Alberta Municipal Benchmarking Initiative

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1 Introduction and Background

1.1 Introduction

Today's municipalities are challenged by an ever-increasing demand to deliver a greater variety and a higher level of public services while maintaining low taxes and user fees.

To meet this challenge, municipal governments are continually looking for new ways to improve performance, operationally and fiscally.

In the spring of 2012, a number of municipalities in Alberta expressed an interest in benchmarking their service delivery against leading practices as a way to improve service. At a workshop hosted by the Town of Banff in May 2012, participating municipalities discussed the benefits of benchmarking; developed a preliminary list of guiding principles; and identified considerations related to governance, scope, data collection, resources, and risks.

Subsequent to this workshop, the Town of Banff, on behalf of a group of 13 municipalities, successfully applied to the provincial government for a Regional Collaboration Grant to fund the development of a municipal service delivery benchmarking framework. With the support of the provincial government, the Alberta Municipal Benchmarking Initiative (ABMI) was launched in 2013.

1.2 Background

The Alberta Municipal Benchmarking Initiative is a collaboration of small and large-municipalities. Their objective is to develop and implement a framework that will enable a continuous, multi-year benchmarking process for participating municipalities. The initiative includes identifying and gathering comparable metrics and preparing an annual report to prompt questions, start discussions, identify and share leading practices, and ultimately improve the municipal services provided to Albertans.

Ten service areas benchmarked for efficiency and effectiveness performance measures are:

1. Drinking Water Supply
2. Wastewater Collection, Treatment and Disposal
3. Roadway Operations and Maintenance
4. Snow and Ice Management
5. Residential Solid Waste Management
6. Parks Provision and Maintenance
7. Fire Protection
8. Police Protection
9. Transit
10. Recreation, Facility Booking and Maintenance

A method for collecting data to ensure it would be comparable between communities and a database to hold the data and produce performance measure reports are being

developed. The foundation of this method is a "User Manual" for each service area, containing:

- Definitions for cost and service data, and
- Definitions for the calculations of performance measures, both efficiency and effectiveness.

To ensure an "apples to apples" comparison, all participating municipalities must agree on the content of the user manual. The first user manual has been created for water. If this manual proves successful, the model will be employed for the nine other service areas.

1.3 Participating Municipalities

The municipalities participating in Phase 2 of the Project are the cities of Airdrie, Lethbridge, Medicine Hat, Red Deer, and Wetaskiwin, and the towns of Banff, Beaumont, Canmore, Cochrane, and Okotoks.

1.4 Governance Structure

To guide and drive the project, a model has been developed consisting of:

- A governance committee consisting of six municipal leaders
- A working committee with representatives from each of the participating municipalities
- A finance group with representatives from each of the participating municipalities
- A subject matter expert (SME) Group for each service area with representatives from each of the participating municipalities

Governance Committee - The governance committee was created to provide overall guidance and oversight, and to ensure that the work conducted is in the best interest of the group of municipalities as a whole as opposed to an individual municipality. The committee is: Robert Earl (Chair), Town of Banff, Paul Schulz, City of Airdrie, Lisa de Soto, Town of Canmore, Kathy Hopkins, City of Lethbridge, Rick Quail, Town of Okotoks and Ted Gillespie, City of Wetaskiwin.

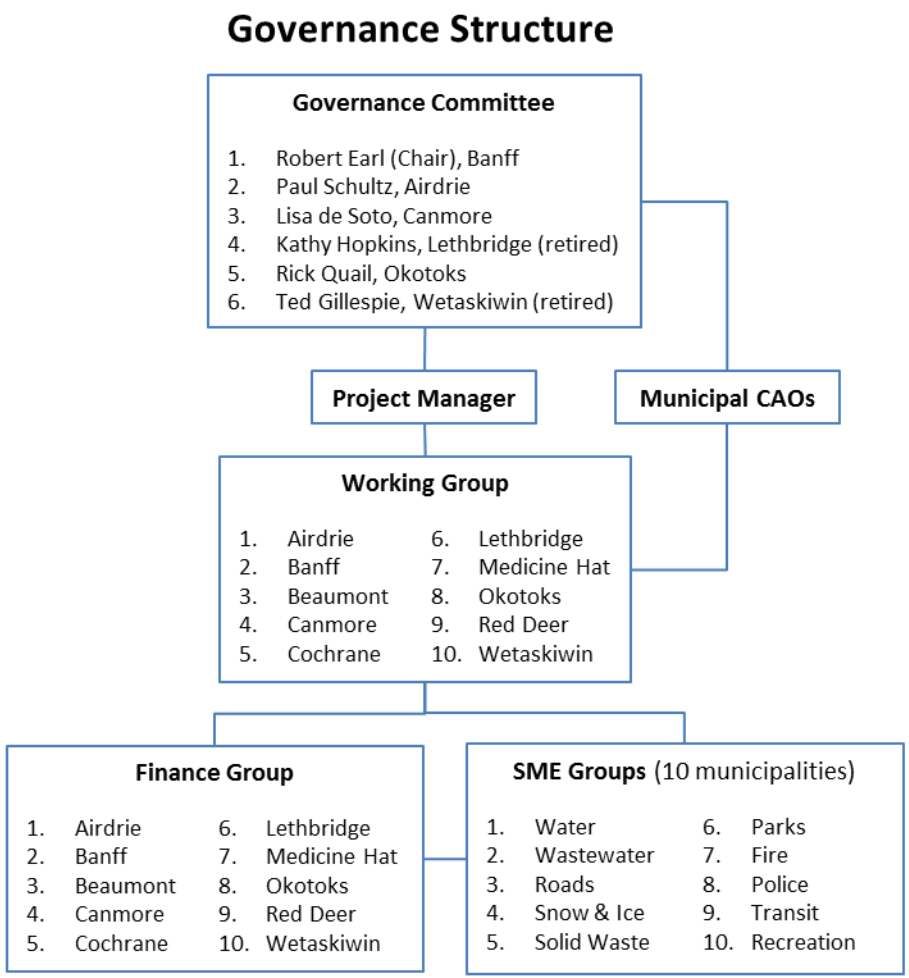
Working Committee - Each of the participating municipalities is represented on the working committee. Its members' primary role is liaising between the project manager and the respective municipality. They oversee the completion of activities within the municipality, support the identification of SMEs needed for the development of the Database User Manual, and assist with the gathering of relevant data.

Finance Group – The primary role and responsibility of the Finance Group is to collect and enter data for a calculation to allocate overhead to each service area, collect and enter data for amortization of assets in each service area, and assist service area SMEs on collection of cost data for each service area. The Finance Group also ensures all data is accurate by

confirming the financial data to the municipality's non-consolidated financial statements.

Subject Matter Expert Group (SME) – The primary role and responsibility of the SME groups is to provide subject matter expertise in the development of the service definitions, performance measures, and collection of data for the benchmarking pilot project.

The CAOs' Role – In addition to the governance committee, the CAOs from each of the participating municipalities were asked to confirm their commitment to this pilot project, to be the executive sponsor for their respective municipality, to champion this pilot project within their municipality, and ensure that all participating municipalities are informed of the activities and outcomes.



1.5 Benefits of Benchmarking

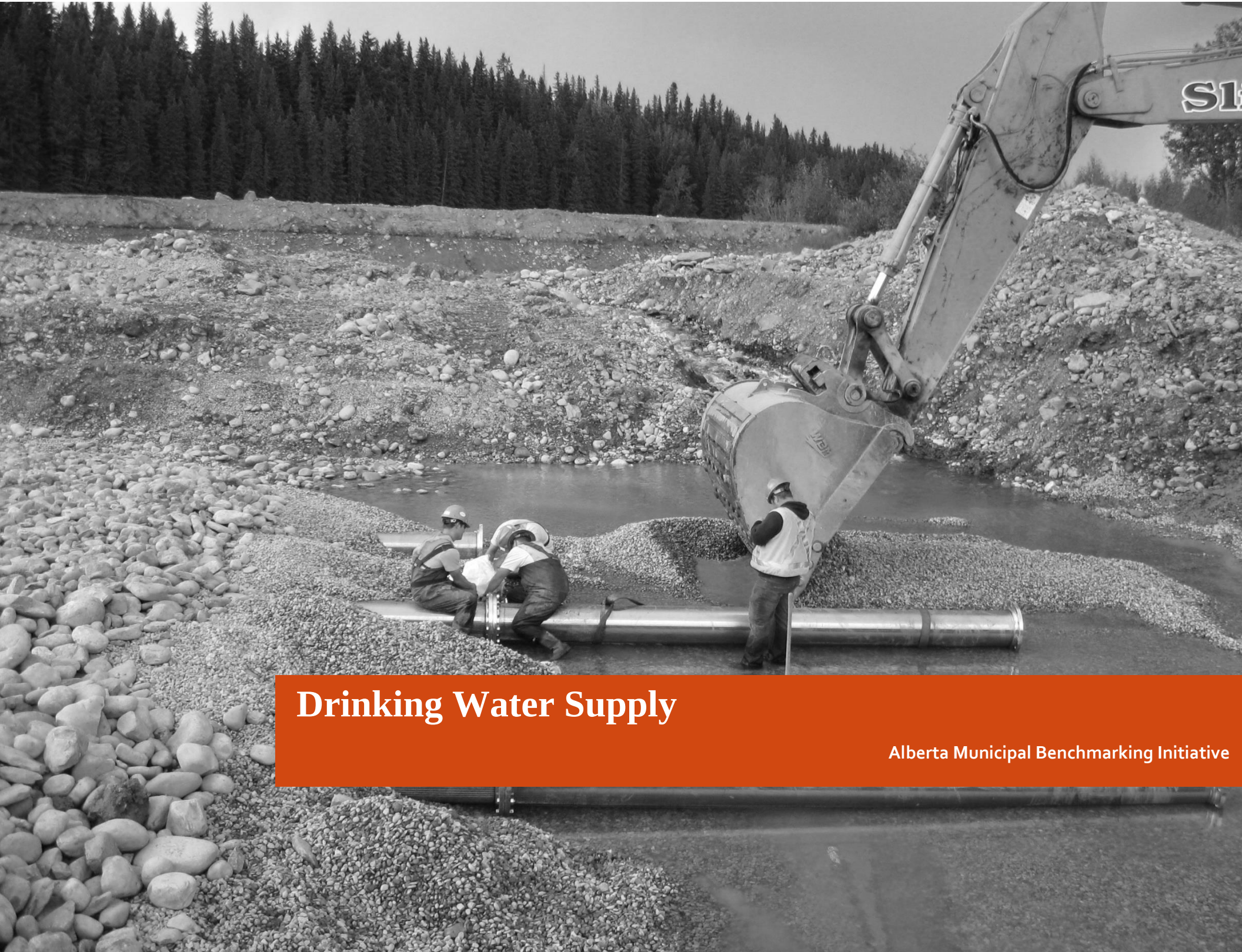
The anticipated benefits from this benchmarking project are:

- Helps tell the municipal "performance story"
- A sound business practice used in the government and private sectors
- Sets the stage for sharing knowledge and best practices among the municipal sector
- Understanding of trends within each municipality
- Identification of opportunities for change to improve efficiency or effectiveness of municipal services
- Formation of objective evidence that shows the differentiation between municipalities and provides information for Municipal CAOs to address questions from Council, staff, and the community on service efficiency and effectiveness
- Encouragement of continuous improvement initiatives and a better understanding of the drivers that impact performance results
- Encourages continuous improvement, and
- Awareness of the value of collaboration between municipalities.
- Supports results-based accountability

1.6 Definitions

Efficiency – Efficiency is a measure of productivity based on dividing the quantity of output (measured in units of deliverables) by the quantity of resources input (usually measured in person hours or dollars).

Effectiveness – Effectiveness is a measure of the value or performance of a service relative to a goal, expressed as the actual change in the service. An effectiveness measure compares the output of a service to its intended contribution to a higher level goal.



Drinking Water Supply

Alberta Municipal Benchmarking Initiative

2 Drinking Water Supply

2.1 System Description

2.1.1 Municipal Water Services

Water Services include the treatment and distribution of drinking water from the water supply source to the customer. Customers include residential, commercial, industrial, and institutional. Water is also supplied for emergency purposes such as fire protection. Water services are funded through municipal water rates.

Municipalities get their raw water from sources underground (shallow/deep wells), on the surface (rivers/lakes) or by purchase from a nearby municipality. Raw water is pumped to a treatment facility.

