

A Joint Pilot Project for the Development of a Sustainable Waste Management Plan for Wemindji



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Executive Summary

Hereafter is a summary of the measures recommended in order for the First Nation of Wemindji to attain its recovery and recycling objectives.

Waste collection

Wemindji's situation is unique on the Cree territory and indeed quite rare in Northern Quebec, owing to its incinerator, acquired in 2003 to resolve its waste management crisis. This incinerator can burn up to three tons of waste per day. In line with recommendations included in the *Impact Study on the Incinerator*, one of the major factors explaining Wemindji's recycling priority is that the incinerator cannot burn non-combustible materials. These include glass and metal, which are both recyclable.

In 1996, 8.3 million tons of residual materials were generated in Quebec. The general objective of the province's Action Plan on Residual Materials is to divert 65% of the 7.1 million tons of residual materials that can be diverted from the waste stream every year.

Usually, during a first year of implementation, a recycling project rarely diverts more than 25% of the waste stream. As Wemindji generates about 441 tons of waste per year, the recycling potential can be estimated at a maximum 100 tons for the first year of operation.

There exists a number of options for the collection of recyclables in Wemindji. The first one relies on the use of drop-off containers and comes with a price tag of approximately \$10,000. This option would ideally be combined with a segregation of the different recyclables at the disposal sites. The second option for Wemindji is to collect recyclables on a door-to-door basis. Toward this end, a small trailer would be hitched to the back of the current garbage collection truck. Recyclables would then be taken to a Materials Recycling Facility (MRF) for processing. To source-sort recyclables, households would be provided with either coloured bags (\$12,090 per year), recycling stickers (\$4,000 per year) or wheeled carts (\$24,900) with a life expectancy of 15 years. Each technique has its advantages and disadvantages.

After the waste collection

After household recyclables have been collected, they would then need to be prepared for shipping to recyclers. Wemindji has three options in this regard. The first one only covers non-combustible materials. Every week, the garbage men would pick up the metal containers from the drop-off zones and dispose of their contents at an identified location at the dumpsite along with other recyclable metals. Every two or three years, metal recyclers would be hired to come and clean up the metal yard.

The other two options attempt to considerably reduce the waste stream generated by the community. However, they are much more expensive than the first option. These options require a materials recycling facility (MRF). The MRF staff would remove the non-recyclable items as well as all glass, and group the rest of the recyclables “together” (plastics number 1 and 2, metals – except for pop cans -, fibres) into the baler, before shipping them south to recyclers. Two recyclers have expressed an interest in doing business with Wemindji. One company, Chibougamau based Recyclaction P.L.B., is willing to travel to Wemindji to pick up its recyclables. They would provide empty containers for the storage and shipping of bales. Recyclaction P.L.B. would pay \$35 per ton of recyclables sent to their recycling centre. This option would cost \$48,800 for the first year and \$18,800 in operation and maintenance costs in the following years¹. The other company, Sanimos, is based in Rouyn-Noranda but is unwilling to travel to Wemindji to pick up the recyclables. Therefore, once the storage area is near capacity, the LEA would contact KEPA Transportation to arrange for the backhauling of the recyclables to the recyclers. If unsorted, the recyclers would levy a sorting charge of about \$60 per ton. This option would cost \$75,500 for the first year with an operation and maintenance cost of \$19,500 in the following years².

Initial funding for the Wemindji program is essential for its start-up. Given that a recycling project proposal has already been prepared, Wemindji could submit applications to obtain funding from existing public programs. Until then, the purchase of equipment, the building of a transfer station (warehouse) or a door-to-door collection process should be put on hold. Consequently, and given certain inescapable geographic and demographic constraints as well as the costs associated with each option, this paper concludes that the most adequate program, which best complements Wemindji's incinerator at the present time, is the setting-up of drop-off recycling zones for metals and glass. These materials could then be taken to the disposal site to be segregated and then picked up by recyclers every two years or so. Ideally, this initiative would be combined with the building of a hazardous waste storage shed, the setting-up of a salvaged construction waste yard and the implementation of Recyc-Quebec's programs on the Cree territory (for used oil, used paint, soda cans, rechargeable batteries and tires). Such a program is not expensive and does not involve any major investment in large infrastructures (such as a warehouse or baler). It would also increase people's awareness so that when a door-to-door collection actually began, participation levels would be high.

¹ This estimated cost does not include the cost for the source-sorting tool (coloured bag, sticker or wheeled cart) previously mentioned.

² Ibid.

Introduction

This document sets forth a residual materials management plan for the Cree First Nation of Wemindji. In addition to complying with sustainable development criteria, this plan has been designed with two objectives in mind:

- Maximizing the diversion rate of non-combustible residual materials from the waste stream including both ferrous and non-ferrous metals, glass and certain hazardous materials.
- Reducing the annual volume of residual materials eliminated through the incinerator or landfilling by enhancing the effectiveness and life expectancy of existing infrastructures while abiding by the incinerator's compliance criteria.

Furthermore, this plan attempts to meet the requirements of the Environment Quality Act which makes it compulsory, since 1999, for all Quebec Regional County Municipalities (RCMs) to elaborate a Residual Materials Management Plan. Although Wemindji does not have the status of an RCM and consequently is not subject to this Act, it is resolved to launching such an initiative because of its commitment to preserving the quality of its natural environment for the benefit of future generations.

The first section of this document describes the geographic, demographic and economic context of the First Nation of Wemindji. There follows a general description of current residual materials management practices in the community (section II) and a characterization of the waste generated by households and various institutions, retail outlets and industries (section III). Section IV of this document outlines the measures recommended to manage the community's various residual materials including recyclables, construction-renovation-demolition debris, hazardous materials, bulky waste, textiles and organic waste. This section outlines the various options that are available to the community to manage its residual materials along with their associated costs and respective advantages and disadvantages. The final section of this document (section V) deals with some of the particulars of an information and education awareness campaign so essential for the successful implementation of such a program in the community.



Jean-François Luc Vachon

I - DESCRIPTION OF THE TERRITORY

A. A Distinctive Land Regime and Administration

The Cree community of Wemindji is part of Quebec administrative region number 10 as well as the James Bay and Northern Québec Agreement's (JBNQA) territory. By virtue of the JBNQA, signed in 1975, the governments of Canada and Québec recognize the Cree traditional land tenure. The latter identifies the Cree family trapline as a territorial unit under the stewardship of a tallyman.

The JBNQA creates three land categories. Category I lands are set aside for the exclusive use of the Cree. On these lands, Cree First Nations may exercise local government powers, namely regarding public works, environmental and social protection as well as protection and use of natural resources. The Cree-Naskapi (of Québec) Act of 1984 describes these powers in more detail for Category IA lands, which are Category I lands remaining under federal jurisdiction (almost all Cree housing units are located on Category IA lands). The Act authorizes local governments to enact by-laws relating to matters of health and hygiene, for instance the construction, operation and regulation of waste disposal systems as well as the collection, removal and disposal of waste.

Category II and III lands remain crown lands and fall under provincial jurisdiction. However, given the importance of wildlife resources for Cree society and economy, the JBNQA grants the Cree specific wildlife harvesting rights. On Category II lands, the Cree have exclusive harvesting rights; on Category III lands, both Native and Non-Native people may hunt and fish, although only the Cree can trap designated species. All of these land designations (I, II and III) are part of the JBNQA land regime in accordance with Cree traditional land tenure.

