Alberta Municipal Benchmarking Initiative – Solid Waste

April 2017

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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 benchmarking reports to prompt questions, start discussions, identify and share leading practices, and ultimately improve the municipal services provided to Albertans.

The ten service areas to be considered as part of this initiative are for efficiency and effectiveness performance measures are:

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

A method for collecting data to ensure it is comparable between communities, and a database to hold the data and produce performance measure has been 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, for both efficiency and effectiveness.

To ensure an "apples to apples" comparison, participating municipalities work to agree on the content of the user manual.

1.3 Participating Municipalities

The municipalities currently participating in the Solid Waste section of the Project are the cities of Airdrie, Lethbridge, Medicine Hat, Red Deer and the towns of Banff, Canmore, 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, Corey Wight, City of Lethbridge, and two vacant positions.

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.

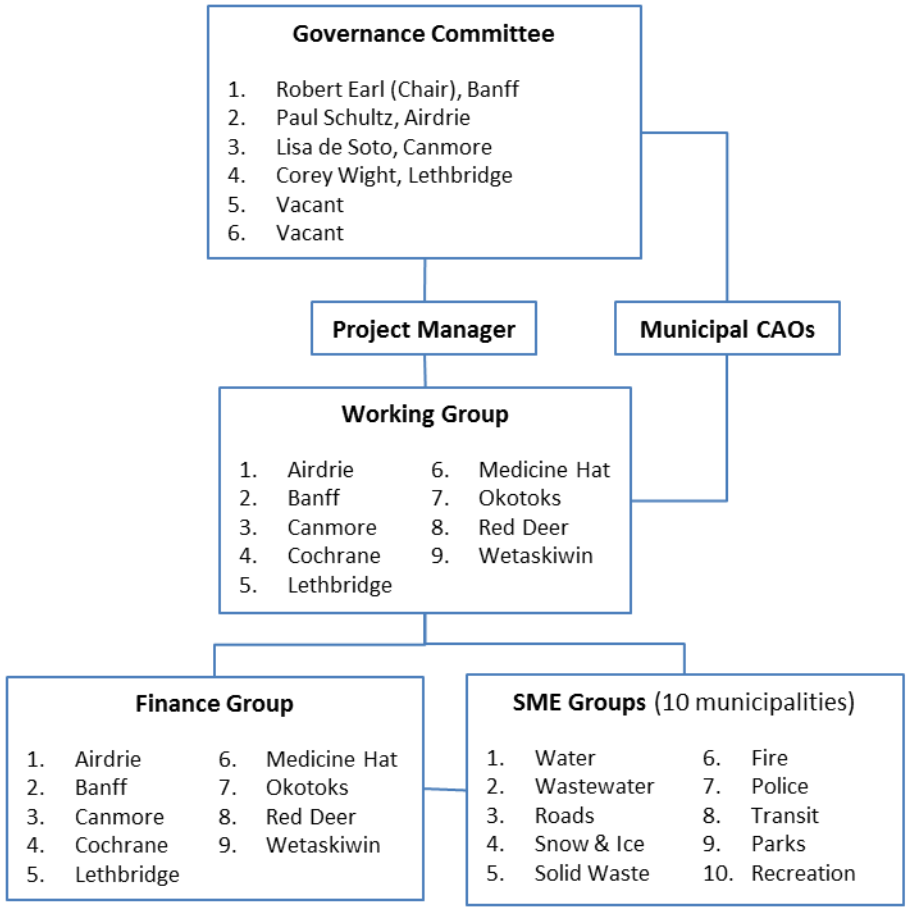
Finance Group – The primary role and responsibility of the Finance Group is to collect and enter data for a calculation to allocate overhead to each service area, collect and enter data for amortization of assets in each service area, and assist service area SMEs on collection of cost data for each service

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 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.

Governance Structure



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.

Solid Waste Services

Alberta Municipal Benchmarking Initiative

2 Solid Waste Services

2.1 System Description

2.1.1 Residential Solid Waste Services

The solid waste service collects residential garbage and recyclables, handles and markets the recyclable component, arranges for further processing of household hazardous waste, composting of organics, and handles and disposes the garbage component to a landfill.

Most municipalities collect waste and recyclables weekly at the curbside from single family residences, and from bins for multi-family buildings, and industrial, commercial and industrial customers. As part of the service there can be large item pick up, bagged yard waste leaf pick up in the fall. Municipalities may also have a self-haul program; customers bring waste and recyclables to bins at collection centres. Collection centres can offer multiple bins so customers can sort recyclables from garbage. Customers can also bring recyclables and garbage to landfill sites for disposal or further processing, usually at a cost (tipping fee). Some municipalities own and operate a landfill site. Municipalities also offer a range of collection programs for special materials, e.g. hazardous materials, metal, paint, oil, electronics, tires, batteries, pumpkins and Christmas trees.

Municipalities use contractors for the solid waste service to varying degrees from fully contracted to some components contracted to fully internally operated.

Increasingly, municipalities are under demand for higher rates of diversion of recyclables to minimize disposal to landfills. As a result, the subject matter expert group for solid waste benchmarking decided the solid waste service area is one that municipalities have the opportunity to address multiple bottom lines, e.g.;

1. Financial – the cost of providing the service
2. Environmental – the diversion from landfills of recyclables from the waste collected (garbage and recyclables)

For the financial dimension, the group felt the benchmarking financial focus could be misleading. Financially, the lowest cost and easiest approach is to have customers put all garbage and recyclables in one cart for curbside collection and take all waste collected to local, municipally-owned landfill sites. While this approach is the most cost efficient, it does not provide environmental benefits.

For the environmental dimension, the group agreed that all programs to increase environmental benefits, through increased diversion of recyclables for further processing,

increases the service cost, but achieves higher environmental performance.

2.1.2 Factors Influencing Solid Waste Services

Age of Infrastructure: Age and condition of solid waste system assets and frequency of maintenance costs.

Size of System: Size and complexity of the solid waste system.

Urban Density: Denser population may lower collection costs for the solid waste system.

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

2.1.3 Solid Waste System Narrative Data (See Section 3 for definitions of each column heading)

The Narrative Data shows differences and similarities between municipalities for this service area.

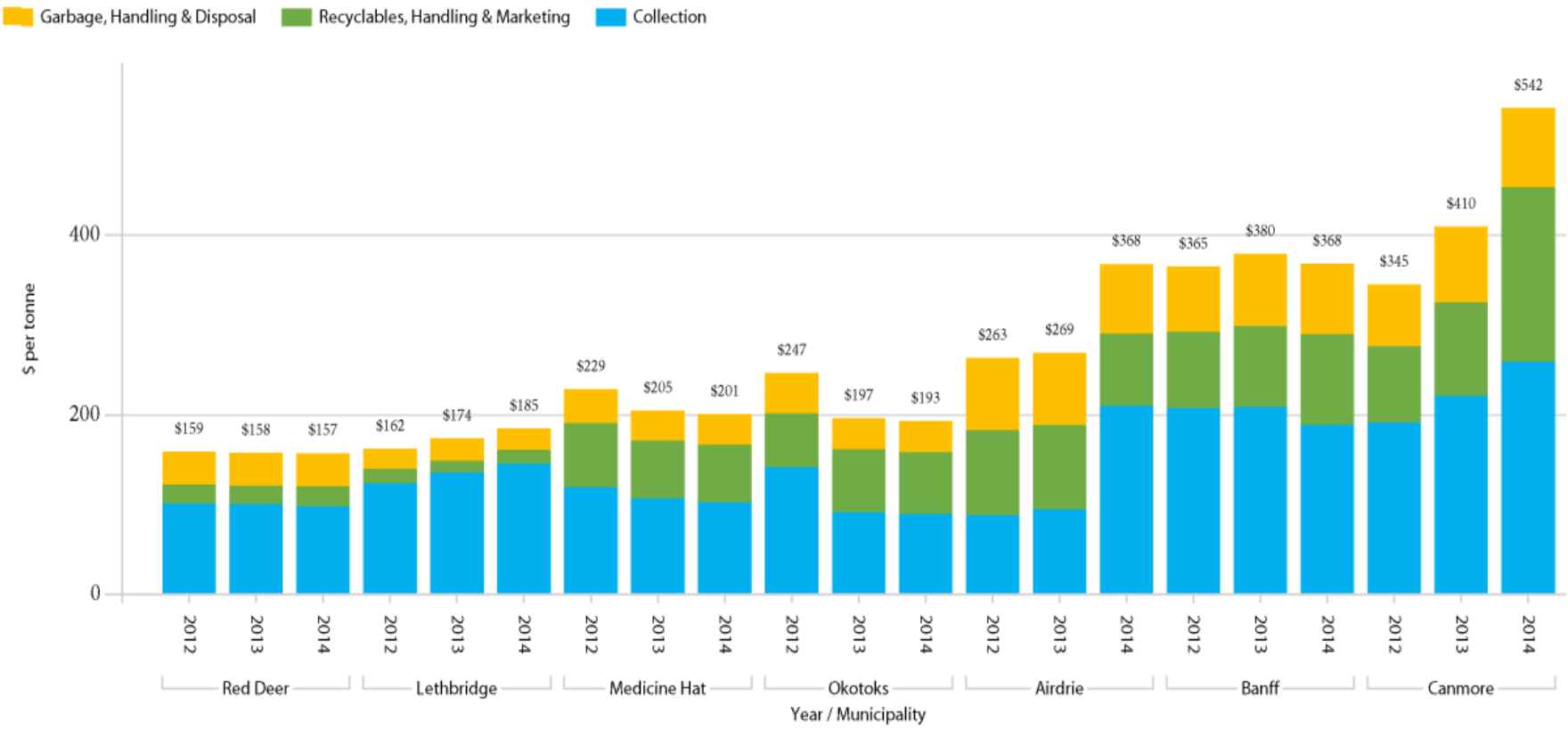
Municipality	Year	Municipal Waste Limits	Subscription Based Collection	Collection System Automated	Collection System Manual	Contract All Solid Waste Services	Collection from Rear Lanes (%)	Diversion Goal Set	Tipping Fees ($/tonne)
Airdrie	2012	Y			Y	Y	0%		$113
	2013	Y			Y	Y	0%		$113
	2014	Y			Y	Y	20%		$113
Banff	2012			Y			0%		$35
	2013			Y			0%		$35
	2014			Y			0%		$35
Canmore	2012			Y			0%	Y	$35
	2013			Y			0%	Y	$35
	2014			Y			0%	Y	$35
Lethbridge	2012			Y			50%		$21
	2013			Y			50%		$21
	2014			Y			50%		$21
Medicine Hat	2012	Y	Y	Y			60%		$52
	2013	Y	Y	Y			59%		$52
	2014	Y	Y	Y			59%		$52
Okotoks	2012	Y	Y	Y			20%	Y	$60
	2013	Y	Y	Y			27%	Y	$60
	2014	Y	Y	Y			28%	Y	$60
Red Deer	2012	Y			Y	Y	70%		$62
	2013	Y			Y	Y	70%	Y	$64
	2014	Y			Y	Y	70%	Y	$65

NOTES:

1. All municipalities with curbside collection offer the service weekly. Canmore and Banff collect continuously from bear-proof communal bins to which residents bring their solid waste.

2.2 Residential Solid Waste Total Costs 1 ($/tonne collected) – Efficiency

This chart shows the total cost of collecting residential waste, diversion of recyclables for further processing into useful products, and disposal of garbage to a landfill per tonne of residential waste collected. Municipalities are in order from lowest to highest cost based on the average of 2012, 2013, 2014 results.



2.2.1 Total Solid Waste Data (See Section 3 for definitions of each column heading)

Municipality	Year	Collection Costs ($)	Recyclables, Handling & Marketing Costs ($)	Garbage, Handling & Disposal Costs ($)	Total Costs ($)	Total Recyclables & Garbage Collected (tonnes)	Cost per Tonne Collected ($)
Airdrie	2012	$895,865	$958,799	$816,727	$2,671,391	10,142	$263
	2013	$1,077,584	$1,064,542	$917,348	$3,059,474	11,358	$269
	2014	$2,811,053	$1,076,051	$1,042,253	$4,929,357	13,388	$368
Banff	2012	$519,146	$212,309	$171,618	$903,073	2,348	$385
	2013	$577,514	$250,551	$212,820	$1,040,884	2,625	$397
	2014	$534,952	$287,221	$214,016	$1,036,189	2,700	$384
Canmore	2012	$916,404	$406,299	$330,815	$1,653,518	4,791	$345
	2013	$1,088,991	$516,370	$415,323	$2,020,684	4,931	$410
	2014	$1,319,787	$993,319	$452,494	$2,765,600	5,102	$542
Lethbridge	2012	$3,930,447	$520,000	$713,643	$5,164,090	31,829	$162
	2013	$4,462,329	$426,670	$819,705	$5,708,704	32,831	$174
	2014	$4,639,998	$493,781	$745,176	$5,878,955	31,837	$185
Medicine Hat	2012	$2,852,907	$1,709,217	$909,900	$5,472,025	23,946	$229
	2013	$3,172,102	$1,913,641	$974,312	$6,060,054	29,622	$205
	2014	$2,934,446	$1,836,739	$972,147	$5,743,332	28,562	$201
Okotoks	2012	$1,345,957	$573,350	$426,675	$2,345,982	9,508	$247
	2013	$990,713	$760,918	$376,358	$2,127,989	10,822	$197
	2014	$1,057,040	$810,489	$409,495	$2,277,024	11,800	$193
Red Deer	2012	$3,892,036	$805,527	$1,413,047	$6,110,610	38,369	$159
	2013	$3,999,586	$805,641	$1,459,953	$6,265,180	39,771	$158
	2014	$4,125,616	$943,632	$1,549,589	$6,618,837	42,029	$157

NOTES:

1. Collection costs are for activities to collect garbage, recyclables, including organics from residences, by curbside or other means.
2. Recyclables handling and marketing costs are for activities to process recyclables so they can be marketed to other businesses for further processing/ recycling/reprocessing.
3. Garbage handling and disposal costs are for activities to transport to garbage to a landfill and pay tipping fees but not the operation of a landfill.

2.2.2 Lessons Learned

1. Adding new programs to increase recyclables diversion rates has a large effect on total cost/tonne collected. For example;
    - Airdrie – A new organics recycling program increased costs from about $269/tonne in 2013 to $368/tonne in 2014
    - Canmore – An expanded recycling program to make recycling more convenient for residents increased costs from about $410/tonne in 2013 to $542/tonne in 2014

2. Technology improvements can lower total costs. For example,
    - Okotoks changed from curbside sorting by customers to collection of co-mingled waste (single stream) for automated sorting. Collection costs/tonne decreased from $142/tonne to $90/tonne
    - Airdrie is moving to comingled curbside collection for 2017

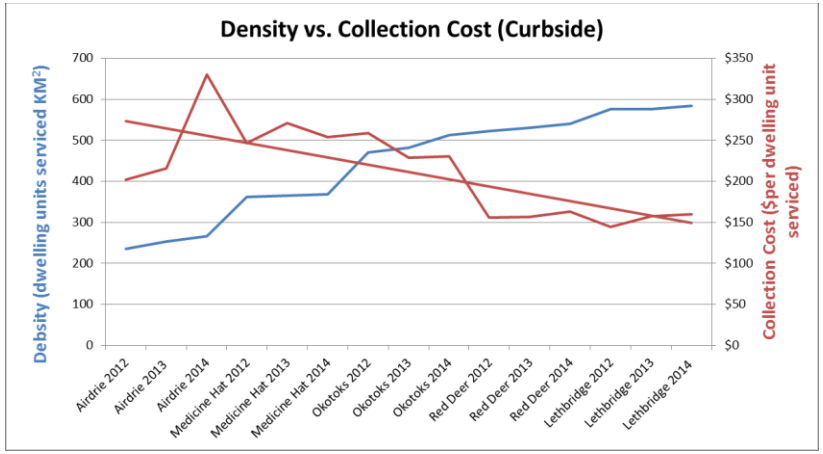
3. There is not enough data to support a conclusion on the effect on costs of contracting all or part of the service.

4. For municipalities with a curbside collection system, as dwelling unit density increases (dense vs. suburban spread) cost per tonne decreases.

The definitions for this lesson learned are;

- For collection cost use total collection cost per dwelling unit serviced. This is because not all dwelling units recorded in the census are serviced by the municipality, e.g. some multi-family buildings use contractors
- For density use total # dwelling units serviced per KM2 of developed area, i.e. the area where the units exist. Most municipalities have a developed area smaller than geographic area to municipal boundaries.

