

Water and Wastewater Linear Infrastructure

2024 Off-site Levies

Bylaw Review Whitepaper
September 18, 2023



Introduction

The purpose of this document is to provide background information on the infrastructure, benefit methodology and levy rate calculation being used to support the water and wastewater linear infrastructure portion of the 2024 Off-site Levies Bylaw. Water and wastewater linear infrastructure includes:

- Water feeder mains.
- Wastewater trunks.
- Pump stations.
- Lift stations.
- Reservoirs.
- Other capital projects needed to serve growth.

The preliminary linear levy rate is \$150,636 per hectare. Once approved, this levy rate is anticipated to be updated periodically through bylaw amendments to reflect changes to any inputs, including new infrastructure, capital cost estimates, interest rates, land inventory and discount rates.

This paper sets out:

1. The capital cost of the infrastructure needed to support growth.
2. The benefit allocation, or degree (expressed as a percentage) to which that infrastructure will benefit different areas, and growth assumptions.
3. The levy rate calculation.

Infrastructure

Linear infrastructure provides an important connection between residents and businesses to water and wastewater plants. The costs of the following type of linear infrastructure are included in the levy:

- **Water feeder mains** convey safe, high-quality drinking water to residents and businesses from water treatment plants. Water feeder mains 500 millimetres or larger in size are included in the off-site levy. This includes feeder main extensions, extending a new feeder main from the current water distribution network to serve new lands, and feeder main upgrades, which increases the size of existing feeder mains to increase water transfer capacity.
- **Wastewater trunks** collect wastewater from residents and businesses and convey it to wastewater treatment plants. Wastewater trunks 600 millimetres or larger in size are included in the off-site levy. This includes trunk extensions, extending a new trunk from the current wastewater collection network to serve new lands, and trunk upgrades, which increases the size of existing trunks to increase wastewater transfer capacity.
- **Pump stations** pump potable water to residents and businesses. Pumping is required to deliver water at appropriate service pressures.
- **Lift stations** pump wastewater to wastewater treatment plants. While the majority of wastewater is gravity fed, some lift stations are required where gravity flow is not possible, such as river crossings and low-lying areas.
- **Reservoirs** provide storage for potable water. It acts as a buffer for high water demand periods and ensures water is always available for residents, businesses and for fire protection.
- **Other infrastructure** includes any capital projects required to serve a growing city. An example would be a relocation of a meter chamber so new growth can utilize an existing feeder main.

Rationale for Infrastructure Inclusion

Linear infrastructure operates as an integrated network across the city. The network approach provides redundancy in the event of an unforeseen service disruption, such as a feedermain failure. Therefore, the off-site levy for linear infrastructure is charged as a citywide rate.

The need for linear infrastructure extensions is often identified in an Area Structure Plan (ASP), while linear infrastructure upgrade requirements are informed through water and wastewater long-range plans, engineering studies, and continuous monitoring of the water distribution and wastewater collection networks to identify any capacity constraints.

The City builds linear infrastructure that services lands approved for growth. Planned infrastructure necessary to serve approved lands, that is expected to be initiated by 2026, has been included in the 2024 Off-site Levies Bylaw. Any planned infrastructure necessary to service approved lands and/or unapproved lands triggered after 2027 has been excluded. This infrastructure is anticipated to be included in the off-site levy through future bylaw amendments.

Infrastructure Costs

Linear infrastructure cost estimates were developed by engineering consultants. Project costs are refined over time as the scope of each project is defined and the timing of the project is confirmed. Projects are at different stages of development and design, and cost estimates range from Class 5 (order of magnitude) for a project that has been identified but with very limited information, to Class 1 for a project in its final, pre-tender design. The latest information for each project is used in the off-site levy. Estimated costs assume infrastructure is delivered through design-build contracts administered by The City.

Growth Assumptions and Allocation of Benefit

The calculations for the off-site levy rate assumes that all lands approved for growth will be developed in the future. A land absorption forecast provided by The City of Calgary Corporate Economics is used to calculate the off-site levy. The forecast looks at various historic trends and current market conditions to predict land absorption rates in the future.

Each capital project has expenditures allocated to growth, maintenance, regulatory compliance and service improvements. Only the growth component is considered in the off-site levy. The benefit for growth is further divided for each project, and is allocated between the Greenfield Area, Established Area and the region. Greenfield's portion is paid through the off-site levy, Established Area's portion is paid through utility rates and the region's portion is paid through service agreements with surrounding municipalities.

Each individual project is assessed to determine how many residents and businesses currently benefit from the specific project, and a population forecast estimates how many residents and businesses will benefit from the specific project when the benefiting lands are ultimately built out. The allocation of costs between the Greenfield Area, Established Area and the region is determined based on where the growth is anticipated to occur.

Levy Rate Calculation

The levy rate calculations and supporting data are available in the *Water Linear Infrastructure Levy Rate Model 2024 Off-site Levies Bylaw*. Linear infrastructure is debt financed. Principal and interest payments are determined when the debt is taken, which forms the basis of the off-site levy rate calculation. Greenfield's portion of principal and interest payments are calculated for every off-site levy project based on the allocation of benefit and the formula shown below.