Development projects can be carried out on all three land categories, following an assessment and review procedure. On Category 1 lands, this procedure is managed by a Local Environment Administrator (LEA). The Cree Regional Authority (CRA) provides policy guidance and technical support to local governments. However, the CRA is not empowered to act as a Regional County Municipality (RCM or "Municipalité régionale de comté (MRC)" in French). According to the Environment Quality Act, as amended in 1999 (Bill 90), no entity is currently qualified to prepare a residual materials management plan for the James Bay Territory.

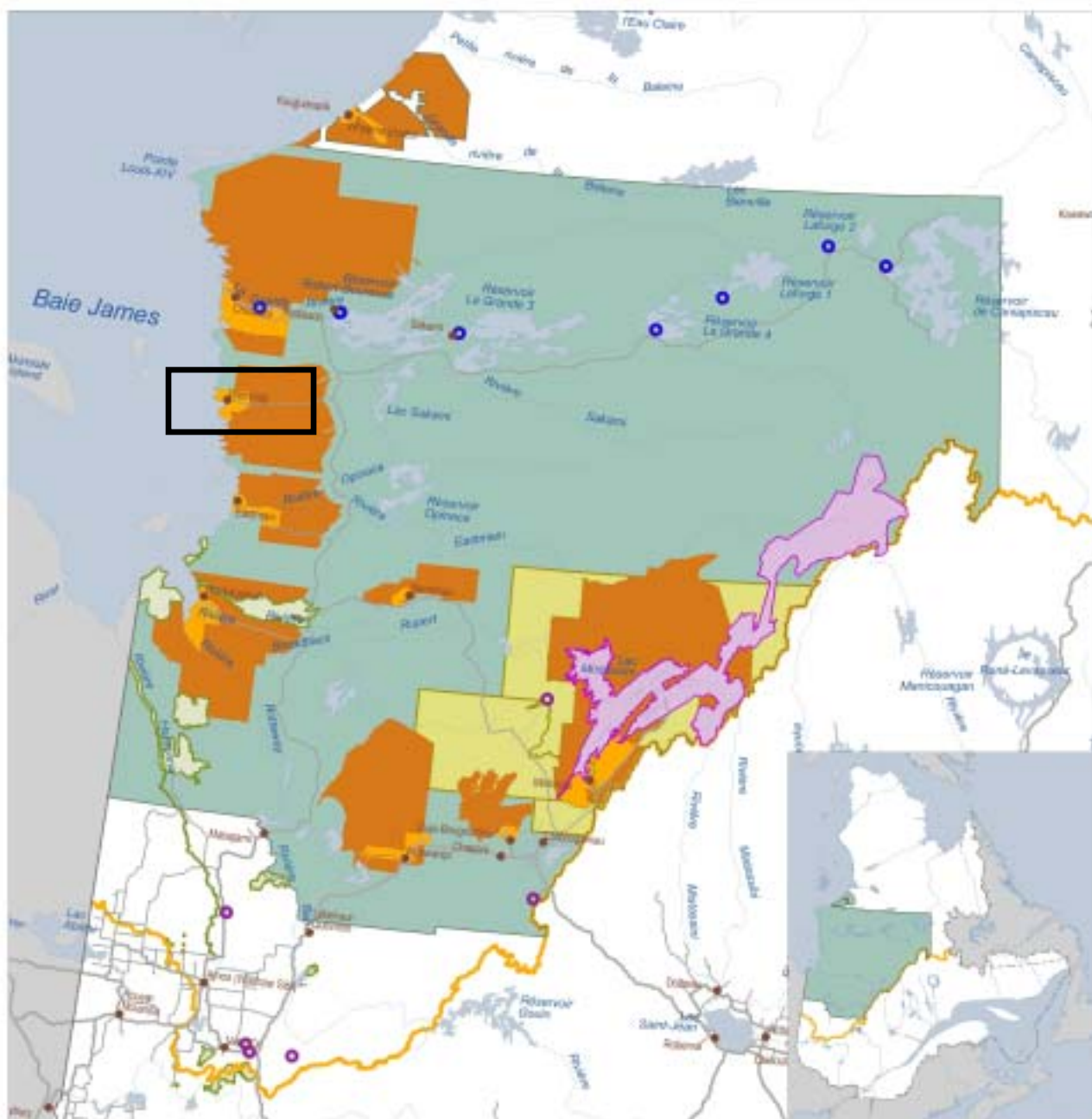
B. Geography

Category IA and IB lands for Wemindji cover a total area of 513 square kilometres. Category II lands cover a total of 6,822 square kilometres (see Map 1).

Wemindji's neighbours are the Cree communities of Chisasibi and Eastmain as well as the Non-Native community of Radisson. Chisasibi is 270 kilometres north of Wemindji by road whereas Eastmain is 370 kilometres south. The town of Radisson is located about 200 km away by road. Chisasibi, Wemindji and Eastmain are located on the east coast of James Bay. The distance from Wemindji to Val d'Or, by road, is 1,008 kilometres, and the distance from Wemindji to Montreal is 1,418 kilometres.

Wemindji is accessible by road, air and water. A permanent road which opened in September 1995 connects Wemindji to the James Bay highway, which leads to Matagami and La Grande 2. This 96-km long access road is located at Kilometre 518 of the James Bay highway. Wemindji also has a local airport and a small harbour. The Maquatua River connects Wemindji to the James Bay.

Map 1: Geography of the Cree territory



- Cree Category I lands
- Cree Category II lands
- Southern limit of JBNQA Territory
- Interprovincial border

* Oujé-Bougoumou Category I and II lands are under negotiation
 ** The Atahkwa Sibik Eeyou Association is temporarily based in Atahkwa

- Hydroelectric power station
- Active mine site
- Wildlife sanctuary
- Planned Québec national park
- Protected area

Sources

Cartographic bases	MRNF	2005
Land division	MRNF	2005
Mine site	MRNF	2005
Recreational and protected area	MDDEP	2005

Metadata

Lambert Conic Projection
 Geodetic datum: NAD 83

Produced by

Direction générale de l'information géographique
 Ministère des Ressources naturelles
 et de la Faune, June 2005

0 100 km



Comité consultatif pour l'environnement de la Baie James
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C. Demographics

1) Population³

In 2004 Wemindji had 1,254 community members, of which one-third were under 30 years of age (approximately 450 members). Most of the people live in the village, which covers an area of two square kilometres. There are 443 active trappers, all members of the Cree Trappers Association (CTA). Trappers still live a traditional Cree lifestyle and live off the land. They provide the community with traditional food. In order to be considered a full time trapper and a beneficiary of the Income Security Program (ISP), a Cree has to be engaged a minimum of 120 days per year in harvesting and related activities. The hunting season is mainly between September and June. During the summer months (July and August) the trappers either stay in the community or practice fishing activities.

2) Housing⁴

There are two types of homes in Wemindji: bachelor units and family units. Of the 280 band units in Wemindji, six are bachelors and the rest are family units. The Cree School Board (CSB) has 24 units in Wemindji, mainly for teachers and CSB employees. The Cree Health Board has five houses and three bachelor units for their employees. Finally, there are also five home ownership units for a total of 317 housing units in the community of Wemindji (see Map 2).

3) Population Forecast

The Economic Development Office of Wemindji predicts a doubling of the population over the next 20 to 30 years. Indeed, the population growth in Wemindji is approximately 2.5 to 3% per year⁵.

³ Data from Wemindji's *Beneficiary List 2004*, made available by Sarah Stewart, Wemindji's beneficiary clerk.

⁴ Data from Wemindji's *Tenant List 2004*, made available by Sarah Hughboy, Wemindji's housing administrator.

