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Survey of Drinking Water Plants

2011



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Survey of Drinking Water Plants

2011

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The following standard symbols are used in Statistics Canada publications:

- . not available for any reference period
- .. not available for a specific reference period
- ... not applicable
- 0 true zero or a value rounded to zero
- 0^s value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
- p preliminary
- r revised
- x suppressed to meet the confidentiality requirements of the *Statistics Act*
- E use with caution
- F too unreliable to be published
- * significantly different from reference category ($p < 0.05$)

Other symbols

- | | |
|----------------------------------|---|
| 0 ... | the estimate is calculated from a sample where all the responses are equal to zero, such that the coefficient of variation cannot be calculated |
| A Excellent data quality | coefficient of variation is 0.01% to 4.99% |
| B Very good data quality | coefficient of variation is 5.00% to 9.99% |
| C Good data quality | coefficient of variation is 10.00% to 14.99% |
| D Acceptable data quality | coefficient of variation is 15.00% to 24.99% |
| E Use with caution | coefficient of variation is 25.00% to 49.99% |
| F Too unreliable to be published | coefficient of variation is >49.99% (data are suppressed for purposes of publication and made available only upon request) |

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Preface

The Survey of Drinking Water Plants is conducted to provide Canadians with national and regional information related to the production of drinking water. The survey is a census of drinking water plants serving 300 or more people, and asks for information on volumes of water treated, type of treatment, financial aspects of the operation, as well as the quality of the raw water used as a source for the treatment plant.

This survey is part of the Canadian Environmental Sustainability Indicators (CESI) initiative. The data collected will be used in CESI's reporting activities. The survey results offer a national portrait of treatment processes, their costs and source water quality for facilities that range from complex to basic. The data are used to track the state of stocks of water on a regional and national basis in Canada and in the development of environmental accounts and indicators.

Highlights

- Drinking water plants in Canada supplied 5,103 million cubic metres of potable water in 2011, a reduction of 9% since 2007.
- Drinking water plants furnished potable water to nearly 29 million Canadians in 2011. The majority of those (just over 25 million people) received drinking water supplied by surface water sources, which accounted for 89% of the water withdrawn from the environment by drinking water plants.
- For plants reporting the percentage of water used by the residential sector, the average person used 251 litres per day at home in 2011.
- The residential sector used the largest share of drinking water in 2011, followed by the industrial, commercial, institutional and other non-residential sectors combined. Nationally, 18% of the total water volume produced could not be allocated to a particular sector.
- Capital expenditures on additions, expansions, or upgrades to drinking water plants totalled \$1,336 million in 2011.
- In 2011, drinking water plants spent \$882 million on operation and maintenance costs for the acquisition and treatment of potable water.
- Conventional plants and direct filtration plants produced 60% of the treated water in 2011, up 5% from 2007. The share of the total population served by these plants increased by 7% to just over 19 million people, or 66% of the population served.
- In untreated surface water sources used by drinking water plants, 22% of monthly *E. coli* maximum measurements were zero.
- The turbidity of untreated surface water sources was lower on the east and west coasts of Canada and higher in the interior. Turbidity, which naturally varies between watersheds, was highest in source surface water in the Assiniboine–Red, the North Saskatchewan, the Lower Saskatchewan–Nelson and the St. Lawrence drainage regions.

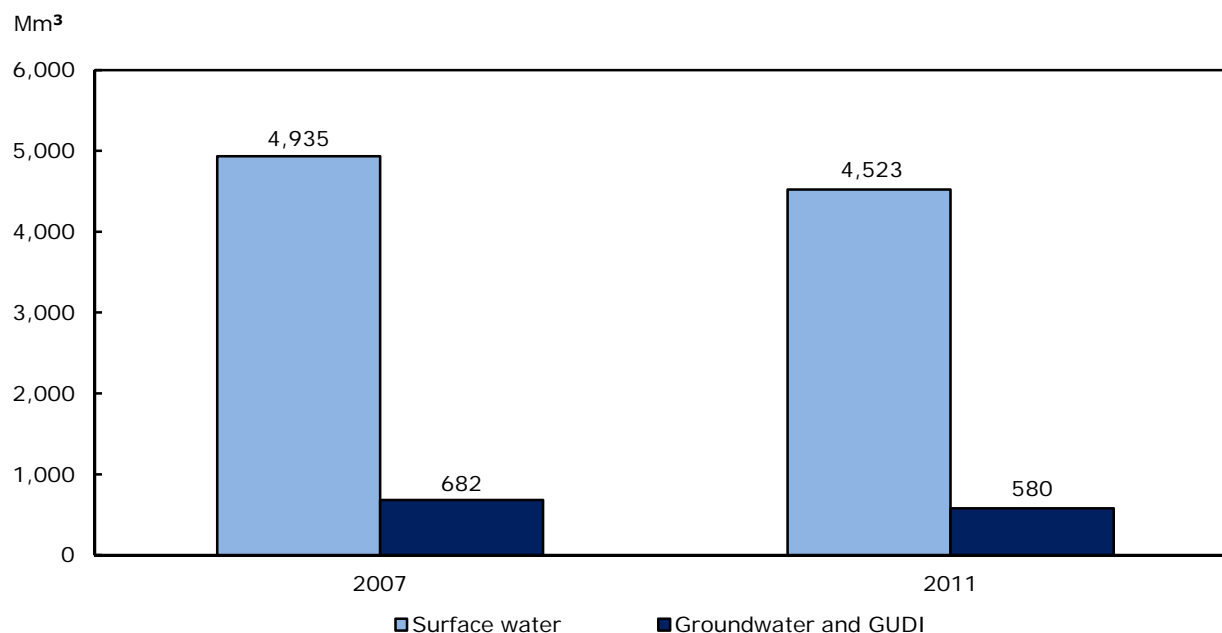
Results

Potable water volumes

Drinking water plants in Canada supplied 5,103 million cubic metres of potable water in 2011 (Tables 1-1 and 1-2). Surface water sources provided about 89% of the total volume, groundwater sources provided about 10%, and the remaining 1% came from groundwater under the direct influence of surface water (GUDI)¹ sources.

Comparing the 2011 survey results to those from the last survey (2007), the total volume of potable water produced decreased by 9% from 5,617 million cubic metres, reflecting a trend of declining water use over the last decade.² The decline for groundwater and GUDI sources was more pronounced at 15% (combined) than it was for surface water sources at 8% (Chart 1). This reflects a trend away from using groundwater towards using surface water piped from larger lakes.³

Chart 1
Potable water volumes by source water type, Canada, 2007 and 2011



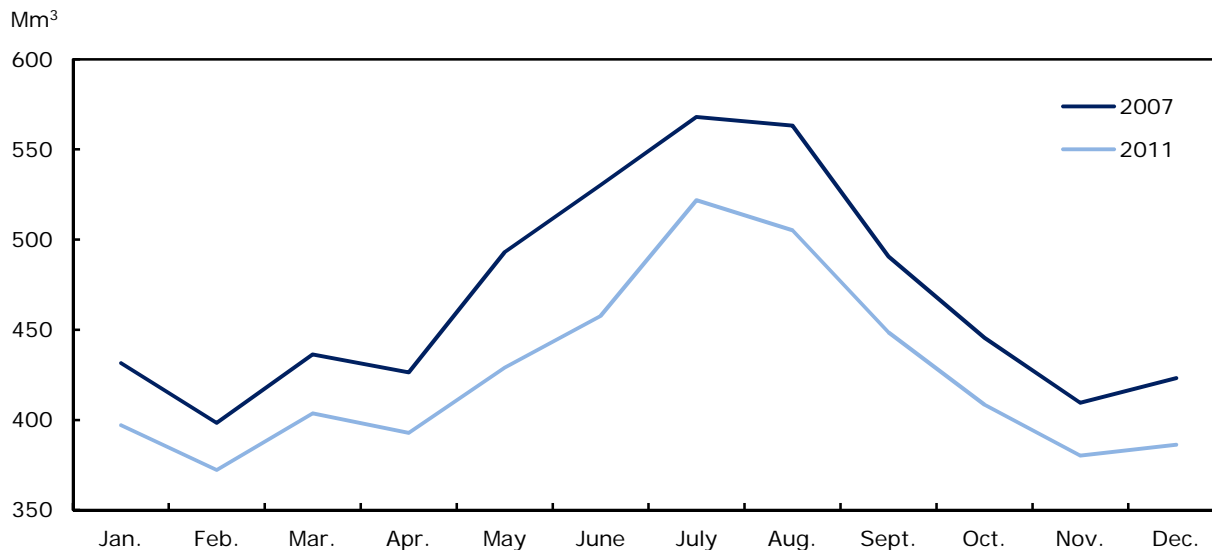
Note(s): GUDI stands for groundwater under the direct influence of surface water.

Source(s): Statistics Canada, Environment Accounts and Statistics Division, CANSIM table 153-0105.

1. GUDI refers to groundwater supply sources under conditions where microbial pathogens are able to travel from surface water to the groundwater source. (Daigle, Annie E. and Gina M. Giudice. 2006. "A protocol for determining groundwater under the direct influence of surface water in New Brunswick" Canadian Water Resources Association, *Water News*. Vol. 25, No. 4.)
2. For supporting detail, see the later section entitled "Average daily water use".
3. Council of Canadian Academies, 2009, *The Sustainable Management of Groundwater in Canada*, The Expert Panel on Groundwater.

Chart 2 compares monthly volumes of potable water produced by drinking water plants in 2007 and 2011, showing that the seasonal fluctuations in both years are similar (Tables 1-3 and 1-4).⁴ In 2011, volumes ranged between a low of 372 million cubic metres in February to a peak of 522 million cubic metres in July. Volumes for 2011 were 7% to 14% lower than in 2007.

Chart 2
Monthly potable water volumes, Canada, 2007 and 2011



Source(s): Statistics Canada, 2010 and 2013, Environment Accounts and Statistics Division, Survey of Drinking Water Plants (survey number 5149).

Population served

In 2011, drinking water plants provided potable water to nearly 29 million Canadians (Tables 2-1 and 2-2). The majority of those (just over 25 million people) received drinking water drawn from surface water sources. Groundwater sources supplied nearly three and a half million people, while GUDI sources supplied just over 440,000 people. The remaining five and a half million Canadians either had their own water supply or received water from facilities outside the scope of the survey.

Between 2007 and 2011, the total population served by drinking water plants grew by three and a half percent, or nearly one million people. Surface water sources accommodated all of this growth; groundwater and GUDI sources experienced small declines in the number of people they supplied.

Treatment methods

Conventional plants and direct filtration plants produced 60% of potable water in 2011 (Table 3-1), up 5% from 2007. The share of the total population served by these plants increased by 7% to just over 19 million people, or 66% of the population served (Table 3-1). Conventional plants apply coagulation, flocculation, sedimentation and granular media filtration in the treatment process. The difference between conventional plants and direct filtration plants is that direct filtration plants do not include a sedimentation process.⁵ Plants using unfiltered systems that disinfect

4. For more information on this topic, see Statistics Canada. 2010. "Monthly variations in drinking water production, 2005 to 2007." in *Envirostats*, Winter 2010. Available from <http://www.statcan.gc.ca/pub/16-002-x/2010004/t019-eng.htm> (accessed November 9, 2012).

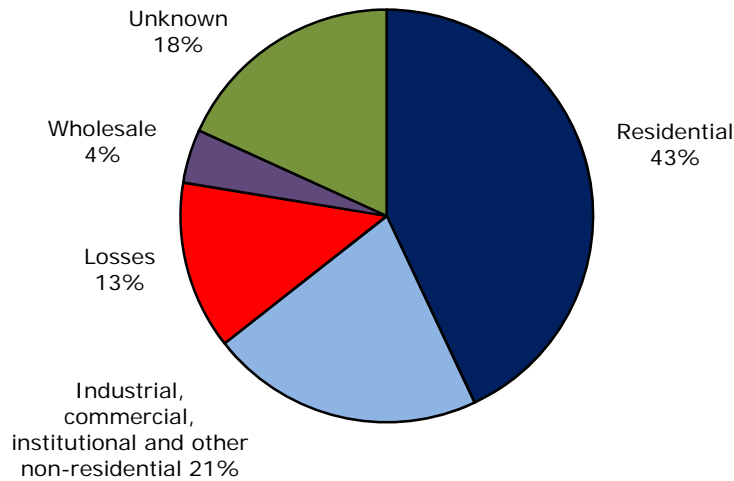
5. American Water Works Association, 2011, *Water Quality and Treatment: A Handbook on Drinking Water*, Sixth Edition, J.K. Edzwald (ed.), New York, McGraw-Hill.

only, or disinfect and use other non-filtration processes, served 16% of the population. Plants using membrane filtration systems served 8% of the population and another 8% of the population was served by plants with other types of filtration systems. The remaining 1% of the population was served by plants with no treatment system, which primarily drew water from groundwater sources.

Water use by sector

The survey collected data on the use of potable water by sector for the first time in 2011 (Table 4). Chart 3 shows that the portion of water volumes used by the residential sector was 43% or 2,196 million cubic metres. The industrial, commercial, institutional and other non-residential uses combined used 1,092 million cubic metres (21%). Nationally, the end-use for 18% of the total water volume (930 million cubic metres) was unknown to the respondent and could not be allocated to a particular sector. Losses from the distribution system (such as leakage) made up 13% of the volume produced. The remaining 4% of water was not allocated to a specific user because it was reported as wholesale transfers to other jurisdictions.

Chart 3
Potable water volumes by sector of use, Canada, 2011



Note(s): For plants reporting wholesale water, other data sources and administrative data for the jurisdictions served were used as much as possible in order to allocate their water to the other categories. Figures do not add up to 100% due to rounding.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Survey of Drinking Water Plants (survey number 5149).

The provinces and territories with the highest percentage of unknown water use were the Northwest Territories (67%), Newfoundland and Labrador (67%), New Brunswick (52%) and Québec (30%) (Table 4). Higher proportions of unknown water use reduce the accuracy of average daily water use estimates.

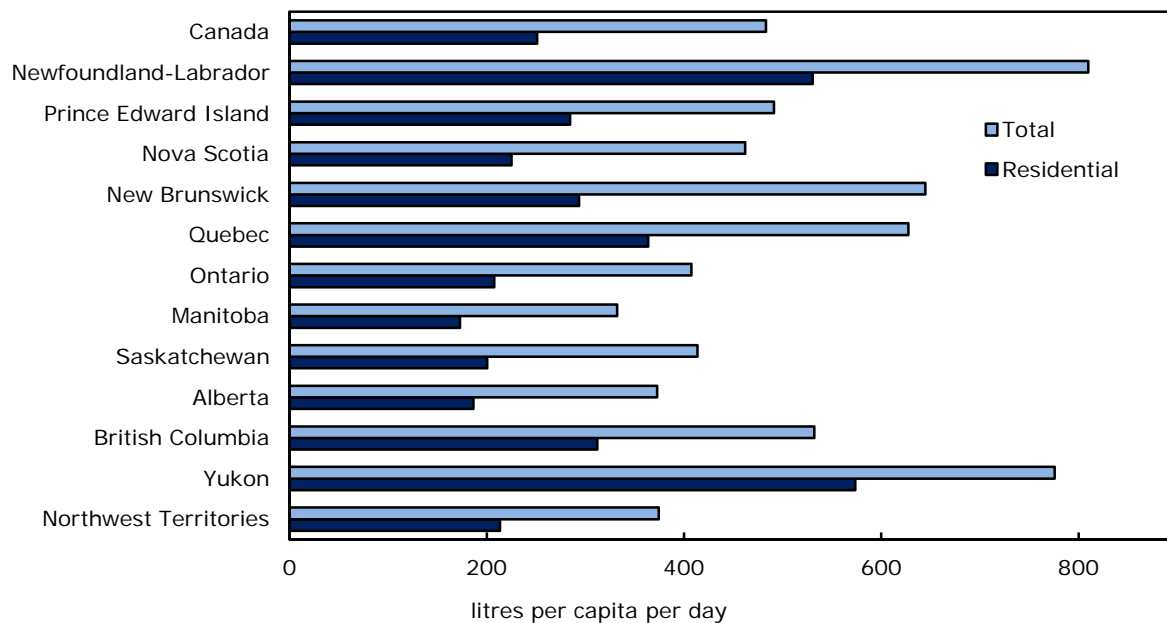
Average daily water use

In total for all sectors⁶, Canadians served by drinking water plants used an average of 483 litres of water per person per day in 2011 (Table 4), a reduction of 12% from 550 litres per person per day in 2007. For plants reporting the percentage of water used by the residential sector, the average person used 251 litres per day at home in 2011.

Newfoundland and Labrador, Prince Edward Island, New Brunswick, Quebec, British Columbia and Yukon were higher in total water use per capita than the national average (Chart 4 and Table 4). Total water use per capita was lowest in Manitoba, Alberta and the Northwest Territories.

Chart 4

Average daily total and residential potable water use per capita of the population served, Canada, provinces and territories, 2011



Note(s): The provinces and territories with the highest percentage of unknown water use were the Northwest Territories (67%), Newfoundland and Labrador (67%), New Brunswick (52%) and Québec (30%) (Table 4). Data for Nunavut were too unreliable to be published. Higher proportions of unknown water use reduce the accuracy of average daily residential water use estimates.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Survey of Drinking Water Plants (survey number 5149).

In terms of residential use, households in Newfoundland and Labrador, Prince Edward Island, New Brunswick, Quebec, British Columbia and Yukon used more water per capita than the Canadian average. Residents of the three Prairie Provinces used the least.

Many factors can account for differences in water use, including water metering and pricing, water supply shortages, conservation measures, climate, demographics, dwelling types, economic activities and the state of infrastructure.

The decline in per capita water use is influenced both by increasing population and decreasing drinking water demand. Results from an Environment Canada survey showed a decline in per capita water use between 2001

6. Total water use accounts for all uses including residential, industrial/commercial, other non-residential uses, losses in the distribution system and unknown uses.

and 2009 in Canada.⁷ The trend of waning demand over the last decade mirrors that being experienced in the United States.⁸

Capital expenditures

Capital expenditures on drinking water plants totalled \$1,336 million in 2011 (Table 5).⁹ Plants treating primarily surface water received most of this investment (\$1,075 million or 80%). Plants treating primarily groundwater spent \$205 million (15% of the total) and the remainder was spent by plants treating primarily mixed or GUDI source water. These expenses exclude costs related to the distribution of potable water.

Compared to 2007, capital expenditures in 2011 were 51% greater as the result of upgrades to existing infrastructure and new water treatment plants being commissioned. The increase was larger for plants treating primarily groundwater (+97%) or GUDI (+65%) and smaller for those treating primarily surface water (+45%) or mixed source water (+28%).

Operation and maintenance costs

In 2011, drinking water plants spent \$882 million on operation and maintenance (O&M), including \$338 million on labour, \$213 million on materials, \$200 million on energy and \$130 million on other requirements for the acquisition and treatment of potable water (Tables 6-1 and 6-2). Total O&M costs rose by approximately 9% from \$807 million in 2007. These expenses exclude costs related to the distribution of potable water.

On average, drinking water plants incurred about \$173 in O&M expenses to supply one thousand cubic metres of potable water in 2011, or about 17 cents per cubic metre (Table 6-3). A cubic metre is equal in volume to about five household hot water tanks. Labour costs were responsible for 38% of O&M expenses, materials for 24%, energy for 23% and other types of O&M costs for 15%.

Nationally, O&M costs in 2011 were \$150 per thousand cubic metres for plants treating primarily surface water (Table 6-4) and \$334 per thousand cubic metres for plants treating primarily groundwater and GUDI (Table 6-5).

A number of factors influence O&M costs, such as source water type, plant size and method of treatment.¹⁰ Costs per unit of volume are lower for surface water plants in part because they are mostly high-volume plants that benefit from economies of scale (Table 6-4). Plants that treat groundwater or GUDI supplies are mostly lower-volume plants (Table 6-5). Chart 5 demonstrates the effect of plant size (based on production volume categories) and main source water type on O&M costs per unit volume in 2011. For both source water types, costs per unit volume went down as production volumes went up.

7. Environment Canada, 2001, 2004, 2006 and 2009. Municipal Water and Wastewater Survey. Available from <http://www.ec.gc.ca/eau-water/default.asp?lang=En&n=ED0E12D7-1> (accessed Nov. 13, 2012).