Shallow underground wells and surface sources are susceptible to events, such as weather and run-off, which can affect the turbidity of the water. The measurement of turbidity is a key test of water quality. Turbidity is the cloudiness or haziness of a fluid caused by large numbers of individual particles that are generally invisible to the naked eye, similar to smoke in air.

How is the water treated so you can drink it?

Coagulation is the addition of approved water treatment chemicals to convert microscopic particles and other contaminants into larger and heavier particles

Sedimentation removes the majority of these larger particles by settling them in tanks called clarifiers

Filtration of the "settled" water removes most of the remaining particles to thousandths of a millimetre (too small to see)

Fluoridation is the addition of fluoride ion into the water to benefit the community's dental health. Not all municipalities fluoridate their treated water

Disinfection of the water with chlorine is a way to protect public health from disease causing organisms that can be found in the water. The risk to public health is reduced further by treatment with ultraviolet (UV) light to protect the water against bacteria or other organisms on its journey to the home tap.

Residuals Management is the handling and disposal of water and solids from cleaning filters and other equipment in the Treatment facility.

NOTE: Coagulation + Sedimentation + Filtration can account for up to 90% of the cost of treatment.

2.1.2 Factors Influencing Water Services

Treatment Plants: Number, size and technology used for municipal water treatment.

Age of Infrastructure: Age and condition of treatment plants and distribution systems. The water distribution pipe material, (e.g. cast iron vs. PVC, can impact the frequency of repair and maintenance activities.

Water Supply: Cost is impacted by the quality of the source water. Generally, water from (under)ground sources requires less treatment than water from surface sources. Some municipalities purchase drinking water from a nearby supplier.

Conservation Programs: Water conservation programs can impact water consumption levels and, as a result, the volume of water that needs to be treated.

Climate and Geographic Conditions: Extreme and frequent weather events, e.g. may affect quality of surface sources of water. Hotter, dryer locations may lead to higher consumption of treated. Varied topography may require more pumping.

Urban Density: Size of the geographic area serviced, e.g. denser communities have smaller distribution systems.

Urban Growth: High growth municipalities have newer infrastructure with higher amortization (depreciation) costs.

2.1.3 Water System Overview, Raw Water Data (See Section 3 for definitions of each column heading)

Municipality	Year	Source, Surface	Source, Ground	Source, GUDI[1]	Source, Purchase	Quality, Min (NTU)	Quality, Max (NTU)	Quality, Avg (NTU)
Airdrie, purchases	2012				Yes			
	2013				Yes			
	2014				Yes			
Banff[2]	2012		Yes			0.05	0.09	0.07
	2013		Yes			0.05	0.09	0.07
	2014		Yes			0.06	0.09	0.07
Beaumont, purchases	2012				Yes			
	2013				Yes			
	2014				Yes			
Canmore	2012	Yes	Yes	Yes		.02	.15	.04
	2013	Yes	Yes	Yes		.02	2.09	.05
	2014	Yes	Yes	Yes		.03	.85	.05
Cochrane	2012	Yes				0.66	>100	2.18
	2013	Yes				.8	>480	7.33
	2014	Yes				1.39	>100	3.12
Medicine Hat[3]	2012	Yes				1	1322	34
	2013	Yes				2	9480	101
	2014	Yes				2	3825	78
Lethbridge	2012	Yes				2.5	630	25
	2013	Yes				2.1	3500	56
	2014	Yes				3	2900	65
Okotoks	2012			Yes		0.01	1.89	0.09
	2013			Yes		.04	3.85	.17
	2014			Yes		.04	10.9	.19
Wetaskiwin	2012	Yes				1	26	4
	2013	Yes				1	26	4
	2014	Yes				1	26	4

NOTES:

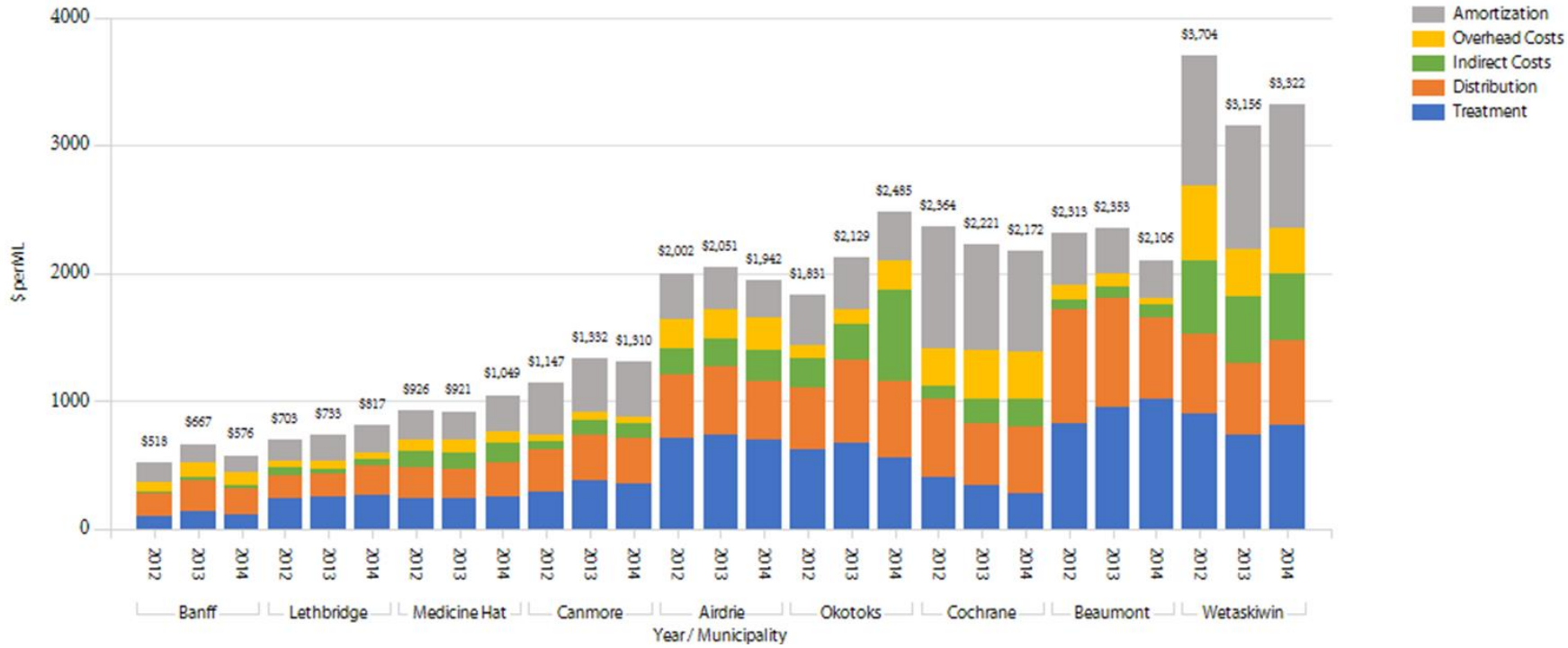
1. GUDI: Groundwater Under the Direct Influence Of Surface Water
2. Banff raw water has the lowest (best) individual and average turbidity.
3. Medicine Hat raw water has the highest (worst) individual and average turbidity.

2.1.4 Water System Overview, Treatment Data (See Section 3 for definitions of each column heading)

Municipality	Coagulation	Sedimentation	Filtration, Membrane	Filtration, Direct	Filtration, Slow Sand	Filtration, Rapid Sand	Fluoridation	Disinfection, Chlorine	Disinfection, UV	Residuals, De-chlorination	Residuals, Solids Handling	Count Steps
Airdrie, purchases												
Banff								Yes				1
Beaumont, purchases												
Camnore	Yes			Yes		Yes		Yes	Yes			5
Cochrane	Yes	Yes	Yes					Yes	Yes	Yes	Yes	7
Medicine Hat	Yes	Yes	Yes	Yes				Yes	Yes			6
Lethbridge	Yes	Yes					Yes	Yes	Yes	Yes		6
Okotoks	Yes	Yes			Yes			Yes	Yes	Yes		6
Wetaskiwin	Yes	Yes	Yes				Yes	Yes	Yes	Yes	Yes	8

2.2 Total Water Supply (or Purchase) Costs - Efficiency

In order from lowest to highest based on average of 2012, 2013, 2014 results.



2.2.1 Total Water Supply (or Purchase), Data (See Section 3 for definitions of each column heading)

Municipality	Year	Treatment Costs ($)	Distribution Costs ($)	Amortization Costs ($)	Indirect Costs ($)	Overhead Costs ($)	Water Sold (ML)
Airdrie	2012	$2,783,460 (35%)	$1,930,257 (24%)	$1,414,332 (18%)	$757,762 (9%)	$1,132,449 (14%)	3883
	2013	$2,976,590 (35%)	$2,130,640 (25%)	$1,324,390 (16%)	$878,151 (10%)	$1,190,230 (14%)	4020
	2014	$3,129,743 (35%)	$2,096,359 (23%)	$1,327,337 (15%)	$1,106,587 (12%)	$1,365,010 (15%)	4513
Banff	2012	$246,668 (19%)	$453,445 (34%)	$369,585 (28%)	$41,849 (3%)	$204,163 (16%)	2542
	2013	$337,086 (20%)	$619,659 (38%)	$358,978 (22%)	$57,189 (3%)	$275,756 (17%)	2473
	2014	$313,499 (20%)	$576,300 (36%)	$379,463 (24%)	$53,187 (3%)	$276,183 (17%)	2774

Municipality	Year	Treatment Costs ($)	Distribution Costs ($)	Amortization Costs ($)	Indirect Costs ($)	Overhead Costs ($)	Water Sold (ML)
Beaumont	2012	$860,368 (35%)	$922,930 (38%)	$420,983 (17%)	$81,154 (3%)	$167,121 (7%)	1038
	2013	$987,610 (40%)	$888,504 (36%)	$362,649 (15%)	$86,734 (3%)	$169,751 (7%)	1035
	2014	$1,157,599 (47%)	$723,903 (29%)	$333,821 (14%)	$111,511 (5%)	$142,437 (6%)	1139
Canmore	2012	$515,577 (26%)	$563,508 (28%)	$724,420 (36%)	$118,084 (6%)	$86,398 (4%)	1750
	2013	$662,363 (29%)	$623,988 (27%)	$724,499 (31%)	$199,174 (9%)	$104,151 (5%)	1738
	2014	$645,372 (27%)	$645,392 (27%)	$779,580 (33%)	$207,787 (9%)	$108,583 (5%)	1822
Cochrane	2012	$617,735 (17%)	$932,123 (26%)	$1,450,397 (40%)	$154,701 (4%)	$456,643 (13%)	1528
	2013	$569,124 (15%)	$805,378 (22%)	$1,356,145 (37%)	$315,220 (9%)	$629,041 (17%)	1655
	2014	$495,831 (13%)	$922,770 (24%)	$1,405,460 (36%)	$392,556 (10%)	$651,705 (17%)	1781
Lethbridge	2012	$4,555,944 (35%)	$3,279,318 (25%)	$3,217,939 (25%)	$1,025,519 (8%)	$983,887 (8%)	18692
	2013	$4,631,411 (34%)	$3,422,942 (25%)	$3,812,875 (28%)	$726,464 (5%)	$1,065,612 (8%)	18646
	2014	$4,829,925 (33%)	$4,186,561 (28%)	$3,956,525 (27%)	$794,280 (5%)	$1,064,314 (7%)	18151
Medicine Hat	2012	$2,751,367 (27%)	$2,654,871 (26%)	$2,543,912 (25%)	$1,392,459 (13%)	$978,780 (9%)	11142
	2013	$2,765,330 (26%)	$2,604,774 (25%)	$2,596,287 (25%)	$1,553,668 (15%)	$1,071,295 (10%)	11499
	2014	$2,983,014 (24%)	$3,200,312 (26%)	$3,300,278 (27%)	$1,664,959 (14%)	$1,162,675 (9%)	11734
Okotoks	2012	$1,277,248 (34%)	$1,022,543 (27%)	$814,785 (22%)	$465,581 (12%)	$207,139 (5%)	2068
	2013	$1,392,615 (32%)	$1,323,218 (30%)	$852,457 (19%)	$586,970 (13%)	$227,901 (5%)	2059
	2014	$1,225,016 (23%)	$1,283,941 (24%)	$843,380 (16%)	$1,555,455 (29%)	$492,608 (9%)	2173
Wetaskiwin	2012	$1,006,308 (24%)	$690,011 (17%)	$1,135,084 (28%)	$636,000 (15%)	$658,616 (16%)	1114
	2013	$904,212 (23%)	$680,342 (18%)	$1,176,038 (30%)	$646,025 (17%)	$455,765 (12%)	1224
	2014	$1,004,509 (24%)	$813,505 (20%)	$1,193,068 (29%)	$652,475 (16%)	$438,591 (11%)	1235

2.2.2 Lessons Learned

1. What factors have an effect on Cost/ML?
   Total volume treated; this has an inverse relationship on Cost/ML; as treated volume increases, Cost/ML decreases due to higher efficiency and the large portion of fixed costs in Cost/ML. Total volume treated increases with the number of commercial, high volume accounts.

