
WASTE MANAGEMENT IN NORTHERN CANADIAN COMMUNITIES

REANNA BERG & SHAWN SAMBORSKY

CORE ENVIRONMENTAL CONSULTING INC.



SETTING



- Northernmost regions of Canada
- Yukon, Northwest Territories, Nunavut

FACTORS AFFECTING WASTE MANAGEMENT



- Unique geography
- Climate conditions
- Population size
- Socio-economic challenges

MUNICIPAL SOLID WASTE (MSW)



<https://www.shutterstock.com/video/clip-1321219-burning-garbage-dump-ecological-pollution>

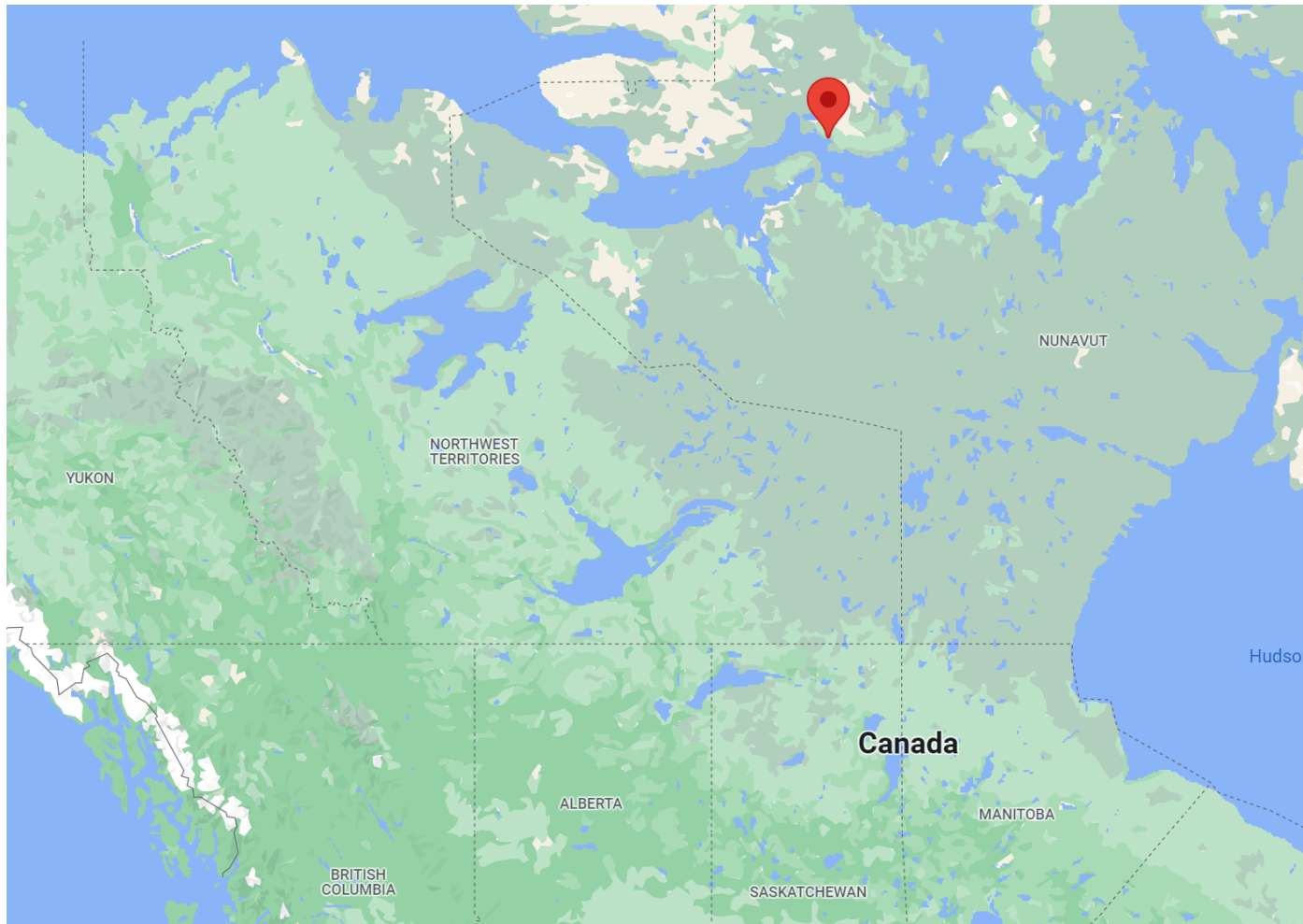
- Many communities use open-air incineration
- Overall lack of recycling programs
- Current landfills have limited capacity for community growth

