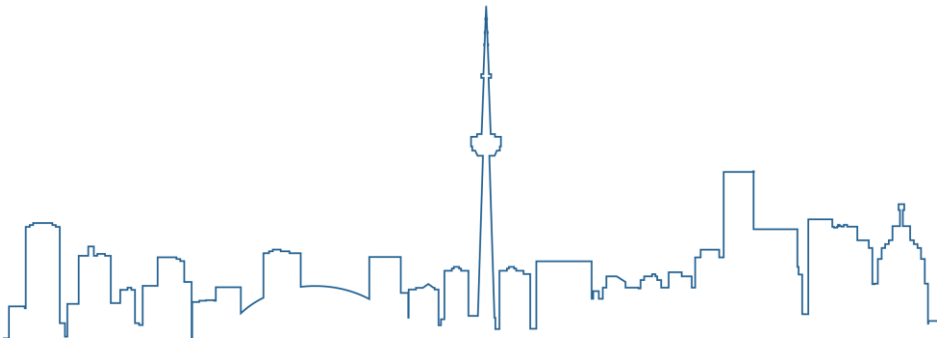
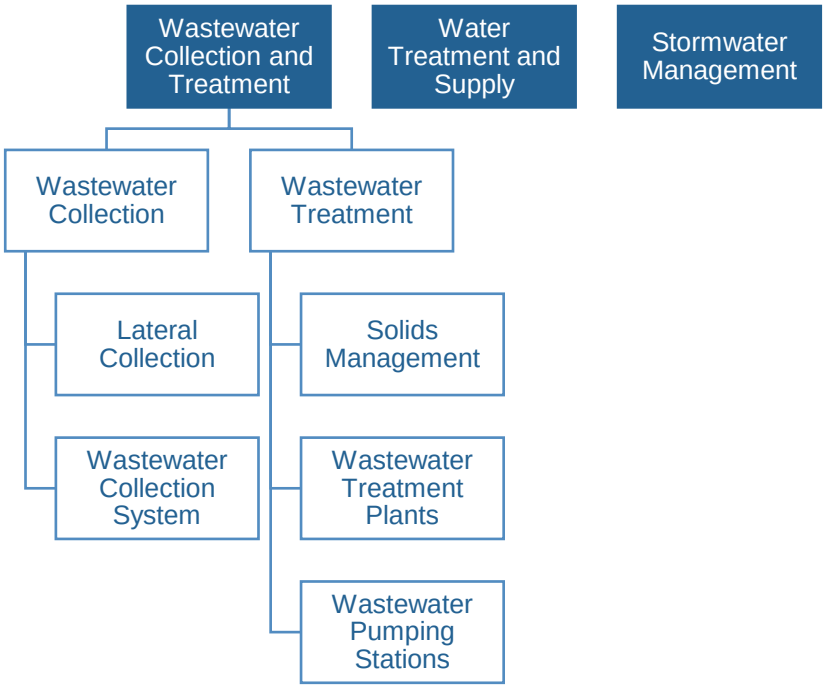
TORONTO



# WASTEWATER SERVICES

## PROGRAM MAP




Wastewater services encompass the collection of wastewater from residential or ICI (industrial, commercial, and institutional) properties and its treatment in wastewater treatment plants before it is returned to Lake Ontario. It also includes the disposal or use of residual materials.

In Toronto, wastewater is collected and treated from 4,086 kilometres of separate sanitary sewers, and 1,525 kilometres of combined storm/sanitary sewers for a total 5,611 km of wastewater pipe. Also, 4,909 kilometres of completely separate storm sewers do not flow to Toronto's wastewater plants.

Wastewater is pumped by 74 pumping stations to four wastewater treatment plants where physical and biological treatment processes remove solids, chemicals and pathogens. There are also 12 storm water pumping stations which do not feed to the treatment plants. Toronto's combined wastewater treatment plants can treat over 1.5 billion litres of wastewater a day.

The safe and effective treatment of wastewater is important to a community's continued health and well-being. Toronto Water must operate under strict regulations and meet or exceed treatment standards set by the Ministry of the Environment to ensure wastewater treatment has a minimal impact on the natural environment. Funding for these services is provided through municipal water rates, which include a sewer surcharge.

# SUMMARY OF PERFORMANCE MEASUREMENT RESULTS

| Question | Indicator/Measure | Internal Comparison of Toronto's 2016 vs. 2015 Results | External Comparison to Other Municipalities (MBNC) By Quartile for 2016 | Chart & Page Ref. |
|---|---|---|---|---|
| **Service / Activity Level Indicators** | | | | |
| How much wastewater is treated each year? | Megalitres of Wastewater Treated per 100,000 Population – (Activity Level) | **Decrease**<br>**Volume of wastewater treated decreased**<br>**(activity level indicator)** | **3**<br>**Low volume of wastewater treated compared to others (activity level indicator)** | 35.1<br>35.2<br>pg. 5/6 |
| How old is the wastewater pipe system? | Average Age of Wastewater Pipe - (Service Level) | **Stable**<br>**Average age of wastewater pipes has remained relatively stable at 64 years (service level indicator) (No graph)** | **4**<br>**Wastewater pipe is older compared other municipalities (service level indicator)** | 35.9<br>pg. 12 |
| **Community Impact Measures** | | | | |
| How much wastewater bypasses full treatment each year? | Percentage of Wastewater estimated to have Bypassed Treatment – (Community Impact) | **Decrease**<br>**Volume of wastewater bypassing full treatment decreased** | **1**<br>**Lower rate/volume of wastewater bypassing full treatment compared to others** | 35.3<br>35.4<br>pg. 7/8 |
| How often are Toronto beaches unsafe for swimming? | Average Percentage of Time (Days) Beaches are Posted as Unsafe to Swim from June to August – (Community Impact) | **Decrease**<br>**Warnings of unsafe swimming conditions decreased** | **N/A** | 35.5<br>pg. 8 |
| **Customer Service Measures** | | | | |
| How many wastewater mains (sewers) backup? | Annual Number of Wastewater Main Backups per 100 kilometres of Wastewater Main (Customer Service) | **Decrease**<br>**Rate of wastewater main backups decreased** | **4**<br>**Highest rate of wastewater main backups compared to others** | 35.6<br>35.7<br>pg. 9/10 |
| **Efficiency Measures** | | | | |
| What does it cost to collect wastewater? | Operating Cost of Wastewater Collection per kilometre of Pipe – (Efficiency) | **Decrease**<br>**Operating cost of wastewater collection decreased** | **3**<br>**Higher operating cost of wastewater collection compared to others** | 35.8<br>35.9<br>pg. 11/12 |