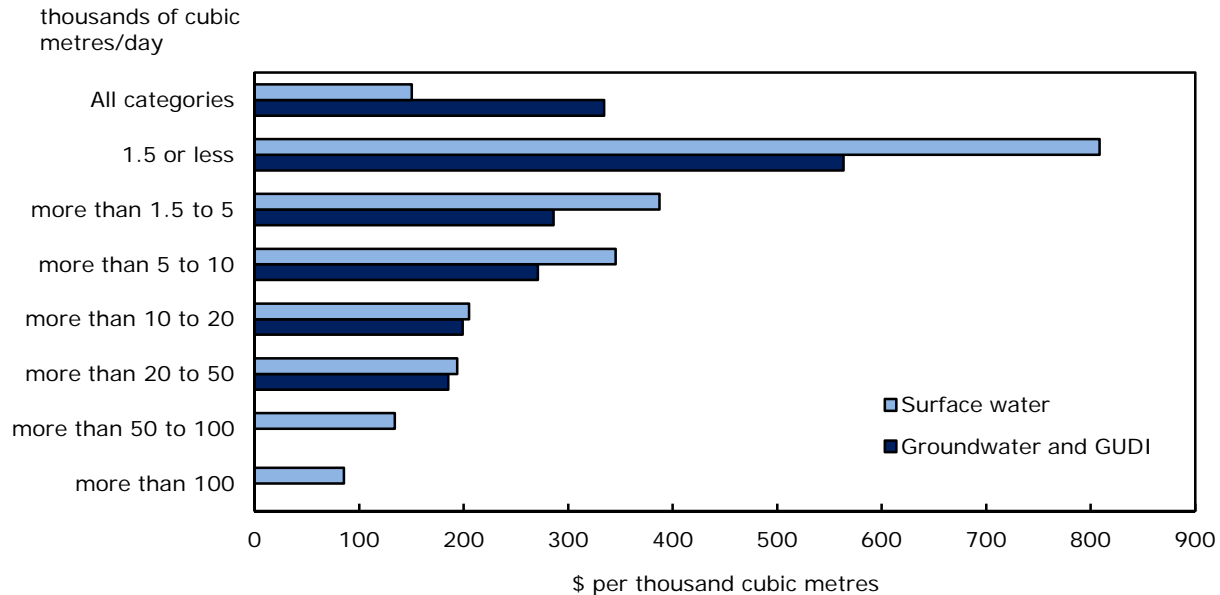
8. American Water Works Association. 2011. "Declining demand likely to continue beyond recession" in *AWWA Streamlines*, Volume 3, Number 20.

9. Expenditures include improvements to buildings, machinery, processing equipment and other physical assets related to the acquisition and treatment of water, but exclude expenses related to distribution.

10. For additional information on this subject, refer to Statistics Canada. 2011. "Operation and maintenance costs of drinking water plants." in *Envirostats* Spring 2011. Available from <http://www.statcan.gc.ca/pub/16-002-x/2011001/part-partie3-eng.htm> (accessed November 14, 2012).

Chart 5

Operation and maintenance costs per unit volume by plant production volume and main source water type, 2011



Note(s): GUDI stands for groundwater under the direct influence of surface water. One thousand cubic metres is equal to one mega litre. There were no plants with a main source water type of "Groundwater and GUDI" in the two largest production volume categories. Data do not include costs associated with the distribution of potable water (see the Glossary).

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Survey of Drinking Water Plants (survey number 5149).

For plants treating primarily surface water, O&M costs ranged from \$85 to \$809 per thousand cubic metres, whereas for plants treating mainly groundwater and GUDI, O&M costs ranged from \$185 to \$564 per thousand cubic metres, depending on the plant size. Only surface water plants treated more than 50,000 cubic metres per day. In the medium size categories (between 10,000 and 50,000 cubic metres per day), O&M costs per unit volume were similar for both source water types. In the three smallest plant size categories, O&M costs per unit volume for surface water exceeded those of groundwater and GUDI by considerable margins.

The O&M costs associated with treating water also varied by plant type. In 2011, O&M costs for conventional plants and direct filtration plants were \$203 and \$104 per thousand cubic metres of production, respectively (Table 6-3).

Overall, O&M costs associated with the acquisition and treatment of water ranged from \$74 to \$936 per thousand cubic metres because of differences in plant size, treatment technology and source water type.

Source water quality

Under the Canadian Environment Sustainability Indicators¹¹ (CESI) project, fresh water quality is assessed by Environment Canada using a network of 173 core monitoring stations from federal, provincial, territorial and joint programs. This network was established to monitor water quality for the protection of aquatic life and pressures on them from human activities.

11. Environment Canada, National freshwater quality indicator for 2007 to 2009, Canada, Available from <http://www.ec.gc.ca/indicateurs-indicators/default.asp?lang=En&n=68DE8F72-1> (accessed December 31, 2012).

Other networks of water quality information include source water monitoring done by drinking water plant operations. Water utilities then can also play a role in assessing source water quality and ecosystem conditions.¹² Monitoring of source water intakes provides water quality information from over 800 surface water and over 950 groundwater sites across Canada.

Source water quality data

The Survey of Drinking Water Plants collected data on several water quality parameters to provide information about the quality of source water used by drinking water plants in Canada. The data analysed are from plants using 90% or more surface water or groundwater – no plants using GUDI or other mixed sources were included. The data represent source water quality in the environment before treatment and not final drinking water quality.

Source water quality results presented in this report are based on reported data only. No effort was made to account for non-response. The results are based on the plants that reported data for the given parameter and apply only to the water processed and the population served by those plants. In some cases, there are no results for certain drainage regions due to low response for the given parameter in that area.

Median maximum refers to the median of all the maximum values reported for a particular source water quality parameter.

Median average refers to the median of all the average values reported for a particular source water quality parameter.

Median minimum refers to the median of all the minimum values reported for a particular source water quality parameter.

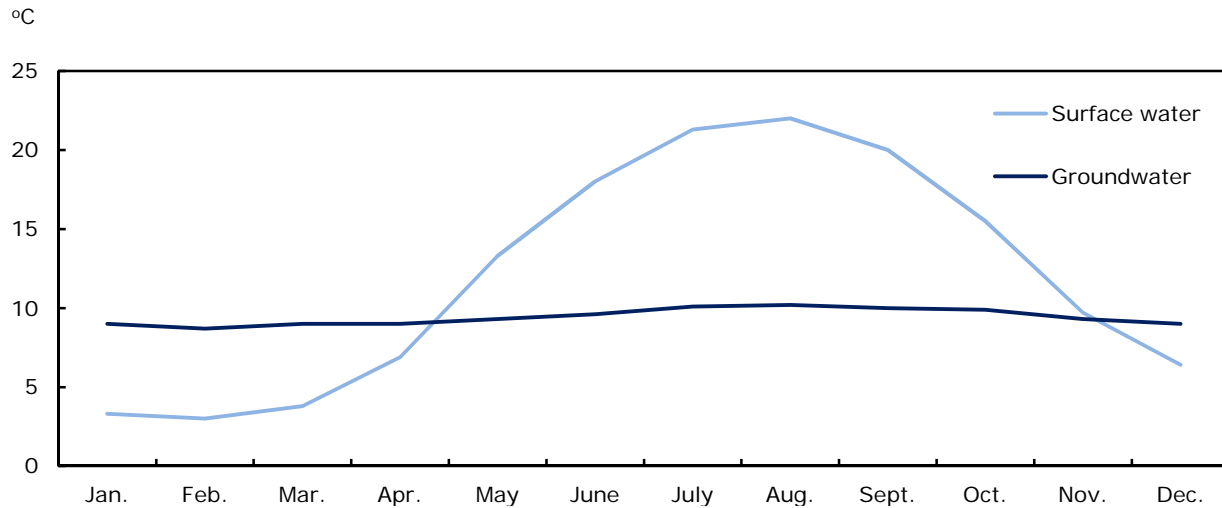
Source water quality – Temperature

Water temperature affects many other water quality parameters; for example, the concentration of pathogens in water can rise as temperature increases.¹³ Chart 6 contrasts the seasonal variation of water temperature in raw groundwater and raw surface water sources in 2011.

12. Grigg, Neil S., 2012 "Water utility leadership and its key role in protecting aquatic ecosystems", *Journal-American Water Works Association*, Volume 104, Number 10, pp. 50-59.

13. Delpla, I., Jung, A.V., Baures, E., Clement, M., Thomas, O. (2009). "Impacts of Climate Change on Surface Water Quality in Relation to Drinking Water Production", *Environment International*, 35, 1225–1233.

Chart 6
Monthly median values for maximum temperature by source water type, 2011



Note(s): Data are from 419 raw surface water sources and 190 raw groundwater sources used to produce 4,100 million cubic metres of drinking water, serving 23.3 million people. Eighty-four (84) of the sites were sampled continuously, another 273 were sampled at least daily and 252 were sampled less frequently. Of the remaining 1,185 surface source water and groundwater source sites, 389 respondents did not measure temperature, 703 did not respond for temperature and 93 reported partial data.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Survey of Drinking Water Plants (survey number 5149).

The monthly maximum temperature for raw groundwater sources was relatively stable, with median maximum values ranging between about 9°C and 10°C. Monthly maximum temperatures of raw surface water sources, which are more influenced by seasonal weather fluctuations, had median values that ranged from 3°C to 22°C, peaking in August.

Source water quality – Measuring total coliforms and *Escherichia coli* (*E. coli*)

An important objective of treating drinking water is to eliminate total coliforms, *E. coli* and other pathogens. Methods routinely used to detect total coliforms and *E. coli* organisms in water include a qualitative method (presence-absence or P-A) and two quantitative methods (membrane filtration, which measures colony forming units (CFUs) per 100 millilitres (mL) and multiple tube fermentation, which measures the most probable number (MPN) per 100 mL). Because respondents did not use the same method when analysing source water quality, both quantitative test methods are pooled together in Charts 7 and 8. According to the most recent version of *Standard Methods for the Examination of Water and Wastewater*, the membrane filter test is more precise; however data from each test yield approximately the same water quality information.¹⁴ Charts 7 and 8 show that the majority of respondents use the membrane filter test.

Source water quality – Total coliforms

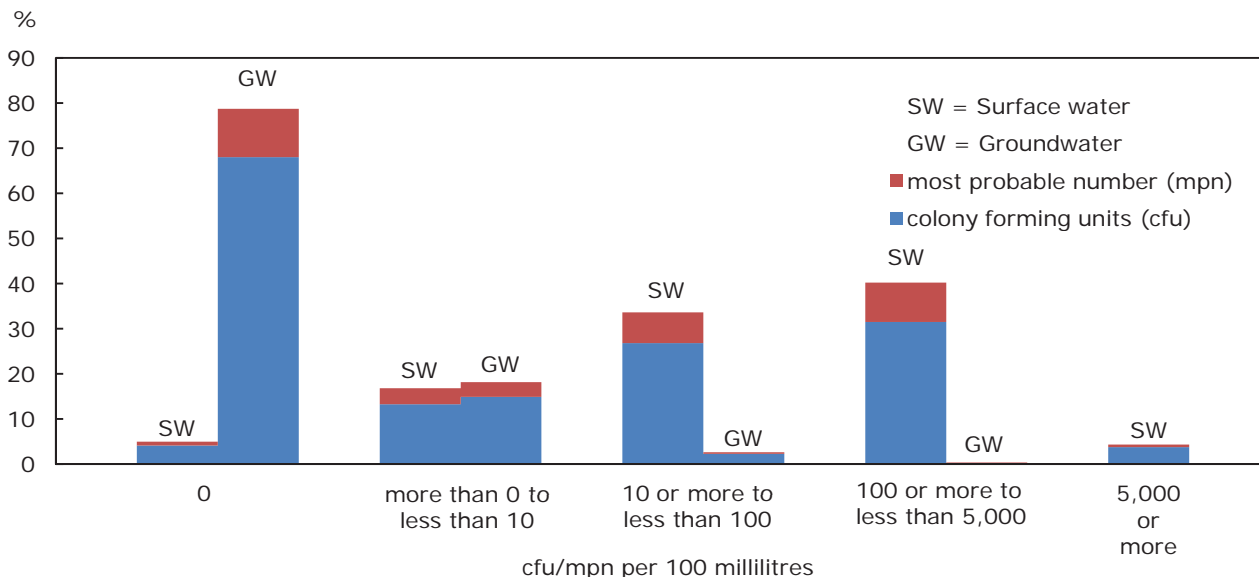
Coliforms are a group of bacteria that are naturally found on plants and in soils, in water, and in the intestines of humans and warm-blooded animals. Because they are widespread in the environment, they are not good indicators of faecal contamination in surface water and GUDI sources. Conversely, total coliforms can be used to indicate potential contamination of groundwater, since coliforms should not be found in these sources.¹⁵

14. American Public Health Association, American Water Works Association, Water Environment Federation, 2012, *Standard Methods for the Examination of Water and Wastewater*, 22nd Edition.

15. Health Canada, 2011, *Total Coliforms in Drinking Water*, Document for Public Consultation, Federal-Provincial-Territorial Committee on Drinking Water, http://www.hc-sc.gc.ca/ewh-semt/consult/_2011/coliform/draft-ebauche-eng.php (accessed September 7, 2012).

The monthly data from two quantitative test methods (see text box above) are pooled together in Chart 7 to show the distribution of monthly maximum total coliform values for 2011 in raw surface water and raw groundwater sources (no GUDI sources are included). Ninety-seven percent of total coliform maximums in groundwater were less than 10 CFU or MPN per 100 mL, compared to 22% for surface water. Results from 2005 to 2007, which only reported CFU ranges, were similar at 94% and 21% respectively.¹⁶

Chart 7
Monthly maximum ranges for total coliforms by raw source water type and unit of measure, 2011



Note(s): Data are from 280 raw surface water sources and 295 raw groundwater sources used to produce 3,736 million cubic metres of drinking water, serving 21.4 million people. Of the remaining surface source water and groundwater source sites, 341 respondents did not sample total coliforms, 592 did not respond for total coliforms, and 285 reported partial quantitative data or only qualitative data.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Survey of Drinking Water Plants (survey number 5149).

Source water quality – *Escherichia coli* (*E. coli*)

E. coli is naturally found in the intestines of humans and warm-blooded animals but usually does not occur naturally on plants or in soil and water. *E. coli* is well recognized as an indicator of recent faecal contamination and can indicate an increased potential for pathogens to be present in both surface and ground water sources.¹⁷

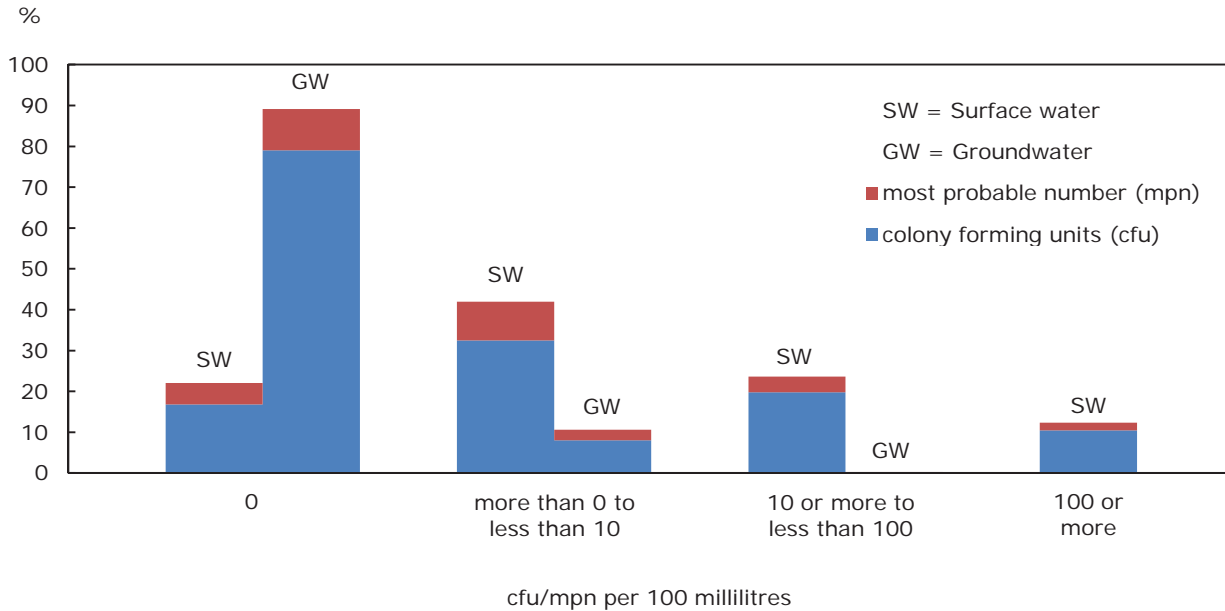
The monthly data from two quantitative test methods (see text box above) are pooled together in Chart 8 to show the distribution of monthly maximum *E. coli* values for 2011 in raw surface and raw groundwater sources (no GUDI sources are included). The presence of *E. coli* was lower in groundwater sources, as 89% of the monthly maximums were zero compared to 22% for surface water sources. For groundwater, 99.7% of *E. coli* maximums were less than 10 CFU or MPN per 100 mL, compared to 64% of surface water maximums. Results from 2005 to 2007, which only reported CFU ranges, were similar at 99% and 64% respectively.¹⁸

16. Statistics Canada, 2009, Environment Accounts and Statistics Division, *Survey of Drinking Water Plants*, catalogue no. 16-403-X.

17. Health Canada, 2011, *Escherichia coli in Drinking Water*, Document for Public Consultation, Federal-Provincial-Territorial Committee on Drinking Water, http://www.hc-sc.gc.ca/ewh-semi/consult/_2011/ecoli/draft-ebauche-eng.php (accessed September 7, 2012).

18. Statistics Canada, 2009, Environment Accounts and Statistics Division, *Survey of Drinking Water Plants*, catalogue no. 16-403-X.

Chart 8
Monthly maximum ranges for *Escherichia coli* by raw source water type and unit of measure, 2011



Note(s): Data are from 283 raw surface water sources and 307 raw groundwater sources used to produce 3,578 million cubic metres of drinking water, serving 20.5 million people. Of the remaining surface source water and groundwater source sites, 306 respondents did not sample *E. coli*, 582 did not respond for *E. coli*, and 314 reported partial quantitative data or only qualitative data.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Survey of Drinking Water Plants (survey number 5149).

Elimination of coliforms and *E. coli* is the objective of the primary disinfection processes applied at treatment plants. Secondary disinfection processes are also applied to maintain a disinfectant “residual” throughout the distribution system to avoid recontamination before water reaches the final user. Chlorination, which can be used for both primary and secondary disinfection, was applied to 96% of the water processed by drinking water plants in 2011 (Table 3-2). Ultraviolet irradiation and ozonation, which are effective for primary disinfection only, were applied to 21% and 27% of treated water respectively.

