

## 8.2.3 Water Distribution

### 8.2.3.1 What do we own and what is it worth?

Please refer to section 5.1.1 for general context and appropriate asset management interpretation of this section's specifics.

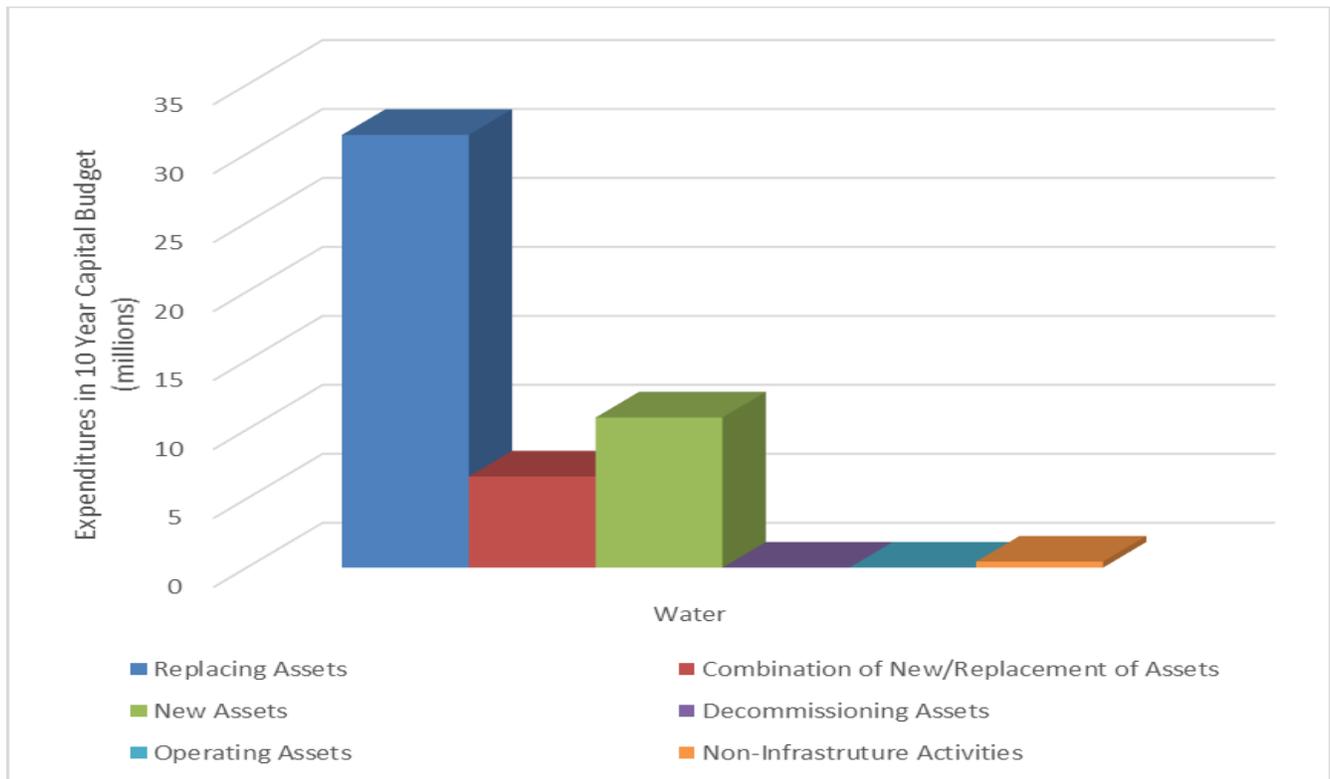
The water distribution network is comprised of 436 km of pipes with associated valves and appurtenances and 2,508 fire hydrants. The total replacement value of the water distribution network is approximately \$368 million.

### 8.2.3.2 Allocation of Infrastructure Funding

Please refer to section 5.1.2 for general context and appropriate asset management interpretation of this section's specifics.

As indicated in Section 4.3, the capital budget has the most significant portion of funding allocated for the City's infrastructure assets. Through the Approved 2020-2022 Capital Budget and 2023-2029 Capital Forecast, it is estimated that the City will invest \$49 million over the next 10 years in Water assets. The estimated distribution of the funding is shown in **Figure 24**.

**Figure 24: 2020-2029 Capital Funding Distribution for Water Assets**



The City also spends money on infrastructure through its annual operating budget.