⁵ Cree Nation of Wemindji. 2002. *Impact Study on the Incinerator*.

Map 2: Cree Nation of Wemindji – Community Map



D. Businesses, Institutions, Industries

The Wemindji community features a “mixed economy”, in which income is derived from domestic production through subsistence activities, wage labour, entrepreneurial ventures and transfers from the federal and provincial governments⁶. Presently, most wage jobs are provided by the First Nation Council and the CSB. Important local industries operate in the fields of mining, construction and transportation. There are high levels of unemployment in the community (up to 40 %), so the Council encourages labour-oriented activities⁷.

Wemindji offers many services that employ locals:

- health care and public safety
- fire department and police services
- social services
- elementary and high school (one building)
- three restaurants, one coffee shop and one hotel
- one sports complex and one arena
- one bank, one post office and two grocery stores
- one gas station.

⁶ Notzke. 1999 (See complete references on page 43).

⁷ Comments from Benessaiah et al. 2003

II - CURRENT WASTE MANAGEMENT

Recycling and reusing have long been a part of the Cree traditional lifestyle. However, with garbage in-trench disposal sites and landfills being a relatively new phenomenon, modern recycling techniques have yet to be implemented and the only waste management measure currently carried out in Wemindji consists in the collection and elimination of residual materials. Recyclables, compostables and bulky waste are all treated and managed the same way, through incineration or landfilling. The cold environment and the great distances separating the community from recyclers explain why elimination has been adopted as the “easy solution” for local waste management and led to many waste management issues.

However, since 1996, the First Nation of Wemindji has been striving to improve its waste management system in order to eliminate the negative environmental impacts of in-trench disposal sites. Several studies were commissioned in recent years to provide the First Nation Council with different waste management options. Wemindji received a certificate of authorization for the opening of a new solid waste disposal site in 1999, which site is located at Km 11 of the access road. Moreover, based on several environmental studies, the First Nation of Wemindji installed a waste incinerator purchased from Echo-Waste Solutions (Ontario). The new in-trench disposal site at Km 11 was intended to be used for the disposal of ash and non-combustible materials⁸. However, even if the new in-trench disposal site was duly approved in 1998, the local tallyman’s uneasiness with operations led Council to restrain use of the site. A new site for residual ashes, located at Km 3, is now under environmental review and, pending approval, should open before 2006.

A. Waste Collection Description

1) Frequency

Waste collection is conducted daily by First Nation employees, but the community is divided into two sectors. Consequently, residents have their waste picked up two or three times a week. These services are provided to approximately 300 households in Wemindji.

2) Type of Collection

Waste collection is done door-to-door in Wemindji. Wooden bins are used to store household waste. The bins are located near residents’ driveways. The typical bin is two feet wide, four feet long and three feet high.

⁸ Dessau-Soprin Inc, November 2004.

B. Facilities

1) Old Disposal Site

The old disposal site exceeded its capacity back in 1996. Today, it is still being used until Wemindji agrees on the location of a new disposal site. The old site is used on a regular basis by construction companies. Most household waste is sent to the incinerator. However, when the incinerator temporarily breaks down, household waste is taken to the old dump site.

2) Incinerator

The Cree Nation of Wemindji has been interested in incineration since the mid-90s as a desirable alternative to conventional waste disposal with open air burning of waste. In 2003, Wemindji



decided to purchase an “Echo-Waste oxidizer”, a batch style starved incinerator capable of burning all types of domestic waste. The incinerator has two primary 1.5-ton chambers, a secondary chamber (the afterburner) with minimum 2-second detention time, connecting ductwork, a stack and control system for a daily burning capacity of three tons. The incinerator, in addition to satisfying the community’s needs over the next 40 years, reduces the volume of waste by at least 90% and does not result in any adverse impact on the environment. Indeed, emissions and ashes both comply with Canada’s and Quebec’s environmental standards and regulations⁹.

The incinerator also generates waste through its residual ashes from the burning of household residual materials. The weekly 20 cubic metres¹⁰ of ashes generated by the incinerator are currently sent to Km 11 for disposal, and will be until the new disposal site becomes operational, with the temporary approval of the local tallyman in order to allow Wemindji to find a new site.

3) New Disposal Site

The new disposal site project for Wemindji is going through an environmental impact assessment according to JBNQA’s Chapter 22. The location of this new facility is expected to be at Km 3 of the Wemindji access road. If the new disposal site is approved, it could open in November 2005.

⁹ Information gathered from the *Impact Study on the Incinerator*, by Option Environnement, June 2002.

¹⁰ Empirical analysis, July 2005.

C. Waste Collection Costs

The Cree Nation of Wemindji's waste collection program costs approximately \$300,000 annually¹¹. This includes all collection costs as well as the costs related to the operation and maintenance of the incinerator (labour, garbage truck, energy, contracted services). In order to receive the waste collection services, each household must pay an annual user fee of \$200.

D. Local Authorities Involved

1) Cree First Nation Council

The First Nation Council of Wemindji is composed of Chief Reggie Mark and his six councillors. As they are responsible for the administration of the community's services, they assume the monetary costs of waste collection. They also approve or reject proposals and may adopt bylaws applicable to Category I lands. The Local Environment Administrator reports to the Council. Director of Operations Tony Gull is the head administrator who oversees the administration for Wemindji.

2) The Local Environment Administrator

Mr. Johnny Mark has been Wemindji's Local Environment Administrator (LEA) since 2001. The LEA is responsible for the environmental protection of Category I lands, and is the community liaison for development on Category II and III lands. Thus, the LEA, by resorting to the Environmental Protection By-Law, can approve or reject any development resulting in an environmental or social impact on Category I lands. Consequently, the LEA plays a crucial role in any development project subject to the JBNQA Section 22 Regime for Category I lands.

The LEA is the person responsible for waste management matters. Indeed, his role consists in managing the Environmental Health Department (see next section). Since 2001, Mr. Mark has endeavored to find solutions to the waste management issues in Wemindji. After the feasibility study and an impact assessment under Section 22 of the JBNQA, it was recommended that the incinerator project be approved: Mr. Mark therefore authorized the project in accordance with Section 22 and By-Law 90-42. He has also been a major proponent of the new recycling project that is being proposed for Wemindji.

3) Environment Health Department

This department includes the waste management employees that actually collect household waste and process it at the incinerator. Mr. John Ratt is the manager of this department which has three full-time employees, namely Jeffery Kakabat, John William Natawapineskum and Darren Croxen. All four staff members collect the garbage from Wemindji's households on a daily basis. In the afternoon, they supervise the burnings in the incinerator. Consequently, the new recycling program would be managed by Mr. Ratt

¹¹ Environment and Land Management Department of Wemindji, personal communications, 2005.

under the supervision of the Local Environment Administrator, Mr. Johnny Mark, who reports to the First Nation Council of Wemindji.

III - WASTE CHARACTERIZATION: WEMINDJI

Waste characterization was twice conducted on the Cree territory. For Wemindji, the last survey was conducted in February 2000 for the purpose of a feasibility study on waste incineration. A similar survey in Chisasibi in 1991 revealed a daily average of 1.01 kg of waste per capita. This waste characterization was based on three distinct surveys (compared to one for Wemindji). We may assume similar conditions for Wemindji and use this value for the total amount of waste generated in the community. However, compiling data at the materials recycling facility (MRF) and at the incinerator would be beneficial in the future for the Cree Nation of Wemindji.