Using these definitions in the chart below, the trend line (red) for cost decreases as density increases (the data table follows chart);

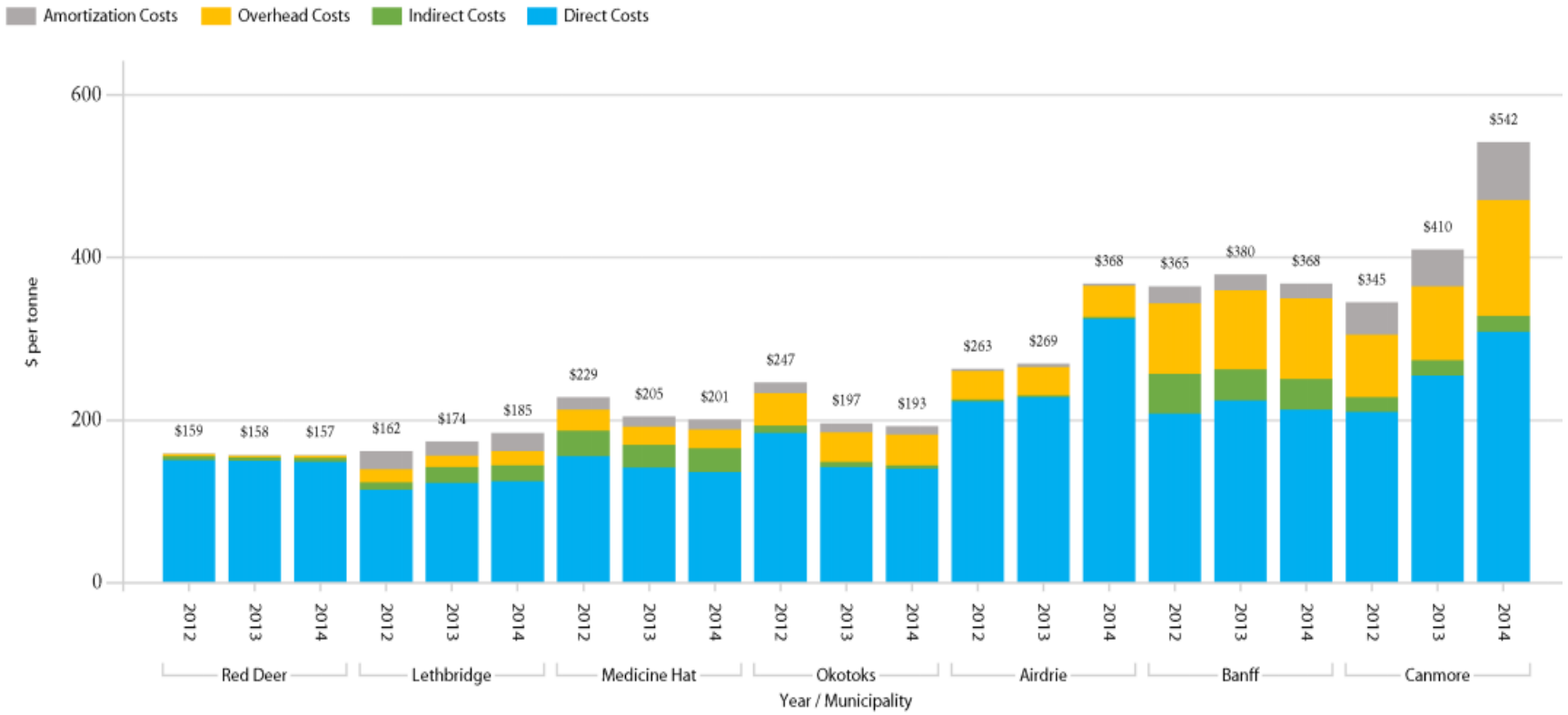


Municipality	Year	Geographic Area (KM²)	Developed Area (KM²)	Total Dwelling Units, from Census (#)	Dwelling Units Serviced (#)	Density (Dwelling Units Serviced per KM² Developed Area)	Total Collection Costs ($)	Collection Cost per Dwelling Unit Serviced ($)
Airdrie	2012	86.00	56.00	17,174	13,229	236	$2,671,391	$202
	2013	86.00	56.00	18,230	14,160	253	$3,059,474	$216
	2014	86.00	56.00	20,003	14,932	267	$4,929,357	$330
Lethbridge	2012	122.80	62.00	37,738	35,696	576	$5,164,090	$145
	2013	122.80	63.00	38,279	36,273	576	$5,708,704	$157
	2014	122.80	63.00	38,803	36,834	585	$5,878,955	$160
Medicine Hat	2012	120.00	61.30	28,321	22,176	362	$5,472,025	$247
	2013	120.00	61.30	30,028	22,362	365	$6,060,054	$271
	2014	120.00	61.30	30,275	22,596	369	$5,743,332	$254
Okotoks	2012	19.20	19.24	9,059	9,059	471	$2,345,982	$259
	2013	19.20	19.24	9,288	9,288	483	$2,127,989	$229
	2014	19.20	19.24	9,873	9,873	513	$2,277,024	$231
Red Deer	2012	107.12	75.23	39,227	39,295	522	$6,110,610	$156
	2013	107.12	75.23	40,893	39,931	531	$6,265,180	$157
	2014	107.12	75.23	41,308	40,611	540	$6,618,837	$163

5. Communal bin collection is more costly per tonne than curbside collection, e.g. the average cost per tonne for communal bin collection system in Banff and Canmore is $322 while for all the others with curbside collection the average is $212 per tonne. There are two reasons for this;
    - The service level is higher in a communal bins system. Solid waste is being collected from the bins seven days a week and solid waste can be brought to bins at any time so there is no need to accumulate it. In a weekly curbside collection system, solid waste is stored by customers until the once per week collection.
    - In a communal bins system, businesses also use the bins to drop off their solid waste increasing the amount to be collected. Note that some businesses use contractors to collect their solid waste from dedicated bins at the business site.

2.3 Residential Solid Waste Total Costs 2 ($/tonne collected) – Efficiency

This chart shows the total cost of collecting residential waste, diversion of recyclables from the waste stream for further processing into useful products, and disposal of garbage to a landfill per tonne; direct costs are those for day-to-day operation of the service, indirect are for management of the service, overhead is a calculated allocation of total overhead to this service, amortization is the depreciation cost of all assets used to deliver the service. Municipalities are in order from lowest to highest cost based on the average of 2012, 2013, 2014 results.



2.3.1 Total Waste Data (See Section 3 for definitions of each column heading)

Municipality	Year	Direct Costs ($)	Indirect Costs ($)	Overhead Costs ($)	Amortization Costs ($)	Total Costs ($)	Total Recyclables & Garbage Collected (tonnes)	Cost per Tonne Collected ($)
Airdrie	2012	$2,262,964	$23,211	$356,234	$28,982	$2,671,391	10,142	$263
	2013	$2,592,192	$23,489	$400,342	$43,451	$3,059,474	11,358	$269
	2014	$4,347,386	$25,958	$520,322	$35,691	$4,929,357	13,388	$368
Banff	2012	$489,682	$114,626	$249,467	$49,298	$903,073	2,348	$385
	2013	$587,928	$101,482	$299,164	$52,310	$1,040,884	2,625	$397
	2014	$575,717	$102,118	$307,917	$50,437	$1,036,189	2,700	$384
Canmore	2012	$1,006,265	$87,406	$369,929	$189,918	$1,653,518	4,791	$345
	2013	$1,259,076	$92,655	$446,766	$222,187	$2,020,684	4,931	$410
	2014	$1,574,473	$101,020	$726,260	$363,847	$2,765,600	5,102	$542
Lethbridge	2012	$3,639,750	$286,031	$520,677	$717,632	$5,164,090	31,829	$162
	2013	$4,038,695	$638,248	$450,038	$581,723	$5,708,704	32,831	$174
	2014	$3,979,896	$619,303	$550,350	$729,406	$5,878,955	31,837	$185
Medicine Hat	2012	$3,724,897	$750,799	$633,425	$362,904	$5,472,025	23,946	$229
	2013	$4,196,659	$829,228	$665,512	$368,655	$6,060,054	29,622	$205
	2014	$3,890,527	$837,714	$652,187	$362,904	$5,743,332	28,562	$201
Okotoks	2012	$1,755,202	$81,830	$383,159	$125,791	$2,345,982	9,508	$247
	2013	$1,539,657	$73,173	$389,368	$125,791	$2,127,989	10,822	$197
	2014	$1,656,089	$51,155	$443,989	$125,791	$2,277,024	11,800	$193
Red Deer	2012	$5,795,629	$187,445	$110,836	$16,700	$6,110,610	38,369	$159
	2013	$5,960,406	$180,862	$107,221	$16,691	$6,265,180	39,771	$158
	2014	$6,253,910	$213,544	$134,685	$16,698	$6,618,837	42,029	$157

2.3.2 Lessons learned

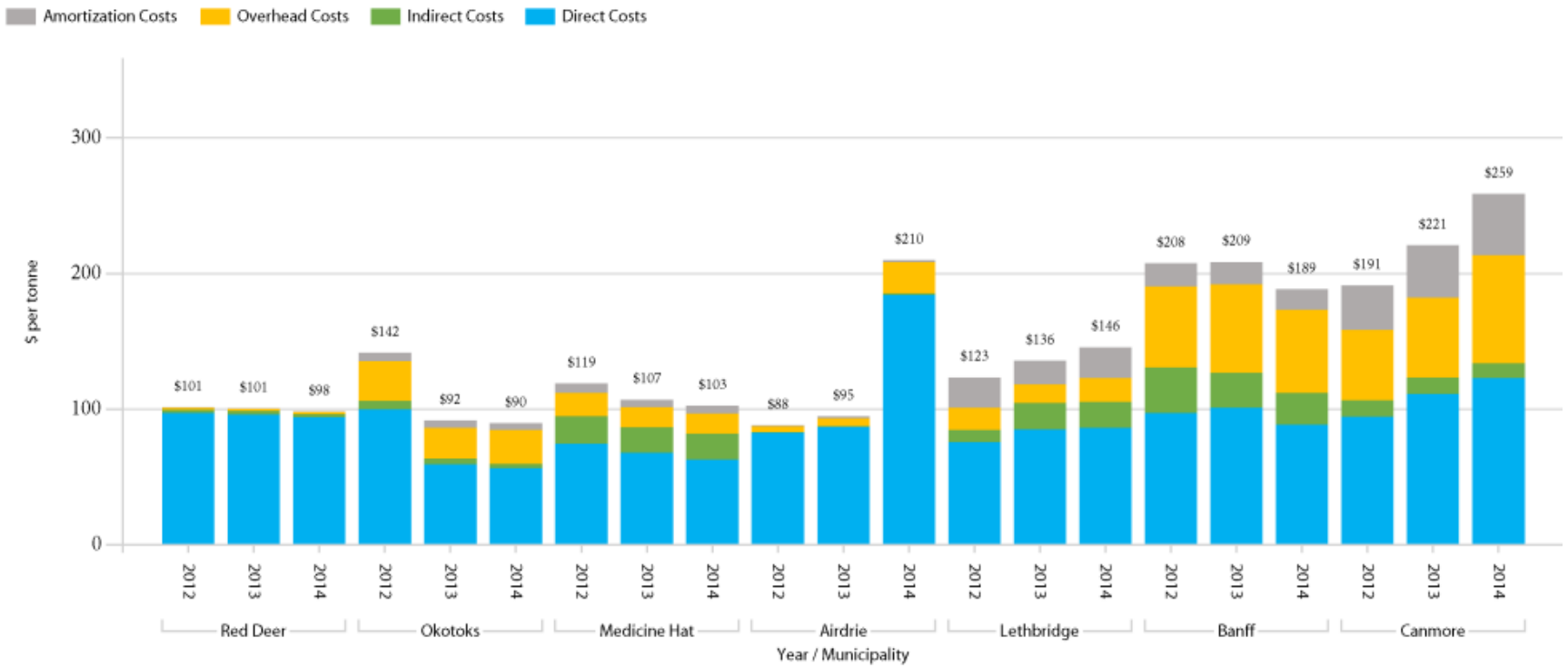
1. Operating as a utility with revenue vs. a tax supported service does not influence direct costs. See table for funding source in 2014.

		Utility Rate	Tax
1	ADR	100%	0%
2	BNF*	75%	25%
3	CMR	100%	0%
4	LBG	100%	0%
5	MHT	100%	0%
6	OKT	100%	0%
7	RDR	100%	0%

*Banff 2012 was 50% Utility and 50% Tax

2.4 Collection Costs ($/tonne collected) – Efficiency

This chart shows the total cost of collecting recyclables and garbage per tonne collected by cost type; direct, indirect, overhead and amortization. Curbside collection at the residence is used in all municipalites except Banff and Canmore, which have residents bring waste to large bear-proof bins located throughout the community. Collection of recyclables varies from curbside single stream (co-mingled with garbage) to curbside separated by customers to separated by customers then dropped off at recycling bins. Municipalities are in order from lowest to highest cost based on the average of 2012, 2013, 2014 results.



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

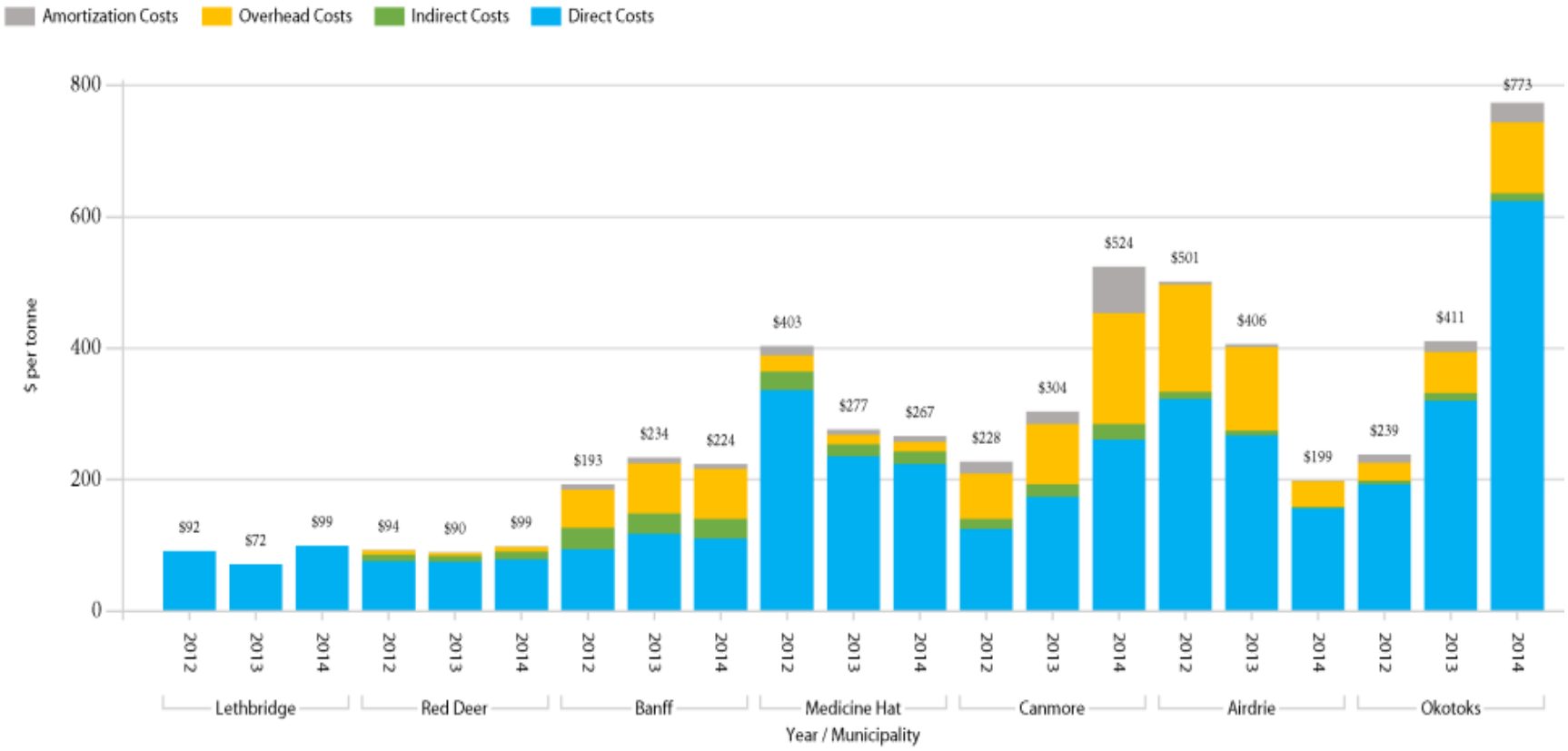
Municipality	Year	Direct Costs ($)	Indirect Costs ($)	Overhead Costs ($)	Amortization Costs ($)	Total Costs ($)	Total Recyclables & Garbage Collected (tonnes)	Cost per Tonne Collected ($)
Airdrie	2012	$838,283	$2,866	$43,980	$10,736	$895,865	10,142	$88
	2013	$989,228	$3,978	$67,797	$16,582	$1,077,584	11,358	$95
	2014	$2,464,162	$15,522	$311,139	$20,230	$2,811,053	13,388	$210
Banff	2012	$228,284	$78,833	$171,569	$40,459	$519,146	2,348	$221
	2013	$264,999	$68,208	$201,074	$43,233	$577,514	2,625	$220
	2014	$239,132	$63,249	$190,715	$41,857	$534,952	2,700	$198
Canmore	2012	$452,654	$58,575	$247,908	$157,266	$916,404	4,791	$191
	2013	$548,679	$60,252	$290,525	$189,535	$1,088,991	4,931	$221
	2014	$627,184	$56,470	$405,978	$230,155	$1,319,787	5,102	$259
Lethbridge	2012	$2,406,107	$286,031	$520,677	$717,632	$3,930,447	31,829	$123
	2013	$2,792,320	$638,248	$450,038	$581,723	$4,462,329	32,831	$136
	2014	$2,740,939	$619,303	$550,350	$729,406	$4,639,998	31,837	$146
Medicine Hat	2012	$1,784,416	$488,416	$412,060	$168,015	$2,852,907	23,946	$119
	2013	$2,013,213	$552,189	$443,169	$163,531	$3,172,102	29,622	$107
	2014	$1,799,581	$543,623	$423,228	$168,015	$2,934,446	28,562	$103
Okotoks	2012	$950,015	$59,620	$279,161	$57,161	$1,345,957	9,508	$142
	2013	$641,652	$46,178	$245,722	$57,161	$990,713	10,822	$92
	2014	$668,032	$34,284	$297,563	$57,161	$1,057,040	11,800	$90
Red Deer	2012	$3,724,861	$99,813	$59,019	$8,343	$3,892,036	38,369	$101
	2013	$3,824,950	$104,404	$61,894	$8,338	$3,999,586	39,771	$101
	2014	$3,956,944	$98,319	$62,011	$8,342	$4,125,616	42,029	$98