Source water quality – Surface water turbidity

Turbidity

Turbidity refers to the relative cloudiness of water and is reported in nephelometric turbidity units (NTU). Tests for it measure the scattering and absorbing effect that suspended particles have on light. Particles that cause turbidity can be inorganic silts, metallic precipitates as well as organic plant or animal debris and microorganisms. Studies show that turbidity in surface water naturally varies between watersheds and seasonally within watersheds. It increases during spring runoff and declines during summer low-flow periods.¹⁹

Changes in source water turbidity can point to a decline in water quality, higher loadings of pathogens and increased challenges to filtration and disinfection. These data help to establish historic trends that characterize changing source water conditions.²⁰ Conventional and direct filtration plants can produce treated water with a turbidity of less than 0.3 NTU and have demonstrated that levels less than 0.1 NTU are achievable on an ongoing basis.²¹

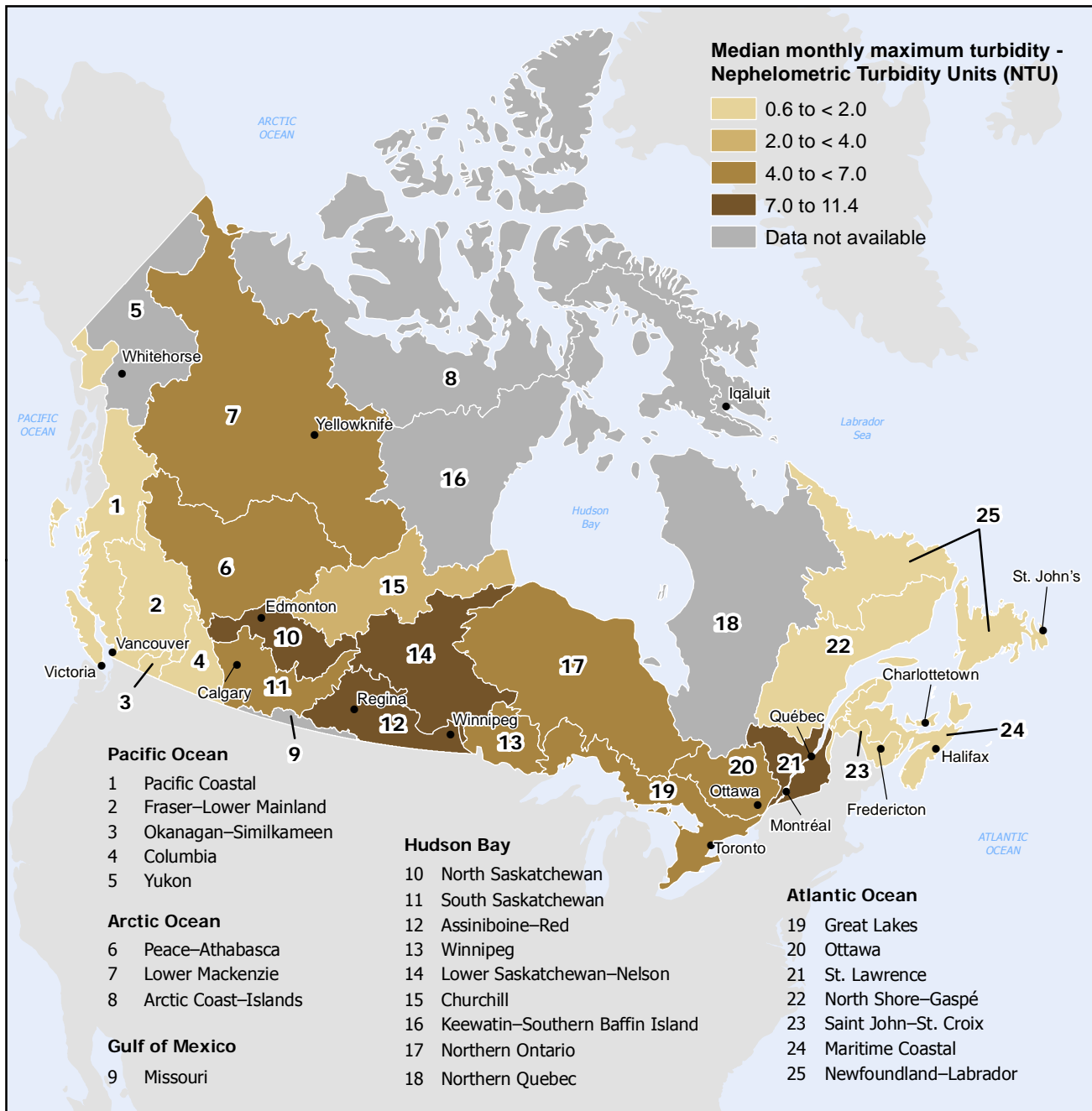
Map 1 presents the median values of monthly maximum turbidity for raw surface water sources by drainage region from plants that reported data for at least 10 months of the year. The results, which represent 90% of the surface water processed by drinking water plants, show that turbidity levels were lowest on the east and west coasts and highest in the interior. Surface water sources in the Assiniboine–Red (12), the North Saskatchewan (10), Lower Saskatchewan–Nelson (14) and the St. Lawrence (21) drainage regions had the highest median maximum turbidity, in the range of 7.0 to 11.4 NTU in 2011.

19. Brown, S., L.M. Lavkulich, H. Schreier. 2011. "Developing Indicators for Regional Water Quality Assessment: An example from British Columbia Community Watersheds". *Canadian Water Resources Journal*, 36 (3): 271-284.

20. Health Canada, 2011, *Turbidity in Drinking Water*, Document for Public Consultation, Federal-Provincial-Territorial Committee on Drinking Water, Health Canada, http://www.hc-sc.gc.ca/ewh-semt/consult/_2011/turbidit/draft-ebauche-eng.php (accessed November 25, 2012).

21. Ibid.

Map 1
Median values of monthly maximum turbidity in raw surface water sources by drainage region, 2011



Note(s): Data are from 465 raw surface water sources used to produce 4,070 million cubic metres of drinking water, serving 23.0 million people. One hundred and twenty-two (122) of these source water sites were sampled continuously, another 238 were sampled at least once a day, and 105 were sampled less frequently. Of the remaining 367 surface source water sites, 49 respondents did not sample for turbidity, 273 did not respond for turbidity, and 45 reported partial data.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Survey of Drinking Water Plants (survey number 5149).

Source water quality – Surface water pH and alkalinity

The pH of source water is an important parameter for drinking water plants to monitor because specific pH ranges are required for a number of treatment processes as well as for corrosion control in the water distribution system. In 2011, pH adjustments for process control were made for just over 30% of all surface water processed by drinking water plants (Table 3-2). Table 7-1 shows the median values of annual minimum, average and maximum pH levels reported for raw surface water by drainage region in 2011. The data, which represent 88% of the surface water processed by drinking water plants, show that source water pH ranges tended to be lower on the east coast — the Maritime Coastal (24) and Newfoundland–Labrador (25) drainage regions — compared to elsewhere in Canada.

Alkalinity²² is a measure of the capacity of water to neutralize acid. Geology can influence water quality. For example, areas that have primarily granitic rocks will be lower in alkalinity and those with more limestone will have higher alkalinity.²³ Alkalinity is adjusted to optimize treatment processes and provide a stable pH in the distribution system. In 2011, alkalinity adjustments for process control were made for nearly 10% of all surface water processed by drinking water plants (Table 3-2). Table 7-2 shows the annual median minimum, average and maximum total alkalinity values reported for raw surface water by drainage region. The data, which represent 86% of the surface water processed by drinking water plants, indicate that source water alkalinity was generally higher in the interior of Canada than it was on the coasts, with the exception of the Winnipeg drainage region (13).

Source water quality – Surface water colour

The presence of natural organic matter in surface water, particularly aquatic humic matter, can cause a yellow-brown colour.²⁴ The presence of metals such as iron, manganese and copper can further intensify water colour. Changes in water colouration may also be used as an indicator of environmental impact from human activities in certain situations.²⁵

Table 7-3 shows the annual median minimum, average and maximum colour values reported for raw surface water by drainage region for 2011. The data, which represent 68% of the surface water processed by drinking water plants, show that surface water in the drainage regions within British Columbia — Fraser–Lower Mainland (2), Okanagan–Similkameen (3) and Columbia (4) — had less colour in contrast to other regions in Canada.

Source water quality – Groundwater

Groundwater quality monitoring is also an important part of source water protection programs. Over 950 groundwater sources in Canada were included in the Survey of Drinking Water Plants. However, data on source water quality was only received from plants representing less than 50% of the groundwater production volume. Given the lower response rates, developing national estimates of source water quality parameters for groundwater are not included in this report.

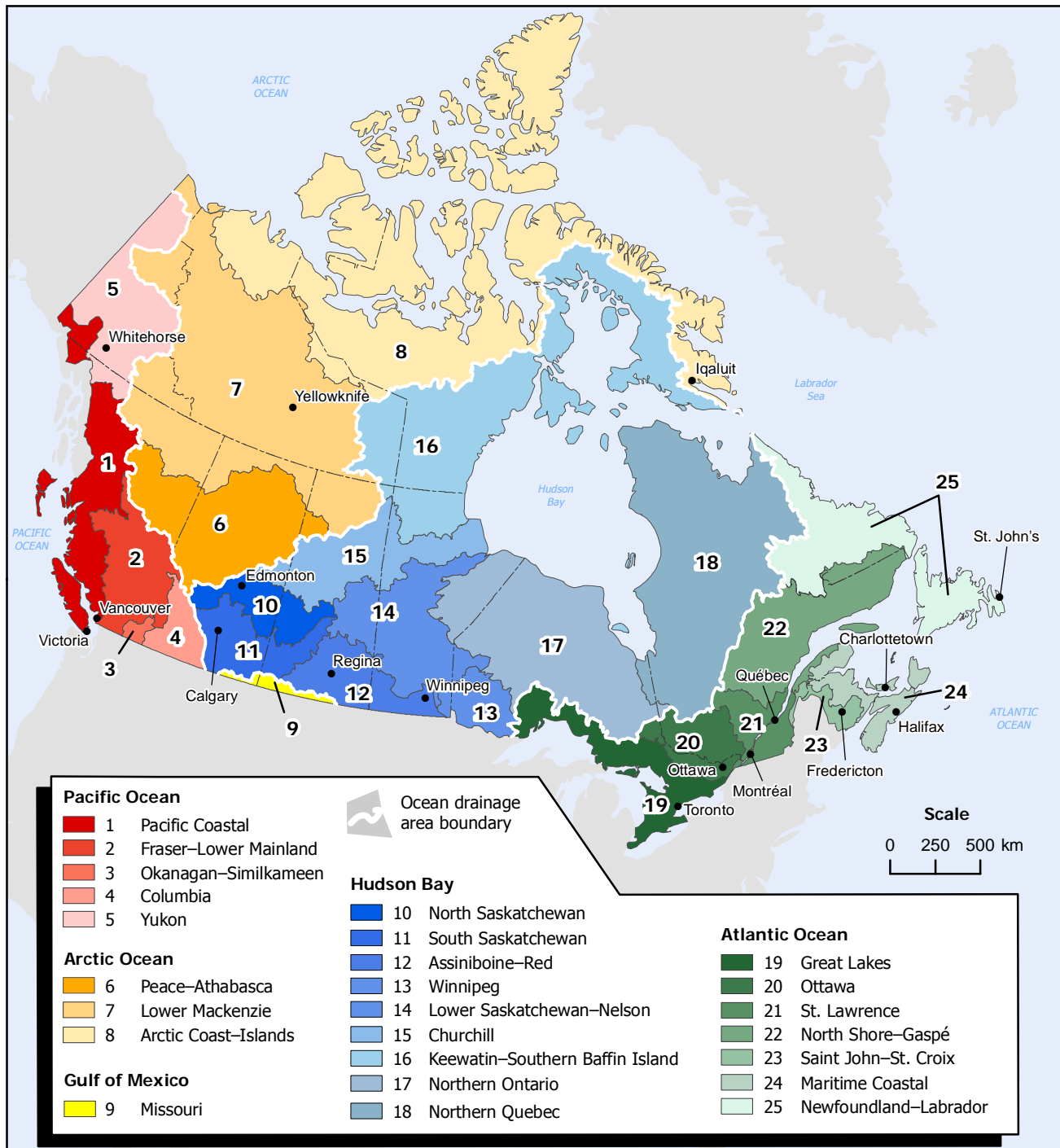
22. In this survey alkalinity refers to the total alkalinity.

23. American Water Works Association, 2011, *Water Quality and Treatment: A Handbook on Drinking Water*, Sixth Edition, J.K. Edzwald (ed.), New York, McGraw-Hill.

24. American Public Health Association, American Water Works Association, Water Environment Federation, 2012. *Standard Methods for the Examination of Water and Wastewater*, 22nd Edition.

25. Canadian Council of Ministers of the Environment, 2001, *Canadian Water Quality Guidelines for the Protection of Aquatic Life, Colour*. <http://ceqg-rcqe.ccmec.ca/> (accessed January 3, 2013).

Map 2
Ocean drainage areas and drainage regions of Canada



Note(s): The drainage region codes in this map are used in Tables 1-2, 1-4, 2-2, 6-2, 7-1, 7-2, and 7-3.

Source(s): Pearse, P.H., F. Bertrand and J.W. MacLaren, 1985, *Currents of Change: Final Report of the Inquiry on Federal Water Policy*, Environment Canada, Ottawa.
 Statistics Canada, Environment Accounts and Statistics Division, 2009, special tabulation.

Related products

Selected publications from Statistics Canada

11-526-X	Households and the Environment
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16-002-X200900210889	Measuring renewable water assets in Canada: Initial results and research agenda
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16-002-X201100111421	Operation and maintenance costs of drinking water plants
16-002-X201100311547	Precipitation trends in Canada
16-002-X201200111640	Snow cover trends in Canada

Selected CANSIM tables from Statistics Canada

153-0050	Water intake in manufacturing industries, by source and North American Industry Classification System (NAICS), biennial
153-0062	Households and the environment survey, dwelling's main source of water, Canada and provinces, biennial
153-0063	Households and the environment survey, primary type of drinking water consumed, Canada and provinces, biennial
153-0066	Households and the environment survey, treatment of drinking water, Canada and provinces, biennial
153-0082	Water intake in mineral extraction and thermal-electric power generation industries, by source and region, biennial
153-0100	Irrigation volume by month and province, biennial
153-0101	Water use in Canada, by sector, biennial
153-0102	Selected glacier mass balance in Canada, annual
153-0103	Departures of temperature and precipitation from 1961 to 1990 normal, by Canada and climatic regions
153-0104	Households and the environment survey, indoor water conservation practices, Canada and provinces
153-0105	Potable water volumes processed by drinking water plants, by source water type for Canada, provinces, territories and drainage regions, occasional

153-0106	Population served by drinking water plants, by source water type for Canada, provinces, territories and drainage regions, occasional
153-0107	Total capital expenditures of drinking water plants, by main source water type for Canada, provinces and territories, occasional
153-0108	Operation and maintenance costs of drinking water plants, for Canada, provinces, territories and drainage regions, occasional

Selected surveys from Statistics Canada

3881	Households and the Environment Survey
5120	Industrial Water Survey
5145	Agricultural Water Survey
5149	Survey of Drinking Water Plants

Statistical tables

Table 1-1
Potable water volumes processed by drinking water plants — Source water type and province and territory

	Surface water	Groundwater	Groundwater under the direct influence of surface water	Total
millions of cubic metres				
Canada	4,522.9^A	512.6^A	67.7^A	5,103.1^A
Newfoundland and Labrador	115.8 ^A	5.6 ^B	0.4 ^D	121.8 ^A
Prince Edward Island	0.0 ^{...}	11.4 ^A	0.0 ^{...}	11.4 ^A
Nova Scotia	82.0 ^B	14.9 ^C	0.3 ^A	97.2 ^A
New Brunswick	60.6 ^A	26.0 ^A	3.0 ^A	89.6 ^A
Quebec	1,480.3 ^A	152.3 ^A	13.1 ^A	1,645.7 ^A
Ontario	1,496.4 ^A	144.1 ^A	29.5 ^A	1,670.0 ^A
Manitoba	101.7 ^A	13.6 ^A	1.9 ^D	117.2 ^A
Saskatchewan	101.6 ^A	18.8 ^A	1.5 ^A	121.9 ^A
Alberta	414.1 ^A	17.0 ^A	9.4 ^A	440.5 ^A
British Columbia	662.8 ^A	101.1 ^A	7.7 ^A	771.7 ^A
Yukon	..	7.8 ^A	0.9 ^A	8.7 ^A
Northwest Territories	5.5 ^B	..	0.0 ^{...}	5.5 ^B
Nunavut	1.9 ^B	0.0 ^{As}	0.0 ^{...}	2.0 ^B

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, Environment Accounts and Statistics Division, CANSIM table 153-0105.

Table 1-2
Potable water volumes processed by drinking water plants — Source water type and drainage region

	Drainage region	Surface water	Groundwater	Groundwater under the direct influence of surface water	Total
millions of cubic metres					
Canada	...	4,522.9^A	512.6^A	67.7^A	5,103.1^A
Pacific Coastal	1	391.4 ^A	24.7 ^A	4.2 ^A	420.3 ^A
Fraser–Lower Mainland	2	163.5 ^A	47.8 ^A	0.5 ^A	211.8 ^A
Okanagan–Similkameen	3	80.1 ^A	14.6 ^A	1.7 ^A	96.5 ^A
Columbia	4	23.3 ^B	9.9 ^B	..	33.3 ^A
Yukon	5	..	7.3 ^A	0.9 ^A	8.2 ^A
Peace–Athabasca	6	33.8 ^A	8.7 ^A	1.3 ^A	43.8 ^A
Lower Mackenzie	7	7.2 ^A	0.3 ^A	0.0 ^{...}	7.5 ^A
Arctic Coast–Islands	8	1.4 ^A	0.0 ^{...}	0.0 ^{...}	1.4 ^A
Missouri	9	0.4 ^A	0.2 ^E	F	0.7 ^B
North Saskatchewan	10	151.2 ^A	6.1 ^A	1.1 ^A	158.4 ^A
South Saskatchewan	11	287.8 ^A	11.9 ^A	9.3 ^A	309.0 ^A
Assiniboine–Red	12	134.5 ^A	20.8 ^A	2.3 ^D	157.5 ^A
Winnipeg	13	9.2 ^A	0.0 ^{...}	0.0 ^{...}	9.2 ^A
Lower Saskatchewan–Nelson	14	5.6 ^A	5.1 ^A	0.0 ^{...}	10.7 ^A
Churchill	15	6.6 ^B	0.8 ^E	..	7.4 ^A
Keewatin–Southern Baffin Island	16	0.7 ^D	0.0 ^{As}	0.0 ^{...}	0.7 ^C
Northern Ontario	17	12.6 ^A	4.6 ^A	0.0 ^{...}	17.2 ^A
Northern Quebec	18	4.0 ^A	10.6 ^E	0.0 ^{...}	14.6 ^D
Great Lakes	19	1,309.9 ^A	135.3 ^A	29.0 ^A	1,474.3 ^A
Ottawa	20	241.7 ^A	19.6 ^B	0.5 ^A	261.9 ^A
St. Lawrence	21	1,325.3 ^A	85.9 ^A	12.3 ^A	1,423.6 ^A
North Shore–Gaspé	22	63.9 ^B	32.0 ^A	0.5 ^D	96.4 ^A
Saint John–St. Croix	23	33.5 ^A	17.8 ^A	3.0 ^A	54.3 ^A
Maritime Coastal	24	119.5 ^A	42.8 ^B	0.4 ^A	162.7 ^A
Newfoundland–Labrador	25	115.8 ^A	5.7 ^B	0.4 ^D	122.0 ^A

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, Environment Accounts and Statistics Division, CANSIM table 153-0105.