WASTEWATER



- Majority of communities collect wastewater and sewage by truck
- Dumped in lagoons or settling ponds
- Northern communities often exempt from Federal discharge standards

CAMBRIDGE BAY, NUNAVUT



- Population: 1,766 (2016 census)
- Largest community on Victoria Island
- Access by plane or barge

CURRENT WASTE MANAGEMENT

- 1 community garbage truck runs 5 days per week
- Open incineration is used to reduce landfill volume
- Landfill proximity to community
- Some improvements have been made recently



MUNICIPAL WASTE AUDIT - OBJECTIVES



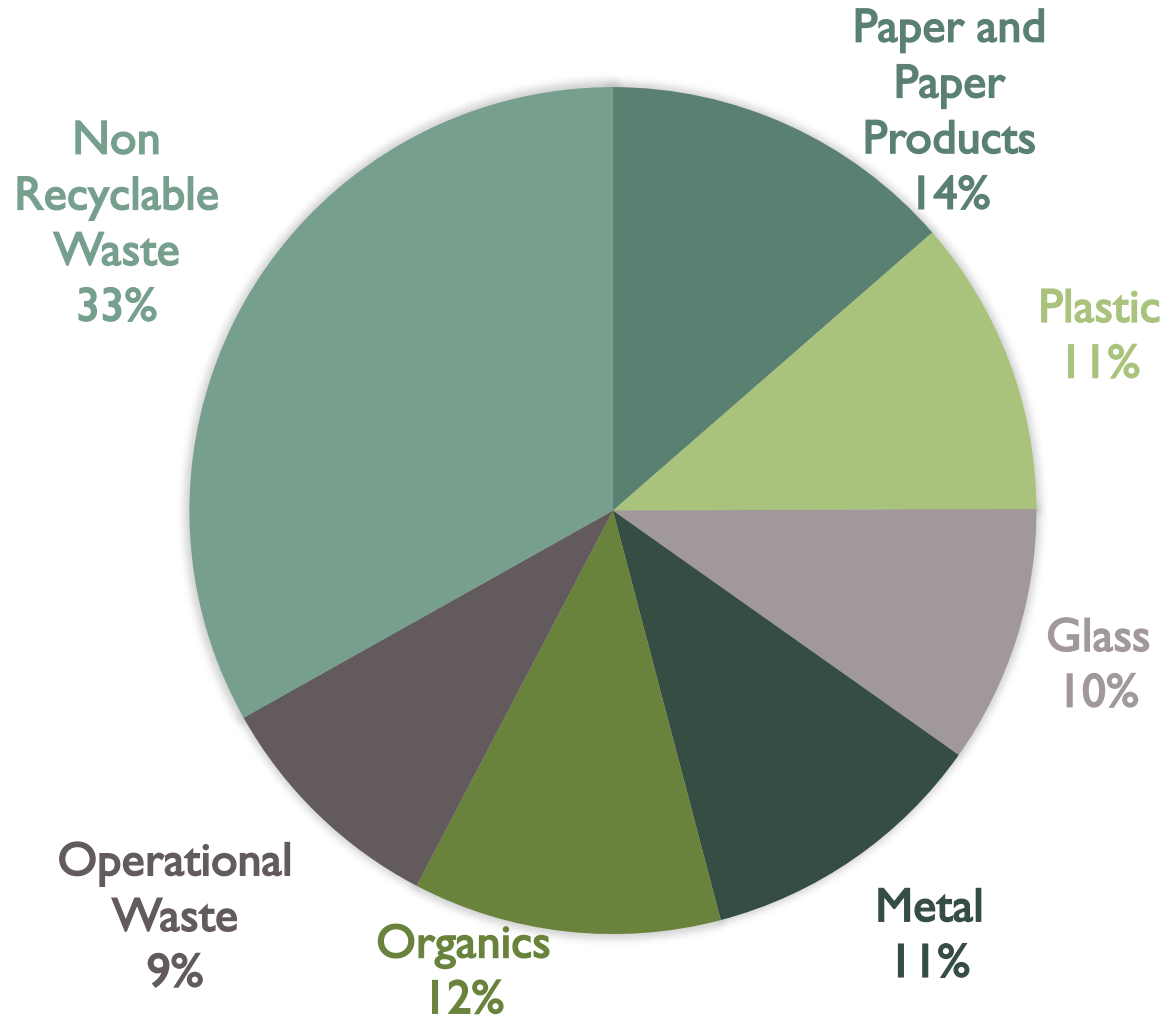
- Quantify annual waste generation
- Determine waste composition
- Identify opportunities for waste reduction/diversion