2.4.2 Lessons learned

1. Commercial waste (recyclables and garbage) is handled along with residential waste. Revenues from commercial waste collection can be used to subsidize the cost of residential collection. Municipalities have various approaches to collecting commercial solid waste. For example;
    - Red Deer collects all commercial
    - Canmore and Okotoks, no commercial
    - Banff and Medicine Hat, some commercial

2.5 Recyclables Handling and Marketing Cost ($/tonne recycled) – Efficiency

This chart shows the cost of diverting recyclables from the waste stream per tonne recycled by cost type; direct, indirect, overhead and amortization. Diversion can be started at curbside by having residents separate their recyclables from the garbage or leaving them co-mingled for separation in a waste processing facility.Separated recyclables are then marketed for further processing into useful products. Municipalities are in order from lowest to highest cost based on the average of 2012, 2013, 2014 results.



2.5.1 Recyclables Handling & Marketing Data (See Section 3 for definitions of each column heading)

Municipality	Year	Direct Costs ($)	Indirect Costs ($)	Overhead Costs ($)	Amortization Costs ($)	Total Costs ($)	Total Recyclables Collected (tonnes)	Cost per Tonne Recycled ($)
Airdrie	2012	$618,282	$20,345	$312,253	$7,918	$958,799	1,913	$501
	2013	$700,739	$19,511	$332,546	$11,746	$1,064,542	2,621	$406
	2014	$849,458	$10,436	$209,183	$6,974	$1,076,051	5,412	$199
Banff	2012	$97,034	$33,509	$72,927	$8,839	$212,309	1,029	$206
	2013	$119,769	$30,827	$90,877	$9,077	$250,551	1,013	$247
	2014	$135,130	$35,741	$107,770	$8,580	$287,221	1,219	$236
Canmore	2012	$222,796	$28,831	$122,020	$32,652	$406,299	1,785	$228
	2013	$295,074	$32,403	$156,241	$32,652	$516,370	1,698	$304
	2014	$494,795	$44,550	$320,282	$133,692	$993,319	1,896	$524
Lethbridge	2012	$520,000	$0	$0	$0	$520,000	5,662	$92
	2013	$426,670	$0	$0	$0	$426,670	5,934	$72
	2014	$493,781	$0	$0	$0	$493,781	4,964	$99
Medicine Hat	2012	$1,425,323	$121,049	$102,125	$60,720	$1,709,217	4,237	$403
	2013	$1,632,506	$125,686	$100,871	$54,578	$1,913,641	6,918	$277
	2014	$1,546,184	$129,227	$100,607	$60,720	$1,836,739	6,890	$267
Okotoks	2012	$463,799	$13,908	$65,121	$30,523	$573,350	2,403	$239
	2013	$592,815	$21,765	$115,815	$30,523	$760,918	1,853	$411
	2014	$653,602	$13,055	$113,309	$30,523	$810,489	1,048	$773
Red Deer	2012	$657,721	$87,632	$51,817	$8,357	$805,527	8,611	$94
	2013	$675,503	$76,458	$45,327	$8,353	$805,641	8,957	$90
	2014	$747,377	$115,225	$72,674	$8,356	$943,632	9,526	$99

2.5.2 Lessons learned

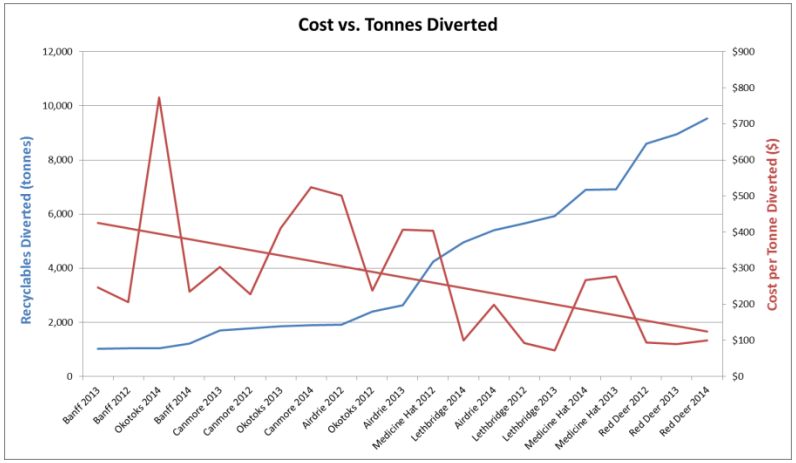
1. There may be a public perception that the sale of recyclables generates revenue to exceed the cost of handling and marketing. Revenues do offset costs; however, this has not been studied in this report.
2. Recyclables handling and marketing costs relate to;
   - **Scale**
     If the volume of recyclables can be increased then fixed costs can be diluted. This was not studied.

- **Proximity to markets**
  The closer a municipality is to markets for recyclables, the lower the transportation cost. An interim step to achieve this is to wait on shipping until full loads are available. This approach lowers the transportation cost per tonne.

3. All municipalities market all recyclables collected. Municipalities do not preferentially market only selected recyclables with higher selling prices.

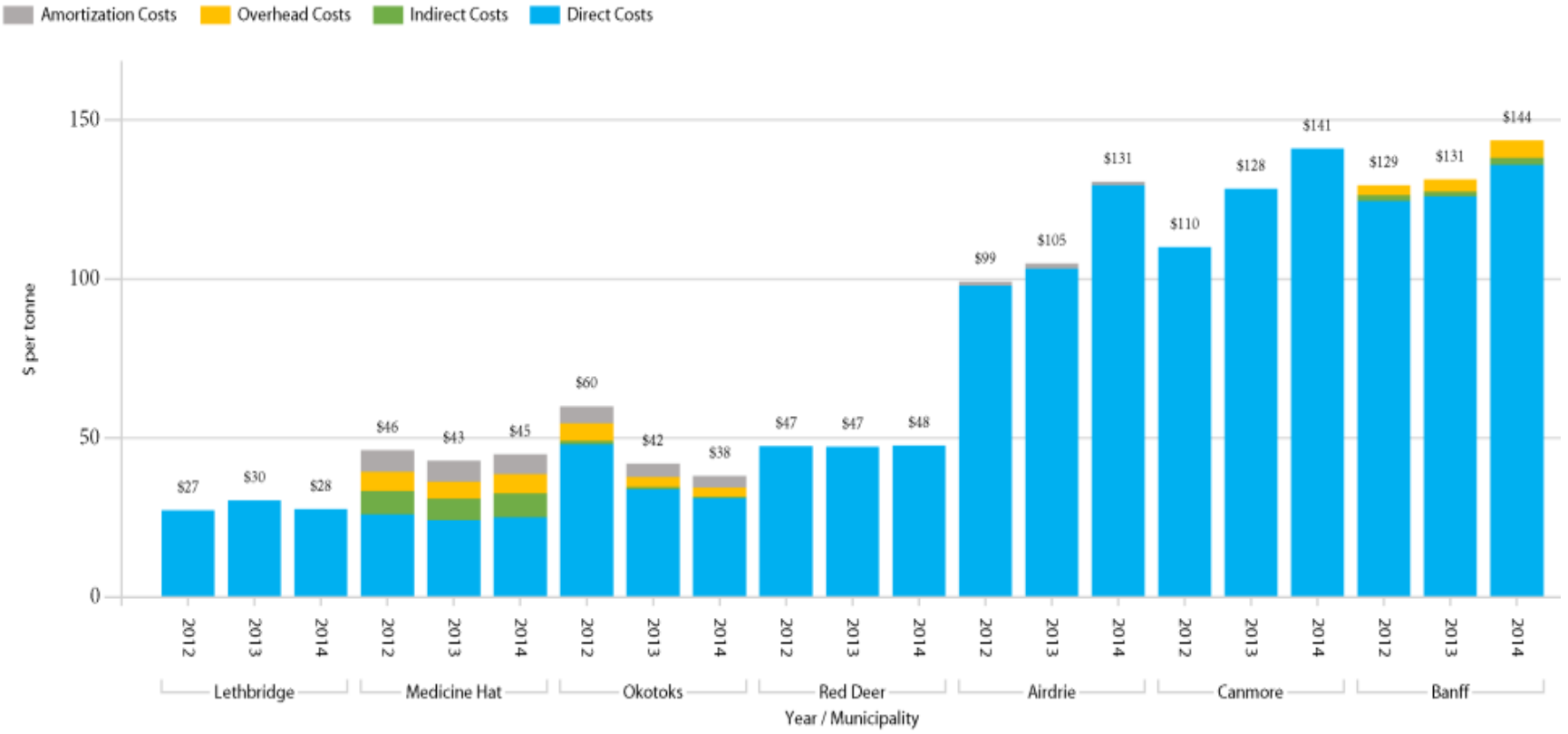
4. New handling facilities and new recycling programs increase tonnes recycled. For example;
   - In 2014 Canmore brought online a new automated recycling facility.
   - In 2014 Airdrie started an organics recycling program.

5. The cost per tonne to handle and market recyclables decreases with increasing tonnes diverted. While there is considerable variation in cost per tonne diverted the trend line (red) is down as tonnes diverted increases.



2.6 Garbage Handling and Disposal Cost ($/tonne garbage collected) - Efficiency

This chart shows the cost of handling garbage (end-of-life waste) and disposal by transportation to a landfill plus tipping fees per tonne of garbage collected by cost type; direct, indirect, overhead and amortization. Municipalities are in order from lowest to highest cost based on the average of 2012, 2013, 2014 results.



2.6.1 Garbage Handling and Disposal Data (handling + disposal) (See Section 3 for definitions of each column heading)

Municipality	Year	Direct Costs ($)	Indirect Costs ($)	Overhead Costs ($)	Amortization Costs ($)	Total Costs ($)	Garbage Collected (tonnes)	Cost per Tonne Collected ($)
Airdrie	2012	$806,399	$0	$0	$10,328	$816,727	8,229	$99
	2013	$902,225	$0	$0	$15,123	$917,348	8,737	$105
	2014	$1,033,766	$0	$0	$8,487	$1,042,253	7,976	$131
Banff	2012	$164,364	$2,284	$4,970	$0	$171,618	1,319	$130
	2013	$203,160	$2,447	$7,213	$0	$212,820	1,612	$132
	2014	$201,455	$3,128	$9,432	$0	$214,016	1,482	$144
Canmore	2012	$330,815	$0	$0	$0	$330,815	3,006	$110
	2013	$415,323	$0	$0	$0	$415,323	3,233	$128
	2014	$452,494	$0	$0	$0	$452,494	3,206	$141
Lethbridge	2012	$713,643	$0	$0	$0	$713,643	26,167	$27
	2013	$819,705	$0	$0	$0	$819,705	26,897	$30
	2014	$745,176	$0	$0	$0	$745,176	26,873	$28
Medicine Hat	2012	$515,158	$141,334	$119,239	$134,169	$909,900	19,709	$46
	2013	$550,940	$151,354	$121,472	$150,546	$974,312	22,704	$43
	2014	$544,762	$164,864	$128,352	$134,169	$972,147	21,672	$45
Okotoks	2012	$341,388	$8,303	$38,877	$38,107	$426,675	7,105	$60
	2013	$305,190	$5,230	$27,831	$38,107	$376,358	8,969	$42
	2014	$334,455	$3,816	$33,117	$38,107	$409,495	10,752	$38
Red Deer	2012	$1,413,047	$0	$0	$0	$1,413,047	29,758	$47
	2013	$1,459,953	$0	$0	$0	$1,459,953	30,814	$47
	2014	$1,549,589	$0	$0	$0	$1,549,589	32,503	$48

NOTES:

1. Airdrie, Canmore, Lethbridge and Red Deer have no indirect, overhead and amortization costs of because they fully contract disposal.

2.6.2 Lessons Learned

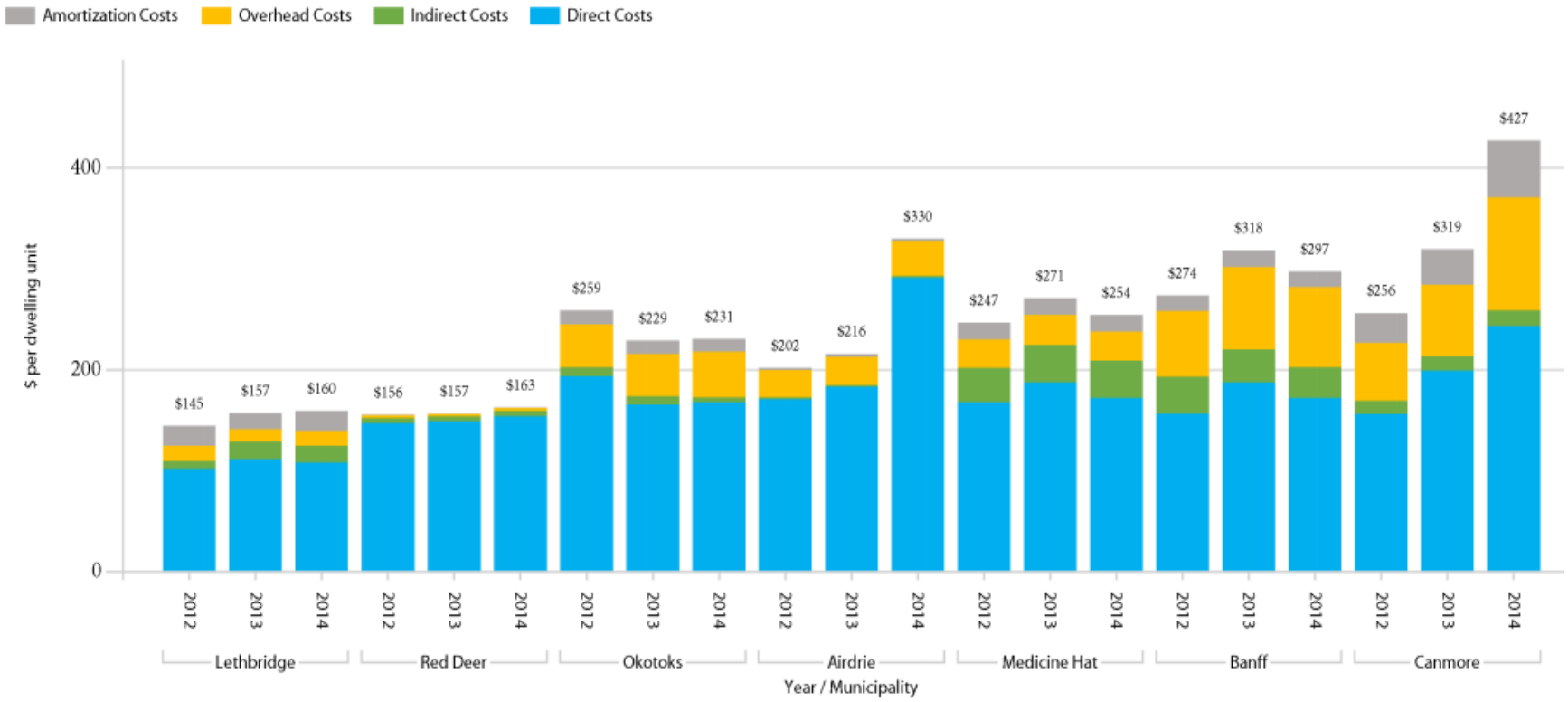
1. Distance to landfill has the largest impact on disposal cost per tonne. Lethbridge, Medicine Hat and Red Deer have local landfill sites while the others operate a transfer station and then have to long haul waste to landfill disposal sites.

