	500
4	n/a	n/a	2015	507	2020	n/a
5	2011	534	2016	504	2021	n/a
6	Average	534	Average	508	Average	500
7	Standard	n/a	Standard	n/a	Standard	514
8	**9 Year Average**					**508**

508. EWSI is proposing to establish the Energy Efficiency standard at 508kWh/ML for the 2022-2024 PBR, or the historic average of the past 9 years. This level demonstrates continued improved performance while recognizing the requirement for continued high levels of diligence in the operations strategy to manage energy utilization.

13.2.4 Safety Index

509. EPCOR and EWSI are committed to a safe, healthy lifestyle and demonstrate this through care and concern for people. Both believe that safety, quality, and productivity are mutually

dependent and when diligently managed will provide challenging and satisfying work experiences in a safe and healthy environment. In order to fulfill this commitment EPCOR has established its Health, Safety and Environment (HSE) Policy that applies to all staff. The Policy is as follows:

Health, Safety and Environment (HSE) Policy

510. Getting home safely and protecting the environment are responsibilities we all share. There is nothing more important than the health and safety of our employees, contractors and the general public.

511. Everyone is expected to understand, promote and support the implementation of this policy. We must deliver on our commitments.

512. We Believe

- All injuries are preventable.
- Everyone has the right to work in a safe workplace.
- All employees and contractors are accountable for working safely and in an environmentally responsible manner.
- Health, safety and environmental aspects must be considered when establishing processes.
- Employee involvement, training and communication are essential to achieve health and safety excellence.

513. Our Commitments

- Sustain an effective HSE management system and promote a positive culture to prevent all injuries and work related illnesses.
- Reduce pollution and minimize harm to the environment.
- Meet or exceed all applicable legal requirements, industry standards and societal expectations.
- Set objectives and targets to continually improve HSE management and performance.
- Provide timely and effective training, resources and equipment.
- Identify hazards, evaluate risks and ensure controls are in place.
- Learn from our incidents and apply corrective actions to prevent reoccurrence.
- Involve employees to improve health and safety performance.

- Measure and share our HSE performance.

EWSI Safety Initiatives

514. In keeping with the EPCOR HSE policy, EWSI believes all incidents are preventable and that safety is a responsibility shared by everyone. In order to achieve a workplace free of occupational injury and illness, all EWSI employees and contractors have an obligation to take responsibility, intervene in unsafe or non-compliant situations, seek to identify and address safety hazards and environmental aspects before they can cause harm, and learn from the incidents that occur. EWSI's overarching goal is to focus on safety awareness and training for all employees and contractors and to achieve a zero injury workplace.

515. Some of the initiatives intended to support and achieve this goal include the following:

- continuous monitoring and analysis of safety incidents;
- root cause analysis teams (RCAT) for serious incidents;
- near miss reporting;
- department specific health and safety plans;
- health and safety summits and seminars;
- safety surveys with accompanying action plans;
- safety recognition programs; and
- safety culture programs.

Performance Measures

516. For the 2022-2024 PBR term, EWSI is proposing to have common safety measures across the Water, Wastewater and Drainage business units in order to drive consistency in approach and comparability of results. The proposed Safety Index be comprised of the following four equally weighted factors:

- Near Miss Reporting;
- Worksite Inspections/Observations;
- Lost Time Frequency (LTIF) Rate; and
- All Injury Frequency (AIF) Rate.

517. The proposed safety measures includes both leading and lagging indicators as a combination provides the broadest assessment of safety programs. Lagging indicators (LTIF and

AIF) measure incidents in the form of past accident statistics and assess the overall effectiveness of safety programs. The major drawback to these indicators is that they are a poor gauge for assessing prevention programs. Leading indicators (near miss reporting and worksite inspections/observations) are measures intended to prevent future incidents. Leading indicators are focused on future safety performance and continuous improvement. These measures are proactive in nature and report what employees are doing on a regular basis to prevent injuries. Industry safety statistics indicate that increasing performance on leading indicators should have an inverse relationship to lagging indicators. That is, higher levels of injury prevention should lead to a corresponding decrease in actual incidents.

13.2.4.1 Near Miss Reporting Factor

518. A **near miss** is an unplanned event, unsafe condition or unsafe action that did not result in contact, injury, illness, or damage, but had the potential to do so. The contact, injury, fatality or damage was only prevented by a fortunate break in the chain of events surrounding the event. An "Unsafe Condition" is any condition in the work place that is likely to cause injury or property damage. An "Unsafe Act" is any performance of a task or other activity that is conducted in a manner that may threaten the health and/or safety of workers.