Table 1-3
Potable water volumes processed by drinking water plants — Month and province and territory

	January	February	March	April	May	June	
millions of cubic metres							
Canada	397.1^A	372.2^A	403.7^A	392.9^A	429.1^A	457.7^A	
Newfoundland and Labrador	9.9 ^A	9.6 ^A	10.3 ^A	10.2 ^A	10.5 ^A	10.7 ^A	
Prince Edward Island	0.9 ^A	0.9 ^A	0.9 ^A	0.9 ^A	0.9 ^A	1.0 ^A	
Nova Scotia	8.4 ^A	7.7 ^A	8.3 ^A	7.9 ^A	8.2 ^A	7.9 ^A	
New Brunswick	7.4 ^A	7.0 ^A	7.7 ^A	7.3 ^A	7.5 ^A	7.3 ^A	
Quebec	134.1 ^A	123.6 ^A	135.7 ^A	129.9 ^A	140.4 ^A	147.6 ^A	
Ontario	128.8 ^A	125.2 ^A	130.3 ^A	128.3 ^A	138.9 ^A	150.1 ^A	
Manitoba	8.9 ^A	8.1 ^A	9.1 ^A	8.8 ^A	9.4 ^A	9.6 ^A	
Saskatchewan	8.8 ^A	8.2 ^A	9.3 ^A	9.2 ^A	10.4 ^A	10.6 ^A	
Alberta	33.3 ^A	30.6 ^A	34.6 ^A	33.3 ^A	38.2 ^A	38.3 ^A	
British Columbia	55.1 ^A	50.1 ^A	56.0 ^A	55.6 ^A	63.1 ^A	73.0 ^A	
Yukon	0.8 ^A	0.7 ^A	0.8 ^A	0.8 ^A	0.9 ^A	0.8 ^A	
Northwest Territories	0.4 ^B	0.4 ^B	0.5 ^B	0.4 ^B	0.5 ^A	0.6 ^A	
Nunavut	0.2 ^B	0.1 ^B	0.2 ^B	0.2 ^B	0.2 ^B	0.2 ^B	
millions of cubic metres							
	July	August	September	October	November	December	Total
Canada	521.9^A	505.1^A	448.6^A	408.4^A	380.3^A	386.2^A	5,103.1^A
Newfoundland and Labrador	11.1 ^A	10.8 ^A	10.0 ^A	9.6 ^A	9.5 ^A	9.5 ^A	121.8 ^A
Prince Edward Island	1.0 ^A	1.0 ^A	0.9 ^A	1.2 ^A	0.9 ^A	0.9 ^A	11.4 ^A
Nova Scotia	8.4 ^A	8.2 ^A	8.2 ^A	8.1 ^A	7.8 ^A	8.0 ^A	97.2 ^A
New Brunswick	7.8 ^A	7.8 ^A	7.4 ^A	7.6 ^A	7.6 ^A	7.2 ^A	89.6 ^A
Quebec	160.8 ^A	151.4 ^A	138.2 ^A	132.1 ^A	124.6 ^A	127.3 ^A	1,645.7 ^A
Ontario	178.1 ^A	159.0 ^A	143.6 ^A	135.4 ^A	125.5 ^A	126.6 ^A	1,670.0 ^A
Manitoba	11.4 ^A	12.0 ^A	10.4 ^A	10.2 ^A	9.5 ^A	9.8 ^A	117.2 ^A
Saskatchewan	12.8 ^A	13.5 ^A	11.4 ^A	9.6 ^A	8.9 ^A	9.1 ^A	121.9 ^A
Alberta	43.2 ^A	44.8 ^A	40.8 ^A	36.0 ^A	33.3 ^A	34.2 ^A	440.5 ^A
British Columbia	85.9 ^A	95.2 ^A	76.5 ^A	57.5 ^A	51.5 ^A	52.3 ^A	771.7 ^A
Yukon	0.7 ^A	0.7 ^A	0.6 ^A	0.6 ^A	0.7 ^A	0.7 ^A	8.7 ^A
Northwest Territories	0.5 ^A	0.5 ^A	0.4 ^B	0.4 ^B	0.4 ^B	0.4 ^B	5.5 ^B
Nunavut	0.2 ^B	0.2 ^B	0.2 ^B	0.2 ^B	0.1 ^B	0.1 ^B	2.0 ^B

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Survey of Drinking Water Plants (survey number 5149).

Table 1-4
Potable water volumes processed by drinking water plants — Month and drainage region

Drainage region	January	February	March	April	May	June
code	millions of cubic metres					
Canada	397.1^A	372.2^A	403.7^A	392.9^A	429.1^A	457.1^A
Pacific Coastal	33.7 ^A	30.6 ^A	33.5 ^A	32.9 ^A	34.4 ^A	38.2 ^A
Fraser–Lower Mainland	14.2 ^A	12.7 ^A	14.7 ^A	14.4 ^A	16.7 ^A	19.3 ^A
Okanagan–Similkameen	4.2 ^A	3.9 ^A	4.7 ^A	5.2 ^A	8.5 ^A	11.7 ^A
Columbia	2.2 ^A	2.0 ^A	2.2 ^A	2.2 ^B	2.8 ^B	3.0 ^A
Yukon	0.7 ^A	0.7 ^A	0.8 ^A	0.8 ^A	0.8 ^A	0.7 ^A
Peace–Athabasca	3.5 ^A	3.2 ^A	3.8 ^A	3.5 ^A	3.9 ^A	3.9 ^A
Lower Mackenzie	0.6 ^A	0.6 ^A	0.6 ^A	0.6 ^A	0.6 ^A	0.7 ^A
Arctic Coast–Islands	0.1 ^A	0.1 ^A	0.1 ^B	0.1 ^A	0.1 ^A	0.1 ^A
Missouri	0.0 ^{Bs}	0.0 ^{Bs}	0.0 ^{Bs}	0.0 ^{Bs}	0.1 ^B	0.1 ^B
North Saskatchewan	12.3 ^A	11.4 ^A	13.0 ^A	12.4 ^A	14.6 ^A	13.9 ^A
South Saskatchewan	22.6 ^A	20.6 ^A	23.3 ^A	22.7 ^A	25.8 ^A	26.8 ^A
Assiniboine–Red	11.7 ^A	10.7 ^A	12.2 ^A	11.8 ^A	12.7 ^A	12.8 ^A
Winnipeg	0.8 ^A	0.7 ^A	0.8 ^A	0.7 ^A	0.7 ^A	0.8 ^A
Lower Saskatchewan–Nelson	0.9 ^A	0.8 ^A	0.9 ^A	0.9 ^A	0.9 ^A	1.0 ^A
Churchill	0.6 ^A	0.6 ^A	0.6 ^A	0.6 ^A	0.7 ^A	0.7 ^A
Keewatin–Southern Baffin Island	0.0 ^{Ds}	0.0 ^{Ds}	0.1 ^D	0.0 ^{Ds}	0.1 ^C	0.1 ^C
Northern Ontario	1.4 ^A	1.3 ^A	1.5 ^A	1.4 ^A	1.4 ^A	1.5 ^A
Northern Quebec	1.1 ^E	1.0 ^E	1.1 ^D	1.1 ^E	1.2 ^E	1.4 ^D
Great Lakes	113.1 ^A	111.5 ^A	114.3 ^A	113.1 ^A	122.7 ^A	132.6 ^A
Ottawa	21.0 ^A	19.4 ^A	21.3 ^A	20.5 ^A	22.2 ^A	23.6 ^A
St. Lawrence	116.0 ^A	106.1 ^A	117.2 ^A	112.0 ^A	120.9 ^A	127.6 ^A
North Shore–Gaspé	8.1 ^A	7.4 ^A	8.3 ^A	7.9 ^A	8.5 ^A	8.5 ^A
Saint John–St. Croix	4.5 ^A	4.3 ^A	4.7 ^A	4.5 ^A	4.3 ^A	4.3 ^A
Maritime Coastal	13.8 ^A	12.7 ^A	13.8 ^A	13.3 ^A	13.9 ^A	13.6 ^A
Newfoundland–Labrador	9.9 ^A	9.6 ^A	10.3 ^A	10.2 ^A	10.5 ^A	10.7 ^A

Drainage region	July	August	September	October	November	December	Total
code	millions of cubic metres						
Canada	521.9^A	505.1^A	448.6^A	408.4^A	380.3^A	386.2^A	5,103.1^A
Pacific Coastal	45.6 ^A	48.0 ^A	40.0 ^A	30.3 ^A	27.9 ^A	25.1 ^A	420.3 ^A
Fraser–Lower Mainland	19.6 ^A	23.7 ^A	20.4 ^A	19.0 ^A	16.8 ^A	20.3 ^A	211.8 ^A
Okanagan–Similkameen	15.7 ^A	17.7 ^A	11.7 ^A	5.1 ^A	4.0 ^A	3.9 ^A	96.5 ^A
Columbia	4.1 ^A	4.8 ^A	3.5 ^A	2.2 ^B	2.0 ^B	2.1 ^B	33.3 ^A
Yukon	0.7 ^A	0.7 ^A	0.5 ^A	0.5 ^A	0.6 ^A	0.7 ^A	8.2 ^A
Peace–Athabasca	3.8 ^A	3.9 ^A	3.7 ^A	3.6 ^A	3.4 ^A	3.5 ^A	43.8 ^A
Lower Mackenzie	0.7 ^A	0.7 ^A	0.6 ^A	0.6 ^A	0.6 ^A	0.6 ^A	7.5 ^A
Arctic Coast–Islands	0.1 ^A	0.1 ^A	0.1 ^A	0.1 ^A	0.1 ^A	0.1 ^A	1.4 ^A
Missouri	0.1 ^A	0.1 ^A	0.1 ^A	0.1 ^B	0.0 ^{Bs}	0.0 ^{Bs}	0.7 ^B
North Saskatchewan	13.8 ^A	14.7 ^A	14.3 ^A	13.2 ^A	12.3 ^A	12.5 ^A	158.4 ^A
South Saskatchewan	32.6 ^A	34.0 ^A	29.6 ^A	24.8 ^A	22.8 ^A	23.4 ^A	309.0 ^A
Assiniboine–Red	16.0 ^A	16.7 ^A	14.1 ^A	13.4 ^A	12.5 ^A	12.8 ^A	157.5 ^A
Winnipeg	0.9 ^A	0.9 ^A	0.8 ^A	0.7 ^A	0.7 ^A	0.7 ^A	9.2 ^A
Lower Saskatchewan–Nelson	1.0 ^A	1.0 ^A	0.9 ^A	0.8 ^A	0.8 ^A	0.8 ^A	10.7 ^A
Churchill	0.6 ^A	0.7 ^A	0.6 ^A	0.6 ^A	0.6 ^A	0.6 ^A	7.4 ^A
Keewatin–Southern Baffin Island	0.1 ^C	0.1 ^C	0.1 ^C	0.1 ^D	0.0 ^{Ds}	0.0 ^{Ds}	0.7 ^C
Northern Ontario	1.6 ^A	1.6 ^A	1.4 ^A	1.4 ^A	1.3 ^A	1.4 ^A	17.2 ^A
Northern Quebec	1.5 ^D	1.4 ^D	1.3 ^D	1.1 ^D	1.1 ^D	1.2 ^D	14.6 ^D
Great Lakes	158.7 ^A	140.4 ^A	127.2 ^A	119.4 ^A	110.4 ^A	111.0 ^A	1,474.3 ^A
Ottawa	25.9 ^A	24.6 ^A	21.9 ^A	21.1 ^A	19.9 ^A	20.4 ^A	261.9 ^A
St. Lawrence	139.7 ^A	131.0 ^A	119.9 ^A	114.7 ^A	108.2 ^A	110.2 ^A	1,423.6 ^A
North Shore–Gaspé	8.9 ^A	8.7 ^A	7.9 ^A	7.6 ^A	7.1 ^A	7.6 ^A	96.4 ^A
Saint John–St. Croix	4.6 ^A	4.7 ^A	4.4 ^A	4.7 ^A	4.8 ^A	4.5 ^A	54.3 ^A
Maritime Coastal	14.3 ^A	14.1 ^A	13.7 ^A	13.6 ^A	12.8 ^A	13.1 ^A	162.7 ^A
Newfoundland–Labrador	11.1 ^A	10.9 ^A	10.0 ^A	9.6 ^A	9.5 ^A	9.5 ^A	122.0 ^A

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Survey of Drinking Water Plants (survey number 5149).

Table 2-1
Population served by drinking water plants — Source water type and province and territory

	Surface water	Groundwater	Groundwater under the direct influence of surface water	Total
	persons			
Canada	25,149,570 A	3,353,524 A	442,641 A	28,945,736 A
Newfoundland and Labrador	379,755 A	28,096 B	F	412,090 A
Prince Edward Island	0 ...	63,807 A	0 ...	63,807 A
Nova Scotia	500,351 B	71,370 C	4,500 A	576,221 B
New Brunswick	224,393 A	140,923 A	15,604 A	380,920 A
Quebec	6,165,044 A	935,925 A	83,763 A	7,184,732 A
Ontario	9,708,702 A	1,288,678 A	234,390 A	11,231,770 A
Manitoba	841,893 A	110,680 A	13,754 B	966,327 A
Saskatchewan	658,470 A	139,162 A	10,155 A	807,787 A
Alberta	3,093,062 A	98,341 A	47,322 A	3,238,725 A
British Columbia	3,500,600 A	449,046 A	25,413 A	3,975,060 A
Yukon	..	27,096 A	3,500 A	30,596 A
Northwest Territories	40,511 A	..	0 ...	40,511 A
Nunavut	F	F	F	F

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, Environment Accounts and Statistics Division, CANSIM table 153-0106.

Table 2-2
Population served by drinking water plants — Source water type and drainage region

	Drainage region	Surface water	Groundwater	Groundwater under the direct influence of surface water	Total
	code	persons			
Canada	...	25,149,570 A	3,353,524 A	442,641 A	28,945,736 A
Pacific Coastal 1	1	2,289,172 A	131,660 A	16,509 A	2,437,341 A
Fraser–Lower Mainland 2	2	896,057 A	237,657 A	1,778 A	1,135,494 A
Okanagan–Similkameen	3	208,859 A	36,548 A	2,916 A	248,322 A
Columbia	4	86,053 A	26,433 A	..	112,487 A
Yukon	5	..	24,796 A	3,500 A	28,296 A
Peace–Athabasca	6	254,122 A	44,470 B	4,210 A	302,802 A
Lower Mackenzie	7	46,721 A	1,500 A	0 ...	48,221 A
Arctic Coast–Islands	8	F	F	F	F
Missouri	9	1,481 A	1,341 E	F	3,097 B
North Saskatchewan	10	1,287,949 A	47,780 A	6,496 A	1,342,225 A
South Saskatchewan	11	1,903,178 A	61,552 A	48,015 A	2,012,745 A
Assiniboine–Red	12	1,083,512 A	165,154 A	16,446 A	1,265,111 A
Winnipeg	13	49,512 A	0 ...	0 ...	49,512 A
Lower Saskatchewan–Nelson	14	33,777 A	39,991 A	0 ...	73,768 A
Churchill	15	39,277 B	5,442 E	..	44,719 A
Keewatin–Southern Baffin Island	16	F	F	F	F
Northern Ontario	17	61,947 A	29,241 A	0 ...	91,188 A
Northern Quebec	18	8,743 C	49,830 E	0 ...	58,573 E
Great Lakes	19	8,481,679 A	1,233,150 A	231,917 A	9,946,745 A
Ottawa	20	1,537,383 A	119,614 A	3,331 A	1,660,328 A
St. Lawrence	21	5,408,028 A	590,657 A	76,644 A	6,075,329 A
North Shore–Gaspé	22	295,818 B	156,496 A	5,212 C	457,526 A
Saint John–St. Croix	23	71,244 A	99,952 A	15,983 A	187,178 A
Maritime Coastal	24	686,525 B	220,663 A	5,170 A	912,358 A
Newfoundland–Labrador	25	379,755 A	29,196 B	F	413,190 A

1. Overestimated because some plants located here serve Fraser–Lower Mainland.

2. Underestimated because some of the population is served by plants located in Pacific Coastal.

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, Environment Accounts and Statistics Division, CANSIM table 153-0106.

Table 3-1
Treatment methods — Population served, operation and maintenance costs and potable water volumes, by treatment category

	Population served	Operation and maintenance costs ¹	Potable water volume by source water type		
			Surface water	Groundwater and groundwater under the direct influence of surface water	Total
Treatment category ²	persons	millions of dollars	millions of cubic metres		
All categories	28,945,736 ^A	881.9 ^A	4,522.9 ^A	580.3 ^A	5,103.1 ^A
Conventional treatment	15,545,909 ^A	502.9 ^A	2,447.7 ^A	31.6 ^A	2,479.2 ^A
Direct filtration	3,533,018 ^A	59.5 ^A	558.5 ^A	14.4 ^A	572.9 ^A
Granular media filtration	2,149,084 ^A	54.8 ^A	610.6 ^A	61.1 ^A	671.7 ^A
Cartridge or bag filter	24,820 ^B	3.3 ^B	1.2 ^E	2.4 ^A	3.5 ^C
Slow sand filtration	115,098 ^A	6.2 ^B	13.1 ^B	9.0 ^A	22.1 ^A
Granular media filtration with other filtration	73,037 ^B	4.6 ^B	7.5 ^D	5.2 ^A	12.7 ^C
Membrane filtration	780,830 ^A	55.1 ^A	133.9 ^A	6.5 ^B	140.5 ^A
Membrane filtration with other filtration	1,486,363 ^A	17.9 ^A	239.7 ^A	2.5 ^B	242.1 ^A
Disinfection only	2,539,140 ^A	93.3 ^A	284.7 ^A	204.6 ^A	489.3 ^A
Disinfection and other (unfiltered systems)	2,217,521 ^A	68.2 ^A	220.6 ^A	160.4 ^A	381.0 ^A
No treatment	403,181 ^B	13.5 ^A	5.4 ^E	71.9 ^B	77.2 ^B
No disinfection with other treatment	77,735 ^B	2.4 ^B	0.0 ...	10.7 ^B	10.7 ^B

1. Includes costs related to the acquisition and treatment, but not the distribution, of water.

2. Plants were assigned to a category based on the reported treatment processes in section 3 of the questionnaire. Refer to Appendix I for the main processes applied in each treatment category.

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Survey of Drinking Water Plants (survey number 5149).

Table 3-2
Treatment methods — Volumes of potable water treated, by source water type and unit processes for water treatment

Unit process	Surface water		Groundwater and groundwater under the direct influence of surface water		Total	
	Volume	Percentage of total	Volume	Percentage of total	Volume	Percentage of total
	millions of cubic metres	%	millions of cubic metres	%	millions of cubic metres	%
Microscreening	781.8 ^A	17.3 ^A	18.6 ^A	3.2 ^A	800.4 ^A	15.7 ^A
Chlorination (hypochlorites or chlorine gas)	4,403.6 ^A	97.4 ^A	492.2 ^A	84.8 ^A	4,895.8 ^A	95.9 ^A
Chlorine dioxide	73.0 ^D	1.6 ^C	1.9 ^C	0.3 ^C	74.9 ^C	1.5 ^C
Chloramination	1,076.6 ^A	23.8 ^A	45.4 ^A	7.8 ^A	1,122.0 ^A	22.0 ^A
Ultraviolet irradiation	967.0 ^A	21.4 ^A	111.4 ^A	19.2 ^A	1,078.4 ^A	21.1 ^A
Ozonation	1,338.4 ^A	29.6 ^A	12.6 ^A	2.2 ^A	1,351.1 ^A	26.5 ^A
Application of potassium permanganate	267.6 ^A	5.9 ^A	33.5 ^A	5.8 ^A	301.0 ^A	5.9 ^A
Other disinfection or oxidation reagents	3.7 ^B	0.1 ^B	9.8 ^D	1.7 ^D	13.5 ^D	0.3 ^D
Fluoridation	1,778.5 ^A	39.3 ^A	78.6 ^A	13.6 ^A	1,857.1 ^A	36.4 ^A
Alkalinity adjustment for process control	428.6 ^A	9.5 ^A	22.5 ^A	3.9 ^A	451.1 ^A	8.8 ^A
pH adjustment for process control	1,386.1 ^A	30.6 ^A	44.3 ^A	7.6 ^A	1,430.4 ^A	28.0 ^A
pH adjustment for corrosion control	1,483.5 ^A	32.8 ^A	46.1 ^A	7.9 ^A	1,529.7 ^A	30.0 ^A
Alkalinity adjustment for corrosion control	541.5 ^A	12.0 ^A	11.2 ^A	1.9 ^A	552.7 ^A	10.8 ^A
Corrosion control inhibitors	530.1 ^A	11.7 ^A	63.9 ^A	11.0 ^A	594.0 ^A	11.6 ^A
Coagulation – aluminum-based	3,131.8 ^A	69.2 ^A	38.7 ^A	6.7 ^A	3,170.6 ^A	62.1 ^A
Coagulation – ferric-based	220.1 ^A	4.9 ^A	2.9 ^A	0.5 ^A	223.1 ^A	4.4 ^A
Other coagulant	356.6 ^A	7.9 ^A	10.9 ^B	1.9 ^B	367.5 ^A	7.2 ^A
Enhanced coagulation	778.0 ^A	17.2 ^A	6.4 ^A	1.1 ^A	784.4 ^A	15.4 ^A
Flocculation	3,074.1 ^A	68.0 ^A	36.6 ^A	6.3 ^A	3,110.7 ^A	61.0 ^A
Sedimentation ¹	2,025.8 ^A	44.8 ^A	25.7 ^A	4.4 ^A	2,051.5 ^A	40.2 ^A
Dissolved air flotation	171.8 ^A	3.8 ^A	1.0 ^D	0.2 ^D	172.8 ^A	3.4 ^A
Other clarification ²	1,071.3 ^A	23.7 ^A	13.8 ^A	2.4 ^A	1,085.1 ^A	21.3 ^A
Filtration – granular media ³	3,792.1 ^A	83.8 ^A	109.9 ^A	18.9 ^A	3,902.0 ^A	76.5 ^A
Granular activated carbon as part of filter media	1,332.9 ^A	29.5 ^A	31.6 ^A	5.5 ^A	1,364.6 ^A	26.7 ^A
Granular activated carbon – separate unit	313.4 ^A	6.9 ^A	3.4 ^A	0.6 ^A	316.8 ^A	6.2 ^A
Microfiltration (membrane)	78.2 ^A	1.7 ^A	3.0 ^B	0.5 ^B	81.2 ^A	1.6 ^A
Ultrafiltration (membrane)	297.1 ^A	6.6 ^A	2.0 ^A	0.3 ^B	299.0 ^A	5.9 ^A
Filtration – cartridge or bag	1.2 ^E	0.0 ^{Es}	6.8 ^A	1.2 ^A	8.0 ^B	0.2 ^B
Filtration – slow sand	98.1 ^A	2.2 ^A	12.8 ^A	2.2 ^A	110.9 ^A	2.2 ^A
Aeration	130.2 ^A	2.9 ^A	18.1 ^B	3.1 ^B	148.3 ^A	2.9 ^A
Air stripping	58.1 ^A	1.3 ^A	9.1 ^D	1.6 ^D	67.2 ^A	1.3 ^A
Lime softening	152.0 ^B	3.4 ^B	7.5 ^B	1.3 ^B	159.5 ^B	3.1 ^B
Activated alumina	2.9 ^D	0.1 ^D	F	F	3.3 ^D	0.1 ^D
Ion exchange	1.5 ^A	0.0 ^{As}	2.0 ^C	0.3 ^C	3.5 ^B	0.1 ^B
Sequestering	17.1 ^C	0.4 ^C	62.8 ^A	10.8 ^A	79.8 ^A	1.6 ^A
Greensand filtration	2.8 ^C	0.1 ^C	63.0 ^A	10.9 ^A	65.9 ^A	1.3 ^A
Powdered activated carbon	890.7 ^A	19.7 ^A	3.6 ^A	0.6 ^A	894.3 ^A	17.5 ^A
Reverse osmosis or nano filtration	3.2 ^B	0.1 ^B	7.1 ^B	1.2 ^B	10.3 ^A	0.2 ^A
Other processes	135.0 ^B	3.0 ^B	33.6 ^A	5.8 ^A	168.6 ^B	3.3 ^B

1. Conventional, tube, plate or high rate.

2. Sludge blanket, pulsed blanket, ballasted, solids contact or other.

3. Single, dual or triple media.

Note(s): The same volumes of water may be treated with, and thus counted under, multiple treatment processes. Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Survey of Drinking Water Plants (survey number 5149).