2. Tipping fees vary but have a lesser effect on direct costs compared to transportation costs. Airdrie has the highest tipping fees as they haul to a landfill operated by Calgary.

Tipping Fees	
	$/tonne
Lethbridge	$ 21
Canmore	$ 35
Banff	$ 35
Medicine Hat	$ 52
Okotoks	$ 60
Red Deer	$ 64
Airdrie	$ 113

2.7 Residential Solid Waste Total Costs 3 ($/dwelling unit serviced) – Efficiency

This chart shows the total cost of collection, recyclables handling and marketing and garbage handling and disposal per dwelling unit serviced by cost type; direct, indirect, overhead, amortization. Municipalities are in order from lowest to highest cost based on the average of 2012, 2013, 2014 results.



2.7.1 Total Cost Data (See Section 3 for definitions of each column heading)

Municipality	Year	Direct Costs ($)	Indirect Costs ($)	Overhead Costs ($)	Amortization Costs ($)	Total Costs ($)	Dwelling Units Serviced (#)	Cost per Dwelling Unit Serviced ($)
Airdrie	2012	$2,262,964	$23,211	$356,234	$28,982	$2,671,391	13,229	$202
	2013	$2,592,192	$23,489	$400,342	$43,451	$3,059,474	14,160	$216
	2014	$4,347,386	$25,958	$520,322	$35,691	$4,929,357	14,932	$330
Banff	2012	$489,682	$114,626	$249,467	$49,298	$903,073	3,129	$289
	2013	$587,928	$101,482	$299,164	$52,310	$1,040,884	3,129	$333
	2014	$575,717	$102,118	$307,917	$50,437	$1,036,189	3,346	$310
Canmore	2012	$1,006,265	$87,406	$369,929	$189,918	$1,653,518	6,451	$256
	2013	$1,259,076	$92,655	$446,766	$222,187	$2,020,684	6,326	$319
	2014	$1,574,473	$101,020	$726,260	$363,847	$2,765,600	6,474	$427
Lethbridge	2012	$3,639,750	$286,031	$520,677	$717,632	$5,164,090	35,696	$145
	2013	$4,038,695	$638,248	$450,038	$581,723	$5,708,704	36,273	$157
	2014	$3,979,896	$619,303	$550,350	$729,406	$5,878,955	36,834	$160
Medicine Hat	2012	$3,724,897	$750,799	$633,425	$362,904	$5,472,025	22,176	$247
	2013	$4,196,659	$829,228	$665,512	$368,655	$6,060,054	22,362	$271
	2014	$3,890,527	$837,714	$652,187	$362,904	$5,743,332	22,596	$254
Okotoks	2012	$1,755,202	$81,830	$383,159	$125,791	$2,345,982	9,059	$259
	2013	$1,539,657	$73,173	$389,368	$125,791	$2,127,989	9,288	$229
	2014	$1,656,089	$51,155	$443,989	$125,791	$2,277,024	9,873	$231
Red Deer	2012	$5,795,629	$187,445	$110,836	$16,700	$6,110,610	39,295	$156
	2013	$5,960,406	$180,862	$107,221	$16,691	$6,265,180	39,931	$157
	2014	$6,253,910	$213,544	$134,685	$16,698	$6,618,837	40,611	$163

NOTES:

1. Dwelling units serviced by a municipality = total dwelling units (from the most recent census) less dwelling units serviced by private solid waste contractors, e.g. multi-unit buildings.

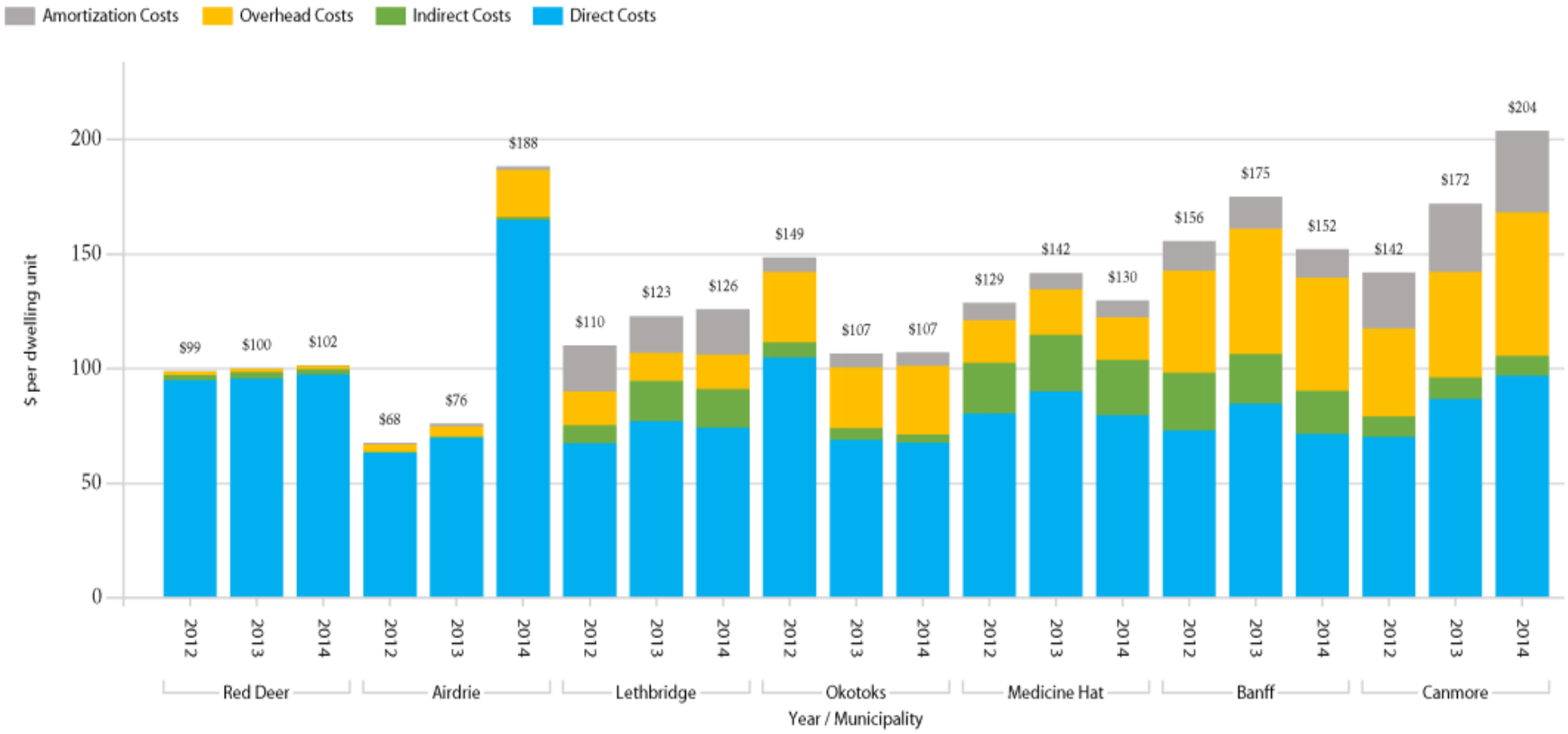
2.7.2 Lessons Learned

1. The number of dwelling units for Airdrie and Red Deer is higher than all others because they contract all collection including multi-unit buildings. The others excluded dwelling units collected by private

contractors. However, the difference was deemed to have a minimal effect on cost per dwelling unit serviced. This analysis will be refined in the future.

2.8 Collection Total Costs ($/dwelling unit serviced) – Efficiency

This chart shows the total cost of collecting solid waste per dwelling unit serviced by cost type; direct, indirect, overhead and amortization. Municipalities are in order from lowest to highest cost based on the average of 2012, 2013, 2014 results.



2.8.1 Collection Data (See Section 3 for definitions of each column heading)

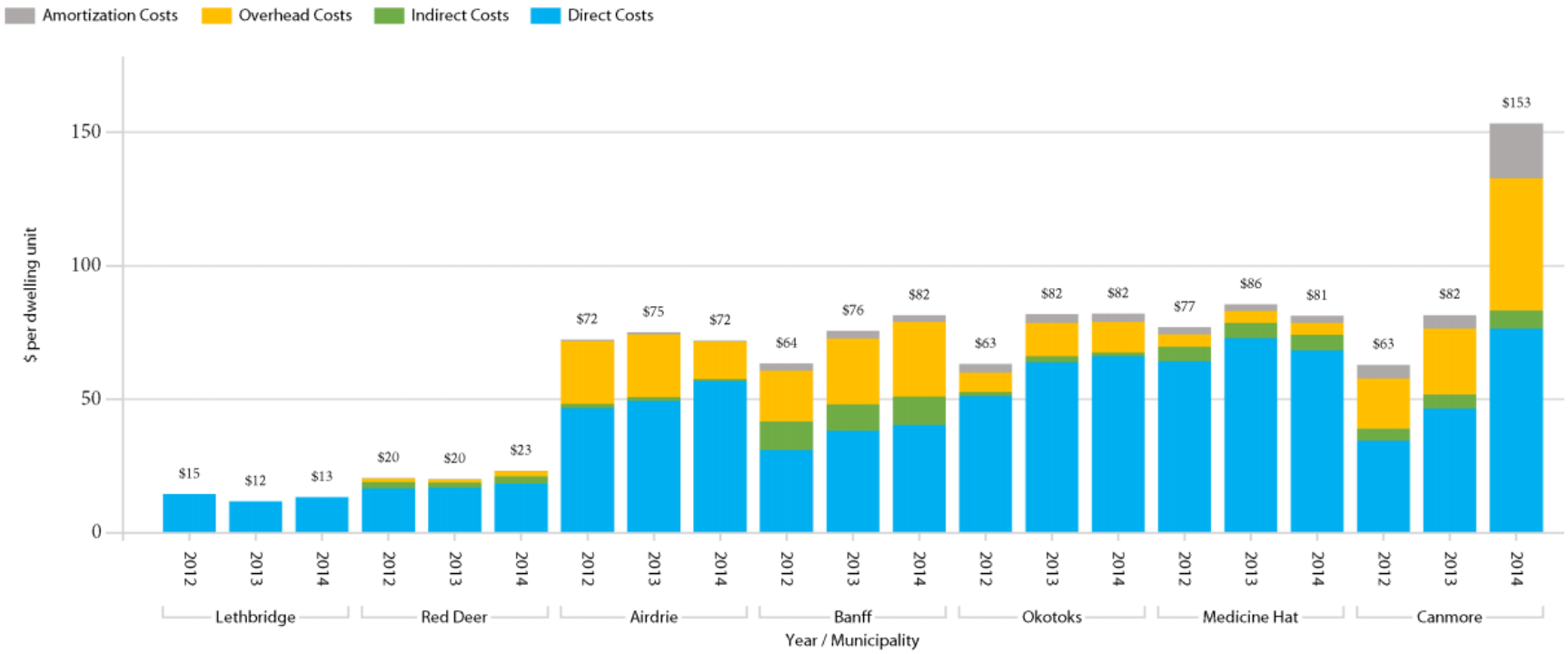
Municipality	Year	Direct Costs ($)	Indirect Costs ($)	Overhead Costs ($)	Amortization Costs ($)	Total Costs ($)	Dwelling Units Serviced (#)	Cost per Dwelling Unit Serviced ($)
Airdrie	2012	838283	2866	43980	10736	895865	13,229	$68
	2013	989228	3978	67797	16582	1077584	14,160	$76
	2014	2464162	15522	311139	20230	2811053	14,932	$188
Banff	2012	228284	78833	171569	40459	519146	3,129	$166
	2013	264999	68208	201074	43233	577514	3,129	$185
	2014	239132	63249	190715	41857	534952	3,346	$160
Canmore	2012	452654	58575	247908	157266	916404	6,451	$142
	2013	548679	60252	290525	189535	1088991	6,326	$172
	2014	627184	56470	405978	230155	1319787	6,474	$204
Lethbridge	2012	2406107	286031	520677	717632	3930447	35,696	$110
	2013	2792320	638248	450038	581723	4462329	36,273	$123
	2014	2740939	619303	550350	729406	4639998	36,834	$126
Medicine Hat	2012	1784416	488416	412060	168015	2852907	22,176	$129
	2013	2013213	552189	443169	163531	3172102	22,362	$142
	2014	1799581	543623	423228	168015	2934446	22,596	$130
Okotoks	2012	950015	59620	279161	57161	1345957	9,059	$149
	2013	641652	46178	245722	57161	990713	9,288	$107
	2014	668032	34284	297563	57161	1057040	9,873	$107
Red Deer	2012	3724861	99813	59019	8343	3892036	39,295	$99
	2013	3824950	104404	61894	8338	3999586	39,931	$100
	2014	3956944	98319	62011	8342	4125616	40,611	$102

2.8.2 Lessons Learned

1. Banff and Canmore offer different service levels that contribute to higher costs per dwelling unit; 24 hour access to bear proof communal collection bins vs. weekly curbside collection.

2.9 Recyclables, Handling and Marketing Total Costs ($/dwelling unit serviced) – Efficiency

This chart shows the cost of handling and marketing recyclables per dwelling unit serviced by cost type; direct, indirect, overhead and amortization. Municipalities are in order from lowest to highest cost based on the average of 2012, 2013, 2014 results.