AUDIT PROCESS



- Paper & paper products
- Plastics
- Glass
- Metal
- Organics
- Operational waste
 - Wood, batteries, electronics, etc.
- Non-recyclable waste
 - Hazardous waste, black plastics, chip bags, cleaning wipes, etc.

AUDIT RESULTS



- 602.95 kg (3-day sample size)
- 468,000 kg generated annually



CORE

Estimated daily production of solid waste in Cambridge Bay

Daily generation of solid waste based on 1766 persons	Source and Specifics
<p>27 tonnes per day Reported 18.1 m³ per person per year, literature density of 0.311 tonnes per m³ for municipal solid waste.</p>	<p>Arktis, 2011 – Cambridge Bay self-reported estimate of waste generation</p>
<p>12 tonnes per day Reported 8.5 m³ per person per year, literature density of 0.311 tonnes per m³ for municipal solid waste.</p>	<p>Arktis, 2011 – Nunavut self-reported estimate of waste generation</p>
<p>3.6 tonnes per day Based on the ECCC National waste Characterization Report.</p>	<p>ECCC, 2020 – Nunavut production of waste based on NT estimates of waste generation</p>
<p>1.8 tonnes per day Based on WRG and CORE waste Audit conducted over a 3-day span in 2021.</p>	<p>WRG, 2021</p>

Annual Waste Generated

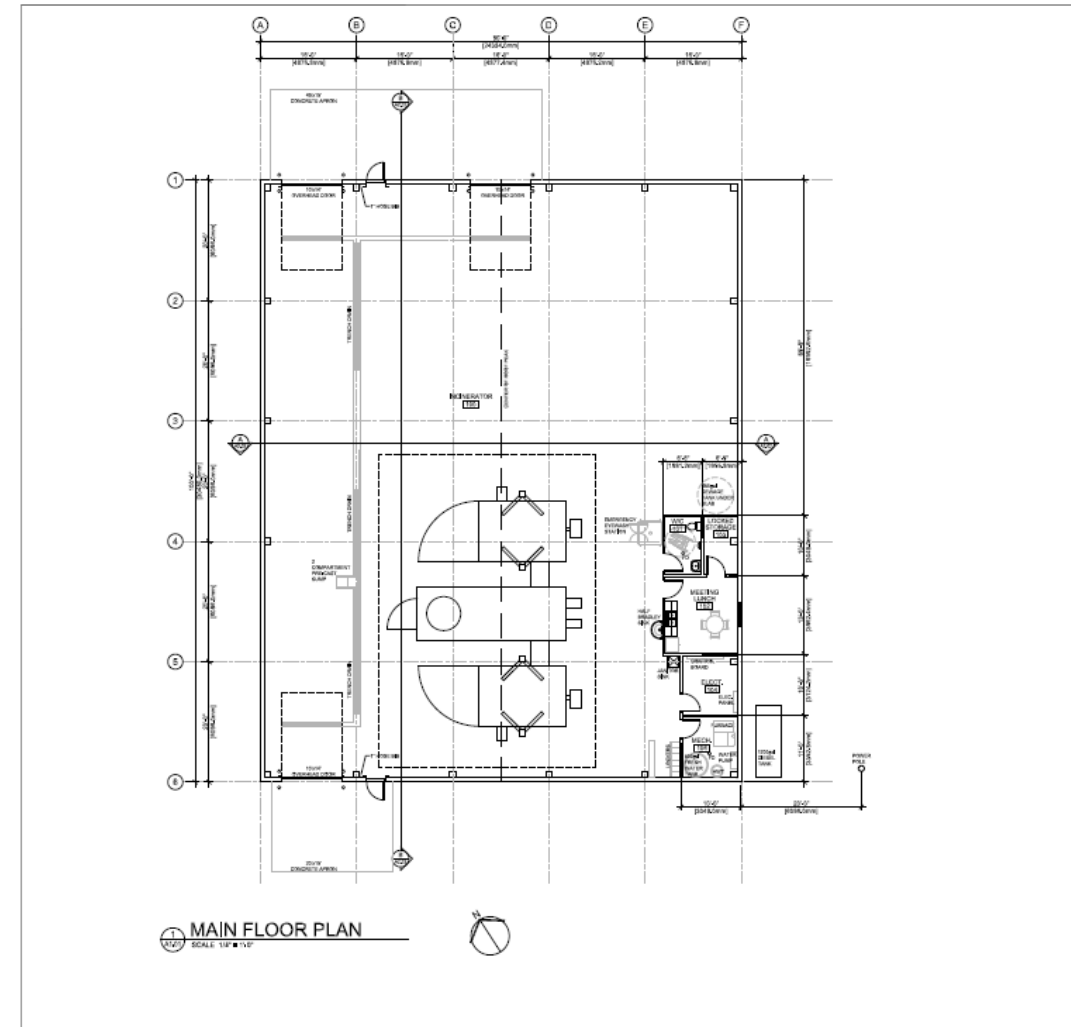
Material	Annual Quantity (kg)	Percentage (%)
Divertible	312,934.01	66.87%
Non-Divertible Material	155,065.99	33.13%
Total	468,000.00	100.00%