Table 4
Potable water use by sector and average daily use — Province and territory

	Potable water volume					Average daily residential use		Average daily total use	
	Residential ¹	Industrial, commercial, institutional and other non-residential	Losses from the distribution system	Wholesale water provided to other jurisdictions ²	Sector of use unknown ³	Total	Volume per capita of the population served ¹	Responding population served ¹	Volume per capita of the population served ⁴
	millions of cubic metres					litres/person/day		persons	litres/person/day
Canada	2,195.8^A	1,091.7^A	673.3^A	212.3^A	930.1^A	5,103.1^A	251^A	23,977,930^A	483^A
Newfoundland and Labrador	27.0 ^B	10.3 ^C	2.8 ^C	F	81.6 ^A	121.8 ^A	530 ^A	139,591 ^A	810 ^A
Prince Edward Island	5.6 ^A	3.6 ^A	1.0 ^A	0.0...	1.2 ^A	11.4 ^A	284 ^A	53,923 ^A	491 ^A
Nova Scotia	42.7 ^B	21.9 ^B	17.6 ^B	1.3 ^D	13.7 ^C	97.2 ^A	225 ^A	519,094 ^B	462 ^A
New Brunswick	27.8 ^A	9.6 ^A	4.2 ^A	1.5 ^B	46.6 ^A	89.6 ^A	293 ^A	259,409 ^A	645 ^A
Quebec	578.4 ^A	257.0 ^A	301.3 ^A	16.7 ^B	492.4 ^A	1,645.7 ^A	364 ^A	4,357,993 ^A	628 ^A
Ontario	793.0 ^A	427.4 ^A	194.5 ^A	126.4 ^A	128.7 ^A	1,670.0 ^A	208 ^A	10,464,326 ^A	407 ^A
Manitoba	57.9 ^A	31.5 ^A	17.5 ^A	4.3 ^A	5.9 ^B	117.2 ^A	173 ^A	918,025 ^A	332 ^A
Saskatchewan	50.2 ^A	34.0 ^A	15.0 ^A	4.2 ^A	18.6 ^A	121.9 ^A	200 ^A	686,351 ^A	414 ^A
Alberta	201.1 ^A	96.8 ^A	45.1 ^A	55.6 ^A	41.9 ^A	440.5 ^A	187 ^A	2,953,454 ^A	373 ^A
British Columbia	403.6 ^A	197.0 ^A	74.1 ^A	2.2 ^D	94.8 ^A	771.7 ^A	312 ^A	3,545,689 ^A	532 ^A
Yukon	5.7 ^A	1.9 ^A	0.2 ^A	0.0 ^{As}	0.9 ^A	8.7 ^A	573 ^A	27,096 ^A	776 ^A
Northwest Territories	1.4 ^D	0.3 ^D	F	0.1 ^E	3.7 ^A	5.5 ^B	214 ^B	17,590 ^C	374 ^A
Nunavut	1.4 ^B	0.4 ^B	0.1 ^C	F	0.1 ^A	2.0 ^B	F	F	F

1. These figures represent the results for plants that reported the percentage of potable water used by the residential sector. Higher proportions of unknown water use reduce the accuracy of average daily residential water use estimates.
2. For plants reporting wholesale water, other data sources and administrative data for the jurisdictions served was used as much as possible in order to allocate their water to the other categories.
3. Some respondents did not know how a portion or all of their water was utilized.
4. These figures represent the total population served by all plants and the total volume of potable water produced.

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Survey of Drinking Water Plants (survey number 5149).

Table 5
Total capital expenditures of drinking water plants — Main source water type and province and territory

	Surface water ¹	Groundwater ¹	Groundwater under the direct influence of surface water ¹	All other source water combinations	Total
	millions of dollars				
Canada	1,074.5^A	204.6^A	20.5^A	36.5^A	1,336.1^A
Newfoundland and Labrador	24.3 ^A	F	0.0...	0.0 ^{As}	24.4 ^A
Prince Edward Island	0.0...	2.8 ^A	0.0...	0.0...	2.8 ^A
Nova Scotia	7.1 ^D	1.3 ^B	0.0 ^{As}	0.0...	8.5 ^D
New Brunswick	5.5 ^A	11.7 ^C	0.2 ^A	1.0 ^A	18.4 ^B
Quebec	253.0 ^B	49.3 ^C	1.8 ^A	9.4 ^A	313.5 ^B
Ontario	480.3 ^A	83.3 ^A	4.7 ^A	16.8 ^A	585.1 ^A
Manitoba	4.4 ^B	16.2 ^E	0.7 ^E	0.8 ^C	22.1 ^D
Saskatchewan	37.0 ^A	19.4 ^B	8.6 ^A	4.5 ^A	69.4 ^A
Alberta	159.5 ^A	9.7 ^B	3.2 ^A	0.4 ^A	172.9 ^A
British Columbia	98.3 ^A	10.8 ^A	1.1 ^A	3.7 ^A	113.8 ^A
Yukon	..	0.0...	0.1 ^A	0.0...	0.1 ^A
Northwest Territories	3.9 ^D	..	0.0...	0.0...	3.9 ^D
Nunavut	1.1 ^A	0.0...	0.0...	0.0...	1.1 ^A

1. Represents sources having 90 to 100 % of the indicated water type.

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, Environment Accounts and Statistics Division, CANSIM table 153-0107.

Table 6-1
Operation and maintenance costs of drinking water plants — Province and territory

	Materials ¹	Labour ²	Energy	Other ³	Total
millions of dollars					
Canada	213.4^A	338.4^A	200.4^A	129.7^A	881.9^A
Newfoundland and Labrador	4.8 ^A	6.3 ^A	4.7 ^A	1.0 ^B	16.9 ^A
Prince Edward Island	0.4 ^A	0.9 ^A	0.7 ^A	1.1 ^A	3.1 ^A
Nova Scotia	8.2 ^A	6.7 ^A	4.6 ^B	3.6 ^C	23.1 ^A
New Brunswick	3.7 ^A	5.2 ^A	2.8 ^A	1.8 ^B	13.5 ^A
Quebec	49.7 ^A	79.7 ^A	56.8 ^A	20.2 ^A	206.4 ^A
Ontario	64.9 ^A	114.1 ^A	73.0 ^A	63.6 ^A	315.7 ^A
Manitoba	16.6 ^A	15.0 ^A	5.9 ^A	2.9 ^A	40.4 ^A
Saskatchewan	14.7 ^A	22.3 ^A	8.4 ^A	6.7 ^A	52.2 ^A
Alberta	30.1 ^A	48.0 ^A	29.2 ^A	15.5 ^A	122.9 ^A
British Columbia	18.5 ^A	34.0 ^A	11.3 ^A	12.7 ^B	76.4 ^A
Yukon	0.3 ^A	0.9 ^A	0.8 ^A	0.1 ^A	2.1 ^A
Northwest Territories	1.0 ^D	3.7 ^D	1.7 ^C	F	7.0 ^D
Nunavut	0.4 ^C	1.5 ^A	0.5 ^C	0.0 ^{Es}	2.3 ^B

1. Includes chemicals and replacement parts.
2. Includes internal and external staff including laboratory personnel.
3. Includes costs such as waste disposal and residuals handling, analytical/sampling costs, any associated administration and service costs directly related to operation and maintenance (consultants and contractors) and costs related to waste treatment processes (that is, backwash processing and residuals disposal).

Note(s): Includes costs related to the acquisition and treatment, but not the distribution, of water. Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, Environment Accounts and Statistics Division, CANSIM table 153-0108.

Table 6-2
Operation and maintenance costs of drinking water plants — Drainage region

Drainage region	Materials ¹	Labour ²	Energy	Other ³	Total
code	millions of dollars				
Canada	213.4^A	338.4^A	200.4^A	129.7^A	881.9^A
Pacific Coastal	9.6 ^A	17.0 ^A	3.6 ^A	5.0 ^C	35.1 ^A
Fraser–Lower Mainland	3.9 ^A	7.9 ^A	3.5 ^A	3.2 ^E	18.5 ^B
Okanagan–Similkameen	3.3 ^A	5.7 ^A	2.1 ^A	2.9 ^A	14.0 ^A
Columbia	1.1 ^A	2.4 ^A	1.2 ^B	1.3 ^A	6.0 ^A
Yukon	0.3 ^A	0.8 ^A	0.8 ^A	0.1 ^A	2.0 ^A
Peace–Athabasca	6.5 ^A	10.3 ^A	5.7 ^A	2.2 ^A	24.7 ^A
Lower Mackenzie	1.2 ^D	2.7 ^B	2.0 ^B	0.6 ^E	6.5 ^C
Arctic Coast–Islands	0.3 ^C	2.9 ^E	0.4 ^B	F	3.6 ^D
Missouri	0.1 ^D	0.4 ^D	0.1 ^D	0.1 ^D	0.6 ^D
North Saskatchewan	10.6 ^A	21.0 ^A	9.7 ^A	3.0 ^A	44.2 ^A
South Saskatchewan	19.9 ^A	27.7 ^A	18.0 ^A	11.8 ^A	77.3 ^A
Assiniboine–Red	21.5 ^A	20.8 ^A	8.4 ^A	5.1 ^A	55.7 ^A
Winnipeg	0.8 ^B	2.1 ^B	0.8 ^A	2.1 ^A	5.9 ^A
Lower Saskatchewan–Nelson	2.1 ^A	3.7 ^A	1.3 ^A	1.1 ^A	8.2 ^A
Churchill	1.1 ^C	2.1 ^C	0.9 ^B	2.1 ^A	6.2 ^B
Keewatin–Southern Baffin Island	0.2 ^E	0.1 ^E	0.2 ^E	F	0.5 ^E
Northern Ontario	2.6 ^A	4.3 ^A	2.1 ^A	1.4 ^A	10.3 ^A
Northern Quebec	0.5 ^D	0.9 ^B	1.4 ^C	0.4 ^B	3.2 ^A
Great Lakes	50.5 ^A	91.1 ^A	60.9 ^A	54.9 ^A	257.4 ^A
Ottawa	14.6 ^A	19.6 ^A	12.6 ^A	6.7 ^C	53.5 ^A
St. Lawrence	40.8 ^A	65.8 ^A	46.3 ^A	16.3 ^A	169.2 ^A
North Shore–Gaspé	4.4 ^B	8.9 ^B	4.9 ^A	1.6 ^C	19.9 ^A
Saint John–St. Croix	2.3 ^A	3.0 ^A	1.7 ^A	0.6 ^A	7.5 ^A
Maritime Coastal	10.7 ^A	10.8 ^A	7.3 ^A	6.3 ^B	35.1 ^A
Newfoundland–Labrador	4.8 ^A	6.4 ^A	4.8 ^A	1.0 ^B	16.9 ^A

1. Includes chemicals and replacement parts.
2. Includes internal and external staff including laboratory personnel.
3. Includes costs such as waste disposal and residuals handling, analytical/sampling costs, any associated administration and service costs directly related to operation and maintenance (consultants and contractors) and costs related to waste treatment processes (that is, backwash processing and residuals disposal).

Note(s): Includes costs related to the acquisition and treatment, but not the distribution, of water. Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, Environment Accounts and Statistics Division, CANSIM table 153-0108.

Table 6-3
Operation and maintenance costs of drinking water plants — Per potable water volume, by treatment category

	Materials ¹	Labour ²	Energy	Other ³	Total
dollars per thousand cubic metres					
Treatment category ⁴					
All categories	41.8^A	66.3^A	39.3^A	25.4^A	172.8^A
Conventional treatment	55.7 ^A	77.7 ^A	46.8 ^A	22.7 ^A	202.9 ^A
Direct filtration	24.9 ^A	45.3 ^A	23.6 ^A	10.0 ^A	103.9 ^A
Granular media filtration	13.0 ^A	33.4 ^A	25.0 ^A	10.3 ^A	81.7 ^A
Cartridge or bag filter	141.4 ^A	583.1 ^C	133.5 ^A	78.4 ^B	936.3 ^B
Slow sand filtration	61.9 ^B	113.1 ^B	53.1 ^A	52.9 ^B	280.9 ^A
Granular media filtration with other filtration	78.4 ^B	139.7 ^B	91.6 ^C	50.1 ^C	359.9 ^B
Membrane filtration	93.4 ^A	143.0 ^A	96.5 ^A	59.4 ^A	392.3 ^A
Membrane filtration with other filtration	6.1 ^B	11.8 ^A	4.6 ^B	51.3 ^A	73.8 ^A
Disinfection only	31.6 ^A	78.3 ^A	38.9 ^A	41.8 ^B	190.7 ^A
Disinfection and other (unfiltered systems)	45.3 ^A	62.6 ^A	33.4 ^A	37.8 ^A	179.1 ^A
No treatment	18.7 ^B	67.2 ^A	53.9 ^A	35.6 ^B	175.4 ^A
No disinfection with other treatment	64.6 ^B	71.8 ^B	67.3 ^A	23.7 ^B	227.4 ^B

1. Includes chemicals and replacement parts.

2. Includes internal and external staff including laboratory personnel.

3. Includes costs such as waste disposal and residuals handling, analytical/sampling costs, any associated administration and service costs directly related to operation and maintenance (consultants and contractors) and costs related to waste treatment processes (that is, backwash processing and residuals disposal).

4. Plants were assigned to a category based on the reported treatment processes in section 3 of the questionnaire. Refer to Appendix I for the main processes applied in each treatment category.

Note(s): Cost per unit volume will vary within each category due to various sizes and configurations of plants. Includes costs related to the acquisition and treatment, but not the distribution, of water. Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Survey of Drinking Water Plants (survey number 5149).

Table 6-4
Operation and maintenance costs of drinking water plants — Treating primarily surface water, by production volume

	Total costs					Unit costs				
	Materials ¹	Labour ²	Energy	Other ³	Total	Materials ¹	Labour ²	Energy	Other ³	Total
millions of dollars					dollars per thousand cubic metres					
Production volume category (thousands of cubic metres per day ⁴)										
All categories	170.4^A	260.3^A	155.1^A	85.2^A	671.0^A	38.2^A	58.3^A	34.8^A	19.1^A	150.4^A
1.5 or less	16.1 ^A	30.4 ^A	11.5 ^A	10.6 ^A	68.5 ^A	189.7 ^A	358.9 ^A	135.3 ^A	124.6 ^A	808.5 ^A
more than 1.5 to 5	18.5 ^A	28.5 ^A	14.4 ^A	11.7 ^A	73.1 ^A	97.8 ^A	151.2 ^A	76.0 ^A	62.2 ^A	387.2 ^A
more than 5 to 10	15.5 ^A	23.6 ^A	14.9 ^A	10.8 ^B	64.8 ^A	82.4 ^A	125.8 ^A	79.6 ^A	57.7 ^B	345.5 ^A
more than 10 to 20	12.5 ^A	20.7 ^A	10.3 ^A	6.8 ^B	50.3 ^A	51.0 ^A	84.2 ^A	42.0 ^A	27.8 ^B	205.0 ^A
more than 20 to 50	33.3 ^A	45.2 ^A	27.3 ^A	10.9 ^B	116.6 ^A	55.2 ^A	75.0 ^A	45.2 ^A	18.1 ^B	193.6 ^A
more than 50 to 100	21.6 ^A	27.7 ^A	21.9 ^A	7.0 ^B	78.3 ^A	37.0 ^A	47.4 ^A	37.5 ^A	11.9 ^B	133.9 ^A
more than 100	53.0 ^A	84.1 ^A	54.9 ^A	27.4 ^A	219.4 ^A	20.6 ^A	32.8 ^A	21.4 ^A	10.7 ^A	85.4 ^A

1. Includes chemicals and replacement parts.

2. Includes internal and external staff including laboratory personnel.

3. Includes costs such as waste disposal and residuals handling, analytical/sampling costs, any associated administration and service costs directly related to operation and maintenance (consultants and contractors) and costs related to waste treatment processes (that is, backwash processing and residuals disposal).

4. One thousand cubic metres is equal to one mega litre.

Note(s): Cost per unit volume will vary within each category due to various sizes and configurations of plants. Includes plants treating 90% or more surface water and costs related to the acquisition and treatment, but not the distribution, of water. Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Survey of Drinking Water Plants (survey number 5149).

Table 6-5
Operation and maintenance costs of drinking water plants — Treating primarily groundwater, by production volume

Production volume category (thousands of cubic metres per day ⁴)	Total costs					Unit costs				
	Materials ¹	Labour ²	Energy	Other ³	Total	Materials ¹	Labour ²	Energy	Other ³	Total
	millions of dollars					dollars per thousand cubic metres				
All categories	36.3 ^A	68.3 ^A	38.6 ^A	34.2 ^A	177.4 ^A	68.4 ^A	128.7 ^A	72.7 ^A	64.4 ^A	334.2 ^A
1.5 or less	19.4 ^A	35.5 ^A	16.3 ^A	12.9 ^A	84.1 ^A	130.2 ^A	237.7 ^A	109.1 ^A	86.5 ^A	563.5 ^A
more than 1.5 to 5	8.1 ^A	16.3 ^A	9.8 ^A	5.6 ^A	39.9 ^A	57.8 ^A	117.3 ^A	70.4 ^A	40.5 ^A	286.1 ^A
more than 5 to 10	3.9 ^A	8.3 ^A	5.2 ^A	5.9 ^A	23.2 ^A	45.1 ^A	96.9 ^A	60.4 ^A	68.7 ^A	271.1 ^A
more than 10 to 20	4.0 ^B	4.7 ^A	4.6 ^B	4.1 ^A	17.5 ^A	45.6 ^B	53.5 ^A	52.8 ^A	47.1 ^A	198.9 ^A
more than 20 to 50	1.0 ^A	3.5 ^A	2.7 ^A	5.6 ^A	12.8 ^A	14.2 ^A	50.9 ^A	39.0 ^A	81.2 ^A	185.3 ^A

1. Includes chemicals and replacement parts.
2. Includes internal and external staff including laboratory personnel.
3. Includes costs such as waste disposal and residuals handling, analytical/sampling costs, any associated administration and service costs directly related to operation and maintenance (consultants and contractors) and costs related to waste treatment processes (that is, backwash processing and residuals disposal).
4. One thousand cubic metres is equal to one mega litre.

