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A Weighty Subject

Understanding Weighted Percentages in Strum Reports

In March 2023, when the Nova Scotia Government's Department of Environment and Climate Change granted approval to Halifax Regional Municipality request to shut down Otter Lake Landfill's Front-End Processor and Waste Stabilization Facility, it came with conditions. HRM was given three years to prove that monitoring, education and enforcement could do the job that the F.E.P. and W.S.F. plus scores of workers did, keeping compostable waste like food out of the landfill.



The department required HRM to limit the volume of compostables to 10% of the solid waste mass going into the landfill by the end of the trial in March 2026. DoE instructed HRM that the city provide the monitoring to assure that accurate numbers were being recorded and the Environment Department provided the formula that would be used for the calculations.



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Every day, all trucks arriving at the Otter Lake Landfill are weighed on the way in and on the way out so the Landfill operators and officials at Halifax Regional Municipality Solid Waste Resources have accurate volumes of garbage going into the landfill. In addition to knowing the total amount of garbage going in, they also know where it's coming from.



Strum Consulting was contracted to measure the amount of compostable waste going into the landfill. Four times a year over the three-year period, Strum has taken measurements in a procedure known as quarterly performance audits. An audit has been done midway through every fiscal quarter, May, August, November, and February..

For the purposes of this monitoring, Halifax Regional Municipality is divided into eight districts plus condominiums so that HRM, Strum and Mirror Nova Scotia, the Otter Lake Landfill operator, can identify the district and where the garbage is coming from and the volumes each district generates. The table below shows the districts.

Table A: Collection Area Descriptions

Waste Collection Area	Area Description
1	Halifax (former city limits); Spryfield
2	Dartmouth (former city limits)
3	Bedford; Hammonds Plains; Pockwock
4	Beechville-Timberlea; Herring Cove; Prospect; Peggy's Cove; St. Margaret's Bay to Hubbards
5	Sackville; Beaver Bank; Fall River; Waverley, Wellington; Dutch Settlement
6	Cole Harbour; Westphal; Cherry Brook; Eastern Passage; Cow Bay
7	Porters Lake; Lawrencetown; Chezzetcook; Lake Echo; Preston
8	Middle Musquodoboit; Musquodoboit Harbour; Elderbank; Sheet Harbour; Eastern Shore
Condos	Multi-residential style properties located in various communities

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Quarterly Audit Procedure

The quarterly performance audits are conducted in the Otter Lake Landfill FEP room by Strum. Samples of garbage from each district are set aside, identified and weighed. Each district sample is dumped individually and then examined. A crew sorts through the garbage, which is separated into what is acceptable for the landfill and what is not.

The compostable material from the sample is weighed. From that result, the amount of compostable material entering the landfill for that period is estimated.

Strum and HRM can tell the total volume of garbage entering the landfill through weigh scale records that Mirror Nova Scotia keeps. From the total volume, Strum can estimate the tonnage of compostable waste that came from each district and total annual percentage of compostable that is deposited into the landfill.



Not Simple Averaging

Calculating the compostable waste percentage is not simple averaging.

The normal averaging process of adding the numbers in each column of a Strum table and then dividing the total by the number of districts is not the correct way to calculate percentage of compostable material going into the landfill. That method only gives an average for the column.

The number of households varies considerably from district to district. District 1, (Halifax former city limits and Spryfield), has vastly more households than there are condos in HRM. So a simple average would assign condos a much higher volume than they actually produce. If, for example, the total annual estimated annual waste (the figure in the far column on the right in the

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table E) had been simply averaged, it would result in 512.7 tonnes per district. Tonnage from the small Condo category would soar by nearly 185 tonnes more than it actually produced. On the other hand, Condos would benefit considerably by averaging column 3, the percentage of compostable waste each district contributes to the landfill. In that calculation, Condo's percentage would drop to 10.98% from 14.7%. Meanwhile, District 4 (Beechville Timberlea, Herring Cove, Prospect, Peggy's Cove, St. Margaret's Bay to Hubbards) would more than double its input from 4.91%. For that reason, the calculations are "weighted."

The weighted average formula

The formula: divide the *Estimated Annual Compostable Waste* (Column 4) by the three-year *Waste Average* (Column 2) to calculate the accurate percentage for each of the eight districts plus condos.