Low raw water quality, i.e. high turbidity, is one component that may increase fixed and variable cost for the treatment, however does not appear to the most significant component affecting Total Cost/ML

SMEs expected the more varied the topography the more power cost for pumping. The effect of topography was not measured during the benchmarking study.

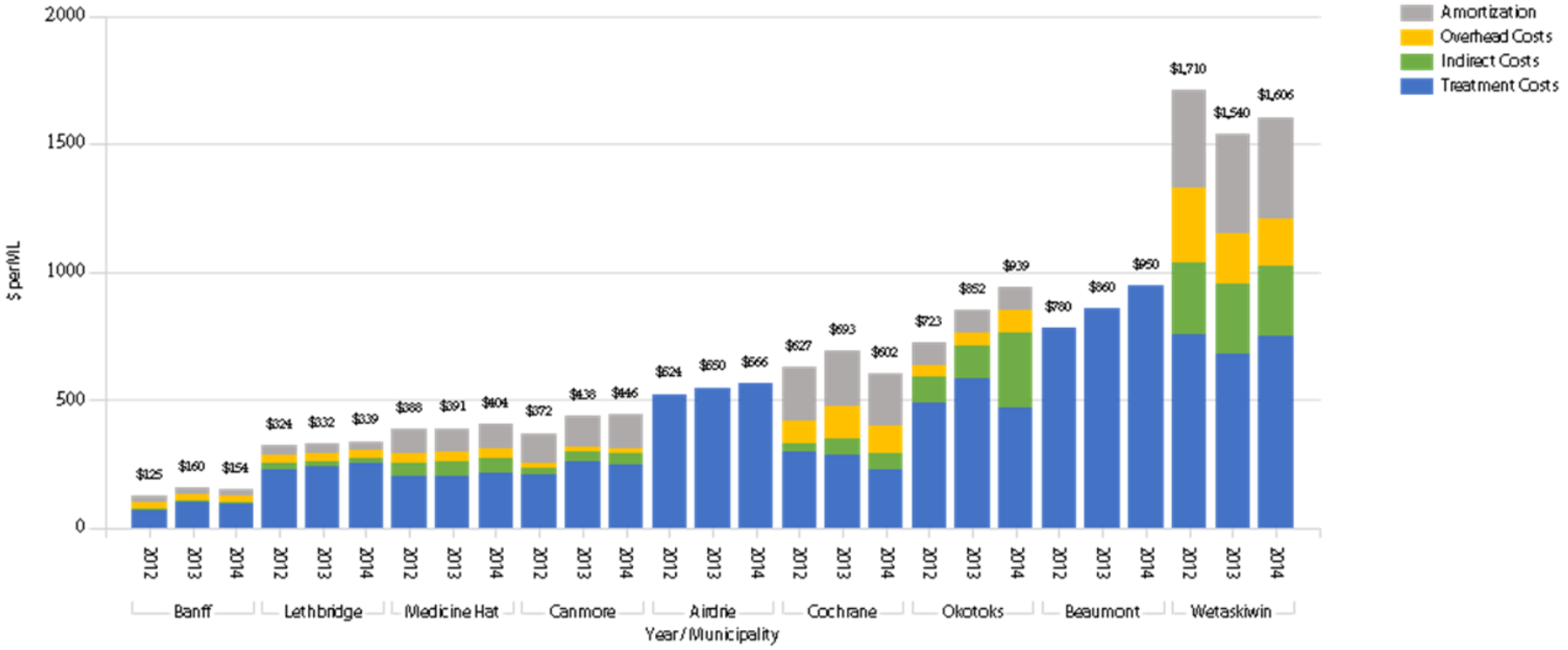
2. Does infrastructure age matter? E.g. Pipe/Plant?
   Yes. With older infrastructure the rate of failure increases, e.g. pipe breaks. This is counterbalanced with lower amortization costs of older systems. Newer infrastructure has a higher amortization cost.

3. Does Amortization schedule matter?
   Shorter amortization schedule increases amortization cost increasing Cost/ML.

4. Does population density matter?
   SMEs expected lower urban density (spread) would increase costs due to the power cost for booster station pumping and more infrastructure requirements. This effect was not measured and is an assumption of the subject matter experts.

2.3 Treatment (or Purchase) Costs - Efficiency

In order from lowest to highest based on average of 2012, 2013, 2014 results.



2.3.1 Treatment (or Purchase), Data (See Section 3 for definitions of each column heading)

Municipality	Year	Treatment or Purchase Costs ($)	Amortization of Treatment Assets ($)	Prorated Indirect Costs ($)	Prorated Overhead Costs ($)	Drinking Water Produced (ML)
Airdrie, purchases	2012	$2,783,460 (100%)				5,310
	2013	$2,976,590 (100%)				5,415
	2014	$3,129,743 (100%)				5,530
Banff	2012	$246,668 (59%)	$88,027 (3%)	$14,744 (3%)	$71,932 (17%)	3,378
	2013	$337,086 (62%)	$85,501 (4%)	$20,149 (4%)	$97,156 (18%)	3,366
	2014	$313,499 (61%)	$88,297 (4%)	$18,739 (4%)	$97,306 (19%)	3,368

Municipality	Year	Treatment or Purchase Costs ($)	Amortization of Treatment Assets ($)	Prorated Indirect Costs ($)	Prorated Overhead Costs ($)	Drinking Water Produced (ML)
Beaumont, purchases	2012	$860,368 (100%)				1,103
	2013	$987,610 (100%)				1,148
	2014	$1,157,599 (100%)				1,219
Canmore	2012	$515,577 (57%)	$294,423 (6%)	$56,419 (6%)	$41,280 (5%)	2,442
	2013	$662,363 (59%)	$301,119 (9%)	$102,558 (9%)	$53,629 (5%)	2,559
	2014	$645,372 (56%)	$345,193 (9%)	$103,892 (9%)	$54,291 (5%)	2,576
Cochrane	2012	$617,735 (48%)	$434,292 (5%)	$61,660 (5%)	$182,007 (14%)	2,065
	2013	$569,124 (41%)	$434,292 (9%)	$130,519 (9%)	$260,460 (19%)	2,011
	2014	$495,831 (38%)	$434,292 (11%)	$137,207 (11%)	$227,785 (18%)	2,152
Lethbridge	2012	$4,555,944 (70%)	$769,644 (9%)	$596,305 (9%)	$572,097 (9%)	20,030
	2013	$4,631,411 (72%)	$731,320 (7%)	$417,731 (7%)	$612,748 (10%)	19,248
	2014	$4,829,925 (74%)	$697,387 (7%)	$425,478 (7%)	$570,129 (9%)	19,241
Medicine Hat	2012	$2,751,367 (52%)	$1,341,855 (13%)	$708,657 (13%)	$498,125 (9%)	13,643
	2013	$2,765,330 (51%)	$1,279,050 (15%)	$800,060 (15%)	$551,663 (10%)	13,818
	2014	$2,983,014 (53%)	$1,257,977 (14%)	$803,224 (14%)	$560,908 (10%)	13,873
Okotoks	2012	$1,277,248 (68%)	$230,285 (14%)	$258,572 (14%)	$115,040 (6%)	2,603
	2013	$1,392,615 (69%)	$214,705 (15%)	$300,984 (15%)	$116,862 (6%)	2,377
	2014	$1,225,016 (50%)	$220,025 (31%)	$759,462 (31%)	$240,519 (10%)	2,605
Wetaskiwin	2012	$1,006,308 (44%)	$508,336 (17%)	$377,295 (17%)	$390,711 (17%)	1,335
	2013	$904,212 (44%)	$520,546 (18%)	$368,649 (18%)	$260,078 (13%)	1,333
	2014	$1,004,509 (47%)	$533,165 (17%)	$360,513 (17%)	$242,335 (11%)	1,333

2.3.2 Lessons Learned

1. Does purchase vs. treatment matter from a Cost/ML perspective?
   Need more participants to determine this.

2. Does scale (volume treated) affect Cost/ML?
   Yes. As volume treated increases, Cost/ML decreases due to the large portion of fixed costs in Cost/ML.

3. Is there a minimum or optimal size?
   Need more participants to determine this.

4. What factors most affect treatment Cost/ML?
   While the subject matter experts expected that low raw water quality (high turbidity) would result in higher treatment Cost/ML, this is not proved by the data. For example, Medicine Hat has the lowest (worst) average quality of source water and yet the

second lowest treatment direct costs; see the blue bars in the graph above.

Medicine Hat suggests this may be related to, "a combination of the sophistication (complexity) of the treatment plants, plant operations procedure optimization, and the power of procuring chemicals in larger quantities to reduce costs, as a few possibilities".

For municipalities that pump water from valley bottom sources uphill to reservoirs, topography means more power cost for pumping.
NOTE: The power to pump water to reservoirs is included as a Treatment Cost per Definitions.

5. What factors explain the outliers at each end of the chart?
For the four below the median (Airdrie), Banff and Canmore have the highest quality raw water.

Banff does not operate a Treatment Plant and so has less infrastructure that other municipalities. Water is treated in their reservoirs.

Airdrie and Beaumont purchase drinking water. Amortization, indirect and overhead costs are included in the contract purchase price.

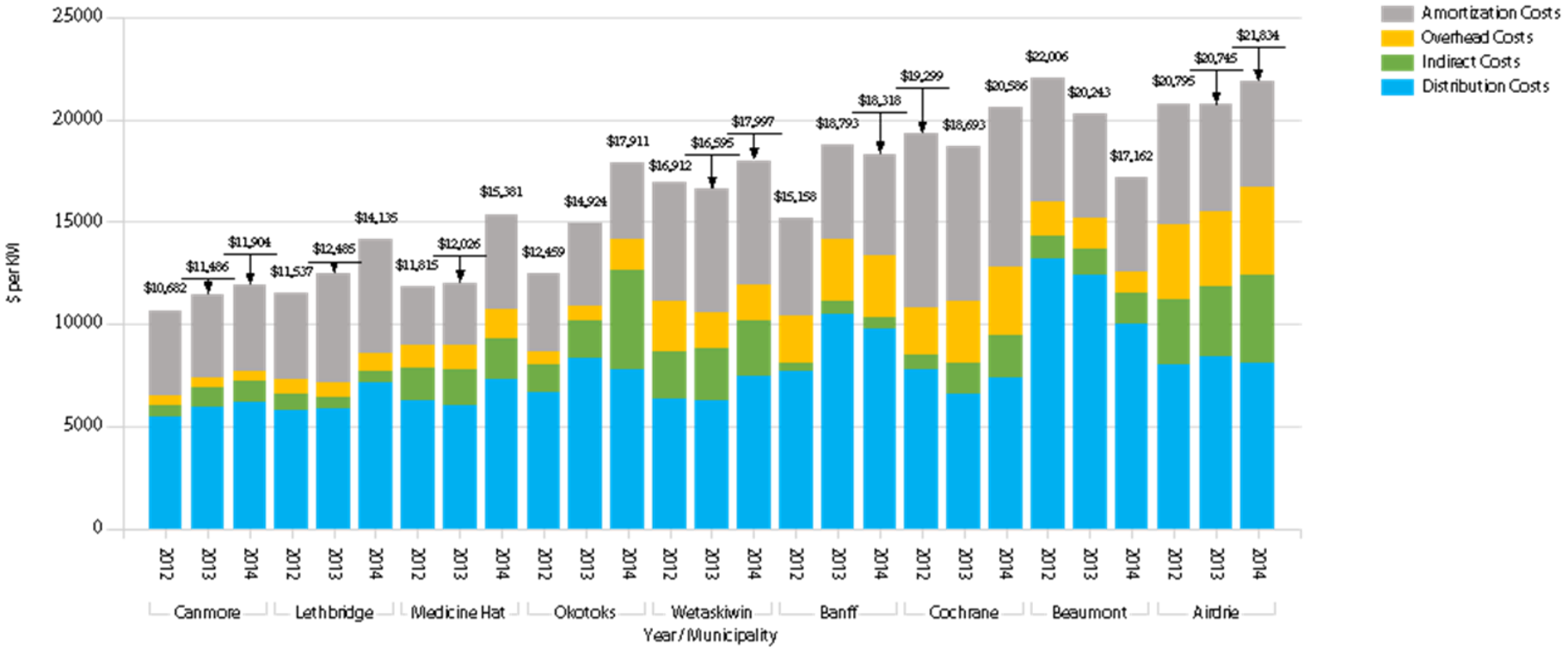
Lethbridge and Medicine Hat have the highest volumes of water produced, which lowers Cost/ML. Banff and Lethbridge have the high volumes of commercial/industrial usage, which also lowers Cost/ML.