Projected Annual Waste Generation Based on Projected Population Growth

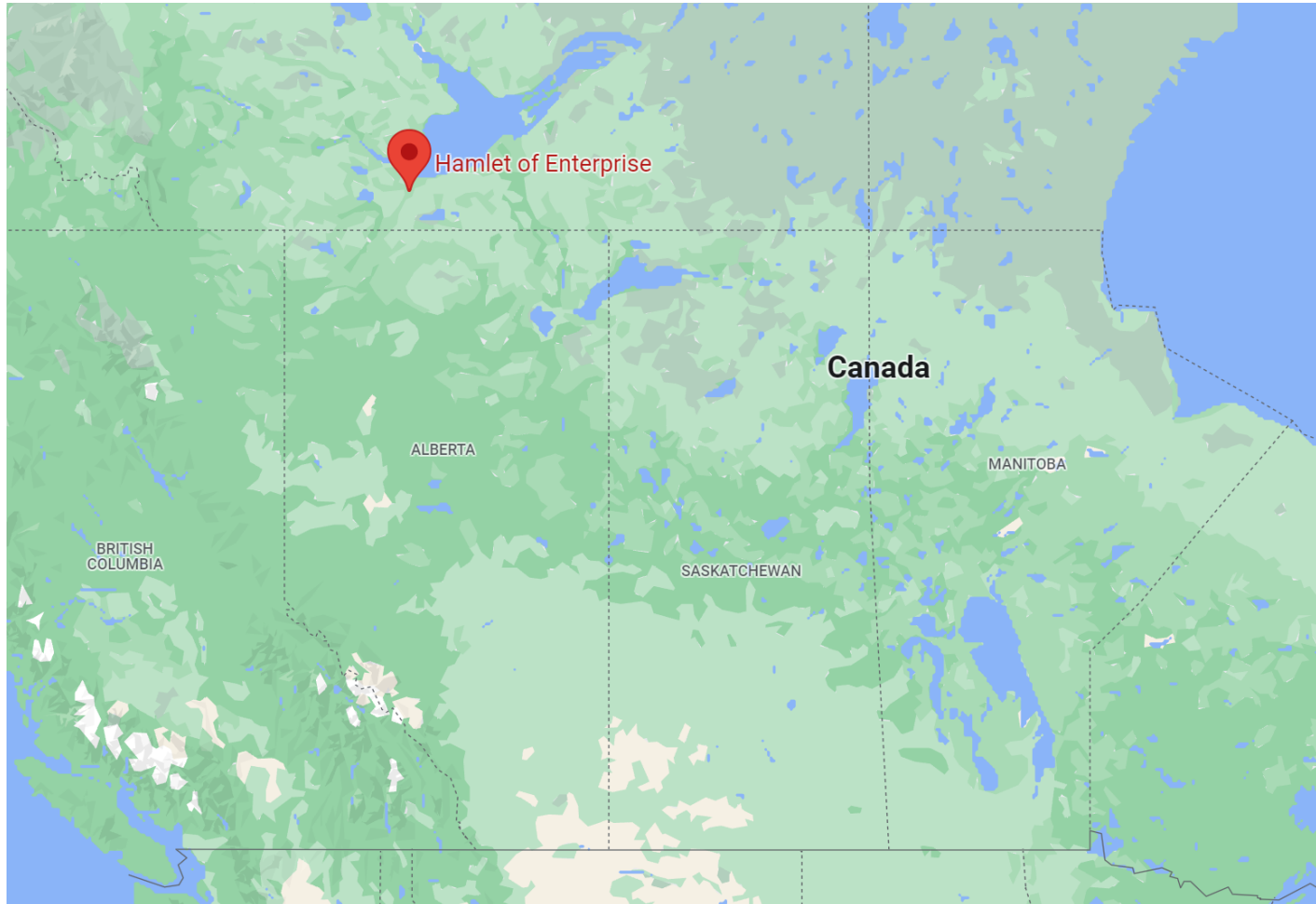
Census year	Projected Annual Waste Generation with Visitors (kg)
2016	464,336.12
2021	500,974.95
2026	537,613.78
2031	574,252.61
2036	610,891.44
2041	647,774.53