Quarterly tonnage estimates (Column 3) *numerator*

_____ Divided By _____ = x %

Three year Waste Average (Column 2) *denominator*

Table E: Estimated Annual Compostable Waste based on November 2025 Data

Waste Collection Area	Three Year Waste Average (Tonnes)	November 2025 Total Compostable Waste	Estimated Annual Compostable Waste (Tonnes)
1	9886.00	6.95%	687.08
2	6744.75	9.64%*	650.19
3	4435.01	12.00%	532.20
4	5337.22	4.91%	262.06
5	8633.03	8.06%	695.82
6	5075.21	7.42%	376.58
7	2894.99	16.92%	489.83
8	3230.78	18.29%	590.91
Condos	2242.28	14.70%	329.62
Total	48479.27	N/A	4614.29
Compostable Waste Percentage = (4614.15/48479.27) X 100 = 9.52%			

Notes:

1. Data used to calculate three-year average provided by Mirror and included tonnage from the fiscal years 2022/2023, 2023/2024, and 2024/2025.
2. * November 2025 Total Compostable Waste percentage for Area 2 is based on average of the two samples (2A and 2B) collected during the November 2025 waste audit.

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Examples from the above table.

$$\text{Condos} \quad \frac{329.62}{2242.28} = 14.7\%$$

$$\text{District 1} \quad \frac{687.08}{9886.00} = 6.95\% \quad \text{November 2025 total Compostable}$$

$$\text{Waste} \quad \frac{4614.29}{48479.27} = 9.52\%$$

Although the November 2025 table, above, shows the volume of compostables going into the landfill is 9.52 % it was the result of an audit from only one quarter, which gives an incomplete picture. By November three of four audits for that fiscal year had been completed. The Total Weighted Compostable Waste Percentage for the fiscal year to date was calculated to be 9.78 % (as shown in the Estimated Annual Compostable Waste – May 2025 August 2025 and November 2025 table on page 5)

Table F: Estimated Annual Compostable Waste – May 2025, August 2025, and November 2025

Waste Collection Area	Three Year Waste Average (Tonnes)	Three Year Waste Average (% Total)	Average Total Compostable % Per Area	Estimated Annual Compostable Waste (Tonnes)
1	9886.00	20.39%	8.80%	870.33
2	6744.75	13.91%	13.05%	880.30
3	4435.01	9.15%	9.64%	427.36
4	5337.22	11.01%	8.30%	442.96
5	8633.03	17.81%	9.21%	794.91
6	5075.21	10.47%	6.51%	330.62
7	2894.99	5.97%	9.43%	272.98
8	3230.78	6.66%	13.32%	430.30
Condos	2242.28	4.63%	12.90%	289.19
Total	48479.27	100.00%	N/A	4738.94
Compostable Waste Percentage = (4738.94/48479.27) X 100 = 9.78%				

Notes:

1. Data used to calculate three-year average provided by Mirror and included tonnage from the fiscal years 2022/2023, 2023/2024, and 2024/2025.

In the above table, it becomes clear why simple averaging is inaccurate. In column 2 *Three Year Waste Average (Tonnes)*, District 1's huge population (District 1 = Halifax {former city limits}; Spryfield) accounts for 20.39% of the total compostable waste dumped into the landfill while

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HRM's condo population is responsible for 4.63% of the total. However, the population of District one is vastly greater than the condo population.



Once that is factored in, condo households send a far greater percentage of their compostable waste to the landfill than households in District 1.

After November's audit, six districts met the 10% Department of Environment and climate Change target.

The same formula is applied in calculating the annual Compostable Waste, but with an added step.

MAY AUDIT	+ AUGUST AUDIT	+ NOVEMBER AUDIT	AVERAGED
Estimated Annual Compostable Waste (Tonnes)	Estimated Annual Compostable Waste (Tonnes)	Estimated Annual Compostable Waste (Tonnes)	Estimated Annual Compostable Waste (Tonnes)
929.68	993.83	687.08	870.33
797.11	1193.82	650.19	880.30
229.23	520.66	532.20	427.36
404.41	662.55	262.06	442.96
713.14	975.91	695.82	794.91
269.10	346.04	376.58	330.62
73.64	255.59	489.83	272.98
319.85	380.09	590.91	430.30
382.24	155.78	329.62	289.19
4118.39	5484.27	4614.29	4738.94

The table immediately above indicates how the estimated annual compostable waste to date is calculated.