For the four above the median, three have raw water quality that requires operating a Treatment Plant, and Beaumont purchases treated water from a nearby supplier.

The one outlier is Wetaskiwin. Their raw water supply and Treatment Plant is 10KM distant from the municipality. This impacts treatment costs due to pumping water to the municipality.

2.4 Distribution Costs - Efficiency

In order from lowest to highest based on average of 2012, 2013, 2014 results.



2.4.1 Distribution, Data (See Section 3 for definitions of each column heading)

Municipality	Year	Distribution Direct Costs ($)	Distribution Amortization Costs ($)	Prorated indirect Costs ($)	Prorated Overhead Costs ($)	Distribution Pipe (KM)
Airdrie	2012	$1,930,257 (13%)	$1,414,332 (9%)	$757,762 (5%)	$888,389 (18%)	240
	2013	$2,130,640 (13%)	$1,324,390 (8%)	$878,151 (5%)	$936,069 (18%)	254
	2014	$2,096,359 (11%)	$1,327,337 (7%)	$1,106,587 (6%)	$1,102,808 (20%)	258
Banff	2012	$453,445 (51%)	$281,558 (31%)	$27,105 (3%)	$132,231 (15%)	59
	2013	$619,659 (56%)	$273,477 (25%)	$37,040 (3%)	$178,600 (16%)	59
	2014	$576,300 (53%)	$291,166 (27%)	$34,448 (3%)	$178,877 (17%)	59

Municipality	Year	Distribution Direct Costs ($)	Distribution Amortization Costs ($)	Prorated indirect Costs ($)	Prorated Overhead Costs ($)	Distribution Pipe (KM)
Beaumont	2012	$922,930 (23%)	$420,983 (11%)	$81,154 (2%)	$2,556,148 (64%)	70
	2013	$888,504 (21%)	$362,649 (9%)	$86,734 (2%)	$2,800,708 (68%)	72
	2014	$723,903 (17%)	$333,821 (8%)	$111,511 (3%)	$3,049,226 (72%)	72
Canmore	2012	$563,508 (51%)	$429,997 (39%)	$61,665 (6%)	$45,118 (4%)	103
	2013	$623,988 (52%)	$423,380 (35%)	$96,616 (8%)	$50,522 (4%)	104
	2014	$645,392 (52%)	$434,387 (35%)	$103,895 (8%)	$54,292 (4%)	104
Cochrane	2012	$932,123 (40%)	$1,016,105 (44%)	$93,041 (4%)	$274,637 (12%)	120
	2013	$805,378 (35%)	$921,853 (40%)	$184,701 (8%)	$368,581 (16%)	122
	2014	$922,770 (36%)	$971,168 (38%)	$255,349 (10%)	$423,920 (16%)	125
Lethbridge	2012	$3,279,318 (50%)	$2,448,295 (37%)	$429,214 (7%)	$411,789 (6%)	577
	2013	$3,422,942 (47%)	$3,081,555 (42%)	$308,733 (4%)	$452,864 (6%)	582
	2014	$4,186,561 (50%)	$3,259,138 (39%)	$368,802 (4%)	$494,185 (6%)	588
Medicine Hat	2012	$2,654,871 (53%)	$1,202,057 (24%)	$683,802 (14%)	$480,655 (10%)	425
	2013	$2,604,774 (50%)	$1,317,237 (25%)	$753,608 (15%)	$519,633 (10%)	432
	2014	$3,200,312 (48%)	$2,042,301 (30%)	$861,735 (13%)	$601,767 (9%)	436
Okotoks	2012	$1,022,543 (54%)	$584,500 (31%)	$207,009 (11%)	$92,099 (5%)	153
	2013	$1,323,218 (56%)	$637,752 (27%)	$285,986 (12%)	$111,039 (5%)	158
	2014	$1,283,941 (43%)	$623,355 (21%)	$795,993 (27%)	$252,088 (9%)	165
Wetaskiwin	2012	$690,011 (37%)	$626,748 (34%)	$258,705 (14%)	$267,905 (15%)	109
	2013	$680,342 (38%)	$655,492 (36%)	$277,376 (15%)	$195,686 (11%)	109
	2014	$813,505 (41%)	$659,903 (34%)	$291,962 (15%)	$196,256 (10%)	109

2.4.2 Lessons Learned

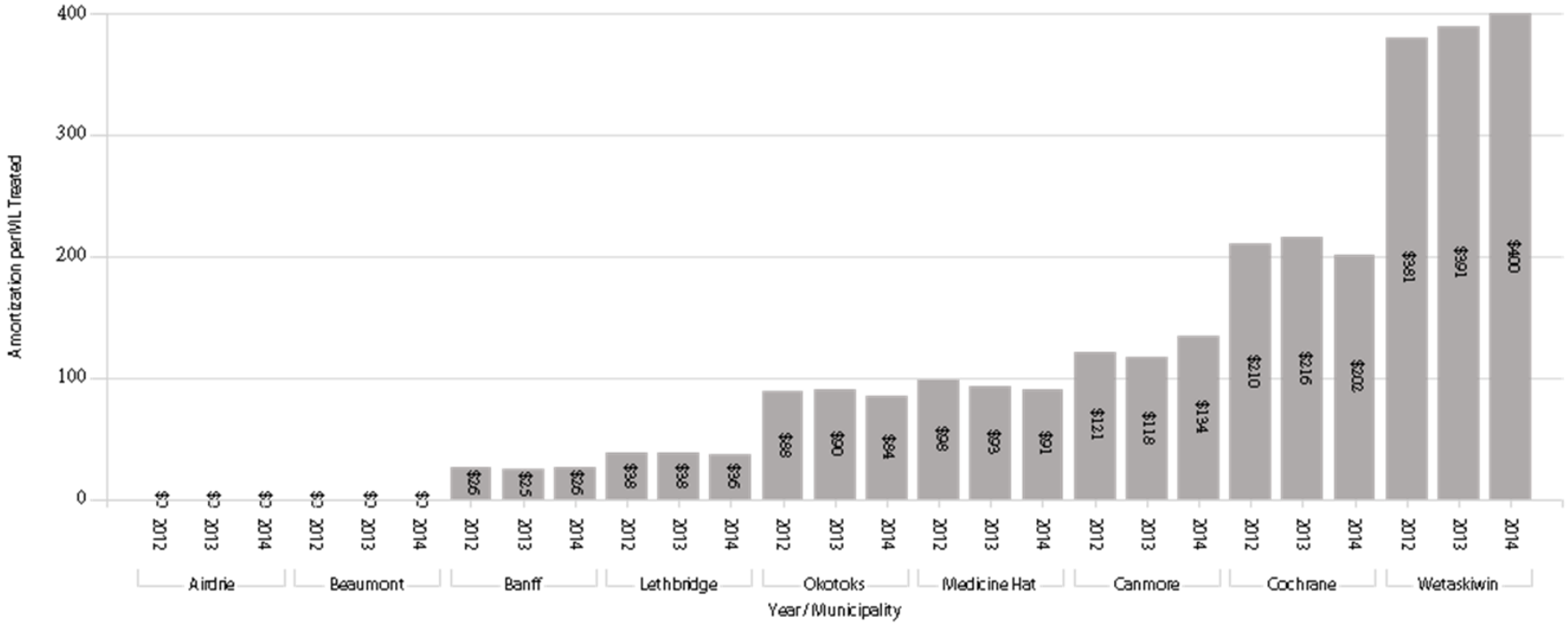
1. Does size of the distribution system, KM of pipe, matter?
   Need more participants to determine this.

2. Does age of infrastructure matter?
   With older infrastructure the rate of water main breaks increases, see Chart 2.8. With newer infrastructure the rate of failure is low but amortization costs are high.

3. Does size or number of reservoirs matter?
   Reservoir size is set by the estimated maximum daily water flow, and fire water flow requirements. Operating costs are higher for systems with more reservoirs, e.g. Cochrane has nine reservoirs compared to 2 or 3 in other municipalities. This can increase the Cost/ML. For the same storage capacity, it is not known how the cost to build more small reservoirs compares to the cost of fewer large reservoirs.

2.5 Amortization Costs – Treatment Assets - Efficiency

In order from lowest to highest based on average of 2012, 2013, 2014 results.



2.5.1 Amortization – Treatment Assets, Data (See Section 3 for definitions of each column heading)

Municipality	Year	Total Ammortization ($)	Water Treated (ML)
Airdrie, purchases	2012		5,310
	2013		5,415
	2014		5,530
Banff	2012	$88,027	3,378
	2013	$85,501	3,366
	2014	$88,297	3,368

Municipality	Year	Total Ammortization ($)	Water Treated (ML)
Beaumont, purchases	2012		1,103
	2013		1,148
	2014		1,219
Canmore	2012	$294,423	2,442
	2013	$301,119	2,559
	2014	$345,193	2,576
Cochrane	2012	$434,292	2,065
	2013	$434,292	2,011
	2014	$434,292	2,152
Lethbridge	2012	$769,644	20,030
	2013	$731,320	19,248
	2014	$697,387	19,241
Medicine Hat	2012	$1,341,855	13,643
	2013	$1,279,050	13,818
	2014	$1,257,977	13,873
Okotoks	2012	$230,285	2,603
	2013	$214,705	2,377
	2014	$220,025	2,605
Wetaskiwin	2012	$508,336	1,335
	2013	$520,546	1,333
	2014	$533,165	1,333

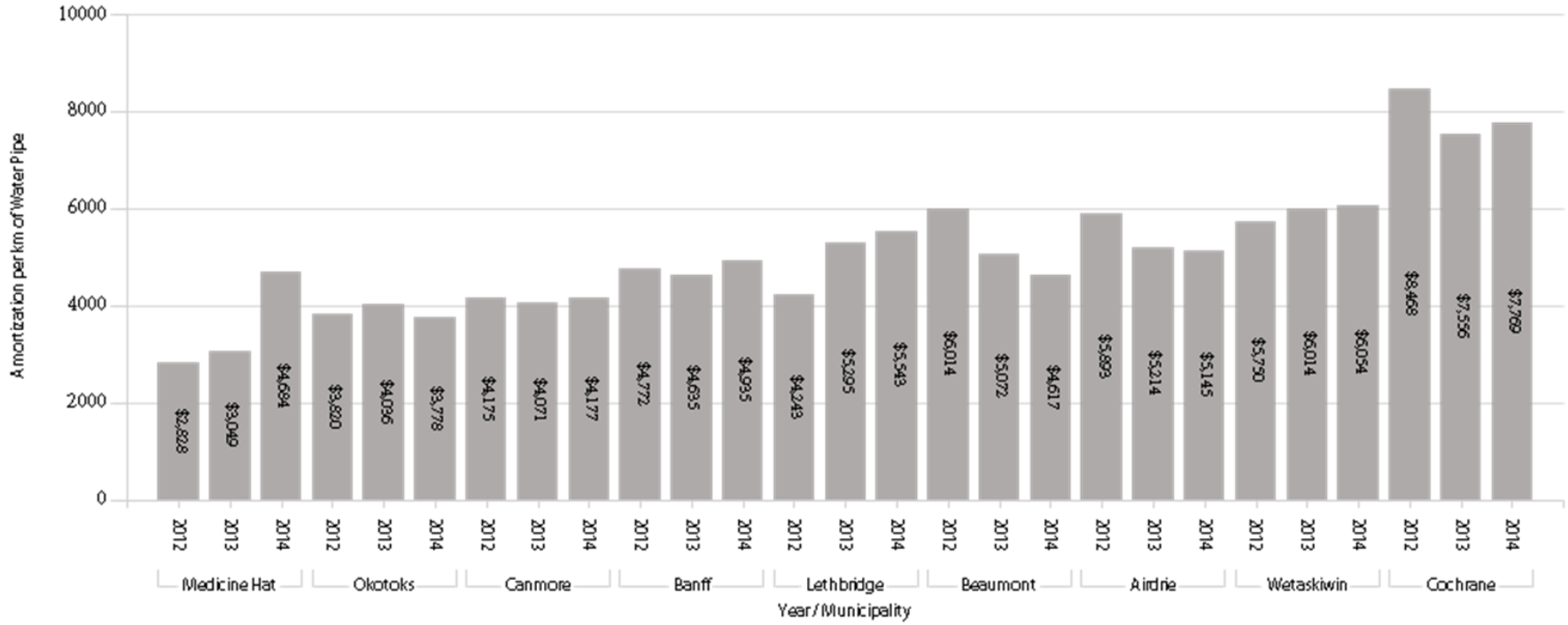
2.5.2 Lessons Learned

1. What causes such a wide variation?
   Newer infrastructure and the amount of infrastructure increases amortization cost, e.g. Wetaskiwin has more infrastructure for Treatment due to the distance from their raw water source. Design of infrastructure has an impact on cost – different configurations will have different amortization costs.
   How amortization is dealt with also affects this cost, e.g. Cochrane feels they may be "overvaluing" contributed assets from developers.