SOLUTIONS

- Enclosed incinerator
 - Choose capacity based on audit data
 - Heat recovery
 - Cost offset opportunities
- Diversion programs
 - Source separated organics and composting
 - Haul-back recycling programs
- Education and awareness strategies
 - Provide resources to educate residents on waste reduction



ENTERPRISE, NORTHWEST TERRITORIES



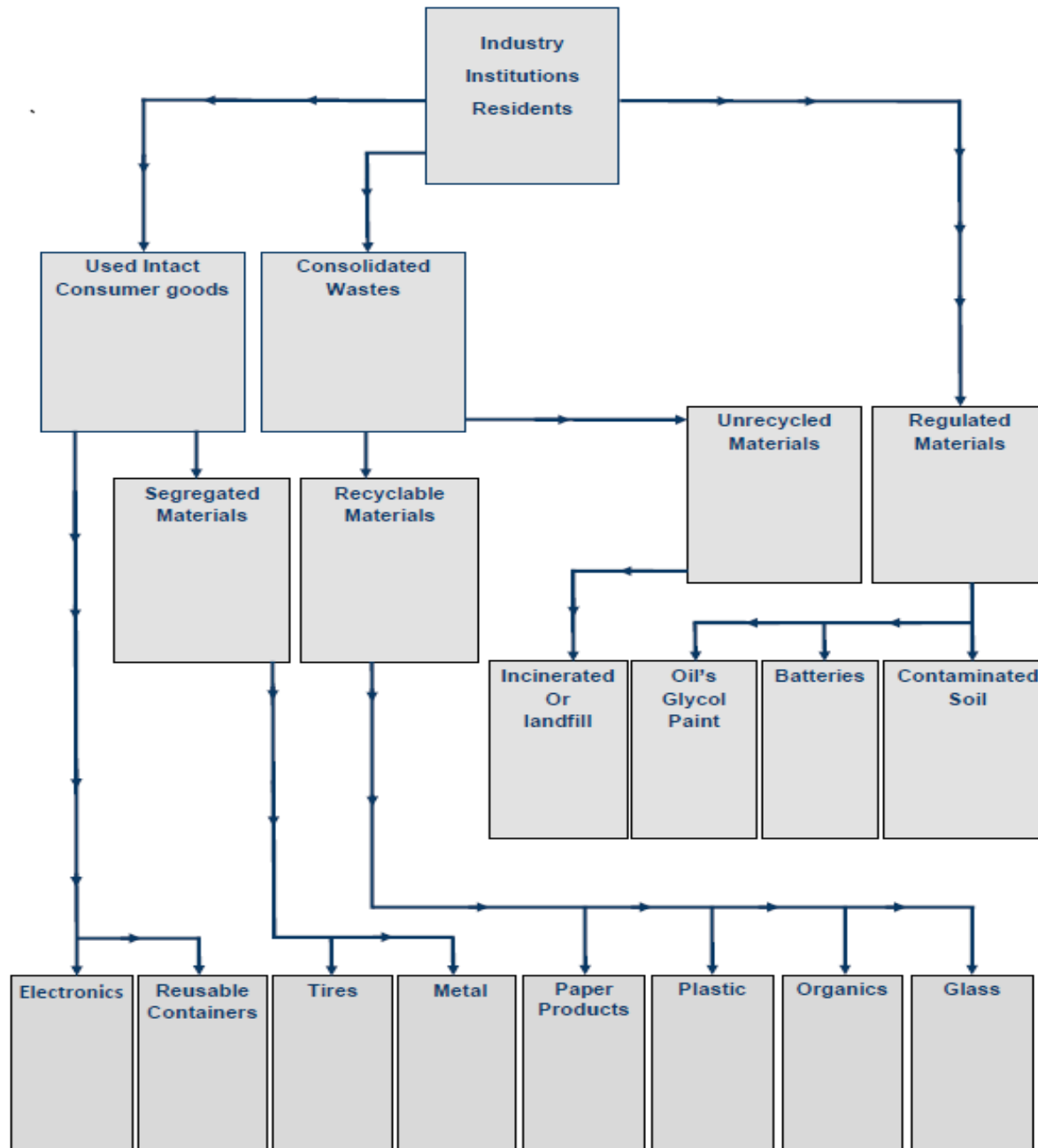
SETTING AND SCOPE

- Looking to solve waste issues in Canada's North
- Smaller communities, regulator
- Population: 106
- Identify 1-4 areas that could be pursued related to waste and environmental issues



APPROACH

- Collect baseline information
- Primarily related to waste volume and logistics
- Undertake analysis of selected business models
 - Barriers
 - Benefits
 - Opportunities
 - High level cost review



RESULTS

- 3 options emerged with 2 sub-options each
 - Procurement of shredding equipment (tires, metal)
 - Centralized solid waste and recycling facilities
 - Construction of a treatment pads (compost, contaminated soil)
- Financial analysis of each
 - Capital and operational costs

Soil Treatment Facility			Composting Facility	
Total Capital investment	\$1,490,000.00		Total Capital investment	\$1,350,000.00
Annual amortized capital	\$177,500.00		Annual amortized capital	\$164,000.00
Annual operating cost	\$181,800.00		Annual operating cost	\$181,800.00
Total Cost	\$359,300.00		Total Cost	\$345,800.00
Cost per tonne based on 15000 annual tonnes	\$39.92		Cost per tonne based on 5000 annual tonnes	\$69.16

Model Details

- Analysis on a per tonne basis with varying volumes
- Appropriate amortization of capital costs