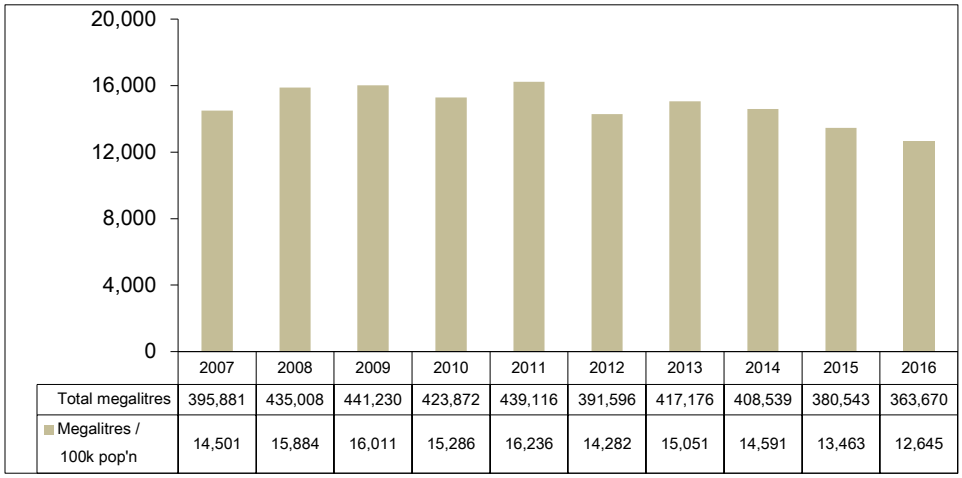
| Question | Indicator/Measure | Internal Comparison of Toronto's 2016 vs. 2015 Results | External Comparison to Other Municipalities (MBNC) By Quartile for 2016 | Chart & Page Ref. |
|---|---|---|---|---|
| What does it cost to collect wastewater? | Total Cost of Wastewater Collection per kilometre of Pipe – (Efficiency) | **Decrease**<br>**Total cost of wastewater collection Decreased** | **3**<br>**Higher total cost of wastewater collection compared to others** | 35.8<br>35.9<br>pg. 11/12 |
| What does it cost to treat wastewater and dispose of the residual material? | Operating Cost of Wastewater Treatment/Disposal per Megalitre Treated – (Efficiency) | **Stable**<br>**Operating cost of wastewater treatment & disposal was relatively stable** | **2**<br>**lower operating cost of wastewater treatment & disposal compared to others** | 35.10<br>35.11<br>pg. 13 |
| What does it cost to treat wastewater and dispose of the residual material? | Total Cost of Wastewater Treatment/Disposal per Megalitre Treated – (Efficiency) | **Increase**<br>**Total cost of wastewater treatment & disposal increased** | **2**<br>**Low total cost of wastewater treatment & disposal compared to others**<br>**(lower amortization)** | 35.10<br>35.11<br>pg. 13 |

| Overall Results | Service/ Activity Level Indicators (Resources) | Performance Measures (Results) | Service/ Activity Level Indicators (Resources) | Performance Measures (Results) | |
|---|---|---|---|---|---|
| | 0- Favourable<br>1- Stable<br>0-Unfavorable | 5 - Favourable<br>1- Stable<br>1- Unfavourable | 0- 1st quartile<br>0 - 2nd quartile<br>1- 3rd quartile<br>1- 4th quartile | 1 - 1st quartile<br>2- 2nd quartile<br>2 - 3rd quartile<br>1 - 4th quartile | |
| | 100% favourable or stable | 86% favourable or stable | 0% in 1st and 2nd quartiles | 50% in 1st and 2nd quartiles | |

For an explanation of how to interpret this summary and the supporting charts, please see the Guide to Toronto's Performance Results. These quartile results are based on a maximum sample size of 15 municipalities.

# SERVICE/ACTIVITY LEVELS

## 35.1 - HOW MUCH WASTEWATER IS TREATED EACH YEAR IN TORONTO?




| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|
| Total megalitres | 395,881 | 435,008 | 441,230 | 423,872 | 439,116 | 391,596 | 417,176 | 408,539 | 380,543 | 363,670 |
| Megalitres / 100k pop'n | 14,501 | 15,884 | 16,011 | 15,286 | 16,236 | 14,282 | 15,051 | 14,591 | 13,463 | 12,645 |