**Table 7** in Section 4.3 provides a summary of the planned expenditures in the 2020-2022 operating budget. Approximately \$1.4 million or 0.7% of the operating budget is considered to be directly related to treating Water Distribution assets. For example, the Water Distribution operating budget includes \$114,000 for watermain flushing activities each year.

### **8.2.3.3 Rehabilitation or Replacement Strategies**

Please refer to section 5.1.3 for general context and appropriate asset management interpretation of this section's specifics.

- Watermains  
Can be either rehabilitated or replaced. The current strategy in Waterloo is to replace watermains that experience a high number of breaks or that have a forecasted performance of 0%, with confirmed deterioration information. The rehabilitation of watermains through the installation of a cured in place liner is not routinely practiced in the City.
- Fire Hydrants  
Can be either rehabilitated or replaced. The current strategy in Waterloo is to replace hydrants that malfunction or have a forecasted performance of 0%, with confirmed deterioration.

### **8.2.3.4 Lifecycle Management Activities**

Please refer to section 5.1.4 for general context and appropriate asset management interpretation of this section's specifics.

For Water pipe maintenance the following lifecycle management activity options exist, but are not limited to:

- Flushing
- Spot repair

For Water pipe rehabilitation the following lifecycle management activity options exist, but are not limited to:

- Lining

For Water pipe reconstruction or replacement the following lifecycle management activity options exist, but are not limited to:

- Replacement

For Valve maintenance the following lifecycle management activity options exist, but are not limited to:

- Scheduled maintenance (valve turning)

For Valve rehabilitation the following lifecycle management activity options exist, but are not limited to:

- Repair

For Valve replacement the following lifecycle management activity options exist, but are not limited to:

- Replacement

For Fire Hydrant maintenance the following lifecycle management activity options exist, but are not limited to:

- Scheduled maintenance (valve turning)

For Fire Hydrant rehabilitation the following lifecycle management activity options exist, but are not limited to:

- Repair

For Fire Hydrant replacement the following lifecycle management activity options exist, but are not limited to:

- Replacement

The Waterloo DSS is used to forecast the Water Distribution asset class performance and corresponding expenditure over a 25-year span. Once the forecast activities are within the one to three year span, SMEs determine the appropriate treatment within the forecasted general categories above. In doing so, all available information relating to the items listed in **Table 10** and **Table 11** is considered by the SMEs in order to determine the treatment of optimal cost/benefit to the community. It is not atypical to adjust treatments and costs from the original forecast. This is because more information becomes available closer to the start of the project (i.e. through surveying, detailed design, etc.). However, the total projected performance and expenditure for the year are not impacted. This is because the limits of scientific forecasting occur at the aggregate level of asset class performance and spending.