How the off-site levy works:

The levy rate is calculated to ensure that payments from developers are equal to their share of the cost for building public infrastructure. The levy rate is calculated using the formula below.

$$\left(\frac{\begin{array}{c} \text{Capital costs (\$)} \\ - \\ \text{Investment income (\$)} \\ + \\ \text{Interest expense (\$)} \end{array} \times \text{Benefit (\%)} }{\text{Leviable land (ha)}} \right) = \text{Levy rate (\$/ha)}$$

This calculation:

- Accounts for the timing of both spending and developer contributions.
- Incorporates a discount rate to reflect the time value of money.
- Incorporates an escalation rate to reflect inflation with respect to the cost of construction.
- Uses Excel's Goal Seek function to generate the levy rate value that, when inserted into the model's calculations, will result in an off-site levy fund balance of zero dollars at the end of the model period. This ensures levy revenues (development contributions) match levy expenditures when all land has been levied and all expenditures have been completed.

The rate will be updated annually using a historic five-year smoothed average of the Non-Residential Building Construction Price Index for Calgary and through future bylaw amendments, on a periodic basis as the inputs affecting the numerator and denominator change over time. This rate calculation methodology assumes all lands approved for growth will be developed in the future.

The steps for calculating the levy rate include:

1. Determining the number of hectares of approved, unlevied land and estimating annual land adsorption through the model period.
2. Identifying the capital costs for infrastructure that benefits approved, unlevied land.
3. Determining the leviable capital cost, as the sum of capital costs multiplied by benefit allocations.
4. Determining the annual debt servicing amounts for debt already taken out.
5. Forecasting the annual debt servicing amounts for debt needed to be taken for future projects.
6. Calculating the Net Present Value (NPV) of all future debt servicing payments for all projects on the off-site levy list.
7. Using Excel's Goal Seek function to calculate the linear infrastructure off-site levy rate. This is the final input to the calculation that allows for the determination of revenue needed to offset debt servicing expenditures and result in a levy fund balance of zero dollars at the end of the model period.
 - a. The levy rate is multiplied by the annual land adsorption to determine the developer contributions.

Attachment 1: Levy Infrastructure

Table 1. Water & wastewater linear infrastructure to be included in the 2024 Off-site Levies Bylaw

Project Name	Infrastructure Type	Estimated Capital Cost (\$ millions)
Ogden Feedermain Phase 1	Water Feedermain Extension	23.9
Lower Sarcee Feedermain	Water Feedermain Extension	36.1
210 Avenue S.W. Pump Station	Pump Station	20.1
210 Avenue S.W. Feedermain	Water Feedermain Extension	13.2
East McKenzie Feedermain	Water Feedermain Extension	0.8
Northridge Feedermain Phase 1	Water Feedermain Extension	42.6
Northridge Reservoir (Partial Cost)	Reservoir	0.1
Northridge Feedermain West Leg Phases 1 & 2 (Partial Cost)	Water Feedermain Extension	0.1
Belvedere Feedermain Phases 1 & 2	Water Feedermain Extension	25.1
Haskayne Feedermain	Water Feedermain Extension	8.8
Starlight East Pump Station Phase 1	Pump Station	41.9
Providence 146 Ave Feedermain (Partial Cost)	Water Feedermain Extension	5.6
Westview Reservoir (Partial Cost)	Reservoir	1.4
Airdrie Feedermain Tie-In & Meter Relocation	Other infrastructure	1.5
Pump Station 36 Installation	Pump Station	0.5
South Glenmore Reservoir Basin II (Partial Cost)	Reservoir	0.048
North Water Servicing Option	Water Feedermain Upgrade	478.4
Mountain View Pump Station Upgrade	Pump Station	4.2
Northridge Macdonald Trunk	Wastewater Trunk Extension	0.042
West Pine Creek Sanitary Trunk Phase 2	Wastewater Trunk Extension	43.1
Seton Tunnel Phase 1	Wastewater Trunk Extension	46.1

Project Name	Infrastructure Type	Estimated Capital Cost (\$ millions)
Seton Tunnel Phase 2 Laterals	Wastewater Trunk Extension	15.7
144 Ave. N.E. Sanitary Trunk	Wastewater Trunk Extension	7.0
North Beddington Sanitary Trunk Phase 2 (Construction Finance Agreement)	Wastewater Trunk Extension	4.6
Beddington Creek II East Leg	Wastewater Trunk Extension	0.04
Belvedere Sanitary Trunk	Wastewater Trunk Extension	13.6
Glacier Ridge East Basin Sanitary Trunk	Wastewater Trunk Extension	10.3
Glacier Ridge West Basin Sanitary Trunk	Wastewater Trunk Extension	19.2
Haskayne Sanitary Trunk	Wastewater Trunk Extension	1.7
Saddle Ridge Sanitary Trunk Upgrade	Wastewater Trunk Upgrade	6.0
Bowness Trunk Upgrade	Wastewater Trunk Upgrade	3.5
Shouldice Trunk Upgrade	Wastewater Trunk Upgrade	12.9
Nose Creek Trunk Upgrade	Wastewater Trunk Upgrade	84.5
Inglewood Trunk Upgrade	Wastewater Trunk Upgrade	101.2
McKenzie Siphon Upgrade	Wastewater Trunk Upgrade	11.1
TransCanada Sanitary Trunk Upgrade	Wastewater Trunk Upgrade	105.6