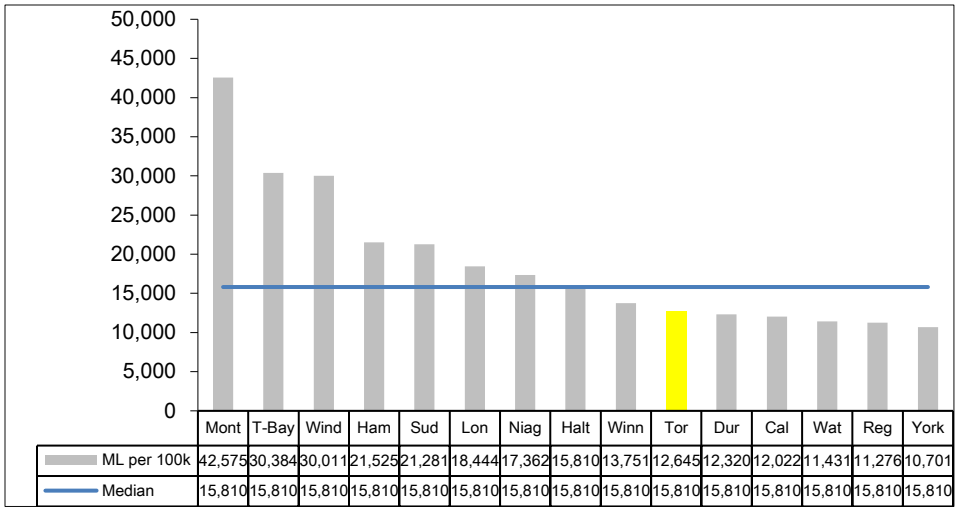
**Chart 35.1** summarizes the volume (megalitres) and ratio per 100,000 population of wastewater that was treated in Toronto wastewater treatment plants. One megalitre is equivalent to one million litres.

**Chart 35.1 (City of Toronto) Mega litres of Wastewater Treated per 100,000 Population**

Results have also been expressed on a per 100,000 population basis to account for population growth and to allow for comparisons to other municipalities.The results for 2010 and prior years are not based on the revised population estimates. In 2016, there was an annual 6.1% decrease in the volume of wastewater treated per 100,000 population. Long term wastewater volume declines correlate with annual water demand decreases described in the Water Services report.

Wet weather flow is the primary driver for year-to-year variations. Lower precipitation results in some year's means less water needs to be treated from combined sewers that carry both wastewater and stormwater together to wastewater plants.

## 35.2 –HOW DOES THE AMOUNT OF WASTEWATER TREATED IN TORONTO COMPARE TO OTHER MUNICIPALITIES?




| | Mont | T-Bay | Wind | Ham | Sud | Lon | Niag | Halt | Winn | Tor | Dur | Cal | Wat | Reg | York |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ML per 100k | 42,575 | 30,384 | 30,011 | 21,525 | 21,281 | 18,444 | 17,362 | 15,810 | 13,751 | 12,645 | 12,320 | 12,022 | 11,431 | 11,276 | 10,701 |
| Median | 15,810 | 15,810 | 15,810 | 15,810 | 15,810 | 15,810 | 15,810 | 15,810 | 15,810 | 15,810 | 15,810 | 15,810 | 15,810 | 15,810 | 15,810 |

**Chart 35.2** provides Toronto's 2016 volume of wastewater treated per 100,000 persons and compares it to other Ontario municipalities.

**Chart 35.2 (MBNC 2016) Megalitres of Wastewater Treated per 100,000 Population**

Toronto ranks tenth of fifteen (third quartile) in terms of having the highest volumes of wastewater treated per 100,000 population. Toronto has a higher population than many cities indicated, hence wastewater treated per capita may be less due to this reason. Moreover, with more condominiums proportion there may be less water and wastewater per person. Another factor to consider is that some municipalities may have a flat rate water cost, thus there is no incentive to reduce water and wastewater. This may increase the amounts of wastewater required to be treated.

It should be noted that these volumes relate to wastewater from both the residential and ICI (industrial, commercial and institutional) sectors, as well as storm water that is collected in Toronto's system through combined sewers. Jurisdictions have different proportions of high volume industrial customers, and combined sewer infrastructure, impacting these comparative results.

# COMMUNITY IMPACT

Municipalities strive to protect the environment by minimizing the amount of untreated wastewater that is released into lakes and rivers.

