



SUBJECT: Solid Waste Generation Estimates for Municipal Water Licences

A more practical approach to achieve regulatory compliance would be for municipalities to report an estimate of accepted solid waste volumes in lieu of records taken by a full-time solid waste facility attendant, until such time that the solid waste facility is upgraded / replaced to include the infrastructure needed to support this position. The volumes shall be based on estimated rates informed by relevant guidelines and studies, and waste audits conducted for the community or similar communities. In this memo, estimated rates are provided based on data obtained through studies engaged by the Government of Nunavut (GN) as well as data from published literature, guidelines, and standards.

Determination of Solid Waste Generation Rates

Following meetings in 2019 between the GN – Department of Community and Government Services, CIRNAC, GN – Department of Health, and GN – Department of Environment it was determined that a standardized total waste generation rate of 10.86 m³/capita/year would be appropriate to be used for municipalities in Nunavut. This decision has been documented in solid waste planning reports completed by Nunami Stantec, EXP, and Dillon Consulting, which have previously been submitted to the Nunavut Water Board.

The sectors of waste that make up the total waste include: 1) Residential, industrial, commercial, and institutional (RICI); and 2) Construction, renovation, and demolition (CRD). RICI and CRD differ in their proportions contributing to the total waste and in their waste composition.

The proportion of waste that is RICI and CRD was estimated by Nunami Stantec based on numerous waste management studies from other remote and Indigenous communities and based on published literature values. The values are presented in Table 1.

Table 1: Percent of total waste by sector.

	RICI (m³/capita/year)	CRD (m³/capita/year)	RICI (% volume)	CRD (% volume)
Determined by Nunami Stantec for communities similar to municipalities in Nunavut	6.15 ⁽¹⁾	3.16 ⁽¹⁾	66.06	33.94
Published Literature values for the NWT, Nunavik, and James Bay, QC	6.35 ⁽¹⁾	3.45 ⁽¹⁾	64.80	35.20
Average	6.25	3.305	65.43	35.57

1. Solid Waste Management Planning Study, Arviat, Nunavut (Nunami Stantec, 2021)

Note that the waste generation rates provided in Table 1 do not equal the standardized waste generation rate, as the standard rate was not established solely using these numbers.

Using the average percentage of waste by volume from RICI and CRD of the 10.86 m³/capita/year, the amount attributable to RICI is 7.106 m³/capita/year and to CRD is 3.863 m³/capita/year.

RICI Waste:

RICI contributes both hazardous and non-hazardous wastes. Hazardous wastes include batteries, oil-based paints, solvents, propane tanks, waste oil, oil barrels, and electronics. The non-hazardous wastes may include organics, papers, plastics, glass, textiles, diapers, and non-bulky metals and wood.

Typical waste composition of RICI is found in literature and design standards. Multiple waste audits were performed in municipalities across Nunavut, which yielded similar results to the findings from literature and standards. A comparison of the values is presented in **Appendix A**.

The values which will be used as the standard for all municipalities are the values from published literature and standards converted to percent by volume.

Table 2: RICI waste composition of total waste by sector.

Waste Type	Assumed Density (kg/m ³)	Percent by Weight (%)	Percent by Volume (%)	Waste Generation Rate (m ³ /capita/year)
Paper / Fibre	65.3 ⁽¹⁾	26.38 ⁽⁵⁾	25.31	1.798
Glass	225.4 ⁽¹⁾	4.83 ⁽⁴⁾	1.34	0.095
Plastics	19 ⁽¹⁾	14.37 ⁽⁴⁾	47.37	3.366
Organics	274.7 ⁽¹⁾	23.09 ⁽⁴⁾	5.26	0.374
Diapers	210 ⁽²⁾	13.66 ⁽⁴⁾	4.08	0.290
Textiles	74.2 ⁽¹⁾	4.36 ⁽⁴⁾	3.68	0.261
Other	148.3 ⁽¹⁾	1.77 ⁽⁴⁾	0.75	0.053
Metals (non-bulky)	29.7 ⁽¹⁾	5.65 ⁽³⁾	11.92	0.847
Wood (non-bulky)	600 ⁽¹⁾	1.18 ⁽³⁾	0.12	0.009
Industrial Hazardous Waste	1307.2 ⁽¹⁾	2.36 ⁽³⁾	0.11	0.008
Household Hazardous Waste	1307.2 ⁽¹⁾	1.18 ⁽⁶⁾	0.06	0.004

1. Volume-to-Weight Conversion Factors (US EPA, 2016)
2. A new approach for assessing the absorption of disposable baby diapers and superabsorbent polymers: A comparative study (Bachra et al., 2020)
3. Waste Management Best Practice Guide (Arktis Solutions, 2010)
4. Cold Regions – Utilities Monograph, Sec. 16, 3rd edition, American Society for Civil Engineers (Heinke, 1996)
5. Guidelines for the Planning Design, Operations and Maintenance of Modified Solid Waste Sites in the Northwest Territories (Ferguson Simek Clark Engineers & Architects, 2003)
6. Solid Waste Stream Composition Study (Sperling Hansen Associates, 2005)

The hazardous waste generation rate is therefore 0.012 m³/capita/year, while the non-hazardous waste generation rate is 7.094 m³/capita/year.

CRD Waste:

Waste items from the CRD sector are typically bulky wastes such as automobiles, appliances, engines, tires, and clean tanks. Batteries and oil removed from automobiles are accounted for under the RICI waste sector.

It is therefore assumed that for CRD, the contribution to the total waste is 3.863 m³/capita/year and this waste is bulky and non-hazardous.

Conclusion

Based on Nunavut solid waste studies, and relevant standards and literature, the waste generation rate for municipalities in Nunavut (except Iqaluit) have been determined as follows:

Table 3: Waste generation rates in Nunavut (uncompacted)

Waste Type	Waste Generation Rate (m³/capita/year)
Hazardous	0.012
Non-hazardous (total)	10.848
Municipal Waste	7.094
Bulky	3.754
Hazardous + Non-hazardous	10.86

Appendix A: Determination of Waste Composition for Residential, Industrial, Commercial, and Institutional

Several waste audits of residential waste were conducted as part of planning studies for solid waste facilities in Nunavut municipalities. The waste audit results, along with relevant waste composition standards, are summarized in the Table below. Since the audit findings closely aligned with standard composition rates, the decision was made to use the standard composition rates for all Nunavut municipalities. These had a smaller proportion of “Other” waste, reducing the impact of assumptions about its density when calculating waste volume percentages.

Table A1: Comparison of waste audit data in Nunavut to documented standards and literature.

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