519. The rationale for including Near Miss Reporting is that most safety activities are reactive rather than proactive. Unfortunately, many organizations wait for losses to occur before taking steps to correct the underlying problem and prevent a recurrence. Near miss events often precede actual loss producing incidents but are largely ignored because no contact, injury, damage or loss occurred. By formally identifying near misses, organizations have been able to develop mitigations and employee awareness programs that have reduced the overall safety incident rates. Near-misses are also an indicator of culture. As employees learn to look for unsafe acts/conditions and act on them, they become more aware of unsafe conditions and eventually safety becomes a way of life, on and off the job.

520. EWSI has developed a formal near miss reporting program including an automated reporting process available to all staff. This metric was first introduced in the 2017-2021 PBR term and since there was not a historic track record upon which base the standard. As a result, the annual target was based on an average of each employee reporting 1.25 near misses annually or 220 near misses reported per year. The actual performance since that time, as outlined in Table 13.2.4.1-1, is above the level.

Table 13.2.4.1-1
Near Miss Reporting

	A	B
	PBR #2 (2017-2021)	
	Year	**#**
1	2017	327
2	2018	241
3	2019	241
4	Standard	220
5	**3 Year Average**	**270**

521. For the 2022-2024 PBR, EWSI is proposing to establish the near miss reporting target at 220, the same standard as per the previous PBR term. While historic results are above this level, EWSI has found that the quality of the near miss reporting is more important than the number. In this respect, quality refers to the identification of issues and concerns that are actionable and lead to tangible change. Higher level targets can lead to items that are reported to meet a target rather than achieve the expected outcomes. EWSI is focused on ensuring that all near miss are aligned with the intended objectives of the metric.

13.2.4.2 Worksite Inspections and Observations Factor

522. Worksite inspections and observations are intended to prevent occupational injury, illness, environmental incident or property damage. Effective worksite inspections assist in maintaining safe working conditions and the removal of any potential hazards that arise in the workplace. EWSI's worksite inspection programme ensures that comprehensive inspections are conducted throughout the work environment including buildings, structures, grounds, excavations, tools, equipment, machinery, work methods and practices both in the field and office environments.

523. Worksite inspections and observations are conducted by specific individuals or as a group. Group participants may include: area worker; area supervisor, specialists (e.g. HSE Advisors, fire system technician, engineer, hygienist, work methods specialist, etc.), and whenever feasible, include a worker health and safety representative. Inspections are physically observed actions on worksites, while observations are behaviour based observations, i.e. how the work is done.

524. The following can be taken into consideration when planning to perform a workplace inspection:

- recent incidents;
- recent procedural changes;
- insurance, fire or other agency reports;
- recent workplace inspection reports (trends);
- items of concern brought up at an HSE meeting; and
- recent changes (new equipment or personal protective equipment (PPE)).

525. All work site inspections are completed and then submitted to the appropriate foreman. Each foreman then submits them to the Advisor, Health and Safety in order to ensure that observations and learnings from one site can be transferred to others areas. All work site report deficiencies are entered into our work request system and assigned to the appropriate group to resolve. The observations are entered directly into the "Workplace Observation Online Tool" by the observer. Any corrective action is then documented, assigned and followed through to completion by the respective area.

526. The actual results of the Worksite Inspection and Observations metrics are detailed in Table 13.2.4.2-1.

Table 13.2.4.2-1
Worksite Inspection and Observations

	A	B	C	D
	PBR #1 (2012-2016)		**PBR #2 (2017-2021)**	
	Year	**#**	**Year**	**#**
1	2012	960	2017	1,088
2	2013	685	2018	971
3	2014	908	2019	1,061
4	2015	1,121	2020	n/a
5	2016	1,121	2021	n/a
6	Average	959	Average	1040
7	Standard	270	Standard	919
8	**8 Year Average**			**919**

527. For the 2022-2024 PBR term, EWSI is proposing to establish the Worksite Inspection and Observations standard at 919 or the same standard as the previous PBR term. As with near miss reporting, EWSI has found that the quality of the inspections/observations is more important than the number. In this respect, quality refers to the identification of issues and concerns that are actionable and lead to tangible change. Higher level targets can lead to items that are reported to meet a target rather than achieve the expected outcomes. EWSI is focused on

ensuring that all observations and inspections reported are aligned with the intended objectives of the metric.