## 35.3 –HOW MUCH WASTEWATER BYPASSES FULL TREATMENT IN TORONTO BEFORE IT IS RELEASED INTO LAKE ONTARIO?

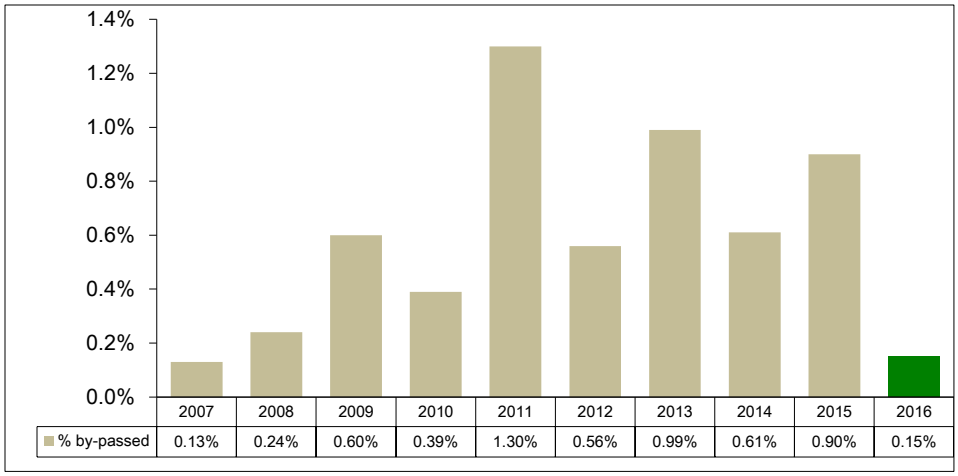


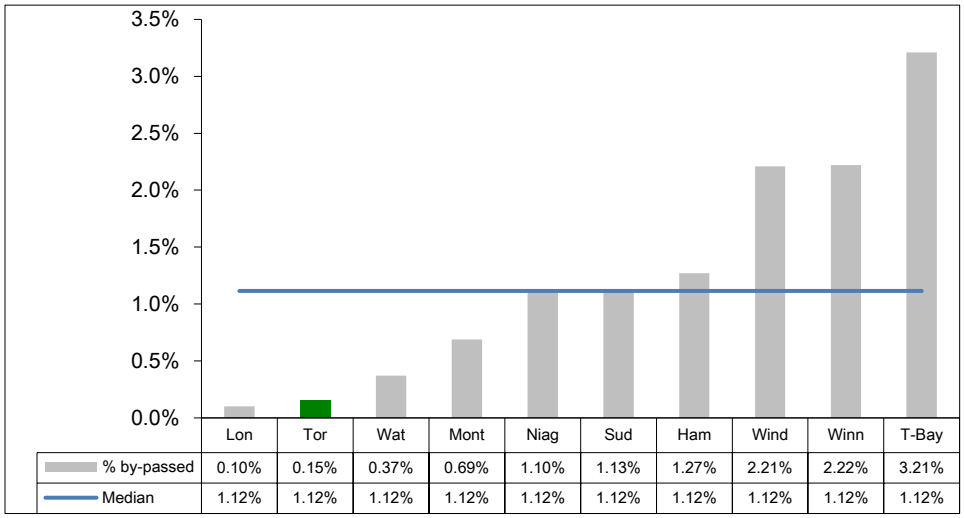

**Chart 35.3** summarizes Toronto's percentage of wastewater that was released into Lake Ontario without full treatment.

**Chart 35.3 (City of Toronto) % of Wastewater Estimated to Have By-Passed Full Treatment**

These are referred to as secondary bypass events, but this wastewater does still receive partial (preliminary and primary) treatment, including disinfection, and are tested for various factors before release. Secondary bypass events are usually the result of storm events with heavy precipitation and water runoff, which can vary from year to year. Water that enters the sewers through combined sewers (wastewater and storm water) or from leakage, is known collectively as infiltration and inflow.

The significant decrease in Toronto’s 2016 by-pass volumes related primarily to the lower frequency and intensity of precipitation events. .

## 35.4 – HOW DOES THE AMOUNT OF WASTEWATER BY-PASSING FULL TREATMENT IN TORONTO, COMPARE TO OTHER MUNICIPALITIES?




| | Lon | Tor | Wat | Mont | Niag | Sud | Ham | Wind | Winn | T-Bay |
|---|---|---|---|---|---|---|---|---|---|---|
| % by-passed | 0.10% | 0.15% | 0.37% | 0.69% | 1.10% | 1.13% | 1.27% | 2.21% | 2.22% | 3.21% |
| Median | 1.12% | 1.12% | 1.12% | 1.12% | 1.12% | 1.12% | 1.12% | 1.12% | 1.12% | 1.12% |

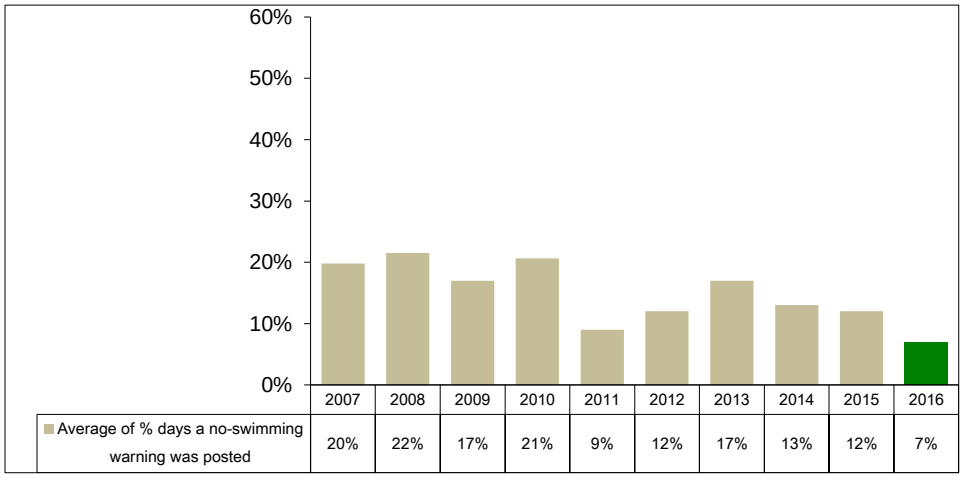
**Chart 35.4** compares Toronto's 2016 results to other municipalities. Toronto ranks second of ten (first quartile), in terms of having the lowest percentage of wastewater bypassing full treatment.

**Chart 35.4 (MBNC 2016) % of Wastewater Estimated to Have By-Passed Full Treatment**

This result is attributable to lower amount of intense storms in Toronto in 2016 to the combined sanitary/storm sewers that Toronto has. Other municipalities had different storm intensities and capacities of their wastewater plants.

Toronto Water has undertaken a number of initiatives that have contributed to improving the water quality along Toronto's waterfront. From June to August, the City of Toronto takes daily water samples from the 11 supervised beaches across the city and tests for E. coli bacteria. When E. coli levels are high Toronto Public Health posts warning signs against swimming.