2. Does amortization schedule matter?
   Yes. Shorter amortization schedule increases Cost/ML, as do different measures of cost, useful life, and residual values.

2.6 Amortization – Distribution Assets - Efficiency

In order from lowest to highest based on average of 2012, 2013, 2014 results.



2.6.1 Amortization – Distribution Assets, Data (See Section 3 for definitions of each column heading)

Municipality	Year	Total Ammortization ($)	Water Pipe Maintained (KM)
Airdrie	2012	$1,414,332	240
	2013	$1,324,390	254
	2014	$1,327,337	258
Banff	2012	$281,558	59
	2013	$273,477	59
	2014	$291,166	59

Municipality	Year	Total Ammortization ($)	Water Pipe Maintained (KM)
Beaumont	2012	$420,983	70
	2013	$362,649	72
	2014	$333,821	72
Canmore	2012	$429,997	103
	2013	$423,380	104
	2014	$434,387	104
Cochrane	2012	$1,016,105	120
	2013	$921,853	122
	2014	$971,168	125
Lethbridge	2012	$2,448,295	577
	2013	$3,081,555	582
	2014	$3,259,138	588
Medicine Hat	2012	$1,202,057	425
	2013	$1,317,237	432
	2014	$2,042,301	436
Okotoks	2012	$584,500	153
	2013	$637,752	158
	2014	$623,355	165
Wetaskiwin	2012	$626,748	109
	2013	$655,492	109
	2014	$659,903	109

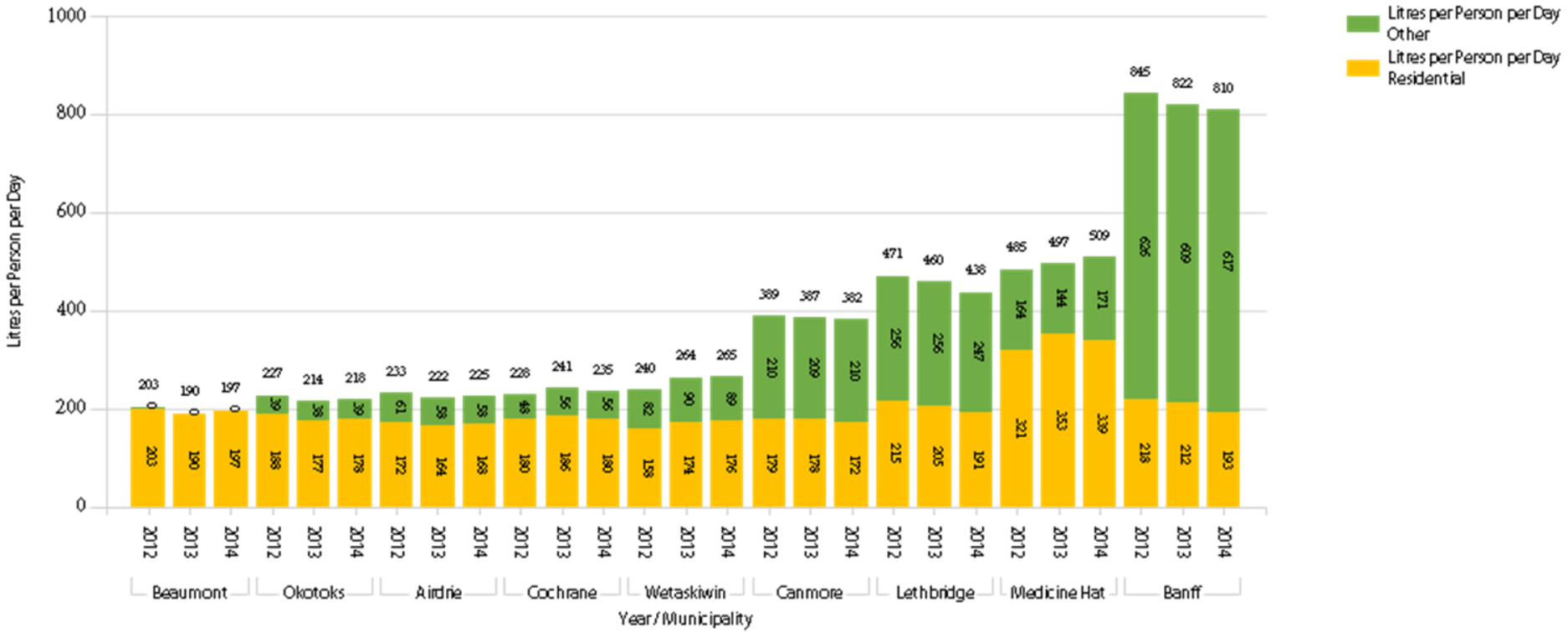
2.6.2 Lessons Learned

1. Does amortization schedule matter?
   Yes. Shorter amortization schedule increases Cost/ML.

2. Does infrastructure age matter?
   Yes. Newer infrastructure increases amortization cost and increases Cost/ML, e.g. Airdrie and Beaumont.

2.7 Water Usage – Total (Litres/person/day) - Effectiveness

In order from lowest to highest based on average of 2012, 2013, 2014 results.



2.7.1 Water Usage – Total, Data (See Section 3 for definitions of each column heading)

Municipality	Year	Residential (ML)	Bulk (ML)	Commercial, Industrial, Institutional (ML)	Population Served
Airdrie	2012	2,863	34	986	45,711
	2013	2,965	25	1,030	49,560
	2014	3,358	21	1,134	54,891
Banff	2012	657	0	1,885	8,244
	2013	639	0	1,834	8,244
	2014	660	0	2,114	9,386

Municipality	Year	Residential (ML)	Bulk (ML)	Commercial, Industrial, Institutional (ML)	Population Served
Beaumont	2012	1,037	1	0	13,977
	2013	1,035	0	0	14,916
	2014	1,139	0	0	15,828
Canmore	2012	805	0	0	12,317
	2013	799	0	0	12,317
	2014	820	0	0	13,077
Cochrane	2012	1,207	74	247	18,377
	2013	1,270	72	310	18,750
	2014	1,358	91	329	20,708
Lethbridge	2012	6,988	0	8,333	89,074
	2013	6,750	0	8,443	90,417
	2014	6,488	0	8,368	93,004
Medicine Hat	2012	7,169	8	8	61,180
	2013	7,880	13	13	61,180
	2014	7,565	13	13	61,180
Okotoks	2012	1,714	18	336	24,962
	2013	1,697	26	336	26,319
	2014	1,779	94	300	27,331
Wetaskiwin	2012	726	14	14	12,583
	2013	798	24	24	12,583
	2014	809	23	23	12,621

2.7.2 Lessons Learned

Total Usage

1. What affects Total Usage?

   The main influence is the amount of commercial/industrial usage. Need more municipalities to determine if there are other factors.

Residential Usage

1. What causes usage variation?

   There is minimal variance between municipalities. Water conservation initiatives lower residential usage, e.g. Airdrie requires developers to install low flow toilets in new construction.

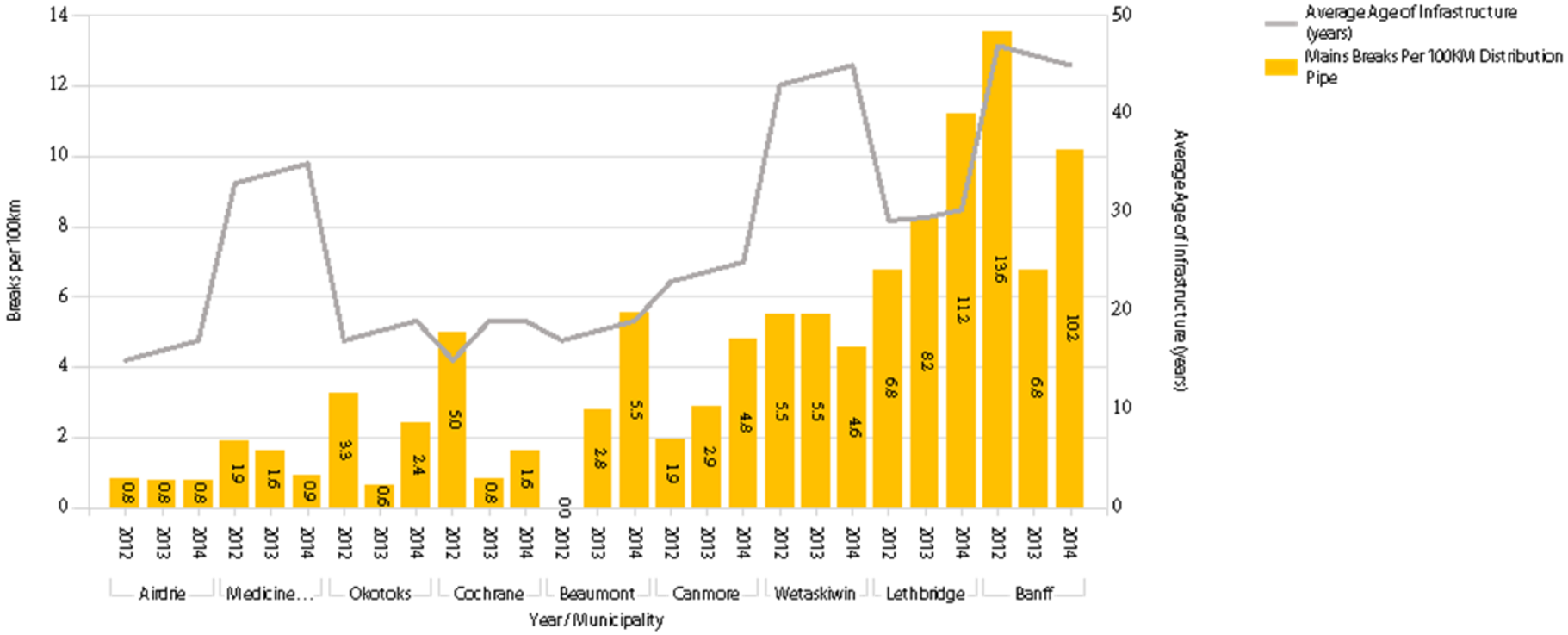
   NOTE: Municipalities need to share conservation initiatives; what works, what doesn't.

2. Does climate zone affect usage?
   This effect was not measured and is an assumption of the subject matter experts. It is expected that the dryer the climate the greater the volume of water consumed, e.g. Medicine Hat commented that their dryer Southern Alberta climate leads to increased levels of irrigation and abundance of swimming pools compared to northern Alberta or mountain communities.

3. Does residential cost affect residential usage?
   The data suggests progressive consumption water rates can decrease residential usage. Need more municipalities involved to determine if this holds true.

2.8 Water Main Breaks - Effectiveness

In order from lowest to highest based on average of 2012, 2013, 2014 results.