2.9.1 Recyclables Handling and Marketing Data (See Section 3 for definitions of each column heading)

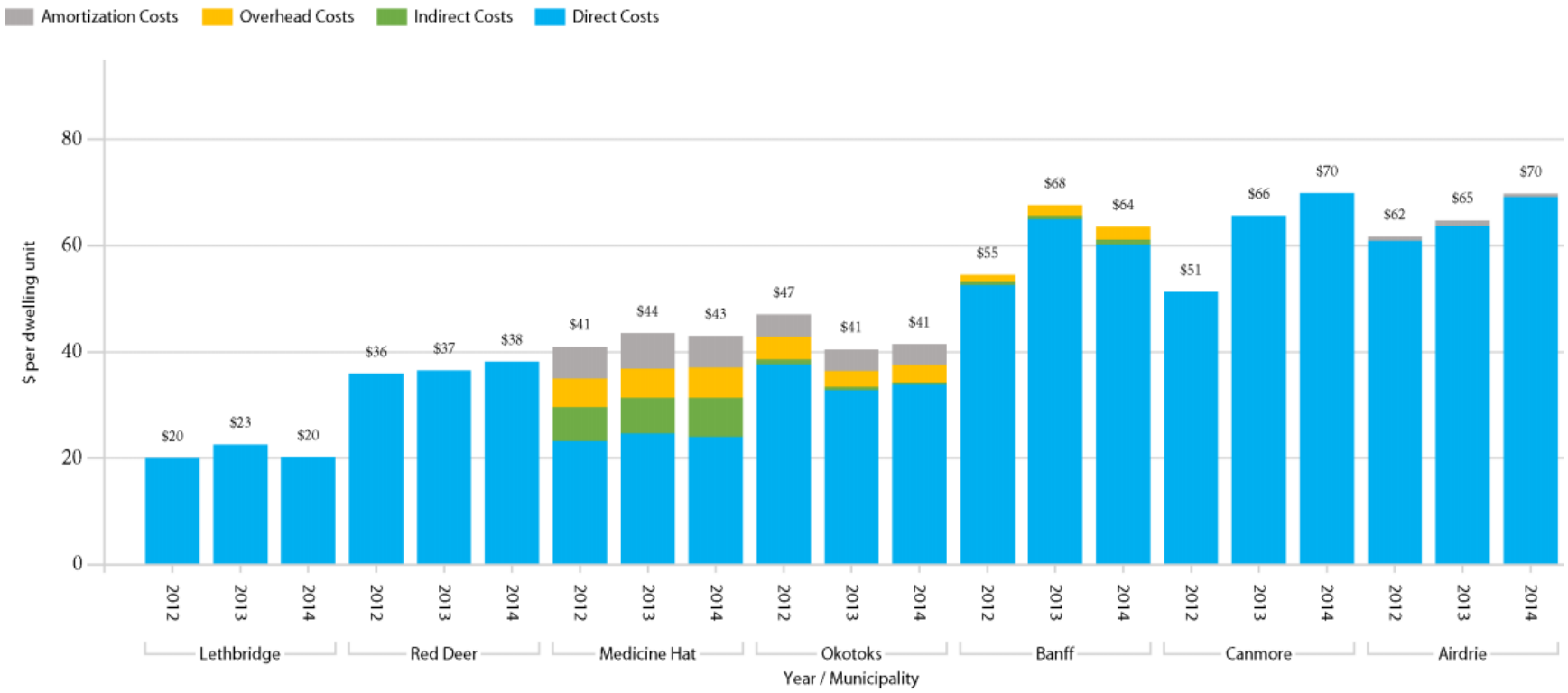
Municipality	Year	Direct Costs ($)	Indirect Costs ($)	Overhead Costs ($)	Amortization Costs ($)	Total Costs ($)	Dwelling Units Serviced (#)	Cost per Dwelling Unit Serviced ($)
Airdrie	2012	$618,282	$20,345	$312,253	$7,918	$958,799	13,229	$72
	2013	$700,739	$19,511	$332,546	$11,746	$1,064,542	14,160	$75
	2014	$849,458	$10,436	$209,183	$6,974	$1,076,051	14,932	$72
Banff	2012	$97,034	$33,509	$72,927	$8,839	$212,309	3,129	$68
	2013	$119,769	$30,827	$90,877	$9,077	$250,551	3,129	$80
	2014	$135,130	$35,741	$107,770	$8,580	$287,221	3,346	$86
Canmore	2012	$222,796	$28,831	$122,020	$32,652	$406,299	6,451	$63
	2013	$295,074	$32,403	$156,241	$32,652	$516,370	6,326	$82
	2014	$494,795	$44,550	$320,282	$133,692	$993,319	6,474	$153
Lethbridge	2012	$520,000	$0	$0	$0	$520,000	35,696	$15
	2013	$426,670	$0	$0	$0	$426,670	36,273	$12
	2014	$493,781	$0	$0	$0	$493,781	36,834	$13
Medicine Hat	2012	$1,425,323	$121,049	$102,125	$60,720	$1,709,217	22,176	$77
	2013	$1,632,506	$125,686	$100,871	$54,578	$1,913,641	22,362	$86
	2014	$1,546,184	$129,227	$100,607	$60,720	$1,836,739	22,596	$81
Okotoks	2012	$463,799	$13,908	$65,121	$30,523	$573,350	9,059	$63
	2013	$592,815	$21,765	$115,815	$30,523	$760,918	9,288	$82
	2014	$653,602	$13,055	$113,309	$30,523	$810,489	9,873	$82
Red Deer	2012	$657,721	$87,632	$51,817	$8,357	$805,527	39,295	$20
	2013	$675,503	$76,458	$45,327	$8,353	$805,641	39,931	$20
	2014	$747,377	$115,225	$72,674	$8,356	$943,632	40,611	$23

2.9.2 Lessons Learned

1. See section 2.5 Recyclables Handling and Marketing ($/tonne collected).

2.10 Garbage Handling and Disposal Total Cost ($/dwelling unit serviced) – Efficiency

This chart shows the cost of having handling garbage (end-of-life waste) and disposal by transportation to a landfill plus tipping fees per dwelling unit serviced by cost type; direct, indirect, overhead and amortization. Municipalities are in order from lowest to highest cost based on the average of 2012, 2013, 2014 results.



2.10.1 Garbage Handling and Disposal Data (See Section 3 for definitions of each column heading)

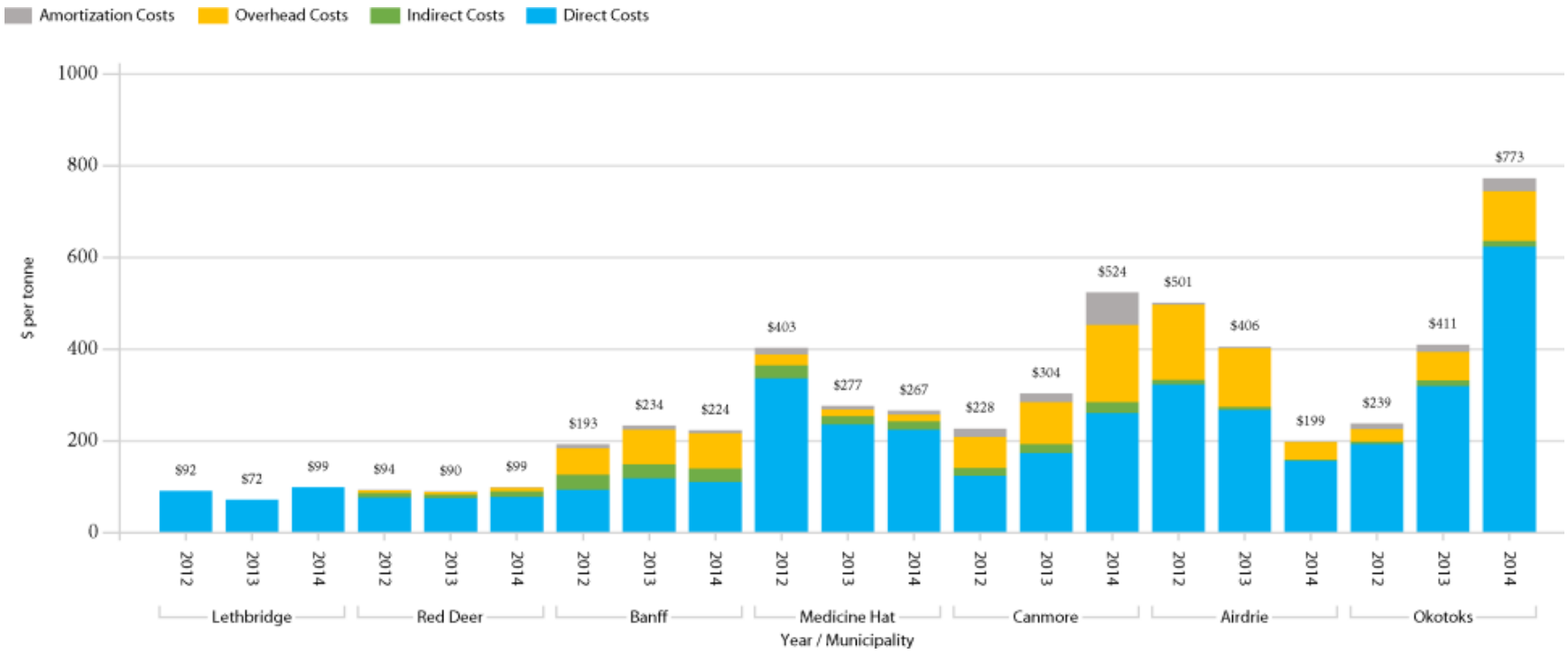
Municipality	Year	Direct Costs ($)	Indirect Costs ($)	Overhead Costs ($)	Amortization Costs ($)	Total Costs ($)	Dwelling Units Serviced (#)	Cost per Dwelling Unit Serviced ($)
Airdrie	2012	$806,399	$0	$0	$10,328	$816,727	13,229	$62
	2013	$902,225	$0	$0	$15,123	$917,348	14,160	$65
	2014	$1,033,766	$0	$0	$8,487	$1,042,253	14,932	$70
Banff	2012	$164,364	$2,284	$4,970	$0	$171,618	3,129	$55
	2013	$203,160	$2,447	$7,213	$0	$212,820	3,129	$68
	2014	$201,455	$3,128	$9,432	$0	$214,016	3,346	$64
Canmore	2012	$330,815	$0	$0	$0	$330,815	6,451	$51
	2013	$415,323	$0	$0	$0	$415,323	6,326	$66
	2014	$452,494	$0	$0	$0	$452,494	6,474	$70
Lethbridge	2012	$713,643	$0	$0	$0	$713,643	35,696	$20
	2013	$819,705	$0	$0	$0	$819,705	36,273	$23
	2014	$745,176	$0	$0	$0	$745,176	36,834	$20
Medicine Hat	2012	$515,158	$141,334	$119,239	$134,169	$909,900	22,176	$41
	2013	$550,940	$151,354	$121,472	$150,546	$974,312	22,362	$44
	2014	$544,762	$164,864	$128,352	$134,169	$972,147	22,596	$43
Okotoks	2012	$341,388	$8,303	$38,877	$38,107	$426,675	9,059	$47
	2013	$305,190	$5,230	$27,831	$38,107	$376,358	9,288	$41
	2014	$334,455	$3,816	$33,117	$38,107	$409,495	9,873	$41
Red Deer	2012	$1,413,047	$0	$0	$0	$1,413,047	39,295	$36
	2013	$1,459,953	$0	$0	$0	$1,459,953	39,931	$37
	2014	$1,549,589	$0	$0	$0	$1,549,589	40,611	$38

2.10.2 Lessons learned

1. See section 2.6 Garbage Handling and Disposal ($/tonne disposed).

2.11 Recyclables Handling Cost ($/tonnes recycled, front end) – Efficiency

This chart shows the cost of handling recyclables from the waste stream per tonne recycled at the front end of the solid waste processing facility by cost type; direct, indirect, overhead and amortization. Municipalities are in order from lowest to highest cost based on the average of 2012, 2013, 2014 results.



2.11.1 Recyclables Handling and Marketing Data (See Section 3 for definitions of each column heading)

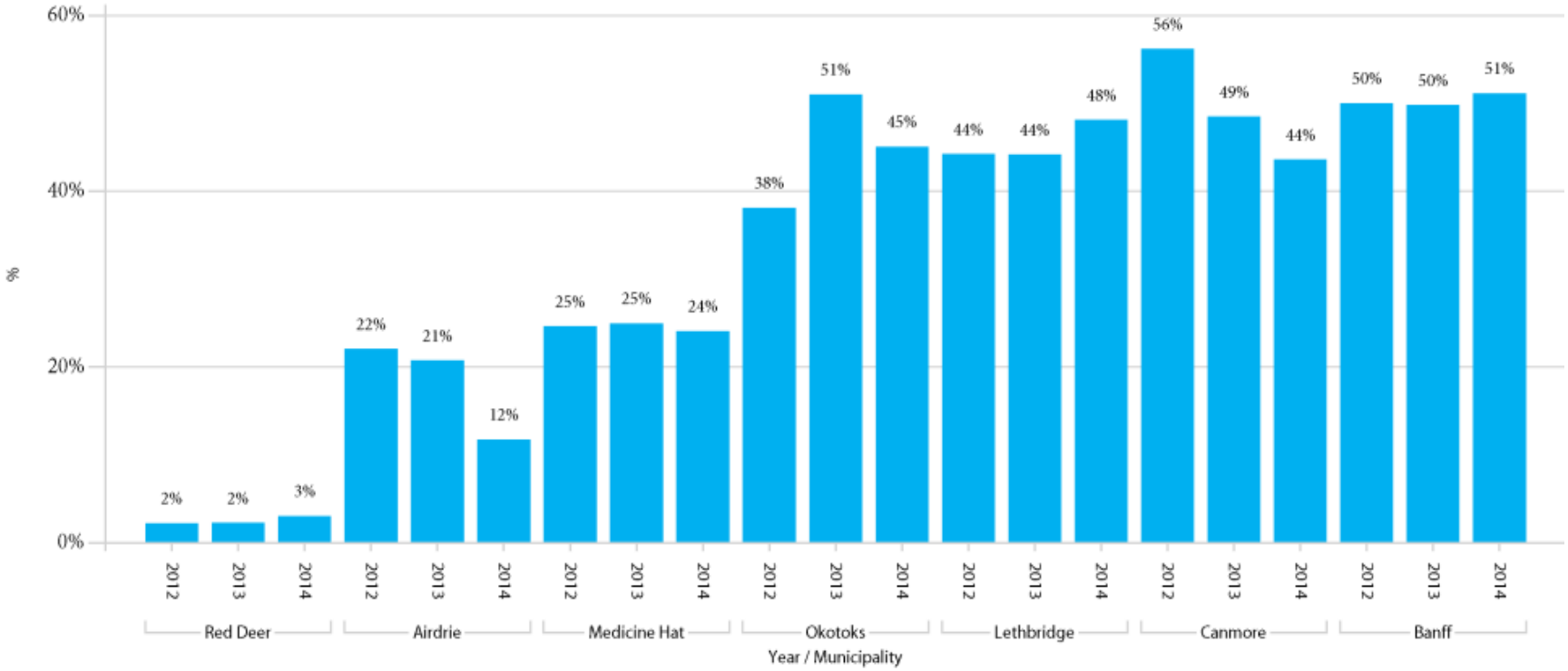
Municipality	Year	Direct Costs ($)	Indirect Costs ($)	Overhead Costs ($)	Amortization Costs ($)	Total Costs ($)	Recyclables Diverted, front end (tonnes)	Cost per Tonne Diverted ($)
Airdrie	2012	$618,282	$20,345	$312,253	$7,918	$958,799	1,913	$501
	2013	$700,739	$19,511	$332,546	$11,746	$1,064,542	2,621	$406
	2014	$849,458	$10,436	$209,183	$6,974	$1,076,051	5,412	$199
Banff	2012	$97,034	$33,509	$72,927	$8,839	$212,309	1,029	$206
	2013	$119,769	$30,827	$90,877	$9,077	$250,551	1,013	$247
	2014	$135,130	$35,741	$107,770	$8,580	$287,221	1,219	$236
Canmore	2012	$222,796	$28,831	$122,020	$32,652	$406,299	1,785	$228
	2013	$295,074	$32,403	$156,241	$32,652	$516,370	1,698	$304
	2014	$494,795	$44,550	$320,282	$133,692	$993,319	1,896	$524
Lethbridge	2012	$520,000	$0	$0	$0	$520,000	5,662	$92
	2013	$426,670	$0	$0	$0	$426,670	5,934	$72
	2014	$493,781	$0	$0	$0	$493,781	4,964	$99
Medicine Hat	2012	$1,425,323	$121,049	$102,125	$60,720	$1,709,217	4,237	$403
	2013	$1,632,506	$125,686	$100,871	$54,578	$1,913,641	6,918	$277
	2014	$1,546,184	$129,227	$100,607	$60,720	$1,836,739	6,890	$267
Okotoks	2012	$463,799	$13,908	$65,121	$30,523	$573,350	2,403	$239
	2013	$592,815	$21,765	$115,815	$30,523	$760,918	1,853	$411
	2014	$653,602	$13,055	$113,309	$30,523	$810,489	1,048	$773
Red Deer	2012	$657,721	$87,632	$51,817	$8,357	$805,527	8,611	$94
	2013	$675,503	$76,458	$45,327	$8,353	$805,641	8,957	$90
	2014	$747,377	$115,225	$72,674	$8,356	$943,632	9,526	$99

2.11.2 Lessons learned

1. Handling and marketing of recyclables increases the total solid waste service cost.

2.12 Labour vs. Total Direct Costs (%)

This chart shows what percentage of total direct costs are labour costs. Municipalities are in order from lowest to highest cost based on the average of 2012, 2013, 2014 results.