Note(s): Cost per unit volume will vary within each category due to various sizes and configurations of plants. Includes plants treating 90% or more groundwater or groundwater under the direct influence of surface water (GUDI) and costs related to the acquisition and treatment, but not the distribution, of water. Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Survey of Drinking Water Plants (survey number 5149).

Table 7-1
Source water quality, annual medians of untreated surface water — pH by drainage region

Drainage region	Median pH values			
	Minimum	Average	Maximum	
code	pH units			
Pacific Coastal	1	6.84	6.92	7.13
Fraser–Lower Mainland	2	7.35	7.45	7.73
Okanagan–Similkameen	3	7.12	7.65	8.09
Columbia	4	7.43	7.64	7.67
Yukon	5	..	..	..
Peace–Athabasca	6	7.81	8.05	8.32
Lower Mackenzie	7	7.55	7.95	8.30
Arctic Coast–Islands	8	..	..	..
Missouri	9	F	F	F
North Saskatchewan	10	7.40	7.97	8.50
South Saskatchewan	11	7.80	8.17	8.50
Assiniboine–Red	12	7.83	8.21	8.63
Winnipeg	13	6.70	7.16	7.60
Lower Saskatchewan–Nelson	14	7.79	8.04	8.21
Churchill	15	7.89	7.90	7.90
Keewatin–Southern Baffin Island	16	..	..	..
Northern Ontario	17	6.77	7.49	8.11
Northern Quebec	18	..	..	..
Great Lakes	19	7.33	8.01	8.34
Ottawa	20	6.58	7.30	7.80
St. Lawrence	21	6.86	7.50	8.10
North Shore–Gaspé	22	6.50	7.19	7.80
Saint John–St. Croix	23	F	F	F
Maritime Coastal	24	6.66	6.90	7.11
Newfoundland–Labrador	25	6.16	6.30	6.06

Note(s): Values were rounded to two decimal places. F denotes that there were too few respondents to calculate a reliable median. Data are from 416 raw surface water sources used to produce 3,988 million cubic metres of drinking water, serving 22.6 million people. Of the remaining surface source water sites, 78 respondents did not sample for pH, 296 did not respond for pH, and 39 reported partial data.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Survey of Drinking Water Plants (survey number 5149).

Table 7-2
Source water quality, annual medians of untreated surface water — Total alkalinity by drainage region

Drainage region	code	Median total alkalinity values		
		Minimum	Average	Maximum
milligrams per litre as calcium carbonate (CaCO ₃)				
Pacific Coastal	1	9	10	14
Fraser–Lower Mainland	2	33	33	33
Okanagan–Similkameen	3	82	82	82
Columbia	4	36	36	36
Yukon	5	..	..	..
Peace–Athabasca	6	109	141	160
Lower Mackenzie	7	86	89	89
Arctic Coast–Islands	8	F	F	F
Missouri	9	F	F	F
North Saskatchewan	10	119	134	152
South Saskatchewan	11	120	134	148
Assiniboine–Red	12	195	241	285
Winnipeg	13	15	17	19
Lower Saskatchewan–Nelson	14	85	99	116
Churchill	15	F	F	F
Keewatin–Southern Baffin Island	16	..	..	..
Northern Ontario	17	25	65	80
Northern Quebec	18	..	..	..
Great Lakes	19	82	92	96
Ottawa	20	16	27	41
St. Lawrence	21	25	48	70
North Shore–Gaspé	22	6	13	24
Saint John–St. Croix	23	F	F	F
Maritime Coastal	24	5	6	10
Newfoundland–Labrador	25	3	11	12

Note(s): Values were rounded to zero decimal places. F denotes that there were too few respondents to calculate a reliable median. Data are from 368 raw surface water sources used to produce 3,872 million cubic metres of drinking water, serving 21.9 million people. Of the remaining surface source water sites, 110 respondents did not sample for alkalinity, 320 did not respond for alkalinity, and 31 reported partial data.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Survey of Drinking Water Plants (survey number 5149).

Table 7-3
Source water quality, annual medians of untreated surface water — Colour by drainage region

	Drainage region code	Median colour values		
		Minimum	Average	Maximum
		true colour units (TCU)		
Pacific Coastal	1	7	11	17
Fraser–Lower Mainland	2	5	5	5
Okanagan–Similkameen	3	5	6	7
Columbia	4	5	5	5
Yukon	5	..	..	..
Peace–Athabasca	6	12	21	44
Lower Mackenzie	7	10	10	24
Arctic Coast–Islands	8	F	F	F
Missouri	9	F	F	F
North Saskatchewan	10	5	16	64
South Saskatchewan	11	3	12	33
Assiniboine–Red	12	23	31	46
Winnipeg	13	20	42	64
Lower Saskatchewan–Nelson	14	5	29	29
Churchill	15	F	F	F
Keewatin–Southern Baffin Island	16	..	..	..
Northern Ontario	17	22	62	151
Northern Quebec	18	..	..	..
Great Lakes	19	2	5	13
Ottawa	20	19	33	49
St. Lawrence	21	13	50	132
North Shore–Gaspé	22	F	F	F
Saint John–St. Croix	23	F	F	F
Maritime Coastal	24	12	23	28
Newfoundland–Labrador	25	26	29	30

Note(s): Values were rounded to zero decimal places. F denotes that there were too few respondents to calculate a reliable median. Data are from 332 raw surface water sources used to produce 3,068 million cubic metres of drinking water, serving 17.1 million people. Of the remaining surface source water sites, 146 respondents did not sample for colour, 321 did not respond for colour, and 30 reported partial data.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Survey of Drinking Water Plants (survey number 5149).

Data sources and methodology

Reference period

The information contained in this report is obtained from the Survey of Drinking Water Plants (SDWP) and reflects the quantity of potable water and quality of source water processed by individual drinking water treatment plants, the treatment systems used and the associated costs for the calendar year 2011. The SDWP is a biennial survey.

Survey frame

The target population is composed of drinking water treatment plants that are licensed and regulated by provincial/territorial agencies (excluding First Nations Communities) and that draw and process source water from the environment to supply potable water for human consumption. The target population is derived from a survey frame built from inventories of drinking water plants held by the provinces and territories. The survey frame is kept up to date using responses from previous survey cycles and through contact with potential respondents prior to the mail out of each new cycle.

The survey frame contains approximately 2,100 drinking water facilities serving communities of 300 or more people, the majority being publicly-owned (municipal) systems. The frame excludes facilities that supply water to communities with less than 300 people and other regulated systems that service schools, camp grounds, commercial establishments, provincial parks, etc.

During data collection for the 2011 reference year, approximately 100 drinking water facilities on the frame were identified as being out-of-scope because they served fewer than 300 people in 2011 or were systems that only distributed potable water. Approximately 25 new water facilities were added to the frame for 2011.

Coverage and sample selection

The SDWP is a census with a cross-sectional design. Data are collected for all units of the target population and, therefore, no sampling is done.

Data collection and processing

Response to the SDWP is mandatory. Data are collected directly from survey respondents using mail out – mail back questionnaires.

Mail out for the 2011 reference year occurred in January 2012 and respondents were asked to return the completed questionnaires within 60 days of receipt. The surveys were addressed to a contact person who was either responsible for, or had knowledge of, the drinking water plant being surveyed. A letter explaining the purpose of the survey, the requested return date and the legal requirement to respond was included with the mail-out package.

Telephone and fax follow-up were used to obtain data from respondents who returned incomplete questionnaires or who failed to respond.

Returned questionnaires were scanned using an imaging system that captured the data for transfer into a database. Some data were manually keyed in. Capture and edit software was then applied to run edit checks on the data which served to identify real or potential response errors.

Data quality

Sampling error can arise when the information obtained from a sample of a population is used to derive an estimate for the entire population. Since the SDWP is a census, sampling error is zero.

Response error may be due to questionnaire design, the characteristics of a question, inability or unwillingness of the respondent to provide correct information, misinterpretation of the questions or conceptual problems. These errors are controlled through careful questionnaire design and testing and the use of simple concepts and consistency checks.

Processing errors may occur at various stages of processing such as data entry, editing and tabulation. All efforts are undertaken to minimize errors through extensive edits, quality control steps and data analysis, but some of these errors are outside the control of Statistics Canada.

Non-response errors result when respondents refuse to answer, are unable to respond or are too late in reporting. Missing data items are imputed for partial non-responses (that is, when some questions are answered and others are left unanswered by a given respondent).

Total non-response (that is, when all questions or all core questions are left unanswered) is dealt with by adjusting the weights assigned to units that did respond, such that one responding unit might also represent other non-responding units with similar characteristics (that is, province, drainage region, source water type, size of population served). The pattern of total non-response, the estimation method, the number of respondents and the variability associated with each measured variable determines total non-response error. If non-respondents are assumed to be randomly "selected" from the population, then responding units may be treated statistically as a random sample. Under this assumption, a measure of total non-response error is the coefficient of variation (CV). It represents the ratio of the standard error of a survey estimate to the estimate itself.

The following symbols are used to indicate the quality of the estimates in this report:

A Excellent data quality	CV is 0.01% to 4.99%
B Very good data quality	CV is 5.00% to 9.99%
C Good data quality	CV is 10.00% to 14.99%
D Acceptable data quality	CV is 15.00% to 24.99%
E Use with caution	CV is 25.00% to 49.99%
F Too unreliable to be published	CV is >49.99% (data are suppressed for purposes of publication and made available only upon request)

The 95% confidence interval for an estimate is given by:

Estimate \pm 1.96 * (CV in %) * Estimate

Response rate

The response rate for the SDWP was 87% in reference year 2011.

Error detection and correction

Returned data are first entered and checked using capture and edit software. This procedure verifies that all core cells have been filled in, that certain values lie within acceptable ranges, that questionnaire flow patterns have been respected, and that totals equal the sum of their components. Collection officers evaluate the edit failures and concentrate follow-up efforts accordingly. Phone follow-ups are performed to verify information in cases where edit checks fail.

Further data checking is performed by subject matter officers who review returned data that have been identified statistically as outliers. Comparison with data from previous years is carried out to determine if the differences between years are reasonable. In some instances, collection officers are asked to confirm responses with the respondents. Subject matter officers also research drinking water plants (annual reports, web sites, etc.) in an effort to verify information submitted by respondents.

Imputation

Seven methods of imputation are used for the SDWP:

- deterministic imputation (only one possible value for the field to impute)
- imputation by linear regression
- trend imputation
- imputation by ratio
- donor imputation (using a "nearest neighbour" approach to find a valid record that is most similar to the record requiring imputation in terms of treated water volume and other characteristics)
- imputation by historical value (use of data from previous cycles) and
- manual imputation.

The criteria for ratio and donor imputation are various combinations of water treatment type, source water type and geographical location (province, region, or Canada). No imputation is conducted on water quality variables.

The imputation rate for the 2011 SDWP (number of affected cells) was approximately 5%.

Estimation

In the estimation process, the response values are multiplied by a factor adjustment (weight) to account for plants in the population who could not be contacted or were unable to participate in the survey. No estimation is conducted on water quality variables.

Quality evaluation

In addition to analyzing individual responses for consistency within a questionnaire, both individual responses and weighted estimates of totals are compared to those from previous survey cycles and to outside sources where possible.

Variables

The survey questionnaire is designed in consultation with specialists at Statistics Canada, Health Canada, Environment Canada, water utility operators, and provincial agencies that regulate drinking water facilities. The information collected includes the sources of raw water, the volumes of potable water processed by the drinking water plants, the use by sector of the potable water, the treatment processes used, and the quality of the source water. Capital expenditures and operation and maintenance costs related to drinking water treatment are also collected.

Revisions

Revisions are made for the previous survey reference period, with the initial release of the current data, as required. The purpose is to address any significant issues with the data that were found between survey cycles. The actual period of revision depends on the nature of the issue, but rarely exceeds three years.

Glossary

Alkalinity is a measure of the capacity of water to neutralize acid.¹ In this survey alkalinity refers to the total alkalinity.

Capital expenditures include money spent to add, expand or upgrade physical assets such as property, buildings, machinery and process equipment/infrastructure, including capitalized costs related to waste treatment processes (that is, backwash processing and residuals disposal related to potable water production). They also include construction and engineering costs. In this survey data is collected for the acquisition and treatment of water, costs associated with water distribution are excluded.

Colony forming units (CFU) are units of measure used to express results determined using the membrane filter technique to measure coliforms.²

Colour of surface water is predominantly due to organic matter, particularly aquatic humic matter, which causes a yellow-brown colour.³

Drinking water plants are facilities that draw and process source water from the environment to supply potable water for human consumption.

Escherichia coli or **E. coli** is a bacterium naturally found in the intestines of humans and warm-blooded animals and usually does not occur naturally on plants or in soil and water.⁴

Groundwater refers to water found in underground aquifers which supplies wells and springs.⁵

Groundwater Under the Direct Influence of surface water (**GUDI**) refers to groundwater supply sources under conditions where microbial pathogens are able to travel from surface water to the groundwater source.⁶

Humic refers to matter formed by the decomposition of leaves and other plant material.

Most probable number (MPN) are units of measure used to express results determined the multiple-tube fermentation technique to measure coliforms.⁷

Nephelometric turbidity units (NTU) are units of measure used to express turbidity as determined by nephelometers, which have scatter-light detectors located 90° to the incident beam.⁸

Operation and maintenance (O&M) costs include costs of materials (chemicals and replacement parts), labour (internal and external staff, including lab personnel), energy, waste disposal and residuals handling, analytical/sampling costs and any associated administration and service costs directly related to O&M (consultants and contractors). They also include costs related to waste treatment processes (that is, backwash processing and residuals disposal related to potable water production). In this survey data is collected for the acquisition and treatment of water, costs associated with water distribution are excluded.

pH is the negative log of hydrogen ion concentration; it is an indicator of a the acidic or basic characteristics of a solution.⁹

1. American Public Health Association, American Water Works Association, Water Environment Federation, 2012, op. cit.

2. Ibid.

3. Ibid.

4. Health Canada, 2011, *Escherichia coli* in Drinking Water, op. cit.

5. Canadian Council of Ministers of the Environment (CCME). 2004. *From source to tap: Guidance on the multibarrier approach to safe drinking water*. Produced jointly by the Federal-Provincial-Territorial Committee on Drinking Water and the CCME Water Quality Task Group. <http://www.ccme.ca/sourcetotap/mba.html> (accessed Dec. 31, 2012)

6. Daigle, Annie E. and Gina M. Giudice. 2006, op. cit.

7. American Public Health Association, American Water Works Association, Water Environment Federation, 2012, op. cit.

8. Ibid.

9. Ibid.

Potable water refers to water that has been treated and is ready to be conveyed to consumers. In this survey it also includes potable water conveyed by drinking water plants without treatment.

Raw water refers to water in its natural state, prior to any treatment.¹⁰

Residential water use in this survey refers to the volume of water used in households.

Source water refers to water in its natural or raw state, prior to being withdrawn for treatment and distribution.¹¹

Surface water refers to water from sources open to the atmosphere such as rivers, lakes and reservoirs.¹²

Total coliforms are a group of bacteria that are naturally found on plants and in soils, in water, and in the intestines of humans and warm-blooded animals.¹³

Total water use in this survey refers to the total volume of water produced by drinking water plants.

Treated water refers to water that has been treated and is ready to be conveyed to consumers. In this survey it also includes potable water conveyed by drinking water plants without treatment.

Turbidity in water is caused by suspended and colloidal matter such as clay, silt, finely divided organic and inorganic matter, and plankton and other microscopic organisms.¹⁴

Wholesale water in this survey refers to potable water provided to other jurisdictions that distribute the water.

10. Canadian Council of Ministers of the Environment (CCME), 2004, *From source to tap: Guidance on the multibarrier approach to safe drinking water*. Produced jointly by the Federal-Provincial-Territorial Committee on Drinking Water and the CCME Water Quality Task Group. <http://www.ccme.ca/sourcetotap/mba.html> (accessed Dec. 31, 2012).

11. Ibid.

12. Ibid.

13. Health Canada, 2011, *Total Coliforms in Drinking Water*, op. cit.

14. American Public Health Association, American Water Works Association, Water Environment Federation, 2012, op. cit.

Appendix I

Treatment categories by main processes applied

Text table 1

Treatment categories by main processes applied

Treatment category	Main treatment processes applied							Other processes
	Disinfection ¹	Coagulation/ flocculation	Clarification, sedimentation	Granular media filtration ²	Membrane (micro, ultra, nano filtration or reverse osmosis)	Slow sand	Cartridge/bag	
Conventional treatment	X	X	X	X	...	...	...	...
Direct filtration	X	X	...	X	...	...	...	...
Granular media filtration ²	X	...	...	X	...	...	...	...
Cartridge or bag filter	X	...	...	...	...	...	X	...
Slow sand filtration	X	...	...	...	...	X	...	...
Granular media filtration ² with other filtration ³	X	...	...	X	...	X ³	X ³	...
Membrane filtration	X	...	...	...	X	...	...	...
Membrane filtration with other filtration ⁴	X	...	...	X ⁴	X	X ⁴	X ⁴	...
Disinfection only	X	...	...	...	...	...	...	...
Disinfection and other (unfiltered systems)	X	...	...	...	...	...	...	X
No treatment	...	...	...	...	...	...	...	...
No disinfection with other treatment ⁵	...	...	...	...	...	...	...	X

1. Chlorination (hypochlorites or chlorine gas), chlorine dioxide, chloramination, uv-irradiation, ozonation (at least one is applied).

2. Granular activated carbon (GAC) may or may not be part of the filters with multi media.

3. Granular media filtration combined with other filtration such as slow sand or cartridge/bag.

4. Membrane filtration combined with other filtration such as granular media or slow sand or cartridge/bag.

5. May include some systems that use filtration processes.

Note(s): For all systems, some pre-treatment (for example, screening) and other treatment processes may also be applied; configuration of plants will vary.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Survey of Drinking Water Plants (survey number 5149).