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The average district totals are calculated in the normal fashion. Tonnage in each of the quarters is totaled and divided by three for the average to-date from that specific district.

To calculate the *Estimated Annual Compostable Waste* tonnage, (table F) 4,738.94 tonnes (in column 4) is divided by the *Three Year Waste Average* (in column 2, which is 48,479.27 tonnes.

$$\text{Annual to date Compostable Waste } \frac{4,738.94}{48,479.27} = 9.78\%$$

Results for the First Three Quarters

By the November 2025 Audit, the total compostable waste to date for fiscal 2025-2026 going into the Otter Lake Landfill was 9.78%, slightly below the 10% target set by the Department of Environment and Climate Change.

Although the audits for the first nine months, suggested HRM was on track to reach the overall 10% target by the March 31, 2026 deadline, the final quarter measurements still had to be calculated. And there was an unexpected issue.

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Otter Lake Compostable Waste Annual Percentage Calculations Presentation. July 26, 2026.

Waste Collection Area	Three Year Waste Average (Tonnes)	Three Year Waste Average (% Total)	Average Total Compostable % Per Area	Estimated Annual Compostable Waste (Tonnes)
1	9886.00	20.39%	10.28%	1016.40
2	6744.75	13.91%	11.82%	797.50
3	4435.01	9.15%	9.54%	423.18
4	5337.22	11.01%	8.03%	428.49
5	8633.03	17.81%	9.83%	848.24
6	5075.21	10.47%	8.36%	424.40
7	2894.99	5.97%	9.39%	271.89
8	3230.78	6.66%	13.32%	430.30



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Mr. Steve Copp
Mirror Nova Scotia Limited

March 23, 2026
Project # 22-8641

Waste Collection Area	Three Year Waste Average (Tonnes)	Three Year Waste Average (% Total)	Average Total Compostable % Per Area	Estimated Annual Compostable Waste (Tonnes)
Condos	2242.28	4.63%	16.76%	375.89
Total	48479.27	100.00%	N/A	5016.28
Compostable Waste Percentage = (5016.28/48479.27) X 100 = 10.35%				

Notes:

1. Data used to calculate three-year average provided by Mirror and included tonnage from the fiscal years 2022/2023, 2023/2024, and 2024/2025.

Strum's fourth quarter calculations indicate that 10.35% of material entering the Otter Lake Landfill are compostables. However the calculation is based on incomplete information.

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Strum's February, 2026 quarterly audit explained that due to weather there was no collection from zone 8 and so it was not included in the fourth quarter audit.

Zone 8 includes Middle Musquodoboit; Musquodoboit Harbour; Elderbank; Sheet Harbour; Eastern Shore. As you can see in Table C the line for Zone 8 is blank.

FEBRUARY 2026 PERFORMANCE AUDIT SUMMARY

A summary of the February 2026 Performance Audit completed at Otter Lake is provided below in Table C. The February 2026 Performance Audit field data sheets containing the data collected respective to each waste collection area during the audit are attached to this report as Attachment 3.

Table C: February 2026 Performance Audit Results

Waste Collection Area	Category Percentage (%)							
	Garbage/ Residue	HHW	White Goods	Fibre - Newsprint/ Paper	Fibre - Corrugated Cardboard	Organics - Food/ Putrescible Waste	Organics - Yard Waste	Total Compostable Waste
1A	84.26%	0.00%	0.00%	3.81%	2.44%	8.63%	0.00%	14.87%
1B	85.15%	0.00%	1.29%	3.27%	5.45%	5.84%	0.00%	14.55%
2	89.10%	0.00%	2.56%	3.27%	1.54%	3.21%	0.13%	8.14%
3	89.51%	0.00%	0.00%	1.85%	1.73%	5.68%	0.00%	9.26%
4	93.04%	0.00%	0.00%	1.01%	3.99%	2.22%	0.00%	7.22%
5	86.13%	0.00%	1.39%	1.75%	6.50%	3.43%	0.00%	11.68%
6	85.80%	0.00%	0.00%	3.14%	3.14%	7.63%	0.00%	13.91%
7	89.69%	0.00%	0.00%	1.24%	4.02%	4.02%	0.00%	9.28%
8	-	-	-	-	-	-	-	-
Condos	70.91%	0.00%	0.00%	3.09%	10.36%	14.91%	0.00%	28.36%

Notes:

1. Total compostable waste percentage based on aggregate of four compostable waste category percentages.
2. No sample was collected from Area 8 during the February 2026 audit due to inclement weather.