2.12.1 Direct Labour Data (See Section 3 for definitions of each column heading)

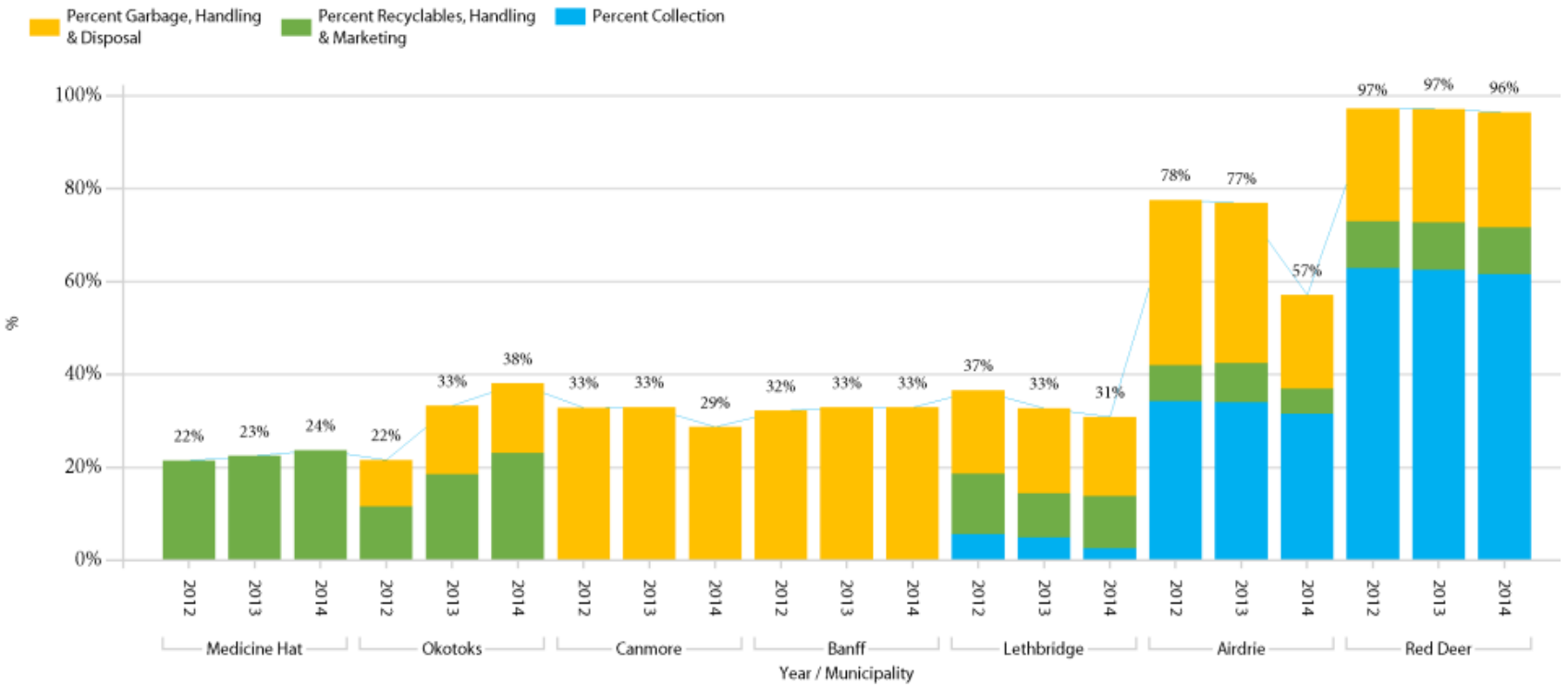
Municipality	Year	Labour Costs ($)	Total Direct Costs ($)	Percent (%)
Airdrie	2012	$500,601	$2,266,416	22%
	2013	$542,873	$2,616,174	21%
	2014	$603,734	$5,127,881	12%
Banff	2012	$245,047	$489,682	50%
	2013	$292,884	$587,928	50%
	2014	$294,564	$575,717	51%
Canmore	2012	$565,639	$1,006,265	56%
	2013	$610,763	$1,259,076	49%
	2014	$686,843	$1,574,473	44%
Lethbridge	2012	$1,757,690	$3,973,699	44%
	2013	$1,979,848	$4,481,897	44%
	2014	$2,106,355	$4,376,771	48%
Medicine Hat	2012	$1,132,217	$4,593,612	25%
	2013	$1,307,137	$5,228,601	25%
	2014	$1,140,226	$4,729,280	24%
Okotoks	2012	$795,677	$2,086,044	38%
	2013	$801,259	$1,569,707	51%
	2014	$780,510	$1,730,643	45%
Red Deer	2012	$131,676	$5,797,661	2%
	2013	$138,120	$5,962,455	2%
	2014	$193,501	$6,255,583	3%

2.12.2 Lessons learned

1. The labour component of direct costs is similar and about 50% for those municipalities who provide the solid waste service in-house. The more of the service that is contracted out the less labour cost, however, this cost will be reflected in the contract cost.

2.13 Contract vs. Total Direct Costs (%)

This chart shows what percentage of total direct costs are contracted costs. Red Deer contracts out 97% of the solid waste service (3% is internal cost to inspect contractor performance and manage the contracts). The chart shows the portion of that total contracted cost that is made up of each of the three components, e.g. about 62% is collection, about 10% is recyclables handling and marketing and about 25% is garbage handling and disposal. Canmore and Banff only contract out Garbage Handling and Disposal. Municipalities are in order from lowest to highest cost based on the average of 2012, 2013, 2014 results.



2.13.1 Contracting Data (See Section 3 for definitions of each column heading)

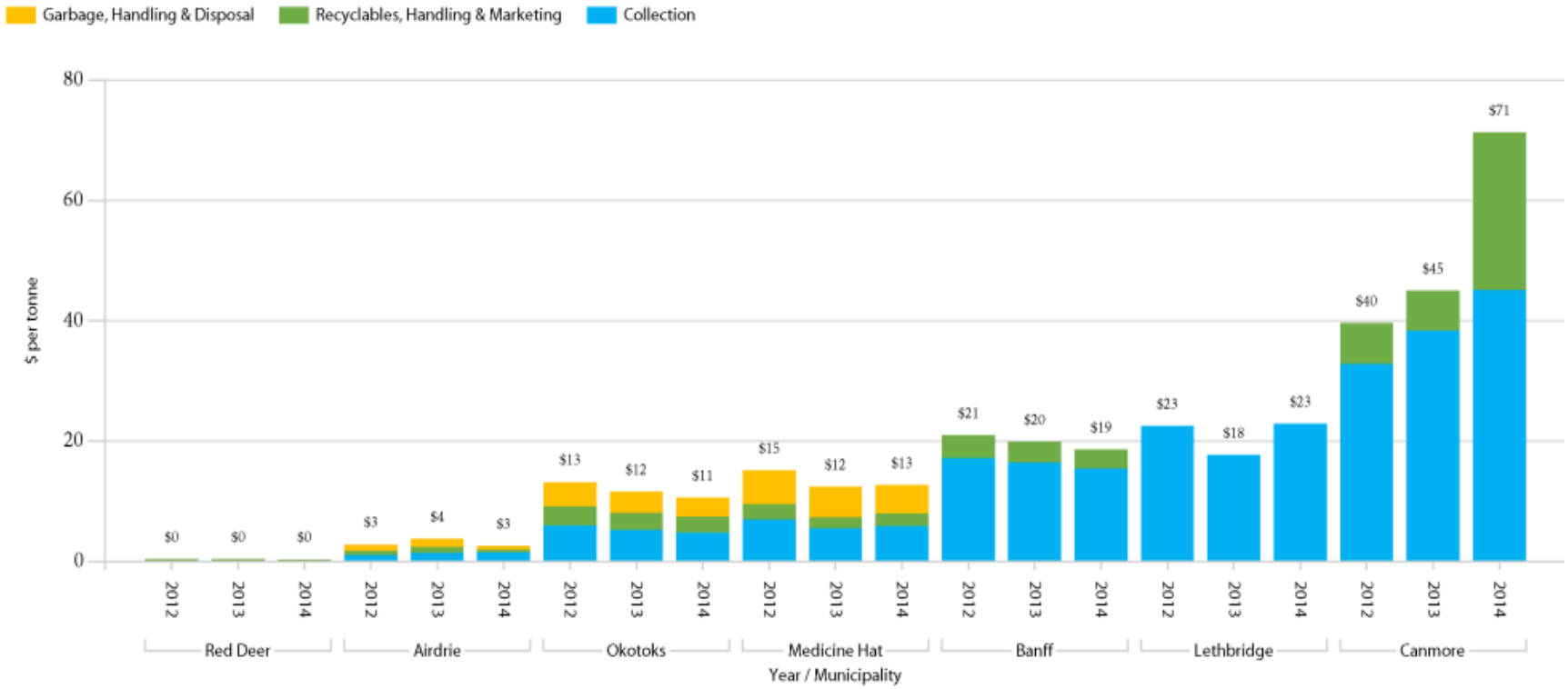
Municipality	Year	Collection Contract Costs ($)	Recyclables Contract Costs ($)	Garbage Contract Costs ($)	Total Contract Costs ($)	Total Direct Costs ($)	Percent (%)
Airdrie	2012	$776,053	$176,459	$806,399	$1,758,911	$2,266,416	78%
	2013	$891,199	$219,901	$902,225	$2,013,325	$2,616,174	77%
	2014	$1,616,581	$279,618	$1,033,766	$2,929,965	$5,127,881	57%
Banff	2012	$0	$0	$157,751	$157,751	$489,682	32%
	2013	$0	$0	$193,654	$193,654	$587,928	33%
	2014	$0	$0	$189,628	$189,628	$575,717	33%
Canmore	2012	$0	$0	$330,815	$330,815	$1,006,265	33%
	2013	$0	$0	$415,323	$415,323	$1,259,076	33%
	2014	$0	$0	$452,494	$452,494	$1,574,473	29%
Lethbridge	2012	$222,621	$520,000	$713,643	$1,456,264	$3,973,699	37%
	2013	$222,030	$426,670	$819,705	$1,468,405	$4,481,897	33%
	2014	$113,968	$493,781	$745,176	$1,352,925	$4,376,771	31%
Medicine Hat	2012	$4,156	$984,103	$0	$988,259	$4,593,612	22%
	2013	$3,204	$1,175,001	$0	$1,178,205	$5,228,601	23%
	2014	$3,285	$1,119,178	$0	$1,122,463	$4,729,280	24%
Okotoks	2012	$0	$242,187	$209,085	$451,272	$2,086,044	22%
	2013	$0	$290,387	$232,515	$522,902	$1,569,707	33%
	2014	$0	$399,222	$260,107	$659,329	$1,730,643	38%
Red Deer	2012	$3,643,346	$586,154	$1,413,047	$5,642,547	$5,797,661	97%
	2013	$3,730,252	$606,153	$1,459,953	$5,796,358	$5,962,455	97%
	2014	$3,856,067	$629,154	$1,549,589	$6,034,810	$6,255,583	96%

2.13.2 Lessons learned

1. There is a variation in how contractors are used to provide the solid waste service. Due to many variables such as service levels, cost of capital assets to switch to a new approach, the group decided there is no simple way to determine which approach is more cost effective.

2.14 Amortization Cost – Solid Waste Assets ($/tonnes collected) - Efficiency

This chart shows the amortization (depreciation) cost of the assets used to deliver the service per tonne collected by process. Municipalities are in order from lowest to highest cost based on the average of 2012, 2013, 2014 results.



2.14.1 Amortization – Solid Waste Assets Data (See Section 3 for definitions of each column heading)

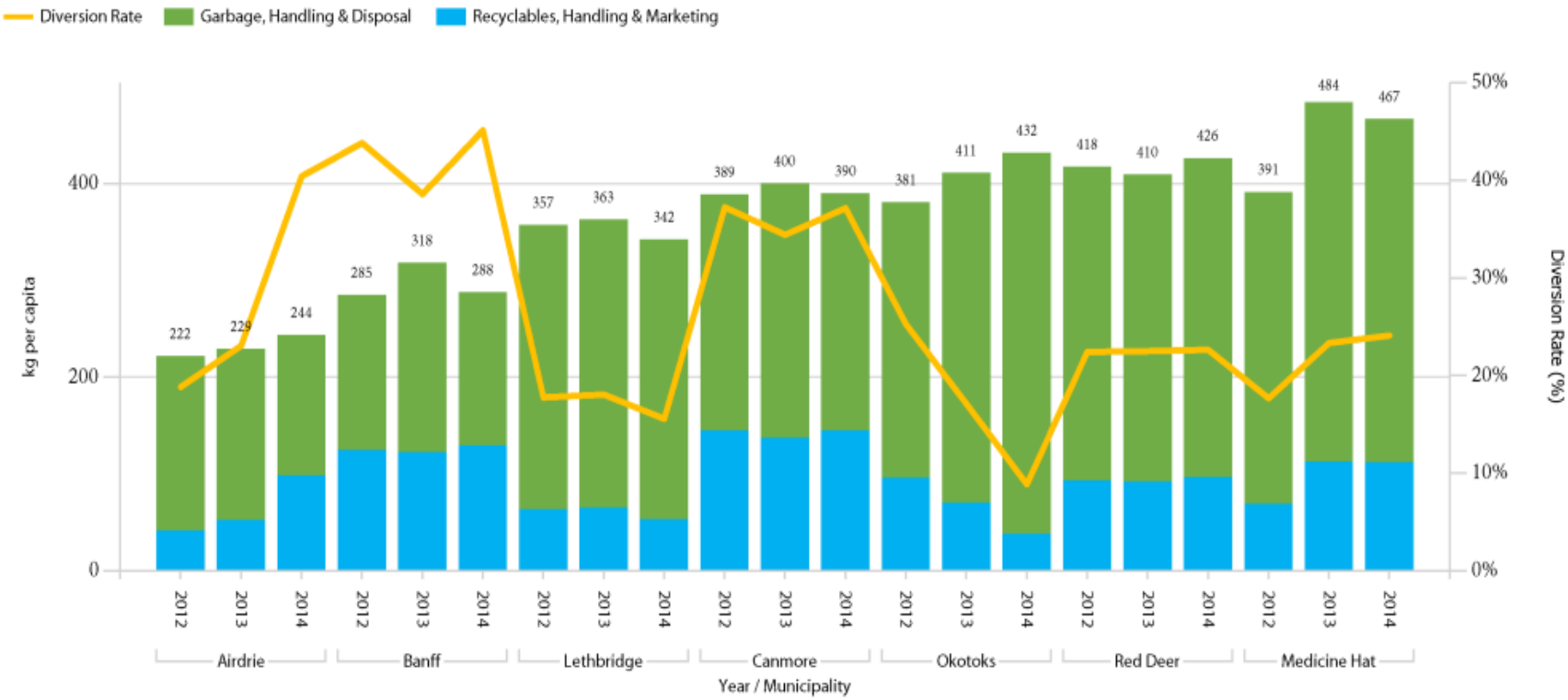
Municipality	Year	Collection ($)	Recyclables ($)	Garbage ($)	Total Costs ($)	Recyclables & Garbage Collected (tonnes)	Cost per Tonne Collected ($)
Airdrie	2012	$10,736	$7,918	$10,328	$28,982	10,142	$3
	2013	$16,582	$11,746	$15,123	$43,451	11,358	$4
	2014	$20,230	$6,974	$8,487	$35,691	13,388	$3
Banff	2012	$40,459	$8,839	$0	$49,298	2,348	$21
	2013	$43,233	$9,077	$0	$52,310	2,625	$20
	2014	$41,857	$8,580	$0	$50,437	2,700	$19
Canmore	2012	$157,266	$32,652	$0	$189,918	4,791	$40
	2013	$189,535	$32,652	$0	$222,187	4,931	$45
	2014	$230,155	$133,692	$0	$363,847	5,102	$71
Lethbridge	2012	$717,632	$0	$0	$717,632	31,409	$23
	2013	$581,723	$0	$0	$581,723	32,001	$18
	2014	$729,406	$0	$0	$729,406	30,828	$24
Medicine Hat	2012	$168,015	$60,720	$134,169	$362,904	23,946	$15
	2013	$163,531	$54,578	$150,546	$368,655	29,622	$12
	2014	$168,015	$60,720	$134,169	$362,904	28,562	$13
Okotoks	2012	$57,161	$30,523	$38,107	$125,791	9,508	$13
	2013	$57,161	$30,523	$38,107	$125,791	10,822	$12
	2014	$57,161	$30,523	$38,107	$125,791	11,800	$11
Red Deer	2012	$8,343	$8,357	$0	$16,700	38,369	$0.44
	2013	$8,338	$8,353	$0	$16,691	39,771	$0.42
	2014	$8,342	$8,356	$0	$16,698	42,029	$0.40

2.14.2 Lessons Learned

1. The amortization (useful life) cost will be related to useful life of the various assets in the future. The useful life of collection assets (carts/bins) needs to be revisited as more data is collected on their average life expectancy. This is because, in some cases, average life is exceeding the useful life that was set when the assets were purchased.

2.15 Residential Solid Waste Statistics (kg/capita) - Effectiveness

This chart shows what portion of the total solid waste collected is recycled and what portion is garbage disposed to a landfill in kilograms per capita. The diversion rate is the ratio (percentage) of weight recycled to total weight collected. Municipalities are in order from lowest to highest cost based on the average of 2012, 2013, 2014 results.