A. Municipal sector

Table 1 : Household waste production per material

Material	% of composition	Yearly generation (tons)
Fibres	31%	137
Plastics	13%	57
Glass	3%	13
Metals	7%	31
Organic	39%	172
Others	7%	31
Total	100%	441

Table 1 shows the amounts of the various waste materials generated by households. As can be observed, organic waste represents an important fraction of the community waste stream. If the objective was solely to reduce the amount of burnings per week, a composting pilot project for the community should be planned for the future. For the recycling project itself, fibres (31%) represent the biggest share of recyclable materials for the community, followed by plastics (13%), metals (7%) and glass (3%). Most of this waste comes from packaging. Indeed, Cree communities receive most of their goods in packages, and bulk food is not available at the community store or at the Northern grocery shop. Canned foods and plastic wraps represent the bulk of these residual materials.

Figure 1 Wemindji's household waste audit

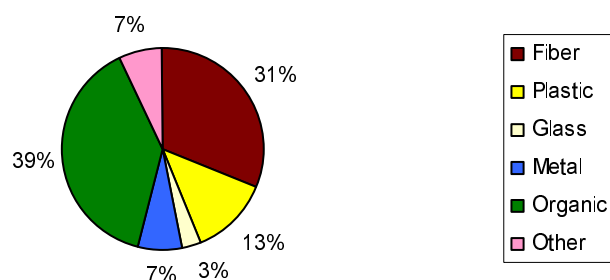


Table 2 Objectives of the Quebec Action Plan on Household Residual Materials Management 1998-2008 for Wemindji

Material	Yearly generation (tons)	Objective (%) of the MDDEP	Objective (tons) of the MDDEP
Fibres	137	60%	82
Plastics	57	60%	34
Glass	13	60%	8
Metals	31	60%	19
Organic	172	60%	103
Others	31		
Total	441		246
Total for Recyclables	238		143

Table 2 illustrates the impact of the possible application of the Quebec Action Plan on Residual Materials adopted by the Quebec Government in 1999. The chances of attaining these objectives by 2008 are very small. However, it helps us to realize how the implementation of this action plan would reduce the amount of waste presently incinerated or landfilled in Wemindji. Indeed, if 441 tons of residual materials are currently eliminated in Wemindji, the incinerator has to burn 3 tons of waste 147 days per year (2.8 times per week). If the Quebec Action Plan's objectives were attained, this would result in a requirement of only 82 days of full capacity incineration (a decrease of 65 days per year) or incinerating only 1.6 days per week compared to almost 3 times per week. If only recyclables (non-organic materials) were managed in a sustainable fashion, we would cut the number of burns by 48 (99 days of full capacity incineration, or 1.9 times a week).

1) Recyclables collection

Currently, only soda cans are recycled by different members of the community. Sam's Video Shop as well as the community store offer drop-off containers for the refundable cans. All other recyclable materials are taken to the incinerator or to the landfill.

2) Compostable materials (food waste)

Avenues for composting in a cold environment are not well documented. Most composting experts consulted have serious doubts about the feasibility of such a project. Recently, an Abitibi-based company, *Solarair Consultant Inc.*, suggested using the energy generated by the Wemindji incinerator to heat greenhouses. Using these greenhouses to heat compost during winter is a possible venue worthy of consideration in the future. Household compost or vermicompost could also be offered by the Environment Department to community members. At the moment, food waste is either incinerated or landfilled.

3) Textiles

No precise data is available for this material. The Wellness Centre accepts some used clothing for local use. However, most used textiles are incinerated or landfilled.

4) Bulky waste/white goods

Appliances are segregated at the disposal site. This year, metal scrap recyclers will be coming to pick up used appliances from the landfill site. However, other dry materials, like furniture, are mixed in with construction waste at the landfill.

5) Hazardous waste

No specific site or collection is organized for hazardous waste.

Some car batteries are segregated together at the disposal site (32) and at the public works garage (50). These acid-lead batteries should be collected by the metal recyclers in August 2005.

Many 45-gallon drums filled with different combustibles (gas, used oils and cooling agents) are kept all over the community. The public works garage has about 70 of these drums. They wanted to recycle the used oil as a source of energy for the garage, but that would necessitate a minimum of 2,000 gallons of used oil per year, which they cannot source from the local market.

Other household hazardous waste (batteries, aerosols and propane tanks) is stored at the disposal site. In the course of an awareness campaign, residents were informed that explosive materials should not be put in garbage bags for safety reasons and to avoid maintenance problems at the incinerator. However, the incinerator manager informed us that explosions were a frequent occurrence in the burning chambers.

6) Tires

In 2004, Recyc-Québec was supposed to collect all used tires from Wemindji following an agreement concluded with the CRA. Unfortunately, due to poor weather conditions, the designated transportation company never showed up. However, it is expected that this will be done this year. Wemindji currently keeps more than 350 used car tires and about 10 heavy equipment tires at its disposal sites.

B. Industries, Businesses, Institutions

The waste audit conducted in 2000 revealed that the industrial sector produced only 24% of Wemindji's waste stream compared to 74% for households. This includes the three restaurants, the hotel, the garage, and all shops, offices and community buildings. Table 3 and Figure 2 present the details from the 2000 survey.

Table 3 : Industries, Businesses, Institutions waste production per material

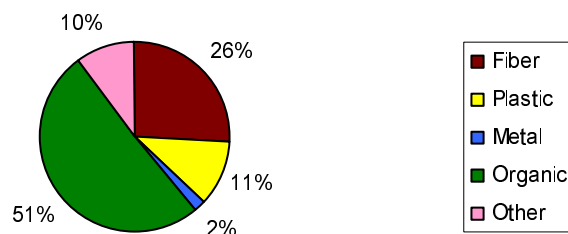
Material	% of composition	Yearly generation (tons)
Fibre	26%	25
Plastic	11%	11
Metal	2%	2
Organic	51%	49
Other	10%	10
Total	100%	97

Cardboard boxes are an important source of residual materials for isolated communities (due to shipping). The survey estimated the amount of cardboard boxes in Wemindji at around 50,000 per year. Combined with the important volume of used paper generated by the schools, the bank and First Nation offices, this explains the importance of fibres in the business sector waste stream.

Since these surveys were conducted during the winter (one in February and the other in November), the amount of waste generated from the construction-renovation-demolition (CRD) sector was not assessed. Indeed, construction mostly takes place during the summer in Wemindji due to climatic factors. Using the data from Recyc-Québec (2003), we

may evaluate the waste generation from this sector to be around 28% of the total waste stream, or 210 tons of CRD-debris per year. Overall, we can therefore estimate total waste generation in Wemindji to be around 748 tons (441 tons from households, 97 tons from businesses and 210 tons from the CRD-sector).

Figure 2: Wemindji's industry, business, and institutions waste audit



IV - WASTE MANAGEMENT PROGRAM

A. Recyclables

Article 53.6 of Quebec's *Environment Quality Act*, amended in December 1999 by Bill 90, compels all Regional County Municipalities (RCMs) to elaborate a *Residual Materials Management Plan*. These plans aim at attaining the objectives set under the 1998-2008 *Quebec Action Plan on residual materials*.

This Action Plan has four objectives:

- Prevent or reduce the generation of residual materials.
- Promote the recuperation of and beneficiation of residual materials.
- Minimize the volume of residual materials eliminated and ensure a safer management of the installations.
- Raise awareness among manufacturers and suppliers about the impact of their products on the environment.