## 35.5 – WHAT IS THE LIKELIHOOD FOR TORONTO'S BEACHES TO POST WARNING SIGNS AGAINST SWIMMING BETWEEN JUNE AND AUGUST?




| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|
| Average of % days a no-swimming warning was posted | 20% | 22% | 17% | 21% | 9% | 12% | 17% | 13% | 12% | 7% |

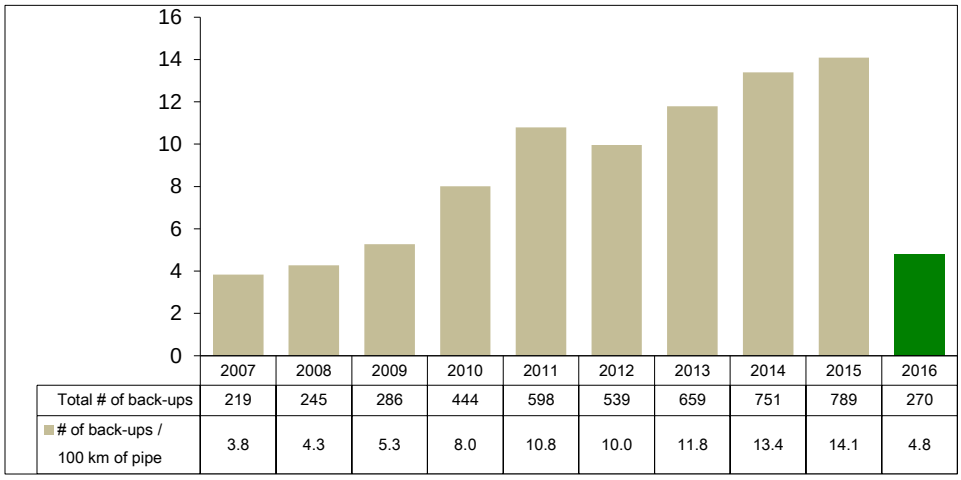
**Chart 35.5** provides 2007 to 2016 results for swimming condition, being the average percentage of days that Toronto's supervised beaches are posted as unsafe for swimming.

**Chart 35.5 (City of Toronto) Average Percentage of Time (days) Beaches are Posted as Unsafe to Swim from June to August**

In 2016, the average percentage of days that Toronto's supervised beaches were posted as unsafe for swimming was 7% (a 5% decrease from the previous year). This result is partially due to increased efforts in controlling effluents effectively and also from fewer intense storms in 2016 affecting beach runoff from wildlife.

# CUSTOMER SERVICE

## 35.6 – HOW MANY WASTEWATER MAIN BACK-UPS OCCUR IN TORONTO?




| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|
| Total # of back-ups | 219 | 245 | 286 | 444 | 598 | 539 | 659 | 751 | 789 | 270 |
| # of back-ups / 100 km of pipe | 3.8 | 4.3 | 5.3 | 8.0 | 10.8 | 10.0 | 11.8 | 13.4 | 14.1 | 4.8 |

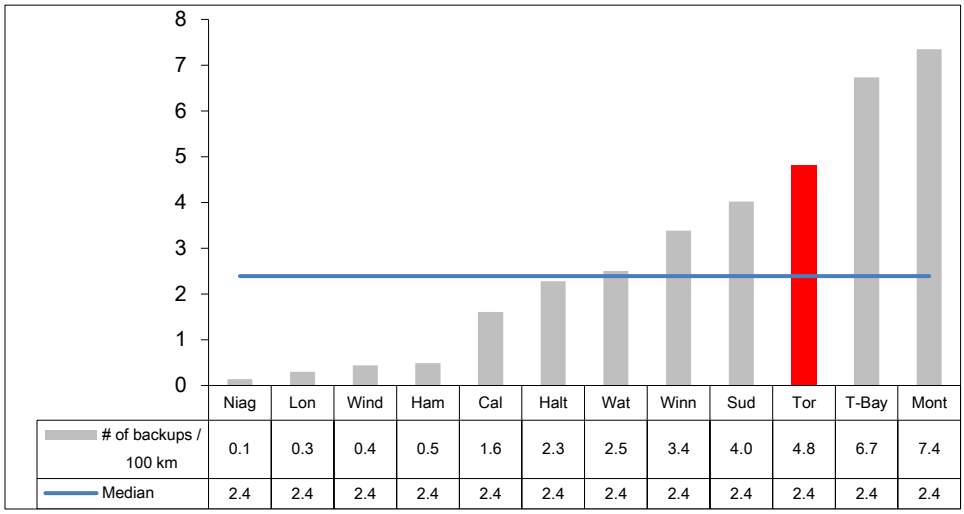
**Chart 35.6** provides the total number of wastewater main back-ups as well as the rate of back-ups per 100 km of pipe.

**Chart 35.6 (City of Toronto) Number of Wastewater Main Back Ups per 100 kilometres of Wastewater Pipe**

Significant infiltration and inflows into the local and trunk sewer systems during severe storm events, can contribute to overloading the system, which may cause water to back up through sewer pipes and result in basement flooding. In 2016, the number of backups per 100 km of pipe decreased by 66%. The sudden decrease in the number of back-ups in 2016 is related to lower number and severity of storm events. In addition there was a more targeted maintenance program for the wastewater linear infrastructure system, such as improved cleaning of catch basins feeding the combined sewer system.

Toronto’s sewer system includes approximately 1,525 km of combined (sanitary and storm) sewers. Although there are some homes where downspouts are still not disconnected because of site conditions, a large number of the City's homes have disconnected their downspouts reducing the load on the wastewater linear system.

## 35.7–HOW DOES THE RATE OF WASTEWATER MAIN BACK-UPS IN TORONTO COMPARE TO OTHER MUNICIPALITIES?




| | Niag | Lon | Wind | Ham | Cal | Halt | Wat | Winn | Sud | Tor | T-Bay | Mont |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| # of backups / 100 km | 0.1 | 0.3 | 0.4 | 0.5 | 1.6 | 2.3 | 2.5 | 3.4 | 4.0 | 4.8 | 6.7 | 7.4 |
| Median | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 | 2.4 |

**Chart 35.7** compares Toronto's 2016 rate of wastewater/sewer backups to other municipalities. Toronto ranks tenth of twelve (fourth quartile) in municipalities with the highest rate of backups.