2.15.1 Diversion Rate Data (See Section 3 for definitions of each column heading)

Municipality	Year	Recyclables (tonnes)	Garbage (tonnes)	Collected (tonnes)	Municipal Population (#)	Recycled per Capita (kg)	Garbage per Capita (kg)	Diversion Rate (%)
Airdrie	2012	1,913	8,229	10,142	45,711	42	180	19%
	2013	2,621	8,737	11,358	49,560	53	176	23%
	2014	5,412	7,976	13,388	54,891	99	145	40%
Banff	2012	1,029	1,319	2,348	8,244	125	160	44%
	2013	1,013	1,612	2,625	8,244	123	195	39%
	2014	1,219	1,482	2,700	9,386	130	158	45%
Canmore	2012	1,785	3,006	4,791	12,317	145	244	37%
	2013	1,698	3,233	4,931	12,317	138	262	34%
	2014	1,896	3,206	5,102	13,077	145	245	37%
Lethbridge	2012	5,662	26,167	31,829	89,074	64	294	18%
	2013	5,934	26,897	32,831	90,417	66	297	18%
	2014	4,964	26,873	31,837	93,004	53	289	16%
Medicine Hat	2012	4,237	19,709	23,946	61,180	69	322	18%
	2013	6,918	22,704	29,622	61,180	113	371	23%
	2014	6,890	21,672	28,562	61,180	113	354	24%
Okotoks	2012	2,403	7,105	9,508	24,962	96	285	25%
	2013	1,853	8,969	10,822	26,319	70	341	17%
	2014	1,048	10,752	11,800	27,331	38	393	9%
Red Deer	2012	8,611	29,758	38,369	91,877	94	324	22%
	2013	8,957	30,814	39,771	97,109	92	317	23%
	2014	9,526	32,503	42,029	98,585	97	330	23%

NOTES:

1. The tonnes collected do not include solid waste collected by private contractors from multi-unit residences for all except Red Deer. This will be added in the future for this Performance Measure to give a more accurate number for weight of solid waste per capita.

2.15.2 Lessons Learned

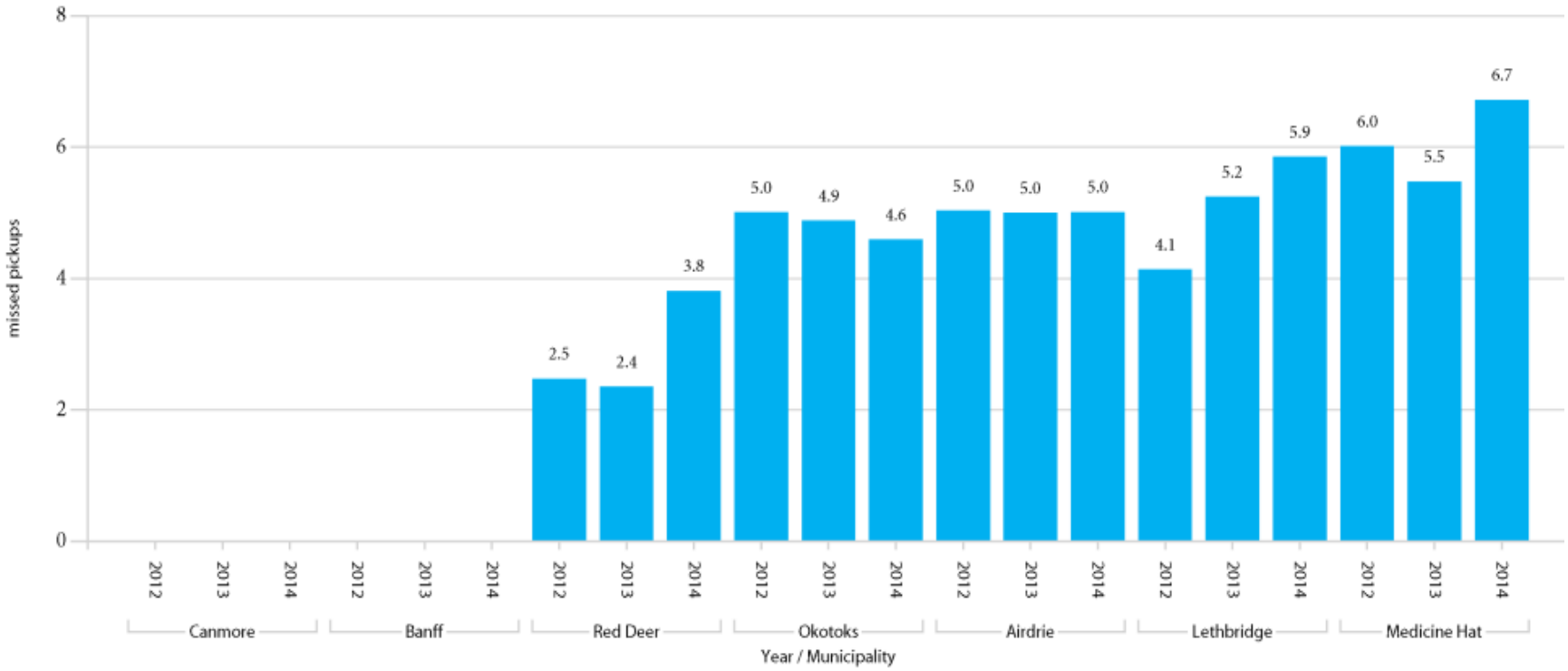
1. Municipal waste limits do not appear to drive diversion of recyclables
    - 2014 diversion rates for municipalities with waste limits are; Airdrie 40%, Medicine Hat 24%, Okotoks 9% and Red Deer 23%.

- Municipalities without waste limits have an average 2014 diversion rate of 35% (Banff, Canmore and Lethbridge).

2. Having "official" goals for diversion set by Council does not appear to increase diversion. No relationship can be derived from the data at this time. This needs further investigation, e.g. public awareness/support of the goals, measurement of the additional tonnes of recyclables collected when new recycling programs are implemented.

2.16 Curbside Collection Accuracy (# missed pick-ups/10,000 pickups) - Effectiveness

This chart shows the accuracy of curbside pick-up; the number of residents reporting their solid waste was not picked up as scheduled per 10,000 actual pick-ups. Municipalities are in order from lowest to highest cost based on the average of 2012, 2013, 2014 results.



2.16.1 Collection Accuracy Data (See Section 3 for definitions of each column heading)

Municipality	Year	Missed Pickups (#)	Total Pickups (#)	Collection Accuracy (#/10,000 pickups)
Airdrie	2012	80	158,750	5.0
	2013	85	169,920	5.0
	2014	150	299,093	5.0
Banff	2012	0	0	0
	2013	0	0	0
	2014	0	0	0
Canmore	2012	0	0	0
	2013	0	0	0
	2014	0	0	0
Lethbridge	2012	601	1,450,540	4.1
	2013	785	1,495,728	5.2
	2014	914	1,559,948	5.9
Medicine Hat	2012	829	1,377,810	6.0
	2013	772	1,408,470	5.5
	2014	974	1,448,260	6.7
Okotoks	2012	236	471,068	5.0
	2013	236	482,976	4.9
	2014	236	513,396	4.6
Red Deer	2012	970	3,912,030	2.5
	2013	933	3,961,170	2.4
	2014	1,534	4,018,950	3.8

2.16.2 Lessons Learned

1. Municipalities with curbside collection (excludes Banff and Canmore) have similar, low missed pickup rates per year. Missed pickups are reported for two reasons that cannot be separated; customer failed to put waste out for pick up and collection vehicle missed garbage on the curb.

2.17 Residential Solid Waste Service Data **(See Section 3 for definitions of each column heading)**

This data consolidates the information about solid waste services for each municipality.

Part 1

Municipality	Year	Curbside Garbage (tonnes)	Curbside Recyclables (tonnes)	Communal Bins Garbage (tonnes)	Communal Bins Recyclables (tonnes)	Self-Haul Garbage (tonnes)	Self-Haul Recyclables (tonnes)	Landfill Recyclables Shipped (tonnes)
Airdrie	2012	8,229	0	0	0	0	1,913	2,047
	2013	8,737	0	0	0	0	2,621	2,075
	2014	7,976	3,606	0	0	0	1,806	2,336
Banff	2012	0	0	1,319	1,029	0	0	0
	2013	0	0	1,612	1,013	0	0	0
	2014	0	0	1,482	1,219	0	0	0
Canmore	2012	0	0	3,006	1,785	0	0	0
	2013	0	0	3,233	1,698	0	0	0
	2014	0	0	3,206	1,896	0	0	0
Lethbridge	2012	23,351	75	374	3,613	2,442	1,974	1,426
	2013	24,102	92	334	3,796	2,461	2,046	2,054
	2014	24,554	110	356	3,846	1,963	1,008	952
Medicine Hat	2012	13,184	2,916	0	0	6,525	1,321	6,570
	2013	13,567	3,126	0	0	9,137	3,792	7,082
	2014	13,680	3,213	0	0	7,992	3,677	7,433
Okotoks	2012	4,396	2,403	0	0	2,709	0	0
	2013	4,529	1,853	0	0	4,440	0	0
	2014	4,227	1,048	0	0	6,525	0	0
Red Deer	2012	17,143	6,932	5,974	1,013	6,641	666	1,133
	2013	17,487	7,210	6,137	922	7,190	825	1,237
	2014	18,228	7,491	6,603	1,031	7,672	1,004	1,302

Part 2

Municipality	Year	Curbside Carts Garbage (#)	Curbside Carts Recyclables (#)	Communal Bins Garbage (#)	Communal Bins Recyclables (#)	Rounds Ups, Toxic (# / year)	Round Ups, Xmas Trees (# / year)	Round Ups, Pumpkins (# / year)	Special Large Items (# / month)
Airdrie	2012	0	0	0	374	0	250	0	0
	2013	0	0	0	670	0	250	0	0
	2014	0	0	0	714	0	250	0	0
Banff	2012	0	0	199	96	1	1	1	740
	2013	0	0	199	96	1	1	1	852
	2014	0	0	199	96	1	1	1	1080
Canmore	2012	0	0	152	10	2	1	1	2
	2013	0	0	169	91	2	1	1	2
	2014	0	0	166	91	2	1	1	2
Lethbridge	2012	27,895	0	51	0	78	36	0	170
	2013	28,764	0	51	0	82	33	0	178
	2014	29,999	0	51	0	77	43	0	155
Medicine Hat	2012	21,654	9,837	522	0	1	3	0	0
	2013	21,840	10,549	522	0	1	3	0	0
	2014	22,082	11,472	514	0	1	3	0	0
Okotoks	2012	10,000	0	0	0	0	0	0	0
	2013	10,000	0	0	0	0	0	0	0
	2014	10,500	9,700	0	0	0	19.5	0	0
Red Deer	2012	0	0	469	490	1	0	0	0
	2013	0	0	477	506	1	0	0	0
	2014	0	0	476	530	1	0	0	0

Part 3; Useful Life Data

Municipality	Year	Useful Life Vehicles (years)	Average Life Vehicles (years)	Remaining Life Vehicles (years)	Useful Life Bins (years)	Average Life Bins (years)	Remaining Life Bins (years)	Useful Life Carts (years)	Average Life Carts (years)	Remaining Life Carts (years)
Airdrie	2012	0	0	0	0	0	0	0	0	0
	2013	0	0	0	0	0	0	0	0	0
	2014	0	0	0	0	0	0	10	1	9
Banff	2012	15	8	7	15	11	4	0	0	0
	2013	15	9	6	15	11	4	0	0	0
	2014	15	10	5	15	11	4	0	0	0
Canmore	2012	7	6	2	25	10	15	0	0	0
	2013	7	4	3	25	11	14	0	0	0
	2014	7	5	2	25	12	13	0	0	0
Lethbridge	2012	7	4	3	25	20	5	10	5	5
	2013	7	5	2	25	21	4	10	6	4
	2014	7	4	3	25	22	3	10	7	3
Medicine Hat	2012	7	5	3	10	10	0	10	3	7
	2013	7	5	2	10	11	0	10	4	6
	2014	7	6	1	10	11	0	10	5	5
Okotoks	2012	10	5	5	0	0	0	10	8	2
	2013	10	5	5	0	0	0	10	8	2
	2014	10	5	5	0	0	0	10	8	2
Red Deer	2012	0	0	0	0	0	0	0	0	0
	2013	0	0	0	0	0	0	0	0	0
	2014	0	0	0	0	0	0	0	0	0

NOTES:

1. Municipalities that use contracted collection services don't own any of waste vehicles, bins or carts. This means they don't have useful life data for these assets.

2.17.1 Lessons Learned

1. The useful life of bins and carts was set at a time when it was unknown how long these assets would remain usable. Since average life may exceed useful life, useful life will be revisited. Until then, Remaining Life was only recoded as positive or zero.

2.18 Lessons Learned, General

Topics for future consideration;

1. How do revenues for recyclables offset costs of handling and marketing of recyclables?

2. Show the typical bill for a residence ($/dwelling units) using utility rates for the solid waste service.

3. Add the residential waste collected by private contractors (multi-unit buildings) to the tonnes of residential solid waste per capita to have a more accurate total weight.

4. Record diversion goals in the future to determine how goals relate to tonnes of recyclables handled and marketed. The observed perception is, "high diversion goals mean imposing inconvenience/effort to the customer, and higher cost".

Database Manual, Solid Waste

Alberta Municipal Benchmarking Initiative

3 Benchmarking Database Manual, Solid Waste

3.1 Municipal Solid Waste Systems

Municipalities manage solid waste from all residential households and some small non-residential establishments through a combination of self-run services and contracted services. The major components of the residential solid waste program consist of collection, recyclables handling and marketing and garbage handling and disposal to landfill operations.

Municipalities encourage the diversion of recyclables from landfill sites. Diverting recyclables benefits the environment and municipal taxpayers by reducing greenhouse gases, reducing demands for natural resources, generating revenue from waste, and maximizing landfill capacity. This can contribute to deferring the costs from the construction and operation of additional landfill capacity.

3.2 Narrative Data

These factors vary with each municipality and influence the cost to deliver the service.

1. Municipal waste limits, e.g. limits on amount of household waste per pickup to reduce the amount of waste collected/processed
2. Level of service provided, waste collection frequency, e.g. weekly, bi-weekly
3. Subscription based collection vs. community wide program
4. Communal bins type; bear proof
5. Automated vs. manual collection
6. Contracted solid waste collection, recyclables and garbage
7. Distance from landfill or further processing/recycling facilities. Using Google Directions, town centre to landfill address.
8. Public education programs, $ budget (including any FTE cost)/year
9. Collection done from rear lanes (less efficient) vs. front curb, %
10. Municipality has diversion rate goals with time lines

3.3 Benchmark Data Definitions - Costs

All costs for Benchmarking are OPERATING COSTS ONLY. Capital costs are not to be included.

3.3.1 Collection Total Direct Costs ($/year)

All operating direct costs involved in activities to collect residential recyclables and garbage.

Includes costs to;

1. Operate vehicles designed for curbside pickup of garbage from carts
2. Operate vehicles designed for curbside pickup of recyclables, organic waste and special materials (includes costs for a large item pick-up program)
3. Operate vehicles designed for communal bin pickup of garbage dropped off
4. Operate vehicles designed for communal bin pickup of recyclables and organic waste and special materials dropped off (includes costs for a large item pick-up program).
5. Operate a solid waste eco-centre/trailer with communal bins for drop off of garbage, recyclables, organic waste and special materials
6. Repair/maintenance of collection equipment
   Includes
   1. Carts, bins, drop off centres, e.g. eco-centre/trailer (e.g. for waste oil),site cleaning

Examples of direct collection operating costs

1. Consumables used, e.g. materials and small equipment (not capitalized for amortization)
2. Labour, wages and benefits
3. Compulsory training for certified staff,
   Includes
   1. Fees for training programs
   2. Conference fees
   3. Travel expense wages and benefits while being trained or attending conferences
4. Fuel for vehicles
5. Dedicated services, if any, e.g. IT, dispatch, radio licence
6. Repair and maintenance of vehicles, if not done by Fleet Department
7. Repair and maintenance of buildings, if not done by Facilities department
8. Contract costs, 3rd party, e.g. collection, recyclables handling and marketing, and garbage handling and disposal activities, repairs/maintenance
9. All public education initiatives on processes required to operate the collection system, includes internal and externally supplied materials
10. Debt interest associated with solid waste collection asset capital improvements

3.3.2 Curbside Collection Direct Costs ($/year), already included in 3.3.1

All direct costs involved in activities to collect residential recyclables and garbage by curbside pickup at residences.

Includes

1. Garbage
2. Recyclables

3.3.3 Communal Bin Collection Direct Costs ($/year), already included in 3.3.1

All direct costs involved in collection of residential waste by having residents drop-off waste into communal bins placed throughout the community and at "eco-centres".

Includes

1. Garbage
2. Recyclables

3.3.4 Recyclables Handling and Marketing Direct Costs ($/year), already included in 3.3.1

All direct costs involved in activities to handle recyclables and market them to businesses for further processing.