Even if Wemindji does not have the same roles and jurisdictional powers as Quebec's RCMs, the First Nation's Council believes it's important to prepare a similar sustainable waste management program in order to deal with current and future issues related to residual materials. Moreover, by virtue of the provisions in the Cree-Naskapi Act, the First Nation of Wemindji's Local Cree Government has the authority to design and implement a residual materials management plan. Toward that end, it has asked the James Bay Advisory Committee on the Environment (JBACE) to assist its Local Environment Administrator in the design of such a program.

1) Context and objectives

In 1996, a planned disposal site at Chapais, which was meant to receive residual materials from its southern neighbours, increased the Cree communities' and JBACE's awareness about waste management issues in the James Bay territory¹². Since then, Cree communities have attempted to develop some kind of regional recycling program¹³. Due to the considerable distances between the different communities, climatic barriers, and local priorities, a regional program was too difficult to orchestrate. Consequently, none of the nine communities runs a functional recycling program.

The Washaw Sibi Cree, through their association with the Pikogan Algonkins, have been recycling since 2004 as the result of an agreement with the city of Amos. The situation for coastal communities is different due to the great distances separating them from recyclers. Indeed, Wemindji is located 900 kilometres away from the first recycler. To solve its waste management issues, Wemindji has decided to undertake a self-sufficient "local" project to collect recyclables.

¹² JBACE, 1996

¹³ Cree Regional Authority, 2000

Also, Wemindji's situation is unique on the Cree territory, and indeed quite rare in Northern Quebec owing to its incinerator. Wemindji acquired an incinerator in 2003 to resolve its waste management crisis. This incinerator can burn up to three tons of waste per day (refer to the equipment section). Wemindji incinerates about 540 tons of waste per year¹⁴. That means that if the community currently burns its waste 5 days a week¹⁵, it burns up to 2.1 tons of waste per day. A recycling project could reduce the number of burnings per week.

Moreover, when there is a problem with the incinerator's chamber, all the garbage is taken to the landfill. The community will soon inaugurate a new disposal site for ashes. The site selection for this project has been time-expensive for the community. Consequently, the community and the local authorities wish to maximize the life expectancy of this site. A sustainable recycling project, by diverting a certain volume of residual materials from the waste stream, would extend the new disposal site's active life.

Finally, and in line with recommendations included in the *Impact Study on the Incinerator*, one of the main reasons for Wemindji's priority on recycling is that the incinerator cannot burn non-combustible materials. These include glass and metal, which are both recyclable. Priority should be given to glass and metal to minimize the technical and financial problems associated with the incinerator.

Currently, only some refundable aluminium cans are recuperated and sent to southern recyclers by the community.

2) Objectives of the 1998-2008 Quebec Action Plan on residual materials

In 1996, 8.3 million tons of residual materials were generated in the province. The general objective of the Action Plan is to divert 65% of the 7.1 million tons of residual materials that can be diverted from the waste stream every year. The recycling objectives for each material managed by the municipalities are as follows:

- 60% of glass, plastic, metal, fibres, bulk waste and compostables;
- 75% of used oils, used paint and pesticides (HHW);
- 50% of textiles; and
- 80% of soda cans and bottles.

3) Proposed measures

Many different steps have to be understood to launch a reliable and sustainable recycling project in Wemindji. All need to be taken very seriously, otherwise the project will not succeed. All community members have to be consulted at all levels, including the general public, Council representatives, the community's youth, as well as garbage collectors and the incinerator's supervisor. The community has to work as one, otherwise the many

¹⁴ Construction waste are not incinerated.

¹⁵ Environment and Land Management Department of Wemindji, personal communications, 2005.

barriers, which have slowed the progress of recycling in northern communities over the last ten years, will compromise the project's successful implementation.

Usually, for the first year of implementation, a recycling project rarely diverts more than 25% of the waste stream. If we refer to section 4.1, we can estimate the potential for recyclables to be a maximum of 100 tons for the first year of operation (25% of 441 tons of household waste or 42% of the recyclable volume of 238 tons)¹⁶. Table 4 summarizes the different options and their related costs.

Table 4: Summary table for recyclable material management in Wemindji			
Option		Cost for the first year	Reference page
<i>The collection</i>			
1	Drop-off containers	\$10,000	19
2	Coloured bags	\$12,090	47
3	Stickers	\$4,000	47
4	Wheeled Cart	\$24,900	48
<i>After the collection</i>			
1	Segregation of materials at the disposal site	None	20
2	Agreement with Recyclaction P.L.B in Chibougamau	\$48,800	23
3	Agreement with Abitibi recyclers and backhauling	\$75,500	24

¹⁶ Including only household's residual materials (not from businesses, institutions or construction).

i) The Collection of Recyclables

Option 1: Drop-off containers

The first option for Wemindji is to use drop-off containers to collect recyclables in Wemindji. This way, Wemindji's authority could decide what they want to recycle. Three different "recycling zones" could be established in the community, so that people would not have to walk more than five minutes to get rid of their recyclables. This option would ideally be combined with a segregation of the different materials at the disposal site (see Option 1 of the following section).

ADVANTAGES

- A drop-off system is usually the first step to sensitize a population about recycling.
- It's inexpensive: there is no need for a recycling facility. Recyclables are picked up once weekly by employees.
- There is no need to sort the residual materials.

DISADVANTAGES

- Usually, public participation in a drop-off system is lower than that associated with door-to-door collection.
- It can lead to some vandalism.
- It's difficult to implement in winter since people have to walk some distance to recycle.

COSTS

- Six drop-off containers for metals and glass: **\$10,000 (\$6,000 + delivery)**

Option 2: Door-to-door collection¹⁷

The second option for Wemindji is to collect recyclables door-to-door. To do this, a small trailer would be hitched to the back of the current garbage collection truck. Recyclables could be collected on specific days (e.g. Mondays and Thursdays), or every day along with non-recyclable garbage. Recyclables would then be taken to a Materials Recycling Facility "MRF" for processing (see next section).

ADVANTAGES

- Easier for residents resulting in an increased participation rate.
- Significantly reduces the volume of garbage to be incinerated.

¹⁷ See Appendix 2 for more details.

DISADVANTAGES

- Some space needed for the waste-sorting equipment (blue box, etc.).
- Requires some sorting.
- More complicated for the garbage collection staff.
- Requires new equipment: more expensive.
- Need for more public education about what is recyclable.

ii) After the collection

After household recyclables have been collected, they would then need to be prepared for shipping to recyclers. Wemindji has three options in this regard. The first one only covers non-combustible materials. The following two attempt to considerably reduce the volume of waste generated in the community, but are somewhat different in their specifics. However, as we will see, they are much more expensive than the first option.

Option 1: Segregation of non-combustible recyclables at the disposal site

This option is very simple. It would be combined with the drop-off collection of recyclables presented in the previous section. Every week, the garbagemen would pick up the metal containers from the drop-off zones and take them to an identified spot at the dumpsite with other metals. Every two or three years, metal recyclers could come and clean the metal yard, just like Trans-Metal will be doing this summer in Wemindji.

Advantages:

- No risk of losing a significant amount of money.
- If combined with an awareness campaign or bylaw, such a solution would solve the non-combustible materials issue for the incinerator.

Disadvantages:

- Does not significantly reduce the quantity of burnings.
- Requires additional space in the landfill (or a new scrap metal yard).

Costs:

- None (except if the waste collection staff has to work overtime).