**Chart 35.7 (MBNC 2016) Number of Wastewater Main Backups per 100 kilometers of Wastewater Pipe**

There are many factors unique to each municipality which affect the comparability of backups, such as capacity levels, linear infrastructure, environment, and operational differences. Note that this chart includes only the 12 of 15 jurisdictions voluntarily contributing their wastewater backup's data.

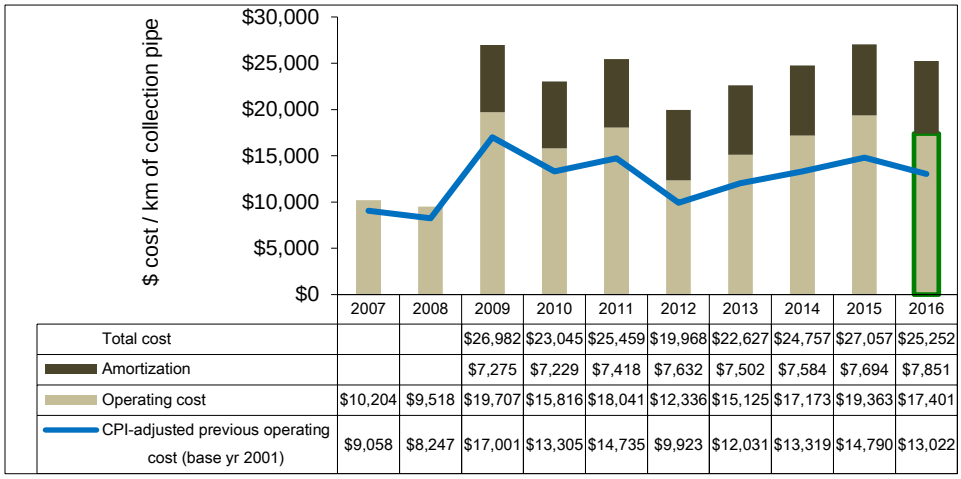
In November 2012, a bylaw requiring property owners to disconnect their downspouts, where feasible, from the sewer system came into effect for the combined sewer service area. The bylaw is being phased in across the City. This will result in less storm water entering the wastewater system, which will help reduce the risk of basement flooding and minimize by-pass events at the treatment plants. In December 2012, all property owners living in a basement flooding study areas were required to disconnect their downspouts, where feasible, from the sewer system.

# EFFICIENCY

Wastewater collection refers to the process of collecting wastewater from the time it exits residential and ICI properties to the point it arrives at the wastewater treatment plant.

Wastewater treatment costs include the operation and maintenance of treatment plants to meet or exceed Ministry of Environment regulations and standards. Treatment costs also include the disposal of biosolids (stabilized sludge). Biosolids are primarily composed of the organic solids that have been removed from wastewater and further processed so that they can, as in the case of the Ashbridges Bay Treatment Plant, be beneficially used for land application purposes. The City's Highland Creek Treatment Plant disposes its biosolids through incineration.

## 35.8 – WHAT DOES IT COST IN TORONTO TO COLLECT WASTEWATER?




| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|
| Total cost | | | $26,982 | $23,045 | $25,459 | $19,968 | $22,627 | $24,757 | $27,057 | $25,252 |
| Amortization | | | $7,275 | $7,229 | $7,418 | $7,632 | $7,502 | $7,584 | $7,694 | $7,851 |
| Operating cost | $10,204 | $9,518 | $19,707 | $15,816 | $18,041 | $12,336 | $15,125 | $17,173 | $19,363 | $17,401 |
| CPI-adjusted previous operating cost (base yr 2001) | $9,058 | $8,247 | $17,001 | $13,305 | $14,735 | $9,923 | $12,031 | $13,319 | $14,790 | $13,022 |

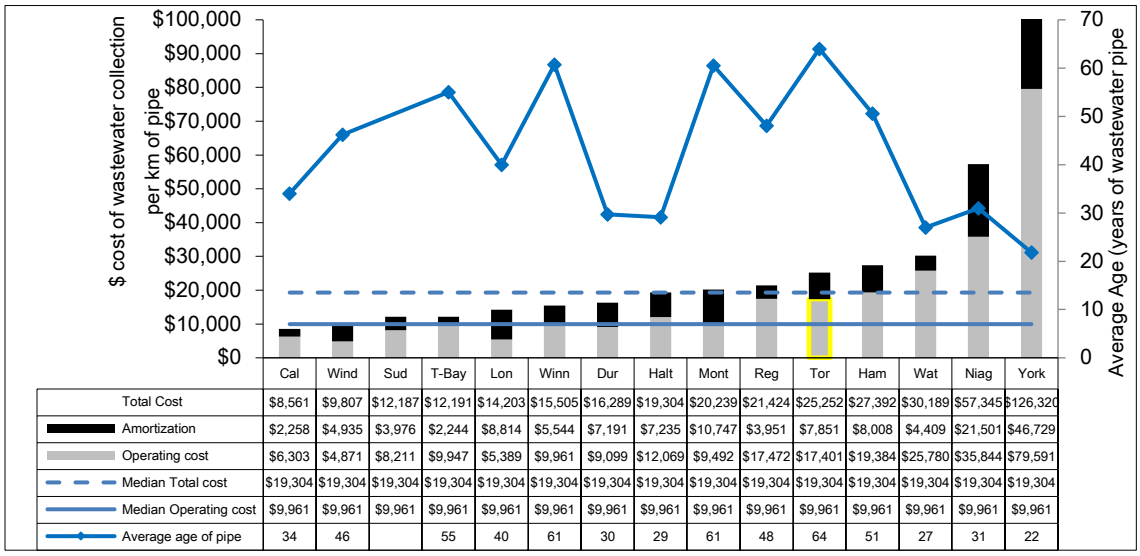
**Chart 35.8** provides Toronto's operating cost and total cost (operating cost plus amortization) of wastewater collection per kilometre of collection pipe.