Includes costs to;

1. Operate equipment, e.g. unload collection vehicles, sorting co-mingled solid waste, processing source-separated solid waste, e.g. compressing/bailing waste for transportation to disposal sites or for further processing
2. Operate buildings or other eco-centres such as a solid waste transfer/processing facility, e.g. power, natural gas, inspections, repairs/maintenance of the building, if not done by a Facilities Department
3. Fees paid, if any, e.g. to have 3rd parties ship to and accept recyclables at reprocessing facilities
4. Repair and maintenance of vehicles, if not done by Fleet Department
5. Repair and maintenance of buildings, if not done by Facilities department

Examples of direct diversion operating costs

1. Consumables used, e.g. materials, tools and small equipment (not capitalized for amortization)
2. Labour, wages and benefits
3. Compulsory training for certified staff, including first-aid
4. Repairs/maintenance of equipment
5. Contract costs, 3rd party, e.g. sorting/bailing activities, repairs/maintenance
6. Debt interest associated with solid waste diversion asset capital improvements

3.3.5 Garbage Handling and Disposal Costs ($/year), already included in 3.3.1

All direct costs involved in activities to transport garbage to a landfill and tipping fees to dispose the garbage (end-of-life waste) to a landfill.

Includes costs to

1. Operate vehicles designed for transporting garbage from a transfer/processing facility to the gate of a landfill
2. Transport garbage to the gate of landfill sites by 3rd party contractors
3. Tipping fees at landfill sites
4. Repair and maintenance of vehicles, if not done by Fleet Department
5. Repair and maintenance of buildings, if not done by Facilities department

Examples of direct disposal operating costs

1. Consumables used, e.g. materials and small equipment (not capitalized for amortization)
2. Labour, wages and benefits
3. Compulsory training for certified staff, including first-aid
4. Fuel for vehicles
5. Contract costs, for garbage disposal by 3rd party
6. Debt interest associated with solid waste disposal asset capital improvements

Excludes

1. Disposal of hazardous waste
1. Disposal of industrial/commercial waste

3.3.6 Labour Direct Costs ($/year)

Labour costs are all costs for the internal labour wages and benefits used for collection, recyclables handling and marketing, and garbage handling and disposal.

3.3.7 Contract Direct Costs ($/year)

Direct contracted costs are all costs of contracted services for collection, recyclables handling and marketing, and garbage handling and disposal.

NOTE: Some municipalities contract all three components of the services. Others contract only portions of the service.

3.3.8 Utility Rates for Solid Waste Services ($/dwelling unit)

To be done in the future.

3.3.9 Indirect Costs ($/year)

Indirect are all costs for the activities to support the Residential Solid Waste Services department.

NOTE: Indirect costs are for those activities that support direct delivery of the service without which the service would, in a short time, be disrupted

Includes costs to

1. Manage and administer the operational activities for collection, recyclables handling and marketing, and garbage handling and disposal, e.g. salaries/office costs for managers and administrators (may be a portion of the total cost, e.g. a public works manager who is also responsible for multiple services)
2. Training; for support staff and soft-skills for all staff (if not covered by HR budget) and other related training not separable between collection, recyclables handling and marketing, and garbage handling and disposal activities
3. Memberships and Conferences for the Residential Solid Waste Services department
4. Travel for support staff
5. Planning, e.g. for the activities of the Residential Solid Waste Services department
6. Insurance
7. Debt interest associated with solid waste asset capital improvements that cannot be identified separately as collection, for collection, recyclables handling and marketing, and garbage handling and disposal

Total indirect costs will be prorated (allocated) separately to solid waste collection, recyclables and garbage activities in the database based on the percentage the direct cost of each represents of the total direct costs to operate the residential solid waste management system.

3.3.10 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
Costs, e.g. human resources, IT, security, engineering, planning, financial services, Council, Administration, tax funded debt interest.

NOTE:

1. 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.

2. Overhead Allocation for the Service Area will then prorated (allocated) separately to collection, diversion and disposal in the database based on the percentage the direct cost of each represents of total direct costs.

3.3.11 Amortization Costs ($/year)

Amortization is one way to capture the cost of depreciation, over time, of the assets, which eventually have to be replaced due to age or failure, required to deliver a service. An alternative way is to have the cost of an annual amount set aside for future replacement of the assets, e.g. a capital replacement fund.

Amortization costs are the costs for capital assets from the tangible capital assets system.

Includes

1. Vehicles, e.g. trucks and trailers
2. Communal bins/carts
3. Trailers
4. Buildings

3.3.12 Out of Scope Costs ($/year)

Out of Scope Costs are all operating costs for activities not captured in the Direct Costs. The total of these costs will be used by Finance to ensure all operating costs for Solid Waste Service accounted for as recorded in the municipality's annual Non-Consolidated Financial Statements.

Includes (because not included in any other cost categories)

1. Cost to operate a landfill facility

The total of these costs will be used by Finance to ensure all operating costs for the Roadways service area accounted for as recorded in the municipality's annual Non-Consolidated Financial Statements.

3.4 Data Definitions - Service

3.4.1 Residential Solid Waste Management

Residential Solid Waste Management is the collection of residential garbage and recyclables, recyclables handling and marketing, and garbage handling and disposal.

Includes

1. Garbage, end-of-life waste destined for disposal in a landfill. The disposal is done under controlled conditions, on or into land, and covered with soil or other fill materials at regular intervals.
2. Recyclables,
   Includes
   1. Waste products or materials that can be reprocessed into new products, materials, or energy (incinerated), e.g. mixed paper (including cardboard) and containers made of metal, glass and plastics
   2. Organics, waste "green" materials, e.g. food waste, shrubs, brush, leaves and grass, that can be reprocessed by biological processes such as anaerobic digestion and composting into an organic fertilizer
   3. Special materials, waste requiring specific handling before disposal, e.g. tires, electrical and electronic equipment, durable goods such as appliances, batteries, fluorescent light bulbs, propane tanks, metal and wood
   4. Residential hazardous materials, e.g. paint, pesticides & herbicides, cleaners, aerosols, solvents, poisons and flammables

Excludes

1. Waste materials from construction/renovation, industrial and commercial sources, e.g. metal, asphalt, concrete, wood

3.4.2 Collection (tonnes)

Collection is the activity of picking up waste from residential sources or receiving solid waste by drop off to bins, and self-hauls to transfer stations/landfills, for recycling or disposal. The total weight of waste collected equals the weight of materials recycled plus the weight of garbage disposed to landfills.

Includes solid waste collected from

1. Curbside, e.g. carts, bags, or garbage cans for pick up of waste from any family dwelling unit by collection vehicles
2. Drop-off by residents to communal large steel bins, which may be animal proof, for specified type of waste, e.g. garbage, recyclables
   - Bins, serviced by collection vehicles, located throughout the residential developed area

- Bins, serviced by collection vehicles, located at central collection locations such as "eco-centres"

3. Self-haul by residents or private contractors to transfer stations/eco-centres/landfills
    - Large Item pick-up
    - Drop off of special materials by residents or private contractors at transfer stations/ eco-centres/landfills
    - Drop off of hazardous waste by residents or private contractors at roundup events or landfills

Excludes

1. Tonnes of residential waste handled by private contractors.

3.4.3 Recyclables Handling and Marketing (tonnes)

Recycling involves,

1. Separation of collected waste into recyclables and residual garbage
2. Marketing of the separated recyclables for further processing by recycling or reprocessing into other products

The total weight of recyclables includes the weight of those materials diverted by the municipality + the weight of recyclables shipped from landfills.

In some municipalities, a transfer/processing facility, "eco-centre", is a building/outdoor location, manned or unmanned, that receives collected waste for separation and compacting/bailing. In addition to being found in the waste stream, recyclables are separately collected in blue box/bin systems.

Includes

1. Receiving, e.g. unloading collected waste at a transfer station
2. Sorting, e.g. manual or machine separation of co-mingled waste into streams; e.g. paper, glass, metal, plastic, special materials and garbage
3. Compacting, e.g. bailing sorted materials
4. Loading, e.g. loading sorted materials into trucks for further transportation
5. Disposing e.g. separated residual garbage

Sources of Residential Recyclable Waste

Includes from

1. Resident separated recyclables, curbside collection, carts/blue box/organics
2. Resident separated recyclables, drop off, communal bins/organics

3. Self-haul drop-off at Eco-Centres and Landfills, by residents and private contractors
   - Municipal Programs(included here since residents/contractors can do this as well);
     - Large Items; used furniture, mattresses and white goods such as stoves, refrigerators, washers, dryers
     - Organics , food waste, yard waste, Christmas trees, pumpkins
   - Special Materials; metal and wood, automobile waste (oil and containers, antifreeze, batteries), fluorescent bulbs, electrical and electronic e-waste (televisions, computers, monitors, computer accessories, (e. g. printers, scanners, fax machines), stereo equipment, VCRs / DVD players, telephones/fax equipment, cell phones/pagers, kitchen small appliances (e.g. toasters, microwaves, coffee makers, etc.), chargers, cables, adapters, power-bars, household/electronic equipment batteries (AA, AAA and others, and from laptop computers, cellphones and power tools), organics (kitchen waste, brush, grass, tree branches)
   - Hazardous Waste, Round Up Programs; paint/containers, pesticides & herbicides, cleaners, aerosols, solvents, poisons and flammables, one pound camping propane canisters

Excludes

1. Tires, commercial waste, construction/renovation/demolition waste, automotive parts, 20lb. propane canisters

3.4.4 Garbage Handling and Disposal (tonnes)

Garbage handling is the transport of garbage in vehicles to landfills. Disposal is the tipping fees charged by a landfill for disposal of the garbage. The total weight of garbage disposed includes the weight of garbage disposed by the municipality + the weight of residential solid waste self-hauled by residents and private contractors to transfer stations and landfills.

Includes

1. Transportation; e.g. cost for operation of vehicles designed carry garbage to the gate of a landfill
2. Distance from landfill e.g. distance, as measured on Google Maps, from city centre to the gate of a landfill

3.4.5 Productivity, Collection (dwelling units serviced/collection truck/hour)

1. Curbside: Productivity is measured in curbside collection systems by the number of dwelling units

receiving pickup per collection truck per hour per total operating hours per year.

2. Communal Bins: The same calculation will be made using the number of dwelling units in the municipality, the number of trucks used to pick up from bins and actual or an estimate of annual truck operating hours.

Includes

1. Number of dwelling units serviced
2. Number of collection trucks deployed
3. Number of hours collection trucks operate per year

3.4.6 Dwelling Units (#)

For Benchmarking, the number of dwelling units is as reported in the most recent census report.

Includes

1. Detached homes
2. Duplexes
3. Triplexes
4. Other multiplexes

Excludes

1. Dwelling units serviced third party solid waste collection companies

3.4.7 Dwelling Units Serviced (#)

For Benchmarking, dwelling units serviced is the number of dwelling units serviced by the municipality for solid waste collection. This excludes the dwelling units serviced by private contractors, e.g. multi-unit buildings.

Dwelling units serviced by municipality = Total Dwelling Units (Census) – Dwelling Units serviced by private contractors

3.4.8 Municipal Population (#)

Includes

1. Municipal population is the number of permanent residents as measured by the most recent census.

Excludes

1. Non-resident population (second home owners, temporary workers)
2. Average visitor population (Banff, Canmore)

3.4.9 Developed Area (KM^2)

Developed area is the area, in **square KM,** developed for use by the municipal population + by commercial businesses.

3.5 Benchmark Performance Measures (PM) Calculations

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

Efficiency

1. Total Residential Solid Waste System Cost 1 ($/tonne collected) – Components

$$\frac{Total\ Collection\ Costs + Total\ Recyclables\ Handling\ and\ Marketing\ Costs + Total\ Garbage\ Handling\ and\ Disposal\ Costs}{Tonnes\ of\ Waste\ Collected\ (Recyclables + Garbage)}$$

2. Total Residential Solid Waste System Cost 2 ($/tonne collected)

$$\frac{Total\ Direct\ Costs + Indirect\ Costs + Allocated\ Overhead\ Costs + Total\ Amortization\ Costs}{Tonnes\ of\ Waste\ Collected\ (Recyclables + Garbage)}$$

3. Total Collection Costs ($/tonne collected)

$$\frac{Collection\ Direct\ Costs + Prorated\ Indirect\ Costs + Prorated\ Overhead\ Costs + Amortization\ of\ Collection\ Assets}{Tonnes\ of\ Waste\ Collected\ (Recyclables + Garbage)}$$

4. Total Recyclables Handling & Marketing Costs ($/tonne recycled)

$$\frac{Recyclables\ Handling\ and\ Marketing\ Direct\ Costs + Prorated\ Indirect\ Costs + Prorated\ Overhead\ Costs + Amortization\ of\ Recycling\ Assets}{Tonnes\ of\ Recyclables\ Diverted}$$

5. Total Garbage Handling & Disposal Costs ($/tonne collected)

$$\frac{Garbage\ Handling\ and\ Diposal\ Direct\ Costs + Prorated\ Indirect\ Costs + Prorated\ Overhead\ Costs + Amortization\ of\ Disposal\ Assets}{Tonnes\ of\ Garbage}$$

6. Total Residential Solid Waste System Cost 2 ($/dwelling unit)

$$\frac{Total\ Direct\ Costs + Indirect\ Costs + Allocated\ Overhead\ Costs + Total\ Amortization\ Costs}{Number\ of\ Dwelling\ Units\ Serviced}$$

7. Total Collection Cost ($/dwelling unit)

$$\frac{Collection\ Direct\ Costs\ (for\ disposal + diversion) + Prorated\ Indirect\ Costs + Prorated\ Overhead\ Costs + Amortization\ of\ Collection\ Assets}{Number\ of\ Dwelling\ Units\ Serviced}$$

8. Total Recyclables Handling & Marketing Costs ($/dwelling unit)

$$\frac{Recyclables\ Handling\ and\ Marketing\ Direct\ Costs + Prorated\ Indirect\ Costs + Prorated\ Overhead\ Costs + Amortization\ of\ Diversion\ Assets}{Number\ of\ Dwelling\ Units\ Serviced}$$

9. Total Garbage Handling and Disposal Costs ($/dwelling unit)

$$\frac{Garbage\ Handling\ and\ Disposal\ Direct\ Costs + Prorated\ Indirect\ Costs + Prorated\ Overhead\ Costs + Amortization\ of\ Disposal\ Assets}{Number\ of\ Dwelling\ Units\ Serviced}$$

10. Total Recyclables Handling and Marketing Costs - Diverted ($/tonnes diverted, i.e. front end)

$$\frac{Recyclables\ Handling\ and\ Marketing\ Direct\ Costs + Prorated\ Indirect\ Costs\ +\ Prorated\ Overhead\ Costs +\ Amortization\ of\ Diversion\ \ Assets}{Tonnes\ of\ Recycled\ Materials\ (includes\ organics), front\ end\ (before\ processing)}$$

11. Labour Costs vs. Total Solid Waste Costs (%)

$$\frac{Direct\ Collection\ Labour\ Costs + Direct\ Recyclables\ Labour\ Costs + Direct\ Garbage\ Labour\ Costs}{Total\ Residential\ Solid\ Waste\ System\ Costs}\ X100$$

12. Contracted Costs vs. Total Solid Waste Costs (%)

$$\frac{Direct\ Collection\ Contracted\ Costs + Direct\ Recyclables\ Contracted\ Costs + Direct\ Garbage\ Contracted\ Costs}{Total\ Residential\ Solid\ Waste\ System\ Costs}\ X100$$

13. Amortization – Residential Solid Waste Assets ($/Tonne)

$$\frac{Amortization\ of\ Collection\ Assets + Amortization\ of\ Recyclables\ Assets + Amortization\ of\ Garbage\ Disposal\ Assets}{Tonnes\ of\ Solid\ Waste\ Collected}$$

Effectiveness

14. Total Residential Waste (KG/capita)

$$\frac{Tonnes\ Collected\ (Recyclables +\ Garbage)\ X\ 1{,}000}{Municipal\ Population}$$

15. Residential Garbage (KG/capita)

$$\frac{Total\ Tonnes\ of\ Garbage\ Disposed + Self\ Hauled\ to\ Transfer\ Stations\ and\ Landfills\ X\ 1{,}000}{Municipal\ Population}$$

16. Recyclables (KG/capita)

$$\frac{Total\ Tonnes\ of\ Recyclables\ Diverted + Recyclables\ Removed\ from\ Landfills\ X\ 1{,}000}{Municipal\ Population}$$

17. Residential Diversion Rate (%)

$$\frac{Tonnes\ of\ Residential\ Recyclables\ Diverted}{Tonnes\ of\ Residential\ Total\ Waste\ Collected}\ X\ 100$$

18. Collection Accuracy (# of missed pick-ups/10,000 pick-ups)

$$\frac{\#\ Missed\ Pickups\ Reported}{Total\ \#\ of\ Pick\ Ups\ per\ Year\ \div 10{,}000}$$