Option 2: Non-sorted bales of recyclables

This option would require a materials recycling facility, MRF, with a sorting table. After their collection, the recyclables would then be layed out on the table. The MRF staff would then remove the non-recyclable items as well as all glass, and put the rest of the recyclables “together” (plastics number 1 and 2, metals – not the pop cans -, fibres) into the baler. Bales are stored together in the storage area or in a container. Glass cannot be put into the baler, and is rather segregated in specific cardboard boxes, put on a wood pallet and stored. Pop cans would be put in bags provided by Boissons Gazeuses Environnement, BGE, and segregated together for their high value. All recycling centres accept mixed-recyclable bales: the volume of recyclables in Wemindji would not be sufficient to bale each material individually. For example, it would take too much time to accumulate a full bale of tin cans.

Advantages:

- Don't have to wait for a sufficient volume to bale recyclables (after three months of storage, fibre bales are not fit anymore for recycling).
- Not complicated for the waste sorter
- Labour expenses are lower than if each material were segregated together.

Disadvantages:

- More difficult to organize.
- May have some technical difficulties with the baler.

The following section presents two different options for the storage and shipping of these bales of recyclables to recyclers.

Option 2a: Agreement with Recycling P.L.B in Chibougamau

This Chibougamau based company is the only recycler willing to travel to Wemindji to pick up recyclables. They would provide empty containers for the storage and shipping of the bales. After being compacted in the baler, recyclables would be stored in the container on wood pallets (salvaged from the summer construction jobs). When the containers are filled with the recyclable bales, the LEA would call Recycling for a pick-up. They would come to Wemindji with two empty containers to replace the filled ones. Recycling P.L.B. is willing to pay \$35 per ton of recyclables sent to their recycling centre.

Advantages

- Very simple: fill the containers and, when full, call the recyclers.
- Possible to use these containers for the shipping of some parcels from Chibougamau (free of charge).
- No need to buy a storage room for recyclables (already in the containers).
- Wemindji could rent their baler (an interesting option since the project's future is uncertain).

Disadvantages

- Expensive over the long run.
- Who will mend the baler if we have problems with it?
- Completely dependent on the company staying in business. What happens if they go bankrupt?

Costs:

- A warehouse for the recycling operations: about **\$30,000**.
- Rent a used baler from Recycling PLB for **\$3,000 per year**.
- Rent 2 containers: \$300 per month = **\$3,600 per year**.
- A small lift = **free (use the one from Public Works)**.
- A part-time worker (10 hours a week at \$10 per hour for 50 weeks per year = **\$5,000 per year**).
- Shipping and treatment of mixed-recyclable bales (100 tons per year = about five trips)
 - o 5 trips at \$2,139 per trip (\$10,700); 100 tons of mixed materials in Chibougamau for \$35 per ton (+\$3,500) = **\$ 7,200 per year**

Total:

- o **First year: \$48,800**
- o **5-year based cost: \$124,000**

Option 2b: Agreement with Abitibi recyclers and backhauling

There are actually two recycling centres in Abitibi-Témiscamingue: Sanimos and H. Perron. Both accept non-sorted recyclable bales. A third one is expected to start its operations in January (Intersan). In this case, recyclables would be put in bales on wood pallets and stored in a storage area (a closed container or a Tempo shelter) that would be the size of a truck load, 48 feet long by 8 feet wide and 8 feet high. Once the storage area is filled with recyclables, the LEA would then contact KEPA Transportation to arrange for the backhauling of the recyclables to the recyclers. However, these recyclers would charge for the recyclables if they are not sorted (at the rate of about \$60 per ton).

Advantages

- Can switch recycler if not satisfied.
- Hiring of a Cree company (KEPA).
- No need to rent containers.

Disadvantages

- Requires more coordination (contact KEPA and the recycler).
- Need to buy storage for recyclables.
- More difficult to operate (from the warehouse to the storage to the truck).

Costs:

- A warehouse for the recycling operations: about **\$30,000**
- A baler (new about **\$21,000**)
- A small lift = **free (use the one from Public Works)**
- A part-time worker (15 hours a week at \$10 per hour times 50 weeks per year = **\$7,500 per year**)
- Storage:
 - o 40-yard long container = **\$5,000;**
 - OR**
 - o 60-yard long 4-season TEMPO shelter = **\$8,625**
- Shipping with KEPA: 5 trips at \$1,200 per full load trip = **\$6,000 per year**
- Treatment of mixed-recyclable bales
 - o With Sanimos in Rouyn: 100 tons of mixed materials at \$60 per ton = **\$6,000 per year**

Total:

- o **First year: \$75,500**
- o **5-year based cost: \$153,500**

4) Costs

All costs are based on one year, five-year, and ten-year estimates for each recycling option presented in **Appendix 3**. The following tables show the cost per year in Canadian dollars for each scenario. All scenarios are ranked relative to their cost, from the cheapest to the most expensive. The last column expresses the comparative cost between a given option and the one preceding it. For example, the second ranked option in table 5 would cost \$42,800 more than the first ranked option. However, the third ranked option would cost \$8,090 more than the second ranked option, and \$50,890 more than the first ranked option (\$42,800 + \$8,090).

Table 5: One year cost estimates for each recycling option (in CAN\$/year)			
Rank	Option	Cost	Marginal Cost
1	Drop-off ¹⁸	10,000	0
2	PLB + stickers	52,800	42,800
3	PLB + coloured bags	60,890	8,090
4	PLB + wheeled carts	73,700	12,810
5	Kepa/Sanimos + stickers	79,500	5,800
6	Kepa/Sanimos + bags	87,590	8,090
7	Kepa/Sanimos + wheeled carts	100,400	12,810

Table 6: Five-year cost estimates for each recycling option (in CAN\$/year)¹⁹			
Rank	Option	Cost	Marginal Cost
1	Drop-off	10,000	0
2	PLB + stickers	26,800	16,800
3	PLB + coloured bags (paid by household)	27,218	418
4	PLB + wheeled carts	29,780	2,562
5	Kepa/Sanimos + stickers	32,700	2,920
6	Kepa/Sanimos + coloured bags (paid by household)	33,118	418
7	PLB + coloured bags (paid by Wemindji)	34,896	1,778
8	Kepa/Sanimos + wheeled carts	35,680	784
9	Kepa/Sanimos + coloured bags (paid by Wemindji)	40,790	5,110

¹⁸ This is a fixed cost for the equipment (containers). The other costs are expressed in CAN\$ per year.

¹⁹ These estimates are based on stable market prices. They do not take into account a possible increase in petroleum prices, nor in the value of recyclable materials. They are therefore subject to changes, and are of interest mainly for cost comparison purposes.

Table 7: Ten-year cost estimates for each recycling option (in CAN\$/year)			
Rank	Option	Cost	Marginal Cost
1	Drop-off	10,000	0
2	PLB + coloured bags (paid by hh)	23,090	13,090
3	PLB + stickers	23,550	460
4	PLB + wheeled carts	24,090	540
5	Kepa/Sanimos + coloured bags (paid by hh)	26,309	2,219
6	Kepa/Sanimos + stickers	26,850	541
7	Kepa/Sanimos + wheeled carts	27,590	740
8	PLB + coloured bags (paid by Wemindji)	31,640	4,050
9	Kepa/Sanimos + coloured bags (paid by Wemindji)	34,940	3,300

5) Discussion, Recommendations, Future prospects

i) Cost of the incinerator

Based on an analysis of the operation costs for a recycling program in Wemindji and several interviews conducted with representatives of other communities and towns that practice recycling in Quebec²⁰, we may conclude that recycling will most probably not generate any profits for Wemindji. Unfortunately, the great distances from the market outlets result in important transportation costs, and these, when combined with the purchase costs of the basic equipment to initiate a recycling program will negate any monetary benefits that could be obtained from the recyclables. The least expensive scenario to launch a door-to-door recycling program requires an investment of over \$50,000 for the first year of operation with \$30,000 in equipment purchase costs and \$20,000 in operations and maintenance costs. For Quebec recyclers, a recycling centre only becomes profitable when it attains a volume of at least 25,000 tons of recyclables per year. The main problem with the development of a recycling program for a coastal Cree community is that any increase in the volume of recyclables results in an extra charge to the community.