2.8.1 Water Main Breaks, Data (See Section 3 for definitions of each column heading)

Municipality	Year	Annual Main Breaks	Distribution Pipe (KM)	Average Age of Infrastructure (years)
Airdrie	2012	2	240	15
	2013	2	254	16
	2014	2	258	17
Banff	2012	8	59	47
	2013	4	59	46
	2014	6	59	45

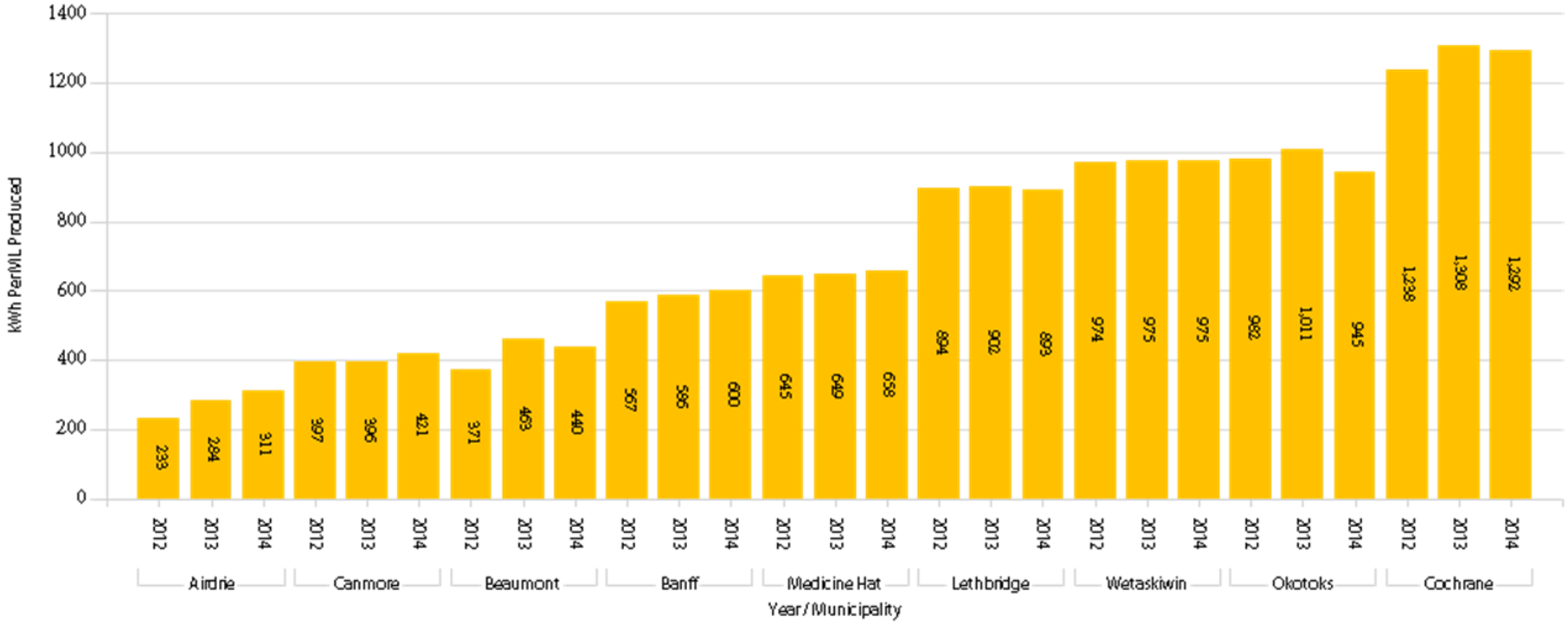
Municipality	Year	Annual Main Breaks	Distribution Pipe (KM)	Average Age of Infrastructure (years)
Beaumont	2012	0	70	17
	2013	2	71.5	18
	2014	4	72.3	19
Canmore	2012	2	103	23
	2013	3	104	24
	2014	5	104	25
Cochrane	2012	6	120	15
	2013	1	122	19
	2014	2	125	19
Lethbridge	2012	39	577	29.2
	2013	48	582	29.5
	2014	66	588	30.3
Medicine Hat	2012	8	425	33
	2013	7	432	34
	2014	4	436	35
Okotoks	2012	5	153	17
	2013	1	158	18
	2014	4	165	19
Wetaskiwin	2012	6	109	43
	2013	6	109	44
	2014	5	109	45

2.8.2 Lessons Learned

1. What causes such a wide variation?
   The pressure in the distribution system may cause the variation, i.e. more varied topography causes more pressure in the distribution pipes leading to more breaks was assumed by subject matter experts. This effect was not measured and is an assumption of the subject matter experts.
2. Does infrastructure age matter?
   Yes. Older infrastructure has a direct correlation to a higher number of breaks.
3. Does size of the distribution system, KM of pipe affect this?
   No. This is normalized using Breaks/100km pipe.

2.9 Energy Consumed - Effectiveness

In order from lowest to highest based on average of 2012, 2013, 2014 results.



2.9.1 Energy Consumed, Data (See Section 3 for definitions of each column heading)

Municipality	Year	Energy Consumed (kWh)	Water Produced (ML)
Airdrie, purchases	2012	1,239,701	5,310
	2013	1,535,663	5,415
	2014	1,717,281	5,530
Banff	2012	1,916,078	3,378
	2013	1,973,477	3,366
	2014	2,019,435	3,368

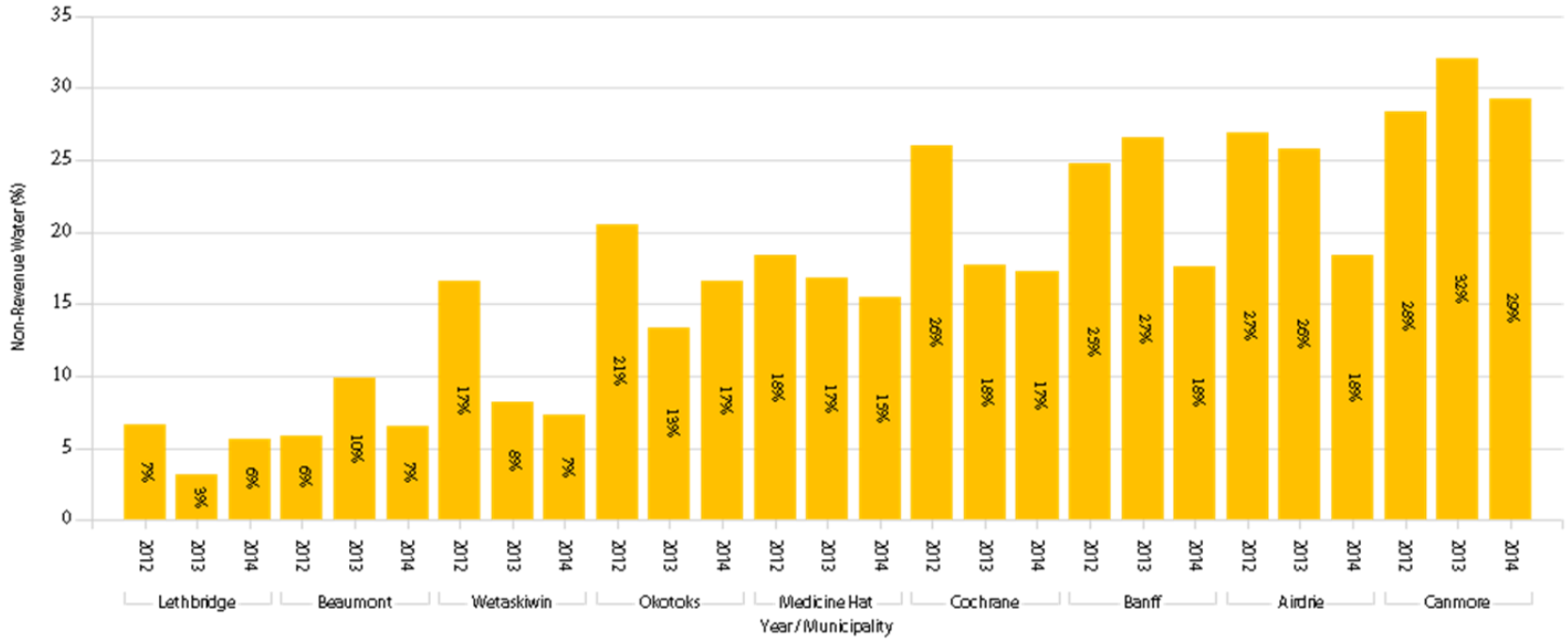
Municipality	Year	Energy Consumed (kWh)	Water Produced (ML)
Beaumont, purchases	2012	408,664	1,103
	2013	531,806	1,148
	2014	536,429	1,219
Canmore	2012	968,768	2,442
	2013	1,013,652	2,559
	2014	1,083,476	2,576
Cochrane	2012	2,557,153	2,065
	2013	2,630,579	2,011
	2014	2,781,036	2,152
Lethbridge	2012	17,914,688	20,030
	2013	17,364,402	19,248
	2014	17,188,668	19,241
Medicine Hat	2012	8,795,037	13,643
	2013	8,974,000	13,818
	2014	9,128,000	13,873
Okotoks	2012	2,556,581	2,603
	2013	2,402,590	2,377
	2014	2,462,419	2,605
Wetaskiwin	2012	1,300,000	1,335
	2013	1,300,000	1,333
	2014	1,300,000	1,333

2.9.2 Lessons Learned

1. What causes such a wide variation?
   Municipalities (Airdrie and Beaumont) that purchase water have lower energy costs because they don't have a treatment plant; cost of energy used to treat and pump water is included in their water contract purchase price. Low raw water quality and/or long distances to the water source results in increases power consumption.
2. Does topography affect this?
   Yes, with more topography generally means more power cost to pump from valley bottoms to reservoirs. Topography, however, can work in your favour, e.g. a portion of Canmore's raw water is from surrounding mountains and is gravity fed from reservoirs to users.

2.10 Non-Revenue Water - Effectiveness (Unbilled metered/unmetered + losses apparent/real)

In order from lowest to highest based on average of 2012, 2013, 2014 results



2.10.1 Non-Revenue Water, Data (See Section 3 for definitions of each column heading)

Municipality	Year	Total Treated or Purchased (ML)	Residential (ML)	Commercial, Industrial, Institutional (ML)	Regional (ML)	Bulk (ML)
Airdrie, purchases	2012	5,310	2,863 (74%)	986 (25%)		34 (1%)
	2013	5,415	2,965 (74%)	1,030 (26%)		25 (1%)
	2014	5,530	3,358 (74%)	1,134 (25%)		21 (0%)
Banff	2012	3,378	657 (26%)	1,885 (74%)		
	2013	3,366	639 (26%)	1,834 (74%)		
	2014	3,368	660 (24%)	2,114 (76%)		