**Chart 35.8 (City of Toronto) Operating Cost for Wastewater Collection per Kilometre of Collection Pipe**

Toronto's 2016 operating costs for wastewater collection decreased by 10.1% to $17,401 per KM partially. This fall in operating cost was partly due to a decrease in direct costs and capital maintenance, based on 2016 having less intensity and number of storms.

Starting in 2009, changes in accounting policies were instituted; therefore, results of 2009 and subsequent years are not as comparable to 2008 and prior years. Amortization is shown as a separate stacked bar. More information is available in the Guide to Toronto's Performance Results. Chart 35.8 also provides Consumer Price Index (CPI) adjusted operating costs (using the operating cost methodology), which are plotted as a line graph, showing strong correlation with each other. This adjustment discounts the actual operating cost result for each year by the change in Toronto’s CPI since the base year of 2001.

## 35.9 – HOW DOES THE COST OF WASTEWATER COLLECTION IN TORONTO COMPARE TO THE OTHER MUNICIPALITIES?




| | Cal | Wind | Sud | T-Bay | Lon | Winn | Dur | Halt | Mont | Reg | Tor | Ham | Wat | Niag | York |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Cost | $8,561 | $9,807 | $12,187 | $12,191 | $14,203 | $15,505 | $16,289 | $19,304 | $20,239 | $21,424 | $25,252 | $27,392 | $30,189 | $57,345 | $126,320 |
| Amortization | $2,258 | $4,935 | $3,976 | $2,244 | $8,814 | $5,544 | $7,191 | $7,235 | $10,747 | $3,951 | $7,851 | $8,008 | $4,409 | $21,501 | $46,729 |
| Operating cost | $6,303 | $4,871 | $8,211 | $9,947 | $5,389 | $9,961 | $9,099 | $12,069 | $9,492 | $17,472 | $17,401 | $19,384 | $25,780 | $35,844 | $79,591 |
| Median Total cost | $19,304 | $19,304 | $19,304 | $19,304 | $19,304 | $19,304 | $19,304 | $19,304 | $19,304 | $19,304 | $19,304 | $19,304 | $19,304 | $19,304 | $19,304 |
| Median Operating cost | $9,961 | $9,961 | $9,961 | $9,961 | $9,961 | $9,961 | $9,961 | $9,961 | $9,961 | $9,961 | $9,961 | $9,961 | $9,961 | $9,961 | $9,961 |
| Average age of pipe | 34 | 46 | | 55 | 40 | 61 | 30 | 29 | 61 | 48 | 64 | 51 | 27 | 31 | 22 |

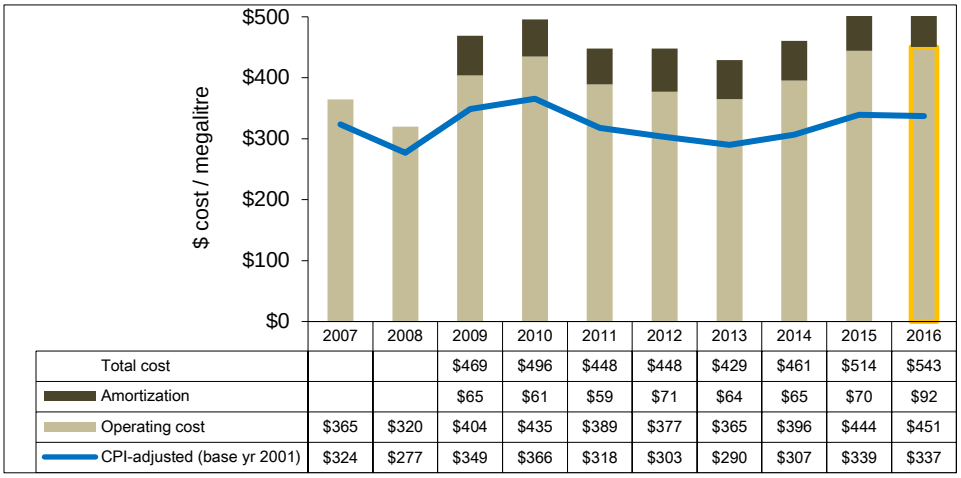
**Chart 35.9 (MBNC 2016) Operating Cost for Wastewater Collection per Kilometre of Collection Pipe and Average Age of Wastewater Pipe**

**Chart 35.9** compares Toronto's 2016 cost of wastewater collection per kilometre of pipe to other municipalities, plotted as bars relative to the left axis.

Toronto ranks eleventh of fifteen participating municipalities (third quartile) in terms of having the lowest total (including amortization) operating costs. Toronto ranks tenth of fifteen participating municipalities (third quartile) in terms of having the lowest operating costs.

The average age of the wastewater pipe, plotted on Chart 35.9 as a line graph relative to the right axis, can have a significant impact on costs as noted earlier. Toronto ranks fourteenth of fifteen participating municipalities (fourth quartile) in terms of having the youngest underground infrastructure of all municipalities (the average age of wastewater pipes is 64 years) and is a key factor in Toronto's higher costs.