Let's take cardboard for example. One ton of cardboard has a \$100 recycling value on the market. If well compacted in bales, a full truckload can stock up to 25 tons of cardboard per haul (for a value of \$2,500). If this load of cardboard was then shipped to the closest fibres recycler, Cascades Group in Jonquière, it would cost \$3,600 only in transportation. Therefore, for every load of recycled cardboard, the net loss would be \$1,100. Furthermore, the volume of recyclable materials actually produced in Wemindji would not be sufficient to deal directly with cardboard recyclers (like Cascades for example). That is why we have to deal with intermediaries to ship our recyclables in Wemindji (Recyclaction P.L.B. in Chibougamau, or Sanimos and Perron in Rouyn-Noranda). A regional recycling centre for the coastal communities would obviously be the only way to make some money from recyclables. However, Wemindji cannot wait for the opening of such a centre to initiate recycling in its community.

However, a materials recycling facility, such as the one suggested in this paper and in previous studies²¹, would allow Wemindji to divert an important share of the waste stream presently burnt. The actual operations cost of Wemindji's incinerator is over \$200 per ton. A recycling program over a ten-year period would cost around \$250 per ton of recyclables treated. Therefore, it would not be too expensive compared to the cost generated by the incinerator. On the one hand, the start-up costs of such a program represent an important investment for the local administration. These costs would be compensated in the long-term if the program was successful. All costs and benefits, whether economic, social or environmental, must be considered in the decision-making process regarding this recycling project.

²⁰ Includes many communities from Abitibi-Témiscamingue (Landrienne, Rouyn-Noranda, Val d'Or, Amos, Pikogan), La Tabatière (Côte Nord), Kahnawake, MRC des Chenaux.

²¹ Grand Council of the Crees and the Cree Regional Authority, 2000.

For all these reasons, the most adequate program that best complements Wemindji's incinerator at the present time is the setting up of drop-off recycling zones for metals and glass. These could then be taken to the disposal site, segregated on-site and then picked up by recyclers every two years or so. Ideally, this initiative would be combined with the building of a hazardous waste storage shed²², the setting-up of a salvaged construction waste yard²³ and the implementation of Recyc-Quebec's program on the Cree territory (for used oil, used paint, soda cans, rechargeable batteries and tires). Such a program is not expensive, and does not involve any major investment in large infrastructures (such as a warehouse or baler). It would also increase people's awareness so that when a door-to-door collection actually began, participation levels would be high.

ii) Wait for funding

Initial funding for the Wemindji program is essential for its start-up. The Kahnawake recycling program received some funding from Indian Affairs for the first year of operation of their "pilot project". They obtained \$40,000 some twelve years ago. Over the first five years, Kahnawake only recycled newspapers, soda cans, and bottles. They also received some funding from social benefits and training programs to remunerate the recycling staff. Now their collection is done twice a week. However, they did not invest massive sums of money at the beginning of the project. On the contrary, theirs was a step-by-step approach²⁴.

With the recycling project proposal written, Wemindji could submit applications to obtain funding from Environment Canada, Recyc-Québec and/or Indian Affairs for their pilot project. Until then, the purchase of equipment, the building of a transfer station (warehouse), or a door-to-door collection should be put on hold. Future prospects for recycling in Quebec are brighter than ever what with the adoption of the Bill 102. This Bill, enacted in 2002, will oblige producers to pay a portion, up to 50 %, of the recycling costs of a community. The JBACE and the CRA are now pressing the provincial government to consider including the Cree territory in its different programs. The prerequisite to be eligible to this regulation is to have a residual materials management plan like this one. The other eligibility requirement is to be an RCM, which is not the case of Cree communities. To extend this regulation beyond the RCM territories is one of the objectives of the JBACE and the CRA.

If sufficient funds were available, we would suggest, for the first five years, doing business with Recyclaction PLB. Indeed, even if recycling with Abitibi's recyclers is more attractive, because we could then use the services of Kepa Transportation, the start-up costs of such an operation are just too high. Recyclaction PLB is the only supplier able to provide a baler and containers on a rental basis. Furthermore, they do their own transportation, so they can bring us some equipment (or materials or even goods!) when they drive up to the community. The problem with Abitibi's recyclers is that we cannot rent containers since the costs associated with the transportation of these containers to

²² See the hazardous waste section.

²³ See the construction waste section.

²⁴ Eva Johnson, personal communications, 2005.

Wemindji would be too expensive. Neither do they have an available baler for rental. To start with Recyclaction PLB would be interesting because it would allow Wemindji to assess its potential for recycling without investing significant sums of money at the beginning. After three to five years, the Local Environment Administrator would then be able to better assess the feasibility of such a project. Combined with an arrangement with PLB, we believe that wheeled carts would be the most desirable option for Wemindji. Indeed, studies have shown that when a municipality provides wheeled carts or blue boxes, public participation in the program is enhanced²⁵. Finally, for the design of the warehouse, Wemindji should consider consulting Stéphane Leclerc from Consortium Écho-Logique since he is very knowledgeable about the setting up of a recycling warehouse²⁶. Mr. Leclerc is also very interested in the Wemindji program and could give us important advice on how to best start a materials recycling facility (MRF).

²⁵ Marlène Hutchison, 2004.

²⁶ See the “Consortium Écho-Logique” information sheet.

B. Construction wastes

1) Context and objectives

Growth in Cree communities is fast paced and construction generates an important volume of waste. Construction-Renovation-Demolition (CRD) debris consists of uncontaminated solid waste resulting from the construction, renovation, repair and demolition of structures and roads. Such waste includes, but is not limited to bricks, concrete and other masonry materials, soil, wood, wall coverings, plaster, drywall, plumbing fixtures, non-asbestos insulation, roofing shingles, asphalted pavement, glass, plastics, electrical wiring and metals.

This waste represents about 28% (3.1 million metric tons) of all residual materials in Quebec. Extrapolations from well-documented waste characterizations suggest that CRD-debris in Wemindji is about 210 tons per year²⁷. But these “dry waste materials” are accumulating at the landfill and occupy an important share of the land. Of these, 90% could either be reused or recycled instead of being eliminated in landfills. For economic reasons, asphalt, concrete, wood and metals are easier to recycle than other CRD-debris. This was made quite obvious this year when a metals recycler agreed to come to Wemindji free of charge to recuperate metal scrap (most of it generated by construction projects).

Quebec’s new regulation on landfilling and incineration, adopted in May 2005, states in article 105 “that incineration of CRD-debris is forbidden”²⁸. This is mainly because of the contamination risks associated with some construction materials. Indeed, treated materials (with paint, varnish, naphthalene, pentachlorophenol, creosote) are toxic and may contaminate the groundwater or ashes if burnt. They can also release toxic compounds in the air if incinerated.

2) Proposed measures

CRD-debris management can only be done through the segregation of materials at all levels. First, the various unused materials (residual materials) have to be source-sorted during any construction, demolition or renovation operation. The main categories for sorting purposes are concrete (bricks, asphalt, concrete, etc.), non-treated wood, metals and others (including treated materials, plaster, drywall, insulation, etc.). After this first sorting operation, the different materials have to be segregated together somewhere else, for instance at the landfill, at a special construction waste disposal site, at a construction debris flea market, or at a construction waste recycling centre. For Wemindji, two measures for the management of construction waste are proposed. The first one is the organization of the landfill and the second one is the creation of a salvaged CRD-debris yard.