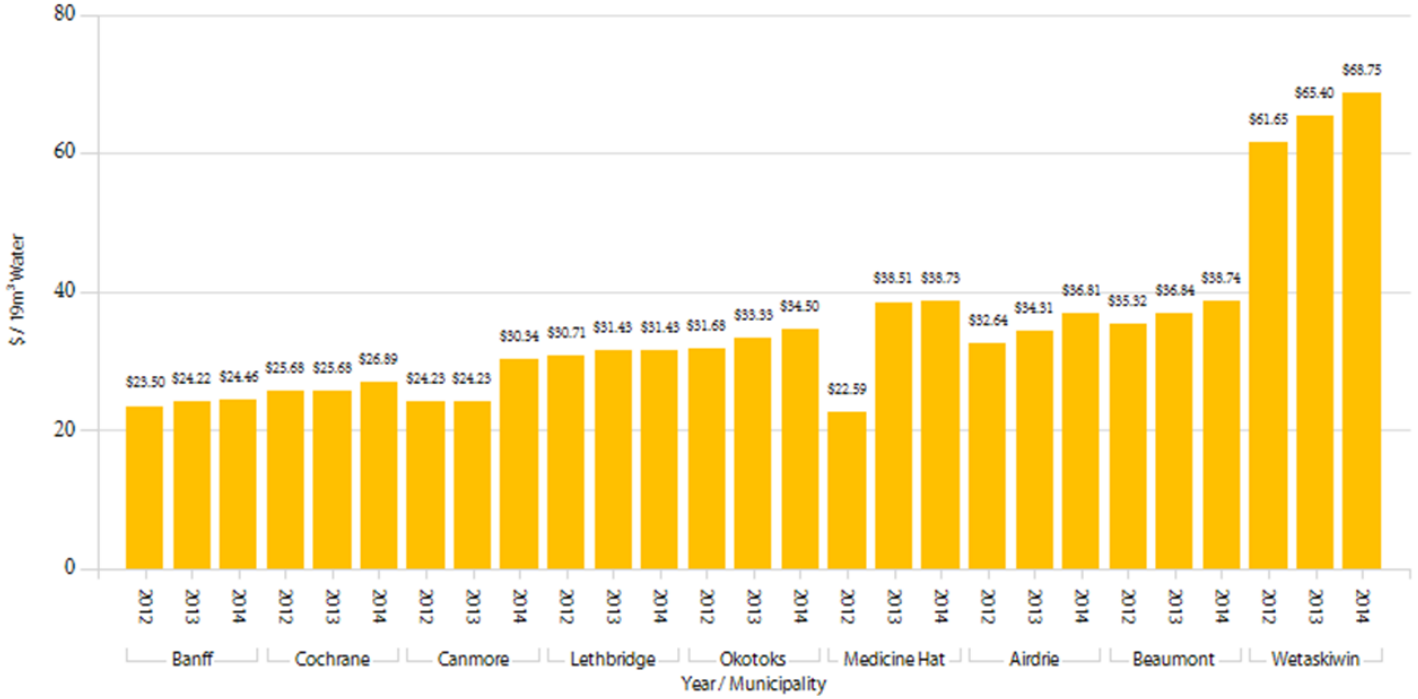
Municipality	Year	Total Treated or Purchased (ML)	Residential (ML)	Commercial, Industrial, Institutional (ML)	Regional (ML)	Bulk (ML)
Beaumont, purchases	2012	1,103	1,037 (100%)			1 (0%)
	2013	1,148	1,035 (100%)			0 (0%)
	2014	1,219	1,139 (100%)			0 (0%)
Canmore	2012	2,442	805 (46%)	945 (54%)		
	2013	2,559	799 (46%)	939 (54%)		
	2014	2,576	820 (45%)	1,002 (55%)		
Cochrane	2012	2,065	1,207 (79%)	247 (16%)	0 (0%)	74 (5%)
	2013	2,011	1,270 (77%)	310 (19%)	3 (0%)	72 (4%)
	2014	2,152	1,358 (76%)	329 (18%)	3 (0%)	91 (5%)
Lethbridge	2012	20,030	6,988 (37%)	8,333 (45%)	3,371 (18%)	0 (0%)
	2013	19,248	6,750 (36%)	8,443 (45%)	3,453 (19%)	0 (0%)
	2014	19,241	6,488 (36%)	8,368 (46%)	3,295 (18%)	0 (0%)
Medicine Hat	2012	13,643	7,169 (64%)	3,644 (33%)	321 (3%)	8 (0%)
	2013	13,818	7,880 (69%)	3,211 (28%)	395 (3%)	13 (0%)
	2014	13,873	7,565 (64%)	3,795 (32%)	361 (3%)	13 (0%)
Okotoks	2012	2,603	1,714 (83%)	336 (16%)		18 (1%)
	2013	2,377	1,697 (82%)	336 (16%)		26 (1%)
	2014	2,605	1,779 (82%)	300 (14%)		94 (4%)
Wetaskiwin	2012	1,335	726 (65%)	363 (33%)	11 (1%)	14 (1%)
	2013	1,333	798 (65%)	390 (32%)	12 (1%)	24 (2%)
	2014	1,333	809 (66%)	388 (31%)	15 (1%)	23 (2%)

2.10.2 Lessons Learned

1. What causes the variation?
   The differences in how municipalities measure use, e.g. for open use irrigation, how much usage is unmetered or metered but not billed. An older infrastructure leads to more leakage in the distribution system.
   NOTE: Excluding municipal water usage may make numbers more comparable, e.g. some municipalities meter/charge for this and others do not.
2. Should water loss rather than Non-Revenue Water be the measure?
   It is harder to get good data for water losses (apparent + real). This will be considered for the future.
   Apparent losses are from metering inaccuracies and unauthorized consumption, e.g. mismatched register on water meter, water theft.
   Real losses are from all types of leaks, breaks, and overflows on mains, reservoirs and service lines.

2.11 Residential Water Bill for 19m³ of Water per Month - Effectiveness (average volume per residence)

In order from lowest to highest based on average of 2012, 2013, 2014 total water cost.



2.11.1 Residential Water Bill, 19m³ Water per Month, Data (See Section 3 for definitions of each column heading)

Municipality	Year	Revenue from 19m³ per month ($)
Airdrie, purchases	2012	$32.64
	2013	$34.31
	2014	$36.81
Banff	2012	$23.50
	2013	$24.22
	2014	$24.46

Municipality	Year	Revenue from 19m³ per month ($)
Beaumont, purchases	2012	$35.32
	2013	$36.84
	2014	$38.74
Canmore	2012	$24.23
	2013	$24.23
	2014	$30.34
Cochrane	2012	$25.68
	2013	$25.68
	2014	$26.89
Lethbridge	2012	$30.71
	2013	$31.43
	2014	$31.43
Medicine Hat	2012	$22.59
	2013	$38.51
	2014	$38.73
Okotoks	2012	$31.68
	2013	$33.33
	2014	$34.50
Wetaskiwin	2012	$61.65
	2013	$65.40
	2014	$68.75

2.11.2 Lessons Learned

1. Is the range of residential water bills, based on 19m³ per month, reasonable?
   Range is $23.50/month to $68.75/month. More municipalities are needed in study to understand this variation. We do not have enough data to relate revenue from residential water usage to the Cost/ML to treat and distribute drinking water.

This effectiveness measure, however, in most cases correlates with the total cost measure, for example Banff has the lowest cost per ML for drinking water and the lowest residential water bill. Wetaskiwin alternatively has more challenges and costs in supplying drinking water and accordingly has the highest water bill in this comparison.

2.12 Water Specific Data **(See Section 3 for definitions of each column heading)**

This data consolidates the information about water services for each municipality.

Municipality	Year	Distribution Pipe (KM)	Average Age Infrastructure (years)	Treatment Plants (#)	Storage Reservoirs (#)	Storage Capacity (ML)	Main Breaks (#/year)	Energy Consumed (kWh)
Airdrie, purchases	2012	240	15		2	20	2	1,239,701
	2013	254	16		2	20	2	1,535,663
	2014	258	17		2	20	2	1,717,281
Banff	2012	59	47	1	4	24	8	1,916,078
	2013	59	46	1	4	24	4	1,973,477
	2014	59	45	1	4	24	6	2,019,435
Beaumont, purchases	2012	70	17		2	17	0	408,664
	2013	72	18		2	17	2	531,806
	2014	72	19		2	17	4	536,429
Canmore	2012	103	23	2	3	22	2	968,768
	2013	104	24	2	3	22	3	1,013,652
	2014	104	25	2	3	22	5	1,083,476
Cochrane	2012	120	15	1	9	33	6	2,557,153
	2013	122	19	1	9	33	1	2,630,579
	2014	125	19	1	9	33	2	2,781,036
Lethbridge	2012	577	29	1	5	103	39	17,914,688
	2013	582	30	1	5	103	48	17,364,402
	2014	588	30	1	6	123	66	17,188,668
Medicine Hat	2012	425	33	1	4	59	8	8,795,037
	2013	432	34	1	4	59	7	8,974,000
	2014	436	35	1	4	59	4	9,128,000
Okotoks	2012	153	17	1	3	20	5	2,556,581
	2013	158	18	1	3	20	1	2,402,590
	2014	165	19	1	3	20	4	2,462,419
Wetaskiwin	2012	109	43	1	2	18	6	1,300,000
	2013	109	44	1	2	18	6	1,300,000
	2014	109	45	1	2	18	5	1,300,000

Water Specific Data, continued (See Section 3 for definitions of each column heading)

Municipality	Year	Useful Life, Treatment (years)	Useful Life, Distribution (years)	Useful Life, Reservoirs (years)	Water Rate, Base ($/month)	Water Rate, Consumption ($/m^3)
Airdrie, purchases	2012		50	45	$13.99	$0.98
	2013		50	45	$14.30	$1.05
	2014		50	45	$15.51	$1.12
Banff	2012	45	75	45	$5.07	$0.97
	2013	45	75	45	$5.22	$1.00
	2014	45	75	45	$5.27	$1.01
Beaumont, purchases	2012		75	45	$14.80	$1.08
	2013		75	45	$14.80	$1.16
	2014		75	45	$14.80	$1.26
Canmore	2012	45	75	45	$12.83	$0.60
	2013	45	75	45	$12.83	$0.60
	2014	45	75	45	$16.09	$0.75
Cochrane	2012	45	75	45	$5.16	$1.08
	2013	45	75	45	$5.16	$1.08
	2014	45	75	45	$5.42	$1.13
Lethbridge	2012	45	50	45	$9.43	$1.12
	2013	45	50	45	$9.73	$1.14
	2014	45	50	45	$9.73	$1.14
Medicine Hat	2012	26	75	45	$21.07	$0.85
	2013	26	75	44	$21.79	$0.88
	2014	24	75	43	$22.01	$0.88
Okotoks	2012	45	75	45	$6.03	$1.35
	2013	45	75	45	$6.35	$1.42
	2014	45	75	45	$6.57	$1.47
Wetaskiwin	2012	45	75	45	$19.85	$2.20
	2013	45	75	45	$22.65	$2.25
	2014	45	75	45	$26.00	$2.25

2.12.1 Lessons Learned

1. What does storage capacity relate to?
   Storage capacity does not relate to population or growth. Design capacity is determined by maximum daily flow and by fire flow requirements.
2. Are there other datasets that should be collected?
   Both a measure and an understanding of the effects of topography need further investigation. Density should be calculated for reports using, for example, Municipal Population and Developed Area.

2.13 Lessons Learned, General

1. There is confidence that the reports on Performance Measures from the Database are now comparable.

2. The focus for benchmarking must remain on what the Subject Matter Experts (SME) for each Service Area can learn about trends and best practices, e.g. sharing of water conservation initiatives.

3. Need more municipalities of similar size to get meaningful comparisons on Costs/ML and service data comparisons.

4. Need more municipalities that purchase water for meaningful comparisons. Municipalities that purchase treated water are considered to have only a Distribution System.

5. Data collection for benchmarking needs to be built into financial systems in the future.

6. SMEs need the details behind the charts to drill down to reasons for differences between municipalities and trends. Work toward this in future.

7. Amortization of assets is recognized as a cost, however, methods for setting an amortization schedule vary between municipalities.

8. Age of infrastructure needs more thought; more analysis needs to be done on cost of the higher rate of failure older infrastructure that has lower amortization vs. lower repair cost of new/replacement infrastructure that has higher amortization cost.

9. As mentioned above (page 40), a better understanding of topography needs to be developed. SMEs thought measuring topography can't be done in a way that would be reliable and comparable and it is not known whether GIS could provide this, e.g. the change in elevation from treatment plant to reservoirs. In addition, topography can work to your advantage, e.g. gravity feed from a water source at an elevation above a town/city site.

Database Manual, Drinking Water

Alberta Municipal Benchmarking Initiative

3 Database Manual, Drinking Water

3.1 Benchmark Data Definitions - Costs

All costs for Benchmarking are OPERATING COSTS ONLY. Capital costs are not to be included, i.e. captured in amortization.

3.1.1 Treatment Direct Costs ($/year)

All operating direct costs involved in the activities to source raw water and treat it to provincial standards for drinking water OR the contract cost to purchase treated drinking water from an external supplier.

Includes costs to;

1. Pump raw water from underground wells and surface sources and pre-treat raw water
2. Final-treat water to meet provincial standards for drinking water, e.g. in a treatment plant OR reservoir that's primary purpose is to disinfect water
3. Test drinking water for quality at key points in the Distribution System
4. Re-chlorinate drinking water in the Distribution System, when required, e.g. by injection OR in a re-chlorination facility
5. Pump drinking water from treatment facilities to storage facilities, e.g. reservoirs, tanks

Examples of direct operating costs for these activities are;

1. Materials used, e.g. filters, coagulants (alum), disinfectants (chlorine)
2. Labour wages, benefits, and compulsory training, e.g. for certified operators, including first-aid
3. Disposal, e.g. grit
4. Testing and reporting of water quality to the Province
5. Power, e.g. electrical
6. Energy, e.g. natural gas
7. Inspections and testing, e.g. equipment and buildings
8. Repairs and maintenance, e.g. parts and labour
9. 3rd party contract costs, e.g. specialized repairs, water quality testing/reporting
10. Maintenance, e.g. reservoirs used for treatment
11. Utility funded debt interest, e.g. for drinking water treatment asset capital improvements

3.1.2 Distribution Direct Costs ($/year)

All operating direct costs involved in the activities to distribute treated drinking water to customers.

Includes costs to;

1. Maintain, e.g. storage facilities
2. Provide water, by gravity feed, or by pumping, e.g. booster stations to move drinking water to residential, commercial, regional and bulk locations
3. Detect, e.g. audio testing, and repair leaks and breaks in valves/mains/pipes in the Distribution System

Examples of direct operating costs for these activities are;

1. Materials used
2. Labour wages and benefits, and compulsory training for certified operators, including first-aid
3. Power; electrical
4. Energy; natural gas
5. Inspections, testing and maintenance of equipment, e.g. valves/mains/pipes, e.g. parts and labour
6. Inspections and repairs of buildings
7. 3rd party contract costs, e.g. specialized repairs
8. Maintenance of water meters
   NOTE: 100% of this cost is applied to Drinking Water Supply recognizing one meter may be used to measure both water and wastewater volumes
9. Operating reservoir used for storage/distribution
10. Hydrant repair and maintenance
11. Utility funded debt interest associated with drinking water distribution asset capital improvements

3.1.3 Indirect Costs ($/year)

All operating costs for the activities to support the water supply Treatment and Distribution Systems.