Using the data in Table C above, the total compostable waste percentage ranged from a minimum of 7.22% (Area 4) to a maximum of 28.36% (Condos), based on the nine samples collected during the February 2026 Performance Audit. As noted previously, a sample was not collected from Area 8 during the February 2026 audit due to inclement weather.

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On table D, all zones except 8 have their Average total waste percentage calculated for the year averaged on four quarters. Zone 8 total compostable waste for 2024-25 was calculated based on based on three quarters. A more precise annual average annual waste percentage couldn't be calculated because of the missing fourth quarter data.

Table D: Average Total Compostable Waste

Waste Collection Area	Three Year Waste Average (Tonnes)	May 2025 Total Compostable Waste	August 2025 Total Compostable Waste	November 2025 Total Compostable Waste	February 2026 Total Compostable Waste	Average Total Compostable Waste Per Area
1	9886.00	9.40%	10.05%	6.95%	14.71****	10.28%
2	6744.75	11.82%	17.70%	9.64%***	8.14%	11.82%
3	4435.01	5.17%	11.74%**	12.00%	9.26%	9.54%
4	5337.22	7.58%	12.41%	4.91%	7.22%	8.03%



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March 23, 2026
Project # 22-8641

Waste Collection Area	Three Year Waste Average (Tonnes)	May 2025 Total Compostable Waste	August 2025 Total Compostable Waste	November 2025 Total Compostable Waste	February 2026 Total Compostable Waste	Average Total Compostable Waste Per Area
5	8633.03	8.26%*	11.30%	8.06%	11.68%	9.83%
6	5075.21	5.30%	6.82%	7.42%	13.91%	8.36%
7	2894.99	2.54%	8.83%	16.92%	9.28%	9.39%
8	3230.78	9.90%	11.76%	18.29%	-	13.32%
Condos	2242.28	17.05%	6.95%	14.70%	28.36%	16.76%

Notes:

1. Data used to calculate three-year average provided by Mirror and included tonnage from the fiscal years 2022/2023, 2023/2024, and 2024/2025.
2. No sample was collected from Area 8 during the February 2026 audit due to inclement weather.
3. * May 2025 Total Compostable Waste percentage for Area 5 is based on average of the two samples (5A and 5B) collected during the May 2025 waste audit.
4. ** August 2025 Total Compostable Waste percentage for Area 3 is based on average of the two samples (3A and 3B) collected during the August 2025 waste audit.
5. *** November 2025 Total Compostable Waste percentage for Area 2 is based on average of the two samples (2A and 2B) collected during the November 2025 waste audit.
6. **** February 2026 Total Compostable Waste percentage for Area 1 is based on average of the two samples (1A and 1B) collected during the February 2026 waste audit.

Based on the data in Table D above, the average total compostable waste percentage ranges from a minimum of 8.03% (Area 4) to a maximum of 16.76% (Condos).

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That reflects on the actual tonnage entering the landfill as shown in table E. There are no entries on the line for zone 8 on that table.