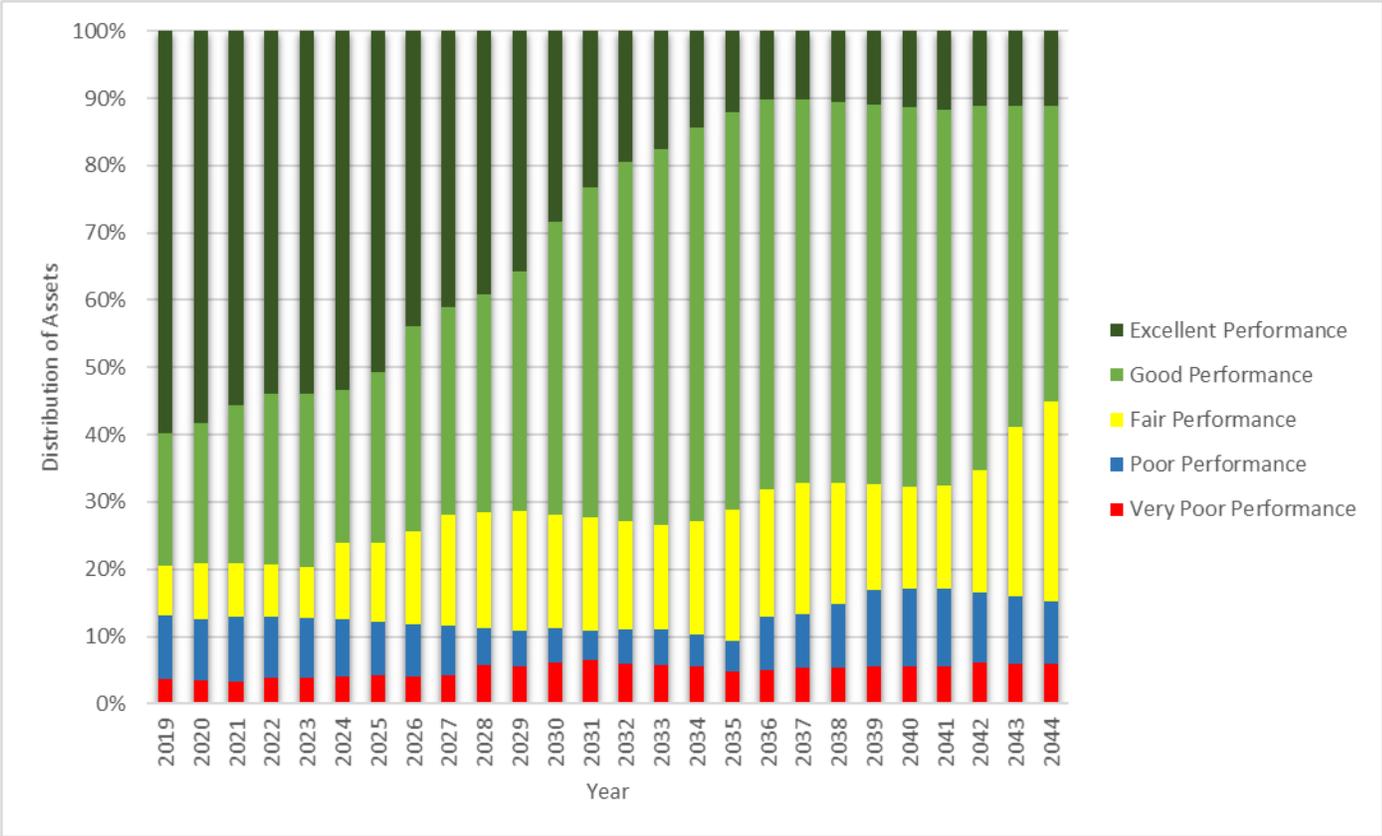
### **8.2.3.5 Levels of Service**

Please refer to section 5.1.5 for general context and appropriate asset management interpretation of this section's specifics.

#### **8.2.3.5.1 Current Performance and Projected impact of Budgeted Capital Expenditures**

There are currently just under 15% of water distribution assets exhibiting poor or very poor performance profiles as illustrated in **Figure 25**. The average annual budgeted capital expenditures of approximately \$3.5 million will maintain the performance profile over the next 25 years. The proportion of the water distributions asset class with fair, good, and excellent performance is approximately 85% over the 25-year span. The remaining portions of the asset class are in the poor and very poor performance categories for the same time span.

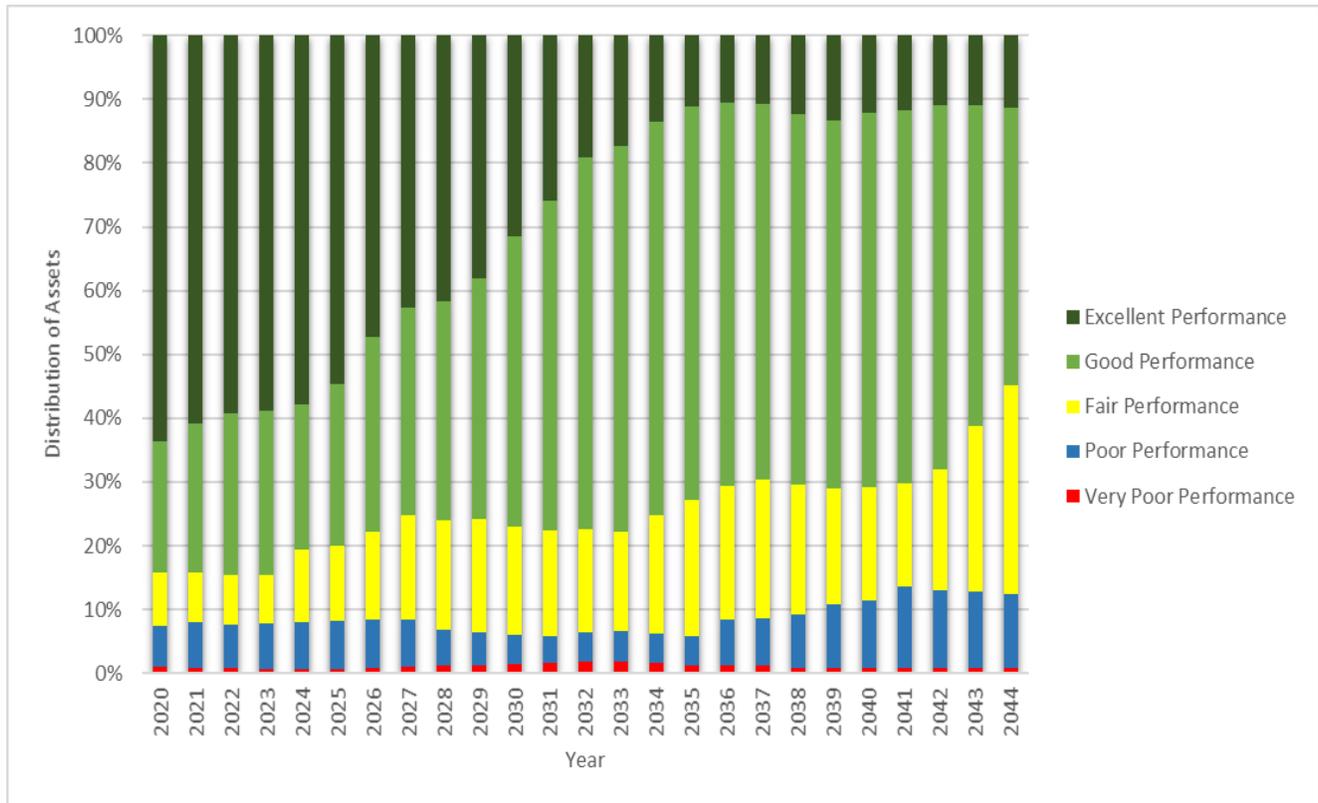
**Figure 25: Annual Performance of Water Assets in the Budget Scenario**