Appendix II

Revised estimates for 2005, 2006, and 2007

Text table 1

Surface water volumes processed by drinking water plants, by drainage region

Drainage region	code	Raw water			Treated water			Backwash and wastewater ¹		
		2005	2006	2007	2005	2006	2007	2005	2006	2007
		millions of cubic metres								
Canada ²	...	5,263.8 ^A	5,141.4 ^A	5,186.3 ^A	5,031.9 ^A	4,891.0 ^A	4,935.0 ^A	231.9 ^A	250.4 ^A	251.3 ^A
Pacific Coastal and Yukon	1,5	414.7 ^A	428.1 ^A	360.8 ^A	414.5 ^A	427.9 ^A	360.6 ^A	0.2 ^E	0.2 ^E	0.3 ^E
Fraser-Lower Mainland	2	198.9 ^A	195.9 ^A	236.5 ^A	192.9 ^A	190.3 ^A	230.8 ^A	5.9 ^A	5.6 ^A	5.7 ^A
Okanagan-Similkameen	3	87.8 ^D	89.4 ^D	92.2 ^D	87.6 ^D	89.2 ^D	92.1 ^D	F	F	F
Columbia	4	36.9 ^D	37.1 ^D	36.6 ^D	35.8 ^D	35.8 ^D	35.2 ^D	1.1 ^E	1.3 ^E	1.4 ^E
Peace-Athabasca and Lower Mackenzie	6,7	45.1 ^A	47.3 ^A	47.7 ^A	42.1 ^A	44.1 ^A	44.7 ^A	3.0 ^C	3.2 ^C	3.1 ^C
Missouri	9	x	x	x	x	x	x	x	x	x
North Saskatchewan	10	151.2 ^A	156.6 ^A	160.4 ^A	141.4 ^A	146.5 ^A	144.4 ^A	9.8 ^A	10.1 ^A	16.0 ^A
South Saskatchewan	11	329.0 ^A	338.5 ^A	342.1 ^A	288.8 ^A	302.6 ^A	302.9 ^A	40.2 ^A	35.9 ^A	39.2 ^A
Assiniboine-Red	12	140.0 ^A	146.2 ^A	142.3 ^A	135.1 ^A	141.4 ^A	138.1 ^A	5.0 ^A	4.8 ^A	4.2 ^A
Winnipeg, Lower Saskatchewan-Nelson, Churchill and Northern Ontario	13,14,15,17	42.2 ^A	42.7 ^A	42.2 ^A	38.1 ^A	38.2 ^A	37.9 ^A	4.2 ^B	4.5 ^B	4.3 ^B
Northern Quebec	18	F	x	x	F	x	x	F	x	x
Great Lakes	19	1,579.5 ^A	1,531.6 ^A	1,556.6 ^A	1,501.0 ^A	1,442.8 ^A	1,474.9 ^A	78.5 ^A	88.8 ^A	81.7 ^A
Ottawa	20	342.3 ^B	334.6 ^B	330.4 ^B	322.0 ^B	303.5 ^B	310.0 ^B	20.3 ^B	31.1 ^C	20.4 ^A
St. Lawrence	21	1,486.2 ^A	1,405.0 ^A	1,442.2 ^A	1,435.1 ^A	1,355.0 ^A	1,384.6 ^A	51.1 ^B	49.9 ^B	57.7 ^B
North Shore-Gaspé	22	67.7 ^A	68.4 ^A	71.1 ^A	66.2 ^A	66.3 ^A	68.9 ^A	1.5 ^D	2.2 ^D	2.2 ^C
Saint John-St. Croix ³	23	x	50.7 ^A	51.1 ^A	x	49.0 ^A	46.4 ^A	x	1.7 ^A	4.7 ^A
Maritime Coastal ³	24	144.5 ^C	138.2 ^C	140.1 ^B	139.9 ^B	133.3 ^C	136.0 ^B	4.5 ^D	4.9 ^D	4.1 ^D
Newfoundland-Labrador	25	144.8 ^B	129.9 ^B	132.0 ^B	140.4 ^B	124.0 ^B	126.1 ^B	4.3 ^B	5.9 ^B	6.0 ^A

1. Calculated as the difference between raw water withdrawals and final volumes of treated water produced.

2. Excludes Arctic Coast-Islands and Keewatin-Southern Baffin Island due to low response.

3. The estimates are revisions which may vary from the preliminary figures originally published.

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Survey of Drinking Water Plants (survey number 5149).

Text table 2

Population served by drinking water plants, by source water type and province and territory

	Surface water			Groundwater		
	2005	2006	2007	2005	2006	2007
	persons					
Canada 1, 2	23,597,817 A	23,798,555 A	24,110,389 A	3,256,474 A	3,310,860 A	3,388,934 A
Newfoundland and Labrador	403,648 B	376,474 B	379,389 A	x	x	x
Prince Edward Island	0 ...	0 ...	0 ...	60,074 A	60,427 A	60,827 A
Nova Scotia 2	500,332 D	501,084 D	506,614 D	58,792 C	59,346 C	60,511 C
New Brunswick	212,201 A	211,736 A	211,379 A	110,662 A	112,921 A	112,996 A
Quebec	5,844,932 A	5,875,002 A	5,949,804 A	847,364 A	853,493 A	867,892 A
Ontario	9,163,966 A	9,227,654 A	9,317,774 A	1,302,012 A	1,330,022 A	1,360,863 A
Manitoba	822,161 A	824,490 A	829,138 A	84,266 C	88,707 B	89,808 B
Saskatchewan	593,140 A	594,027 A	595,078 A	133,356 A	131,663 A	132,394 A
Alberta	2,581,365 A	2,659,175 A	2,751,250 A	120,235 B	124,929 B	130,034 A
British Columbia	3,425,700 A	3,480,251 A	3,526,439 A	514,244 C	521,223 C	538,906 C
Yukon and Northwest Territories	50,372 B	48,662 B	43,525 C	x	x	x
	Groundwater under the direct influence of surface water			Total		
	2005	2006	2007	2005	2006	2007
	persons					
Canada 1, 2	436,749 A	445,864 A	456,017 A	27,308,845 A	27,564,356 A	27,968,039 A
Newfoundland and Labrador	x	x	x	429,494 B	402,690 B	406,364 A
Prince Edward Island	0 ...	0 ...	0 ...	60,074 A	60,427 A	60,827 A
Nova Scotia 2	0 ...	0 ...	0 ...	559,124 D	560,430 D	567,124 D
New Brunswick	28,214 A	28,254 A	28,265 A	351,077 A	352,912 A	352,640 A
Quebec	172,299 C	177,225 C	186,798 B	6,873,823 A	6,914,798 A	7,016,273 A
Ontario	123,763 A	127,835 A	125,493 A	10,595,652 A	10,685,510 A	10,805,048 A
Manitoba	6,475 D	7,071 D	7,483 D	915,568 A	920,268 A	926,429 A
Saskatchewan	7,168 B	7,579 B	8,793 B	733,665 A	733,269 A	736,265 A
Alberta	20,183 A	19,407 A	20,151 A	2,721,782 A	2,803,511 A	2,901,434 A
British Columbia	60,721 A	60,548 A	61,058 A	4,000,665 A	4,062,022 A	4,126,403 A
Yukon and Northwest Territories	x	x	x	67,919 B	68,520 B	69,230 B

1. Excludes Nunavut due to low response.

2. The estimates are revisions which may vary from the preliminary figures originally published.

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, Environment Accounts and Statistics Division, CANSIM table 153-0106.

Text table 3
Population served by drinking water plants, by source water type and drainage region

	Drainage region	Surface water			Groundwater		
		2005	2006	2007	2005	2006	2007
	code	persons					
Canada ^{1, 2}	...	23,597,817 ^A	23,798,555 ^A	24,110,389 ^A	3,256,474 ^A	3,310,860 ^A	3,388,934 ^A
Pacific Coastal and Yukon ³	1,5	2,315,837 ^A	2,345,382 ^A	2,371,455 ^A	175,888 ^C	177,901 ^C	185,734 ^B
Fraser–Lower Mainland ⁴	2	801,593 ^A	817,507 ^A	825,720 ^A	x	x	x
Okanagan–Similkameen	3	188,894 ^B	194,989 ^B	201,328 ^B	30,335 ^B	30,286 ^B	32,828 ^B
Columbia	4	106,501 ^D	107,191 ^D	106,860 ^D	35,688 ^A	38,045 ^B	38,859 ^B
Peace–Athabasca and Lower Mackenzie	6,7	259,084 ^A	270,212 ^A	277,209 ^A	x	x	x
Missouri	9	x	x	x	x	x	x
North Saskatchewan	10	1,026,825 ^A	1,040,495 ^A	1,057,460 ^A	53,638 ^B	54,586 ^B	55,243 ^B
South Saskatchewan	11	1,606,728 ^A	1,660,912 ^A	1,730,482 ^A	82,825 ^B	87,879 ^B	92,207 ^B
Assiniboine–Red	12	1,032,054 ^A	1,034,466 ^A	1,038,519 ^A	138,473 ^B	137,900 ^B	139,541 ^B
Winnipeg, Lower Saskatchewan–Nelson, Churchill and Northern Ontario	13,14,15,17	216,610 ^A	216,819 ^A	217,058 ^A	71,975 ^B	74,713 ^B	73,441 ^B
Northern Quebec	18	x	x	x	x	x	x
Great Lakes	19	8,149,639 ^A	8,200,928 ^A	8,280,934 ^A	1,230,896 ^A	1,258,473 ^A	1,288,214 ^A
Ottawa	20	1,522,329 ^A	1,542,946 ^A	1,558,968 ^A	96,021 ^B	98,579 ^B	102,607 ^A
St. Lawrence	21	4,906,941 ^A	4,907,286 ^A	4,945,360 ^A	557,383 ^B	559,804 ^B	575,411 ^B
North Shore–Gaspé	22	305,203 ^A	325,722 ^A	356,107 ^A	x	151,113 ^A	149,114 ^A
Saint John–St. Croix ²	23	80,198 ^A	80,188 ^A	80,215 ^A	83,732 ^A	84,827 ^A	84,904 ^A
Maritime Coastal ²	24	672,032 ^C	672,326 ^C	677,507 ^C	174,099 ^A	176,168 ^A	177,730 ^A
Newfoundland–Labrador	25	403,648 ^B	376,474 ^B	379,389 ^A	x	x	x

	Drainage region	Groundwater under the direct influence of surface water			Total		
		2005	2006	2007	2005	2006	2007
	code	persons					
Canada ^{1, 2}	...	436,749 ^A	445,864 ^A	456,017 ^A	27,308,845 ^A	27,564,356 ^A	27,968,039 ^A
Pacific Coastal and Yukon ³	1,5	36,570 ^A	36,632 ^A	37,050 ^A	2,528,295 ^A	2,559,915 ^A	2,594,238 ^A
Fraser–Lower Mainland ⁴	2	x	x	x	1,078,230 ^B	1,099,089 ^B	1,119,612 ^B
Okanagan–Similkameen	3	4,733 ^D	4,469 ^E	4,348 ^D	223,962 ^B	229,744 ^B	238,504 ^B
Columbia	4	0 ^A	0 ^A	0 ^A	142,189 ^C	145,236 ^C	145,719 ^C
Peace–Athabasca and Lower Mackenzie	6,7	x	x	x	317,200 ^A	327,692 ^A	335,192 ^A
Missouri	9	0 ^A	0 ^A	0 ^A	4,110 ^A	3,984 ^A	4,004 ^A
North Saskatchewan	10	4,766 ^A	4,789 ^A	4,869 ^A	1,085,229 ^A	1,099,870 ^A	1,117,572 ^A
South Saskatchewan	11	19,805 ^A	19,086 ^A	19,830 ^A	1,709,358 ^A	1,767,877 ^A	1,842,519 ^A
Assiniboine–Red	12	8,733 ^D	9,694 ^C	11,241 ^C	1,179,259 ^A	1,182,060 ^A	1,189,301 ^A
Winnipeg, Lower Saskatchewan–Nelson, Churchill and Northern Ontario	13,14,15,17	4,025 ^A	3,990 ^A	3,990 ^A	295,277 ^A	295,522 ^A	294,489 ^A
Northern Quebec	18	0 ^A	0 ^A	0 ^A	44,751 ^A	53,430 ^A	53,701 ^A
Great Lakes	19	121,682 ^A	125,727 ^A	123,369 ^A	9,508,127 ^A	9,585,127 ^A	9,693,436 ^A
Ottawa	20	11,362 ^C	13,191 ^B	13,207 ^B	1,633,009 ^A	1,654,716 ^A	1,674,782 ^A
St. Lawrence	21	155,429 ^C	156,770 ^C	166,290 ^C	5,619,753 ^A	5,632,938 ^A	5,698,840 ^A
North Shore–Gaspé	22	x	4,469 ^A	4,523 ^A	470,927 ^A	481,304 ^A	509,744 ^A
Saint John–St. Croix ²	23	26,604 ^A	26,670 ^A	26,682 ^A	190,534 ^A	191,684 ^A	191,801 ^A
Maritime Coastal ²	24	3,010 ^B	2,984 ^B	2,983 ^B	849,140 ^C	851,479 ^C	858,220 ^C
Newfoundland–Labrador	25	x	x	x	429,494 ^B	402,690 ^B	406,364 ^A

1. Excludes Arctic Coast–Islands and Keewatin–Southern Baffin Island due to low response.

2. The estimates are revisions which may vary from the preliminary figures originally published.

3. Overestimated because some plants located here serve Fraser–Lower Mainland.

4. Underestimated because some of the population is served by plants located in Pacific Coastal.

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, Environment Accounts and Statistics Division, CANSIM table 153-0106.

Text table 4
Raw water volumes processed by drinking water plants, by source water type and drainage region

	Drainage region	Surface water			Groundwater		
		2005	2006	2007	2005	2006	2007
	code	millions of cubic metres					
Canada 1	...	5,263.8^A	5,141.4^A	5,186.3^A	588.6^A	587.1^A	595.2^A
Pacific Coastal and Yukon	1,5	414.7 ^A	428.1 ^A	360.8 ^A	48.7 ^D	48.2 ^D	48.4 ^D
Fraser–Lower Mainland	2	198.9 ^A	195.9 ^A	236.5 ^A	x	x	x
Okanagan–Similkameen	3	87.8 ^D	89.4 ^D	92.2 ^D	10.8 ^B	10.9 ^B	12.1 ^B
Columbia	4	36.9 ^D	37.1 ^D	36.6 ^D	17.6 ^A	F	F
Peace–Athabasca and Lower Mackenzie	6,7	45.1 ^A	47.3 ^A	47.7 ^A	x	x	x
Missouri	9	x	x	x	x	0.3 ^B	0.3 ^A
North Saskatchewan	10	151.2 ^A	156.6 ^A	160.4 ^A	8.6 ^B	x	x
South Saskatchewan	11	329.0 ^A	338.5 ^A	342.1 ^A	17.9 ^D	18.6 ^D	19.1 ^D
Assiniboine–Red	12	140.0 ^A	146.2 ^A	142.3 ^A	21.4 ^B	22.2 ^B	21.6 ^B
Winnipeg, Lower Saskatchewan–Nelson, Churchill and Northern Ontario	13,14,15,17	42.2 ^A	42.7 ^A	42.2 ^A	12.2 ^B	13.3 ^B	11.8 ^B
Northern Quebec	18	F	x	x	9.4 ^A	13.6 ^A	14.5 ^A
Great Lakes	19	1,579.5 ^A	1,531.6 ^A	1,556.6 ^A	177.3 ^A	176.4 ^A	180.5 ^A
Ottawa	20	342.3 ^B	334.6 ^B	330.4 ^B	17.9 ^B	17.5 ^B	17.4 ^B
St. Lawrence	21	1,486.2 ^A	1,405.0 ^A	1,442.2 ^A	90.9 ^B	86.5 ^B	88.9 ^B
North Shore–Gaspé	22	67.7 ^A	68.4 ^A	71.1 ^A	x	31.4 ^B	31.2 ^B
Saint John–St. Croix ²	23	x	50.7 ^A	51.1 ^A	19.5 ^B	19.1 ^B	19.3 ^B
Maritime Coastal ²	24	144.5 ^C	138.2 ^C	140.1 ^B	32.4 ^B	31.5 ^A	32.9 ^B
Newfoundland–Labrador	25	144.8 ^B	129.9 ^B	132.0 ^B	5.1 ^E	5.0 ^D	4.8 ^D

	Drainage region	Groundwater under the direct influence of surface water			Total		
		2005	2006	2007	2005	2006	2007
	code	millions of cubic metres					
Canada 1	...	93.9^B	93.7^B	96.5^A	5,946.3^A	5,822.2^A	5,878.0^A
Pacific Coastal and Yukon	1,5	9.4 ^A	10.1 ^A	9.4 ^A	472.8 ^A	486.4 ^A	418.7 ^A
Fraser–Lower Mainland	2	x	x	x	260.8 ^A	264.3 ^B	305.0 ^A
Okanagan–Similkameen	3	6.1 ^D	5.1 ^D	5.8 ^E	104.8 ^C	105.5 ^D	110.1 ^D
Columbia	4	0.0 ^A	0.0 ^A	0.0 ^A	54.5 ^C	48.8 ^D	47.8 ^D
Peace–Athabasca and Lower Mackenzie	6,7	x	x	x	54.1 ^A	57.2 ^A	57.2 ^A
Missouri	9	0.0 ^A	0.0 ^A	0.0 ^A	1.1 ^A	x	x
North Saskatchewan	10	0.7 ^A	x	x	160.5 ^A	166.3 ^A	170.1 ^A
South Saskatchewan	11	7.2 ^B	6.7 ^A	6.7 ^A	354.1 ^A	363.9 ^A	367.9 ^A
Assiniboine–Red	12	1.5 ^E	1.7 ^D	2.0 ^D	162.9 ^A	170.0 ^A	165.9 ^A
Winnipeg, Lower Saskatchewan–Nelson, Churchill and Northern Ontario	13,14,15,17	0.9 ^A	0.8 ^A	0.8 ^A	55.3 ^A	56.8 ^A	54.8 ^A
Northern Quebec	18	0.0 ^A	0.0 ^A	0.0 ^A	F	x	x
Great Lakes	19	17.3 ^A	17.2 ^A	17.2 ^A	1,774.1 ^A	1,725.2 ^A	1,754.4 ^A
Ottawa	20	2.4 ^C	2.6 ^B	2.6 ^B	362.6 ^B	354.7 ^B	350.4 ^B
St. Lawrence	21	29.0 ^D	28.8 ^D	31.6 ^C	1,606.1 ^A	1,520.3 ^A	1,562.7 ^A
North Shore–Gaspé	22	x	0.6 ^A	0.6 ^A	101.5 ^A	100.5 ^A	102.9 ^A
Saint John–St. Croix ²	23	x	4.7 ^A	4.7 ^A	76.8 ^A	74.5 ^A	75.1 ^A
Maritime Coastal ²	24	0.5 ^B	0.5 ^B	0.5 ^C	177.4 ^B	170.1 ^B	173.5 ^B
Newfoundland–Labrador	25	7.7 ^A	7.7 ^A	7.9 ^A	157.6 ^B	142.6 ^B	144.7 ^B

1. Excludes Arctic Coast–Islands and Keewatin–Southern Baffin Island due to low response.

2. The estimates are revisions which may vary from the preliminary figures originally published.

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Survey of Drinking Water Plants (survey number 5149).