Includes costs to;

1. Administer, e.g. customer accounts (meter reading, billing, set-up of new accounts)
2. Design and deliver, e.g. conservation/education programs for the public
3. Manage, e.g. drinking water Treatment and Distribution Systems operations, includes salaries/office operation costs for managers (may be a portion of the total cost, e.g. a public works manager who is responsible for water and wastewater)
4. Training, soft-skills (if not covered by HR budget) and other water related training not separable between treatment and distribution
5. Memberships, not separable between Treatment and Distribution
6. Planning, e.g. Utility Master Plans
7. Utility funded debt interest, e.g. associated with asset capital improvements not separable between Treatment and Distribution (apply to both)

Total indirect costs will be prorated (allocated) separately to Treatment and Distribution separately in the database based on the percentage the Direct Cost each represents of total Direct Costs of the Water Supply System.

3.1.4 Amortization Costs – Treatment Assets ($/year)

Amortization costs for capital assets used to source and treat drinking water. Amortization is the cost allocation of an asset over its useful life.

3.1.5 Amortization Costs – Distribution Assets ($/year)

Amortization costs for capital assets used to distribute drinking water to customers.

3.1.6 Overhead Costs ($/year)

Overhead costs are all operating costs of activities necessary for the continued functioning of the municipality but not directly associated with the services being offered.

Includes;

1. Overhead departmental costs, e.g. human resources, IT, security, engineering, planning, financial services, Council, Administration, tax funded debt interest.

Total Overhead Costs will be allocated to each Service Area using a calculation in the database. The calculation includes these factors; for Fleet – number and value of vehicles, for Facilities – area, sq. ft., and for All Other Overhead – Service Area Total Cost and number of FTEs.

Overhead allocated to the Water Supply Service Area will then be prorated (allocated) separately to the Treatment and Distribution Systems in the database based on the percentage the Direct Cost each represents of total Direct Costs of the Water Supply System

The total of these costs will be used by Finance to ensure all operating costs for the Drinking Water Supply service are accounted for as recorded in the municipality's Annual Financial Statements.

3.1.7 Out of Scope Costs ($/year)

Out of Scope Costs are all operating costs for activities not captured in the Treatment Direct Cost, Distribution Direct Cost and Indirect Cost categories

3.2 Data Definitions - Service

3.2.1 Treated Volume Output* (ML/year)

Volume of treated drinking water produced OR purchased.

3.2.2 Billed Metered Consumption; Residential* (ML/year)

Volume of drinking water billed/sold to residential customers measured by private dwelling water meters.

3.2.3 Billed Metered Consumption; Commercial* (ML/year)

Volume of drinking water billed/sold to commercial, industrial, Institutional customers measured by water meters.

3.2.4 Billed Metered Consumption; Regional* (ML/year)

Volume of drinking water billed/sold to regional customers measured by water meters.

3.2.5 Billed Metered Consumption; Bulk* (ML/year)

Volume of drinking water billed/sold to Bulk Customers measured by water meters.

3.2.6 Billed Authorized Consumption; Total* (ML/year)

Total volume of drinking water billed/sold. Used by municipalities that cannot differentiate volume billed/sold by customer type

*** Reference: AWWA Water Balance (American Water Wastewater Association).** Accepted as definitions for water classifications

Volume, Treated water output	**Billed Authorized Consumption**	**Billed Metered Consumption,** e.g. residential, commercial, municipal facilities, irrigation, construction, bulk	**Revenue Water**
		Billed Unmetered Consumption, e.g. municipal irrigation, construction	
	Unbilled Authorized Consumption	**Unbilled Metered Consumption,** e.g. municipal facilities, municipal irrigation	**Non-Revenue Water**
		Unbilled Unmetered Consumption, e.g. municipal irrigation, firefighting, construction, street sweeping, hydrant flushing	
	Water Losses	**Apparent Losses**; metering inaccuracies and unauthorized consumption, e.g. mismatched register on water meter, water theft	
		Real Losses; from all types of leaks, breaks and overflows on mains, reservoirs and service lines	

3.2.7 Distribution Pipe (KM)

Total length of mains/pipe in the Distribution System that carries water to customers and are maintained by the municipality

Includes

1. Length of all connecting mains/pipes
2. Length of pipe in the municipal Right-of-Way, e.g. service pipe from mains to the customer property line

Excludes

1. Length of service connections from the customer's property line to dwelling, building

NOTE: In the future, pipe length data categorized by size and material type may be considered for collection

3.2.8 Water Main Breaks (Breaks/year)

Number of pipe/mains breaks detected per year within the length of maintained distribution pipe.

3.2.9 Energy Consumed (kWh)

Power (electrical) consumed by the entire Drinking Water Supply System to source, treat and distribute water to all customers.

3.2.10 Infrastructure Age (years)

Average age of the distribution pipe maintained in the entire Water Supply System, based on the year of installation.

3.2.11 Useful Life – Treatment Assets (years)

Useful life, for amortization purposes, assigned to the assets in the treatment part of Drinking Water Supply System.

3.2.12 Useful Life – Distribution Pipe (years)

Useful life, for amortization purposes, assigned to the distribution pipe maintained part of the Drinking Water Supply System.

3.2.13 Useful Life – Reservoirs (years)

Useful life for amortization purposes of reservoirs in the Distribution System used to store OR re-chlorinate drinking water.

3.2.14 Treatment Plants (number)

This is number of facilities, e.g. treatment plant or reservoir, whose primary purpose is to treat water to meet provincial standards of drinking water quality.

3.2.15 Storage Reservoirs (number)

Number of reservoirs in the Distribution System used to store OR re-chlorinate drinking water.

Excludes

1. Reservoirs or tanks in the Treatment System used to store raw water or treat raw water.

3.2.16 Capacity of Storage Reservoirs (ML)

Total volume of reservoirs/tanks in the Distribution System used to store OR re-chlorinate drinking water.

3.2.17 Water Rates – Base Rate ($/Month)

This is the monthly base fee for a 15mm water line (residential). If there is no monthly fee, calculate a fee based on the municipality approach using a normalized month of 30.42 days, e.g. Airdrie charges a daily fee but bills every 28 days (4 weeks) => $ Daily fee X 30.42 days = Monthly Base Rate

3.2.18 Water Rates – Consumption Rate ($/m^3)

The fee per cubic metre of water consumed per month. If the municipality has a sliding scale (the more consumed the higher the fee per cubic metre), enter the fee for a typical residential consumption of 19 m^3/month. Reference is City of Edmonton.

3.2.19 Municipal Population (# of Residents)

Number of permanent residents as recorded by the most recent census, and listed at;
http://municipalaffairs.gov.ab.ca/documents/msb/2012_pop.pdf

Excludes

1. Visitor Adjusted Population.

3.2.20 Water System – Raw Water

1. Source is ground, surface (or both), GUDI (Groundwater Under Direct Influence of Surface Water), or purchase.
2. Turbidity or quality is measured in units of NTU, and recorded as minimum, maximum and average.

3.2.21 Water System – Treatment Process

The treatment process has up to six components;

1. Coagulation
2. Sedimentation
3. Filtration;
   - Membrane
   - Direct
   - Slow-sand
   - Rapid-sand
4. Fluoridation
5. Disinfection

- Chlorine
- UV

6. Residuals Management – handling of wastewater containing solids generated in a Treatment Plant from maintenance activities, e.g. flushing filters and blow-down of clarifiers
    - De-chlorination – removing chlorine from the water component of the maintenance wastewater so that it can be released back into the environment
    - Solids Handling – disposal of solids removed from the maintenance wastewater

3.3 Benchmark Performance Measures - Calculations

All calculations are made in the database system based on finalized data input from municipalities.

3.3.1 Treatment (or Purchase Costs), $/ML (ML = 1 million litres)

$$\frac{Treatment\ Direct\ Costs\ (include\ R\&M) + Prorated\ Indirect\ Costs + Prorated\ Overhead\ Costs + Amortization\ of\ Treatment\ Assets}{ML\ of\ Drinking\ Water\ Treated}$$

OR Purchase ($/ML)

$$\frac{Purchase\ Cost\ of\ Treated\ Water}{ML\ of\ Drinking\ Water\ Treated\ (or\ Purchased)}$$

Comments

- R&M = Repairs and Maintenance
- ML = Megalitres = 1000 cubic metres = 1 million litres

3.3.2 Distribution Costs, $/KM pipe maintained (KM = kilometre)

$$\frac{Distribution\ Direct\ Costs\ (include\ R\&M) + Prorated\ Indirect\ Costs + Prorated\ Overhead\ Costs + Amortization\ of\ Distribution\ Assets}{KM\ of\ Distribution\ Pipe\ Maintained}$$

OR Purchase ($/KM)

$$\frac{Distribution\ Direct\ Costs\ (include\ R\&M) + Indirect\ Costs + Overhead\ Costs + Amortization\ of\ Distribution\ Assets}{KM\ of\ Distribution\ Pipe\ Maintained}$$

Comments

- If water is purchased, all indirect and overhead costs are applied to Distribution.
- KM = kilometers

3.3.3 Total Water Supply Costs, $/ML

$$\frac{Treatment\ Direct\ Costs\ (include\ R\&M) + Distribution\ Direct\ Costs\ (include\ R\&M) + Indirect\ Costs + Overhead\ Costs + Amortization\ of\ all\ water\ supply\ assets}{ML\ of\ Drinking\ Water\ Billed\ Authorized\ Consumption, Total}$$

Comments

- Billed Authorized Consumption = Revenue Water = Billed Metered Consumption + Billed Unmetered Consumption

3.3.4 Amortization Costs – Treatment, $/ML

$$\frac{Amortization\ of\ Treatment\ Assets}{ML\ of\ Drinking\ Water\ Treated\ (or\ Purchased)}$$

Comments

- For municipalities that purchase water, there are no Treatment assets to amortize

3.3.5 Amortization Costs – Distribution, $/KM

$$\frac{Amortization\ of\ Distribution\ Assets}{KM\ of\ Distribution\ Pipe\ Maintained}$$

3.3.6 Water Usage – Total, litres/person/day

$$\frac{(ML\ of\ Water\ Billed\ Residential + (ML\ of\ Water\ Billed\ Commercial + ML\ of\ Water\ Billed\ Bulk) - ML\ Regional\ Consumption)\ x\ 1{,}000{,}000}{Municipal\ Population} /365$$

Comments

- AUMA Goal: Alberta's urban municipal sector will achieve a total per capita water use of 341 litres/person/day by 2020 (30% below reported water use 2001-2006). Reference: http://www.auma.ca/live/digitalAssets/80/80674_2014_CEP_Plan.pdf

3.3.7 Water Main Breaks, breaks/year

$$\frac{Number\ of Distribution\ Main\ Breaks}{KM\ Distribution\ Pipe\ Maintained \div 100}$$

3.3.8 Energy Consumed, kWh/ML

$$\frac{Energy\ Consumed\ by\ Drinking\ Water\ Supply\ System\ (kWh)}{ML\ of\ Drinking\ Water\ Treated\ (or\ Purchased)}$$

3.3.9 Non-Revenue Water, %

$$\frac{ML\ of\ Water\ Treated\ (or\ Purchased) - ML\ Water\ Billed\ Authorized\ (Revenue\ Water)}{ML\ of\ Drinking\ Water\ Treated\ (or\ Purchased) - ML\ Regional\ Consumption}\ X\ 100$$

Comments

- AUMA Goal: Alberta's urban municipal sector will maintain the volume of "unaccounted for" water at 10% of total water use.
- Non-revenue water, also referred to as "Unaccounted for" water, is water that has been produced but is lost before it reaches customers. Losses can be real (as a result leakage) or apparent (through theft, metering inaccuracies, or authorized unmetered consumption). Reference: http://www.auma.ca/live/digitalAssets/80/80674_2014_CEP_Plan.pdf

3.3.10 Residential Water Bill for 19 m^3 water/month (reference is a study by Edmonton)

Revenue = Base Rate/month + (Consumption Rate/ m^3 X 19m^3)