### 8.2.3.5.2 Target Performance and Required Expenditures

An average annual expenditure of approximately \$4.5 million over the next 10 to 15 years is required to achieve the target performance profile for the water distribution asset class. In the target scenario, the portion of the asset class with fair, good, and excellent performance is maintained close to 90% over the 25-year span as illustrated in **Figure 26**. The remaining portions of the asset class are in the poor and very poor performance categories for the same time span, with decreased very poor and poor, compared to the budget scenario.

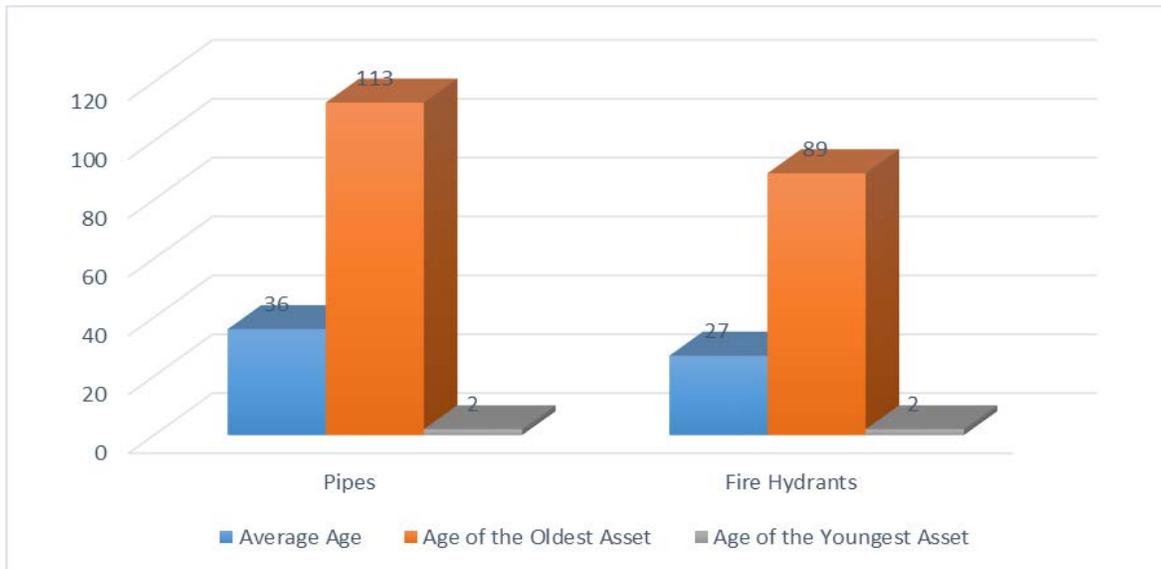
**Figure 26: Annual Performance of Water Assets in the Budget Scenario**



### 8.2.3.5.3 Ontario Regulation 588/17

A requirement for O. Reg. 588/17 is the reporting of the average age of assets. **Figure 27** identifies the average age for both the water distribution pipe network and fire hydrants.