Tire Shredding Equipment		Metal Shredding Equipment	
Total Capital investment	\$1,370,000.00	Total Capital investment	\$1,425,000.00
Capital cost per community	\$62,000.00	Capital cost per community	\$62,500.00
Mobilization Demobilization	\$42,847.00	Mobilization Demobilization	\$42,847.00
Operating Cost per community	\$26,300.00	Operating Cost per community	\$26,300.00
Total Cost per event	\$131,147.00	Removal of material (assume 100 t)	\$232,200.00
		Total Cost per event	\$363,847.00
		Scrap metal recovery revenue	-\$41,000.00
		Net cost per community	\$322,847.00

Model Details

- Analysis on a per community basis (assuming 3 per year)
- Includes barge shipment of equipment and removal of metal
- Appropriate amortization of capital costs

Landfill and recycling building	
Total Capital investment	\$5,170,000.00
Annual amortized capital	\$370,500.00
Annual operating cost	\$425,800.00
Total Cost	\$796,300.00
Cost per tonne based on 15000 annual tonnes	\$119.51

Model Details

- Build a central facility
- Analysis on a per tonne basis
- Appropriate amortization of capital costs
- Much higher cost per tonne than southern facilities



ENTERPRISE NEXT STEPS

- Presented to council
- Decision to form development corporation and find partners
- Determine priorities for further review

OVER ALL CONCLUSIONS

- Waste management in Canada's North requires solutions of appropriate scale and specificity
- Working with communities is more successful with long term relationships which can be difficult to foster for companies from the south
- For relatively little cost/effort community level information can be obtained

ANY QUESTIONS?