February 2026 Performance Audit, Otter Lake Waste Processing & Disposal Facility
Mr. Steve Copp
Mirror Nova Scotia Limited

March 23, 2026

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Table E: Estimated Annual Compostable Waste based on February 2026 Data

Waste Collection Area	Three Year Waste Average (Tonnes)	February 2026 Total Compostable Waste	Estimated Annual Compostable Waste (Tonnes)
1	9886.00	14.71*	1454.60
2	6744.75	8.14%	549.09
3	4435.01	9.26%	410.65
4	5337.22	7.22%	385.09
5	8633.03	11.68%	1008.24
6	5075.21	13.91%	705.72
7	2894.99	9.28%	268.61
8	-	-	-
Condos	2242.28	28.36%	635.99
Total	45248.49	N/A	5418.00
Compostable Waste Percentage = (5418.00/45248.49) X 100 = 11.97%			

Notes:

1. Data used to calculate three-year average provided by Mirror and included tonnage from the fiscal years 2022/2023, 2023/2024, and 2024/2025.
2. * February 2026 Total Compostable Waste percentage for Area 1 is based on average of the two samples (1A and 1B) collected during the November 2025 waste audit.
3. No sample was collected from Area 8 during the February 2026 audit due to inclement weather.

However, when calculating the Estimate Annual Compostable tonnage and percentage for the 2025-26 year, a calculation is again made for zone 8 based on three audits while all other zones and condos are based on 4 quarterly audits.

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Waste Collection Area	Three Year Waste Average (Tonnes)	Three Year Waste Average (% Total)	Average Total Compostable % Per Area	Estimated Annual Compostable Waste (Tonnes)
Condos	2242.28	4.63%	16.76%	375.89
Total	48479.27	100.00%	N/A	5016.28
Compostable Waste Percentage = (5016.28/48479.27) X 100 = 10.35%				

Notes:

1. Data used to calculate three-year average provided by Mirror and included tonnage from the fiscal years 2022/2023, 2023/2024, and 2024/2025.

According to the calculations, 430.3 tonnes of compostable waste entered the Otter Lake Landfill. However, in the absence of fourth quarter information, that is based on incomplete information and may not be entirely accurate although the process is considered acceptable.

The history of district 8 and increases in other districts for the fourth quarter are factors.

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In the May audit, zone 8 had the second highest percentage behind condos but was below 10% its estimated annual contribution to the landfill was 319.85 tonnes to the landfill.

In the August audit, zone 8 had the third highest percentage and at 11.76% was beyond 10% and its annual landfill contribution was estimated to be 380.09 tonnes.

In the November audit, zone 8 had the highest at 18.29% and it was estimated that it contributed 590.91 tonnes of compostable waste annually to the landfill.

Another factor to be considered is that in the fourth quarter, five of the remaining 8 districts including condos experienced spikes in the volume of compostable waste going into the landfill and four were over the 10 per cent.

As an experiment for this report, zone 8's November numbers were plugged for zone 8's fourth quarter just to see how the statistics would be impacted. Such practices are unacceptable and Gordon Vallis reinforced that during a June meeting. However, it was an experiment to test how that would affect the numbers.

When November's numbers were used for the fourth quarter in zone 8, the average total compostable waste in tonnage would be 470.44 tonnes not 430.3 and the compostable waste per centage would be 10.43 not 10.35.

Making up numbers to insert in a blank quarter is unacceptable but the test reveals how important it is to have all four quarters counted. And, 2025-2026 was not an anomaly.

The exact same thing happened in the fourth quarter of last year for the same zone, zone 8. Winter weather prevented the February collection there and affected the numbers in the same way.

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There are a number of variables that affect the volumes of compostables entering the landfill and which impact the formula and, in the end, percentages. When the denominator in the formula changes, the percentage of compostable waste going into the landfill also changes.



More waste is generated by disasters, floods and fires. The 2024 Timberlea and Tantallon wildfire led to more organic waste than usual going to the landfill.

Added debris dumped into landfill, increases the denominator in the formula. So, the percentage of compostable waste, relative to the rest of the rubbish, drops, even though the actual household percentage may be identical to the previous or following quarter.

On the other hand, when an entire category of garbage like paper and cardboard is diverted from the landfill, the denominator decreases. While less waste is being buried, the percentage of compostable waste rises in relation to other types of waste going into the landfill, if the even if the actual volumes of organic waste, like food, hasn't changed

During tough economic times, less waste usually reaches the landfill. Good times at Christmas and summer bbq season are big food wasters so volumes of food waste entering the landfill shoot up.

On a bright note, HRM's record is among the highest in Canada for diverting more than 90% compostable waste through its green cart collections. HRM opened a new compost facility in Ragged Lake in 2024

Rick Grant,
CMC Liaison Assistant
20 October 2026