## 35.10 – WHAT DOES IT COST TO TREAT AND DISPOSE OF WASTEWATER IN TORONTO?



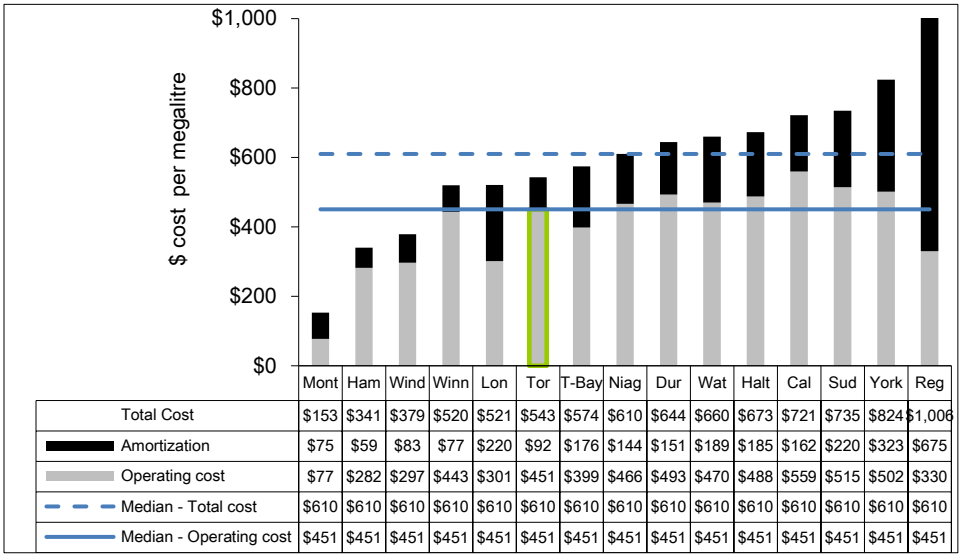

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|---|---|---|
| Total cost | | | $469 | $496 | $448 | $448 | $429 | $461 | $514 | $543 |
| Amortization | | | $65 | $61 | $59 | $71 | $64 | $65 | $70 | $92 |
| Operating cost | $365 | $320 | $404 | $435 | $389 | $377 | $365 | $396 | $444 | $451 |
| CPI-adjusted (base yr 2001) | $324 | $277 | $349 | $366 | $318 | $303 | $290 | $307 | $339 | $337 |

**Chart 35.10** summarizes Toronto's operating cost and total cost (operating cost plus amortization) of treating a megalitre (one million litres) of wastewater.

**Chart 35.10 (City of Toronto) Operating and Total Cost for Wastewater Treatment and Disposal per Megalitre**

The 2016 total costs per megalitre increased 5.7% while operating costs was relatively stable with a slight increase of 1.5% from 2015.

## 35.11–HOW DOES TORONTO'S COST OF WASTEWATER TREATMENT AND DISPOSAL COMPARE TO OTHER MUNICIPALITIES?




| | Mont | Ham | Wind | Winn | Lon | Tor | T-Bay | Niag | Dur | Wat | Halt | Cal | Sud | York | Reg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Total Cost | $153 | $341 | $379 | $520 | $521 | $543 | $574 | $610 | $644 | $660 | $673 | $721 | $735 | $824 | $1,006 |
| Amortization | $75 | $59 | $83 | $77 | $220 | $92 | $176 | $144 | $151 | $189 | $185 | $162 | $220 | $323 | $675 |
| Operating cost | $77 | $282 | $297 | $443 | $301 | $451 | $399 | $466 | $493 | $470 | $488 | $559 | $515 | $502 | $330 |
| Median - Total cost | $610 | $610 | $610 | $610 | $610 | $610 | $610 | $610 | $610 | $610 | $610 | $610 | $610 | $610 | $610 |
| Median - Operating cost | $451 | $451 | $451 | $451 | $451 | $451 | $451 | $451 | $451 | $451 | $451 | $451 | $451 | $451 | $451 |

**Chart 35.11** compares Toronto's 2016 cost of wastewater treatment and disposal per megalitre to other municipalities.

**Chart 35.11 (MBNC 2016) Operating and Total Cost for Wastewater Treatment and Disposal per Megalitre**

Toronto ranks eighth of fifteen municipalities (second quartile) in terms of having the lowest operating costs, and ranks sixth of fifteen municipalities (second quartile) in terms of total costs. One of the key factors that contribute to Toronto's higher costs is the age of Toronto's wastewater treatment plants. The oldest treatment plan has been in operation since 1929. Older and aging treatment plants are relatively more costly to maintain than newer plants in municipalities. Additionally, the strategies in the City's Biosolids and Residuals Master Plan (BRMP), approved in 2009 for three of the City's four wastewater treatment plants, contribute to Toronto's higher costs.

# 2016 ACHIEVEMENTS AND 2017 PLANNED INITIATIVES

**2016 Achievements**

The following initiatives have improved or are expected to further improve the efficiency and effectiveness of Wastewater Services in Toronto:

- The MOECC has completed annual inspections of the City's wastewater treatment facilities and there have been no major non-conformance issues identified.
- Ongoing optimization at treatment plants and pumping stations to minimize energy costs while meeting required legislative standards.

**2017 Initiatives Planned**

- Continue collection and treatment of 400 billion litres of wastewater.

**Factors Influencing the Results of Municipalities**

The results of each municipality included in this report can be influenced to varying degrees by factors such as:

- Composition – variation in wastewater from ICI and residential sectors, relative to total system volumes.
- Urban density – proximity of pipes to other utilities increases the cost for infrastructure repair and replacement.
- Age of infrastructure – age and condition of the wastewater treatment and collection and frequency of maintenance costs.
- Treatment plants/processes – number, size, age and complexity of the wastewater treatment plants operated.
- Maintenance policies – frequency of wastewater collection system maintenance activities.
- System characteristics – age, condition and type of pipe material.
- Weather conditions – negative impacts associated with more severe and frequent extreme weather events.
- Supply and Demand: Respective volume of wastewater generated relative to the total system demand. The quantity of wastewater flows from ICI sectors relative to residential demand
- Government Structure: Single-tier service providers with jurisdiction over the wastewater system vs. two-tier system where the responsibility for wastewater service is divided between the local municipalities and the Regional municipality.