**Figure 27: Average Age (Years) for Water**



Service levels are defined in two terms, community levels of service and technical levels of service. O. Reg. 588/17 identifies specific metrics for core assets that municipalities must report on. As a core asset, water metrics are identified below in **Table 20** and **Table 21**.

**Table 20: Water Community Level of Service Metrics**

<i>Service Attribute</i>	<i>Community Level of Service Measure</i>	<i>Community LOS Performance</i>
<b>Scope</b>	Description, which may include maps, of the user groups or areas of the municipality that are connected to the municipal water system.	The City of Waterloo is largely built out to the municipal boundary, and provides drinking water to most properties within the urban areas while a small portion of the rural areas are serviced by private wells.
<b>Reliability</b>	Description, which may include maps, of the user groups or areas of the municipality that have fire flow.	A vast portion of the built out municipality has access to municipal drinking water and in turn adequate fire flow.
	Description of boil water advisories and service interruptions.	A boil water advisory is issued when contaminants are detected in the water supply and present an immediate public health threat. This excludes precautionary advisories due to operational activities to maintain service.  A service interruption is a result of a failure in the city managed water distribution system and excludes planned interruptions.

**Table 21: Water Technical Levels of Service Metrics**

<i>Service Attribute</i>	<i>Technical Level of Service Measure</i>	<i>2018</i>	<i>2019</i>
<b>Scope</b>	% of properties connected to the municipal water system.	99.53%	99.53%
<b>Reliability</b>	% of properties where fire flow is available	99.86%	99.86%
	# of connection days per year where a boil water advisory notice is in place compared to the total # of properties connected to the municipal water system.	0	0
	# of connection days per year due to water main breaks compared to the total # of properties connected to the municipal water system.	0.84	1.63

### **8.2.3.6 Demand Management Plan**

Please refer to section 5.1.6 for general context and appropriate asset management interpretation of this section's specifics.

Demand for new services is driven by various factors such as population change, regulatory requirements, changes in demographics, seasonal factors, consumer preferences and expectations, technological changes, economic factors, and environmental awareness.

Demand will be managed through a combination of managing existing assets, upgrading existing assets, providing new assets, and demand forecasting. Demand management practices can include non-asset solutions, insuring against risks and managing performance.

The Waterloo DSS will be used to assist Water SMEs in demand management planning.

### **8.2.3.7 Risk**

Please refer to section 5.1.7 for general context and appropriate asset management interpretation of this section's specifics.

Risk related to the Water asset class is managed through:

- SME knowledge and expertise
- Data-driven decision making
- Performance and expenditure forecasting

This three-pronged approach ensures that Water's Level of Service (i.e. performance) supports the community's socioeconomic growth over the short and long term. The Waterloo DSS allows staff to ensure that the future probability of underperforming infrastructure and its consequences is minimized.

In addition to their inherent expertise, in order to minimize risk, SMEs always consider a wide range of factors during infrastructure decision-making processes, the core of which are include in **Table 11**. All corporate information related to Water asset management is centralized within the Waterloo DSS, allowing staff to make comprehensive and informed decisions. The ability to forecast the effects of contemplated decisions increases the reliability of the infrastructure's future performance.

### **8.2.3.8 Conclusion and Next Steps**

The difference between Budget (existing) and Target Levels of Service (i.e. infrastructure performance) over the next 25-years is relatively low when compared to other asset classes. In order to remedy the performance gap it is estimated that an additional \$1 million per annum is required.

In order to ensure management of Water assets continues to be optimal, future asset management steps will aim to find the most efficient means of working towards remedying the performance gap.

Strategic steps will include:

- Continuous effort in increasing performance data collection capabilities
- Continuous improvement of the Waterloo DSS analysis capabilities
- Continuous improvement of forecasting logic
- Corporate awareness and training

Tactical steps will include:

- Minimizing impact on staff time with respect to sharing information required for the Waterloo DSS
- Increasing awareness of the difference between project level (most granular asset inventory) and network (asset class) level application of asset management principles
- Increasing awareness of general forecasting principles

Operational steps will include:

- Where applicable, developing data collection templates and means
- Continuous engagement with SMEs on progress
- Improving consumer-based modelling parameters