13.2.4.3 Lost Time Frequency Factor and Injury Frequency Rate Factor

528. Both of these measures have a standardized reporting protocol that is defined within the Canadian Electrical Association's CEA 1-2 Standard for Recording and Measuring Occupational Injury/Illness Experience and Transportation Incidents. Use of this protocol, while ensuring consistent reporting, also enables EWSI to compare itself against the other business units within EPCOR, and peer utilities. It is noted that the results are not always specifically comparable given the differences between water/wastewater business and electricity focused businesses. The CEA has noted that their standards are consistent with recognized external standards including:

- U.S. Occupational Safety and Health Administration (OSHA) 29 CFR Part 1904, Occupational Injury and Illness Recording and Reporting Requirements: Final Rule; and
- CSA Z795, Coding of Work Injury or Disease Information.

529. In order to clearly define lost time, EWSI has adopted the guidelines developed by the CEA criteria where incidents are separated into four categories:

- Near Miss – an undesired event that could have resulted in a work-related injury, damage, loss of production, etc. The accident did not occur.
- First Aid – simple care of an injury that was taken care of onsite without the help of a medical professional. In the case where the employee went to see a physician, treatment was something that did not require professional training.
- Medical Aid – medical treatment of an injury that could not be performed by a first-aid trained employee. Examples include stitches, casting of broken bones, ordering prescriptions. The employee is able to return to work for their next shift.
- Lost Time – employee cannot return to work for their next shift due to an injury.

530. Each measure is also determined based on Exposure Hours which are defined as the total number of hours employees are exposed to the work site.

531. These indicators vary from year to year depending on the number and nature or occurrences/incidents. EPCOR aims to reduce these indicators by promoting safe behaviours in order to minimize the risk of occurrence of severe incidents. The specific of each of these measures are further defined in the respective sections below.

532. The Lost Time Frequency factor is a measure of the effectiveness of EWSI's safety programs as related to disability injuries and illnesses. It measures the frequency or number of lost time injuries per hours of exposure. The historic results for the Lost Time Frequency Rate are detailed in Table 13.2.4.3-1.

Table 13.2.4.3-1
Lost Time Frequency Rate

	A	B	C	D
	PBR #1 (2012-2016)		**PBR #2 (2017-2021)**	
	Year	**Measure**	**Year**	**Measure**
1	2012	0.00	2017	0.00
2	2013	0.00	2018	0.00
3	2014	0.00	2019	0.00
4	2015	0.00	2020	n/a
5	2016	0.00	2021	n/a
6	Average	0.00	Average	0.00
7	Standard	0.81	Standard	0.75
8	**8 Year Average**			**0.00**

533. For the 2022 to 2024 PBR term, EWSI is proposing to maintain the Lost Time Frequency standard at 0.75 which is approximately what one lost time injury per 200,000 exposure hours would equate to over a calendar year based on the average exposure over the past few years. EWSI has achieved a level of performance higher than this over the past several years but recognizes that it may not be sustainable over the longer term, despite best efforts.

534. The Injury Frequency Rate is a measure of the frequency of disabling injuries and medical aid injuries per unit of exposure. The measure is based on the total number of fatalities (EWSI has never had a workplace fatality) and Lost Time injuries plus the number of medical treatment injuries per 200,000 hours of exposure. The historic results for the Injury Frequency Rate are detailed in Table 13.2.4.3-2.

Table 13.2.4.3-2
Injury Frequency Rate Results

	A	B	C	D
	PBR #1 (2012-2016)		**PBR #2 (2017-2021)**	
	Year	**Measure**	**Year**	**Measure**
1	2012	0.82	2017	1.92
2	2013	0.00	2018	0.00
3	2014	0.00	2019	0.63
4	2015	0.71	2020	n/a
5	2016	0.71	2021	n/a
6	Average	0.45	Average	0.85
7	Standard	2.42	Standard	1.50
8	**8 Year Average**			**0.60**

535. For the 2017 to 2021 PBR term, EWSI set the Injury Frequency Rate standard at 1.50 which is approximately what two injuries per 200,000 exposure hours would equal over a calendar year based on the average exposure over the past few years. For 2022-24, EWSI is proposing to reduce the standard to 1.00. This level represents EPCOR's corporate commitment to health and safety for all employees as a top performing employer.