Text table 5
Total capital expenditures of drinking water plants, by main source water type and drainage region

	Drainage region	Surface water ¹			Groundwater ¹			Groundwater under the direct influence of surface water ¹		
		2005	2006	2007	2005	2006	2007	2005	2006	2007
	code	millions of dollars								
Canada ²	...	821.2^A	930.1^A	740.2^B	111.8^C	112.1^B	103.6^B	13.8^B	14.0^A	12.4^A
Pacific Coastal and Yukon ³	1,5	137.9 ^A	137.5 ^A	108.4 ^A	x	x	3.3 ^E	x	x	x
Fraser–Lower Mainland ⁴	2	x	7.6 ^A	25.0 ^A	1.4 ^E	x	0.9 ^E	x	x	x
Okanagan–Similkameen	3	x	10.4 ^D	3.5 ^B	0.0 ^A	F	x	0.0...	0.0...	0.0...
Columbia	4	6.4 ^E	4.4 ^E	x	0.9 ^D	F	x	0.0...	0.0...	0.0...
Peace–Athabasca and Lower Mackenzie	6,7	19.3 ^E	35.1 ^E	30.7 ^E	x	x	x	x	x	x
Missouri	9	x	x	x	x	x	x	0.0...	0.0...	0.0...
North Saskatchewan	10	18.5 ^A	75.8 ^A	82.8 ^A	F	0.6 ^D	4.1 ^E	x	x	x
South Saskatchewan	11	73.2 ^A	84.2 ^A	69.9 ^A	3.5 ^E	8.4 ^E	6.9 ^E	0.1 ^A	0.2 ^A	0.7 ^A
Assiniboine–Red	12	x	x	x	8.6 ^D	x	x	x	x	0.5 ^E
Winnipeg, Lower Saskatchewan–Nelson, Churchill and Northern Ontario	13,14,15,17	20.9 ^D	21.1 ^E	10.2 ^D	8.1 ^E	2.5 ^E	0.8 ^C	0.0...	0.0...	0.0...
Northern Quebec	18	F	x	x	x	x	x	0.0...	0.0...	0.0...
Great Lakes	19	210.4 ^B	274.8 ^A	180.9 ^A	40.7 ^C	51.6 ^C	43.3 ^B	8.7 ^C	6.9 ^A	7.4 ^A
Ottawa	20	36.1 ^D	38.2 ^C	x	2.3 ^D	4.9 ^E	3.6 ^B	0.0 ^A	x	x
St. Lawrence	21	144.3 ^C	88.5 ^C	48.9 ^B	24.2 ^E	14.3 ^D	19.1 ^E	3.0 ^D	2.1 ^D	1.4 ^E
North Shore–Gaspé	22	3.0 ^A	x	x	x	x	6.4 ^E	x	x	x
Saint John–St. Croix ⁵	23	x	1.4 ^A	1.1 ^A	x	x	0.5 ^E	0.6 ^A	0.6 ^A	1.4 ^A
Maritime Coastal ⁵	24	4.2 ^D	12.1 ^E	11.3 ^E	2.8 ^D	4.3 ^D	5.4 ^D	x	x	x
Newfoundland–Labrador	25	40.0 ^E	19.7 ^E	8.5 ^B	x	1.0 ^E	F	0.0...	0.0...	0.0...
	Drainage region	All other source water combinations			Total					
		2005	2006	2007	2005	2006	2007			
	code	millions of dollars								
Canada ²	...	49.4^D	39.5^C	28.6^B	996.2^A	1,095.7^A	884.9^A			
Pacific Coastal and Yukon ³	1,5	x	x	x	146.5 ^A	146.8 ^A	111.9 ^A			
Fraser–Lower Mainland ⁴	2	x	x	0.1 ^A	3.5 ^C	13.3 ^D	26.2 ^A			
Okanagan–Similkameen	3	0.7 ^E	3.1 ^D	x	x	13.5 ^D	8.2 ^E			
Columbia	4	0.0...	0.0...	0.0...	7.3 ^E	6.5 ^E	9.6 ^E			
Peace–Athabasca and Lower Mackenzie	6,7	0.0...	0.0...	0.0...	19.4 ^E	36.0 ^E	30.8 ^E			
Missouri	9	0.0...	0.0...	0.0...	x	0.0 ^C	x			
North Saskatchewan	10	x	x	x	24.9 ^D	79.5 ^A	87.2 ^A			
South Saskatchewan	11	0.0...	0.0...	0.0...	76.9 ^A	92.8 ^A	77.4 ^A			
Assiniboine–Red	12	x	x	x	104.5 ^A	114.2 ^A	86.6 ^A			
Winnipeg, Lower Saskatchewan–Nelson, Churchill and Northern Ontario	13,14,15,17	0.0...	0.0...	0.0...	29.1 ^D	23.6 ^E	10.9 ^D			
Northern Quebec	18	0.0...	x	0.0...	x	9.5 ^E	x			
Great Lakes	19	30.0 ^E	21.7 ^B	21.3 ^A	289.8 ^B	354.9 ^A	252.9 ^A			
Ottawa	20	0.0...	x	0.0...	38.4 ^D	46.0 ^C	74.2 ^E			
St. Lawrence	21	1.4 ^E	2.2 ^E	1.4 ^E	172.9 ^C	107.1 ^C	70.8 ^B			
North Shore–Gaspé	22	x	x	x	16.9 ^D	11.0 ^E	8.6 ^E			
Saint John–St. Croix ⁵	23	x	x	x	1.4 ^A	2.3 ^A	x			
Maritime Coastal ⁵	24	x	x	x	7.0 ^D	18.0 ^D	17.0 ^E			
Newfoundland–Labrador	25	x	0.0...	0.0...	40.8 ^E	20.7 ^E	8.7 ^B			

1. Represents sources having 90 to 100 % of the indicated water type.

2. Excludes Arctic Coast–Islands and Keewatin–Southern Baffin Island due to low response.

3. Overestimated because some plants located here serve Fraser–Lower Mainland.

4. Underestimated because some of this region is served by plants located in Pacific Coastal.

5. The estimates are revisions which may vary from the preliminary figures originally published.

Note(s): Data do not include costs associated with the distribution of treated water (see page 7 of the questionnaire). Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Survey of Drinking Water Plants (survey number 5149).

Text table 6
Operation and maintenance costs of drinking water plants, by drainage region

	Drainage region	2005				
		Materials	Labour	Energy	Other	Total
	code	millions of dollars				
Canada 1	...	183.6 A	283.1 A	185.4 A	87.5 A	739.6 A
Pacific Coastal and Yukon 2	1,5	4.8 B	9.8 B	3.9 D	2.7 D	21.2 B
Fraser–Lower Mainland 3	2	5.3 B	10.0 B	5.6 C	2.7 D	23.6 B
Okanagan–Similkameen	3	1.5 C	4.1 B	1.7 D	1.0 B	8.2 B
Columbia	4	1.3 E	3.5 C	1.4 D	0.6 D	6.7 D
Peace–Athabasca and Lower Mackenzie	6,7	7.7 C	10.6 A	5.7 B	2.5 E	26.5 B
Missouri	9	x	0.2 C	0.0 Cs	x	0.4 B
North Saskatchewan	10	12.6 B	16.6 E	3.5 B	0.9 D	33.5 C
South Saskatchewan	11	15.7 A	18.9 B	13.0 B	9.4 B	57.0 A
Assiniboine–Red	12	12.1 A	14.3 A	6.9 A	5.0 D	38.3 A
Winnipeg, Lower Saskatchewan–Nelson, Churchill and Northern Ontario	13,14,15,17	9.0 A	12.3 B	5.9 B	6.4 B	33.6 A
Northern Quebec	18	x	0.5 D	0.5 C	x	1.6 D
Great Lakes	19	51.4 A	86.8 A	64.6 A	30.4 A	233.2 A
Ottawa	20	12.8 C	16.4 A	11.4 A	4.6 E	45.3 B
St. Lawrence	21	31.6 A	57.3 A	46.5 A	14.0 C	149.5 A
North Shore–Gaspé	22	3.2 B	5.5 B	3.9 B	2.2 C	14.7 B
Saint John–St. Croix 4	23	1.4 B	2.6 B	1.6 B	0.9 E	6.5 B
Maritime Coastal 4	24	9.1 B	8.5 B	5.6 B	2.3 D	25.5 B
Newfoundland–Labrador	25	3.7 C	5.2 B	3.8 C	1.6 B	14.2 B

	Drainage region	2006				
		Materials	Labour	Energy	Other	Total
	code	millions of dollars				
Canada 1	...	186.8 A	287.1 A	190.5 A	93.1 A	757.5 A
Pacific Coastal and Yukon 2	1,5	5.2 B	10.2 B	4.1 C	2.3 D	21.8 B
Fraser–Lower Mainland 3	2	5.6 B	9.6 B	6.2 C	3.0 C	24.3 B
Okanagan–Similkameen	3	1.7 D	4.7 B	1.9 D	1.1 B	9.4 B
Columbia	4	1.3 E	3.2 D	1.5 D	0.7 E	6.7 D
Peace–Athabasca and Lower Mackenzie	6,7	8.2 C	11.7 A	6.7 C	2.6 E	29.2 B
Missouri	9	0.1 D	0.2 C	0.0 Cs	0.0 Cs	0.4 B
North Saskatchewan	10	9.8 A	11.0 A	3.6 B	0.9 C	25.3 A
South Saskatchewan	11	15.1 A	20.8 B	14.1 A	9.2 B	59.1 A
Assiniboine–Red	12	13.2 A	14.9 A	7.3 A	5.1 C	40.6 A
Winnipeg, Lower Saskatchewan–Nelson, Churchill and Northern Ontario	13,14,15,17	9.5 A	12.8 A	6.3 B	6.7 B	35.3 A
Northern Quebec	18	0.5 C	0.7 B	0.8 A	0.3 A	2.3 A
Great Lakes	19	52.0 A	90.0 A	65.6 A	34.7 A	242.3 A
Ottawa	20	12.9 B	17.7 A	11.5 A	4.4 E	46.6 B
St. Lawrence	21	33.1 A	57.7 A	45.4 A	14.6 C	150.8 A
North Shore–Gaspé	22	3.3 B	5.8 A	4.2 B	1.9 C	15.2 B
Saint John–St. Croix 4	23	1.5 B	2.7 B	1.6 B	1.0 E	6.7 B
Maritime Coastal 4	24	9.7 B	8.6 B	5.8 C	2.5 D	26.6 B
Newfoundland–Labrador	25	4.2 B	4.8 B	4.0 C	2.1 A	15.1 B

See notes at the end of the table.

Text table 6 – continued

Operation and maintenance costs of drinking water plants, by drainage region

	Drainage region	2007				Total
		Materials	Labour	Energy	Other	
	code	millions of dollars				
Canada 1	...	197.9 A	301.7 A	199.3 A	108.3 A	807.2 A
Pacific Coastal and Yukon 2	1,5	6.3	11.3	3.8	2.3	23.7
Fraser–Lower Mainland 3	2	6.3	10.7	6.6	3.6	27.1
Okanagan–Similkameen	3	1.9	4.5	2.0	1.2	9.7
Columbia	4	1.2	3.8	1.6	1.0	7.5
Peace–Athabasca and Lower Mackenzie	6,7	10.4	11.7	7.0	3.4	32.5
Missouri	9	0.1	0.2	0.0	0.0	0.4
North Saskatchewan	10	12.3	12.4	3.8	1.4	29.9
South Saskatchewan	11	17.4	23.0	15.0	10.2	65.6
Assiniboine–Red	12	13.6	16.0	7.4	5.2	42.2
Winnipeg, Lower Saskatchewan–Nelson, Churchill and Northern Ontario	13,14,15,17	9.6	13.7	6.8	6.7	36.8
Northern Quebec	18	0.7	0.7	0.9	0.4	2.7
Great Lakes	19	52.9	93.2	70.0	45.0	261.1
Ottawa	20	12.7	17.7	10.4	F	46.4
St. Lawrence	21	32.4	59.5	47.6	14.9	154.4
North Shore–Gaspé	22	3.7	6.2	4.3	2.0	16.1
Saint John–St. Croix 4	23	1.6	2.9	1.8	1.0	7.4
Maritime Coastal 4	24	10.3	9.0	6.1	2.3	27.8
Newfoundland–Labrador	25	4.5	5.1	4.2	2.1	16.0

1. Excludes Arctic Coast–Islands and Keewatin–Southern Baffin Island due to low response.

2. Overestimated because some plants located here serve Fraser–Lower Mainland.

3. Underestimated because some of this region is served by plants located in Pacific Coastal.

4. The estimates are revisions which may vary from the preliminary figures originally published.

Note(s): Data do not include costs associated with the distribution of treated water (see page 7 of the questionnaire). Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, Environment Accounts and Statistics Division, CANSIM table 153-0108.

Text table 7

Operation and maintenance costs of drinking water plants per treated surface water volume, by drainage region

	Drainage region	2005				Total
		Materials	Labour	Energy	Other	
	code	dollars per thousand cubic metres				
Canada 1	...	28.1 A	41.8 A	29.4 A	11.7 B	111.0 A
Pacific Coastal and Yukon 2	1,5	7.8 B	14.3 B	2.9 A	1.7 B	26.6 B
Fraser-Lower Mainland 3	2	18.5 B	29.9 A	11.6 A	4.9 A	65.0 A
Okanagan-Similkameen	3	12.4 D	38.2 C	14.1 C	9.7 D	74.5 C
Columbia	4	30.8 E	66.9 D	27.2 E	10.6 E	135.4 D
Peace-Athabasca and Lower Mackenzie	6,7	169.7 B	220.8 B	116.4 C	53.1 E	560.0 B
Missouri	9	x	x	x	x	x
North Saskatchewan	10	76.7 B	59.5 A	15.5 A	4.0 E	155.6 A
South Saskatchewan	11	45.0 A	47.4 A	37.5 A	29.1 B	158.9 A
Assiniboine-Red	12	62.3 A	66.2 A	33.9 A	23.3 C	185.7 A
Winnipeg, Lower Saskatchewan-Nelson, Churchill and Northern Ontario	13,14,15,17	188.4 B	229.7 B	116.6 C	123.7 C	658.4 B
Northern Quebec	18	F	F	F	F	F
Great Lakes	19	23.5 A	43.7 A	36.8 A	12.6 A	116.6 A
Ottawa	20	34.1 D	38.6 B	30.6 B	F	115.8 D
St. Lawrence	21	18.4 A	34.9 A	28.3 A	7.2 C	88.8 A
North Shore-Gaspé	22	33.2 B	58.9 A	33.5 A	12.5 B	138.1 A
Saint John-St. Croix 4	23	15.1 A	27.4 A	13.6 A	6.3 A	62.4 A
Maritime Coastal 4	24	51.1 C	41.3 B	27.0 B	9.4 E	128.8 B
Newfoundland-Labrador	25	23.9 C	33.8 B	22.7 B	10.9 C	91.3 B
	Drainage region	2006				Total
	code	Materials	Labour	Energy	Other	
		dollars per thousand cubic metres				
Canada 1	...	29.0 A	44.6 A	30.7 A	13.1 A	117.4 A
Pacific Coastal and Yukon 2	1,5	8.1 B	14.4 B	3.3 B	1.7 B	27.4 B
Fraser-Lower Mainland 3	2	19.7 A	29.2 A	13.9 A	7.3 A	70.1 A
Okanagan-Similkameen	3	13.1 D	43.9 C	15.9 C	10.2 D	83.1 B
Columbia	4	33.2 E	68.7 D	31.2 E	9.5 E	142.6 D
Peace-Athabasca and Lower Mackenzie	6,7	172.4 B	222.5 B	128.6 D	51.8 E	575.2 B
Missouri	9	x	x	x	x	x
North Saskatchewan	10	56.0 A	58.2 A	15.8 A	3.4 D	133.3 A
South Saskatchewan	11	42.4 A	50.5 A	38.8 A	26.2 B	158.0 A
Assiniboine-Red	12	64.1 A	66.4 A	35.4 A	21.9 D	187.9 A
Winnipeg, Lower Saskatchewan-Nelson, Churchill and Northern Ontario	13,14,15,17	189.9 B	234.6 B	123.7 C	132.1 C	680.3 B
Northern Quebec	18	343.5 E	443.4 E	346.6 A	F	1,164.6 D
Great Lakes	19	24.0 A	47.4 A	37.8 A	15.7 A	124.9 A
Ottawa	20	38.4 D	43.8 B	32.8 A	F	127.1 C
St. Lawrence	21	19.8 A	37.3 A	29.1 A	7.8 C	93.9 A
North Shore-Gaspé	22	35.6 B	64.5 A	38.8 A	13.7 C	152.6 A
Saint John-St. Croix 4	23	15.3 A	28.7 A	13.7 A	7.6 A	65.3 A
Maritime Coastal 4	24	56.6 C	44.2 B	29.6 B	11.8 E	142.2 B
Newfoundland-Labrador	25	30.6 B	35.2 B	27.0 B	15.8 B	108.6 B

See notes at the end of the table.

Text table 7 – continued

Operation and maintenance costs of drinking water plants per treated surface water volume, by drainage region

Drainage region	code	2007				Total
		Materials	Labour	Energy	Other	
		dollars per thousand cubic metres				
Canada 1	...	30.6 A	46.7 A	32.1 A	14.9 B	124.3 A
Pacific Coastal and Yukon 2	1,5	12.5 C	19.9 C	3.2 B	2.3 E	37.9 C
Fraser–Lower Mainland 3	2	19.2 A	28.3 A	12.9 A	8.1 A	68.4 A
Okanagan–Similkameen	3	13.8 D	40.1 D	16.4 C	11.6 D	81.9 C
Columbia	4	28.2 D	68.9 D	34.2 E	14.6 E	146.0 D
Peace–Athabasca and Lower Mackenzie	6,7	219.4 B	218.1 A	138.2 B	68.2 E	643.9 A
Missouri	9	x	x	x	x	x
North Saskatchewan	10	70.0 A	65.6 A	16.7 A	3.3 D	155.6 A
South Saskatchewan	11	48.3 A	57.2 A	41.5 A	29.9 B	177.0 A
Assiniboine–Red	12	69.6 A	71.8 A	36.2 A	24.0 C	201.6 A
Winnipeg, Lower Saskatchewan–Nelson, Churchill and Northern Ontario	13,14,15,17	189.7 B	251.6 B	132.6 C	135.0 D	708.9 B
Northern Quebec	18	321.8 E	F	219.0 E	F	851.1 E
Great Lakes	19	23.6 A	49.2 A	40.1 A	18.8 A	131.8 A
Ottawa	20	36.7 D	42.1 C	28.2 C	F	122.8 D
St. Lawrence	21	18.9 A	37.5 A	29.7 A	7.9 C	94.1 A
North Shore–Gaspé	22	38.7 C	68.9 A	39.3 A	14.6 B	161.4 A
Saint John–St. Croix 4	23	19.8 A	33.1 A	17.6 A	7.4 A	77.9 A
Maritime Coastal 4	24	59.7 C	45.9 B	30.5 B	9.8 E	145.9 B
Newfoundland–Labrador	25	33.1 B	37.1 B	28.2 B	15.8 B	114.2 B

1. Excludes Arctic Coast–Islands and Keewatin–Southern Baffin Island due to low response.

2. Some plants located here serve Fraser–Lower Mainland.

3. Some of the region is served by plants located in Pacific Coastal.

4. The estimates are revisions which may vary from the preliminary figures originally published.

Note(s): Data do not include costs associated with the distribution of treated water (see page 7 of the questionnaire). Includes groundwater under the direct influence of surface water. Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, 2013, Environment Accounts and Statistics Division, Survey of Drinking Water Plants (survey number 5149).

Text table 8

Number of drinking water plants, population served, treated water volume and operation and maintenance costs by treatment category

Treatment category 3	Drinking water plants 1	Population served			Treated water volume			Operation and maintenance costs 2		
	2005 to 2007	2005	2006	2007	2005	2006	2007	2005	2006	2007
	number	persons			millions of cubic metres			millions of dollars		
Canada 4, 5	2,158 A	27,308,845 A	27,564,356 A	27,968,039 A	5,706.2 A	5,561.1 A	5,616.8 A	739.6 A	757.5 A	807.2 A
Conventional treatment 5	471 A	13,831,335 A	13,982,561 A	14,200,247 A	2,690.4 A	2,625.9 A	2,665.4 A	390.2 A	401.1 A	430.0 A
Direct filtration	105 B	2,305,173 A	2,339,873 A	2,381,136 A	435.6 A	421.5 A	420.9 A	55.5 B	56.7 B	58.3 B
Granular media filtration	178 B	2,054,259 A	2,064,311 A	2,072,861 A	740.6 A	689.3 A	714.2 A	60.9 B	53.9 A	56.5 A
Cartridge or bag filter	x	x	x	11,208 E	x	x	x	x	x	x
Slow sand filtration	9 D	114,825 E	114,081 E	113,270 E	18.0 E	17.1 E	16.8 E	1.5 E	1.6 E	1.7 E
Granular media and slow sand filtration	27 D	32,580 E	32,001 E	x	7.5 E	7.5 E	7.3 E	2.7 D	3.4 D	3.3 D
Granular media filtration and cartridge or bag	x	x	x	x	x	x	x	x	x	x
Membrane filtration	63 C	464,985 C	465,698 B	513,964 B	112.4 D	104.3 B	104.3 B	24.6 B	28.2 B	32.8 B
Membrane filtration and granular media	29 D	792,767 A	797,278 A	793,427 A	126.3 A	130.2 A	141.7 A	12.4 B	13.4 B	14.1 B
Membrane filtration with cartridge or bag or slow sand	9 E	x	x	x	x	x	x	3.7 C	4.0 C	5.1 C
Disinfection only	674 A	3,065,986 A	3,068,309 A	3,108,571 A	660.9 A	649.9 A	569.4 B	72.7 A	74.0 A	76.5 B
Disinfection and other (unfiltered systems)	346 A	3,820,838 A	3,855,670 A	3,903,267 A	745.7 A	741.1 A	805.2 A	88.4 A	94.5 A	102.8 A
No treatment	187 B	545,004 D	559,937 D	565,244 D	115.4 D	123.9 C	121.3 D	21.7 D	21.4 D	20.6 D
No disinfection with other treatment	41 C	109,641 D	108,982 D	109,019 D	21.0 D	19.0 D	18.4 D	3.6 D	3.6 D	3.6 D

1. Estimates for all three years are calculated for a target population defined as drinking water plants serving a population of 300 or more persons in 2007.

2. Data do not include costs associated with the distribution of treated water (see page 7 of the questionnaire).

3. Plants were assigned to a category based on the reported treatment processes in section 4 of the questionnaire. Refer to Appendix I of the 2005 to 2007 report for the main processes applied in each treatment category.

4. Excludes Nunavut due to low response.

5. The estimates are revisions which may vary from the preliminary figures originally published.

Note(s): Figures may not add up to totals due to rounding.

Source(s): Statistics Canada, 2009, Environment Accounts and Statistics Division, Survey of Drinking Water Plants (survey number 5149).