²⁷ Recyc-Québec, 2003.

²⁸ Quebec’s Regulation Respecting Landfilling and Incineration of Residual Materials, May 2005.

i) Measure 1: Organizing the landfill

Currently, CRD-debris is jumbled together at the disposal site, which will soon be closed. The opening of the new site will provide a terrific opportunity for Wemindji's *Local Environment Administrator* to sort the CRD-waste. As is the case with any Eco-Centre²⁹, a gate would limit residents' and construction companies' access to the disposal site. Construction companies would have to pay to landfill their waste. Once in, they would sort their metals, wood and concrete where indicated. If they did not sort their materials, they'd have to pay double the regular fee. Metals could be segregated with household recyclable metals. Every two or three years, metal recyclers would be asked to recuperate these metals. Wood could be chipped and used as filling material, for landscaping, composting or even incinerated (no problem if the material is not treated). Concrete could be crushed and used as filling material. The "other" category materials could then be buried, but their volume would be much less significant than originally.



²⁹ See the Eco-Centre information sheet.

ii) Measure 2: Salvaged CRD-debris yard

Before recycling or eliminating, reusing some of the salvaged, or unused, materials from the construction sector is essential. Many good quality materials that are not used by the construction companies are simply sent to the dump site because they do not know what use to make of them, but these materials could serve in residents' home improvement projects, especially for their cabins. These reusable materials could be segregated together in one yard accessible to all. Construction companies could drop off some materials in good condition, free of charge, to the yard. An employee would accept or refuse the materials depending on their quality.

Construction companies would then have three options for their CRD debris: drop off the sorted materials at the dump and pay; drop off the non-sorted materials and pay even more; or segregate what can be reused and save money. For more information on salvaged CRD-debris yard, read the information sheet in Appendix 3.

3) Costs

The cost for these two options would be mainly labour related. Indeed, one employee would have to work "on-call" during the summer to assist the construction companies with their waste management. He would also guide them at the disposal site and organize the salvaged materials yard. Land should also be made available for the yard. Actually, the old fox farm would be perfect for what is required. If needed, a small Tempo shelter could be bought for the storage of good-quality materials. Finally, Wemindji would have to buy a gate to block the new landfill site entry.

- One employee for the summer: 20 hours per week for 16 weeks at \$12 per hour: \$3,840
- One gate for the disposal site: \$200
- A Tempo shelter: \$1,000 (optional)
- **Total: \$4,040 to \$5,040** , depending on whether the shelter is purchased or not

4) Discussion

i) Public resistance

Organizing the landfill to manage CRD-debris is the first step for each community. Toward this end, limiting free public access to the disposal site is essential. Eastmain's experience in this regard clearly demonstrates this statement³⁰. Indeed, when Eastmain opened a new disposal site two years ago, a gate blocked people's access to the site. At the disposal site, signage indicated where to drop off the different materials (bulky waste, tires, metals, wood, etc.). Without investing large sums of money, the Eastmain community was able to segregate the materials at the disposal site; thereby making it easier for recyclers to take care of their waste. Unfortunately, public pressure resulted in the opening of the disposal site to everyone. Less than two months later, garbage was piled up such that it became impossible for recyclers to retrieve valuable materials. All communities should learn from past experiences of other Cree First Nations. The Eastmain case clearly demonstrates that if access to the disposal site is not limited and supervised, it cannot be well organized.

ii) Why should companies pay for the disposal of their CRD-debris?

Other questions or comments from the Council, the general public and the companies could be as follows:

- "Why should we/they pay?"
- "It will be more expensive for us"
- "It is not their responsibility to manage their waste"

First, one should ask whose responsibility it is to recycle. Indeed, if construction companies had to include a "waste management" section in the planning/bidding of a project, the community would soon realize that it is not more expensive to manage construction waste, but that it only takes a little more time for the planning of such an operation. If the community offers other options to construction companies (supervised access to the disposal site, cheaper prices if waste is sorted, a salvaged materials yard free of charge), why then would a construction company refuse to manage the waste it generates? In fact, most construction companies feel responsible for the environmental impacts of their activities on the communities they serve³¹.

Wemindji will soon open a new site for the disposal mainly of residual ashes from the incinerator. Filling it with large volume construction waste would be a liability for the community. A dry-materials site, DMS, kept for construction waste only, would be the best solution for Wemindji's dry waste. Pending consultation of the interested tallyman,

³⁰ Information from an Eastmain local authority, personal communications, 2005.

³¹ Construction companies have to disburse an amount for the disposal of their CRD-debris in many parts of Quebec. For more information, read the Eco-Centre information sheet.

the DMS could be established where the actual dumpsite is located. In conclusion, the public should not pay for the waste generated on their land by construction companies.

C. Hazardous Waste

1) Context and objectives

Hazardous waste (HW) can be defined as “any discarded material which is difficult to dispose of or which puts human health or the environment at risk because of its chemical or biological nature”³². According to Health Canada, products are hazardous when they are corrosive, toxic, explosive or flammable. These can be identified on products by these symbols:



Poison



Corrosive



Explosive



Flammable

Hazardous waste materials are everywhere in Cree communities, but the most important ones are batteries, fluorescent tubes, computer monitors, spray cans, propane tanks, cooking and engine oil as well as used tires and paint. These materials usually account for about 1% of the waste stream. For Wemindji, this is approximately equivalent to four tons per year. Even if this volume seems very small, it has to be taken very seriously by the community. Indeed, in its certificate of authorization, the First Nation of Wemindji has made the commitment, as a good-practice, not to put hazardous waste in the incinerator. Besides, explosive materials can result in severe damage to the chamber and consequently increase the operation and maintenance costs of the incinerator, which is, of course, not a desirable outcome for local authorities.

2) Proposed measures

i) Hazardous waste shed

At the present time, two Cree communities have acquired a Household Hazardous Waste shed, namely Waskaganish and Oujé-Bougoumou. These sheds are used to segregate the different hazardous waste together, but also to contain them under lock and key in a safe location to avoid environmental contamination. A shed like this one would be the collection point of all hazardous waste in the community. It would then be combined with Recyc-Québec's programs for the safe disposal of the materials.

Shed

The LEA would use the shed for the storage of the necessary equipment and of hazardous waste materials yet to be decontaminated (fluorescent tubes, used paint or oil). Unless appropriately supervised, this shed must remain locked at all times to avoid accidents.

³² Definition from the National Household Hazardous Waste Forum (NHHWF)

Used Oil

Recyc-Québec and the *Société de gestion des huiles usagées* (SOGHU) have had an agreement to manage used oils in Quebec since 2004. Hazardous waste recyclers are monetarily compensated by the SOGHU to safely collect used oils in the community. They also have to distribute free containers for the storage of waste. The Cree Nations of Waswanipi, Nemaska, Waskaganish and Mistassini already have collecting tanks/containers for their used oil³³. For the Cree territory, ONYX is responsible for these services. An agreement between Wemindji and ONYX should soon be concluded to establish a collection point for the used oil generated. This collection point has to be located near the gas station or near the HW shed to minimize the distance to the main generators.

Another option for Wemindji is to implement the used oil furnace project developed by Henry Stewart from Public Works. This furnace could burn the used oil as a source of energy for the Public Works garage. The only problem is that the volume of used oil generated in Wemindji is not sufficient to feed the furnace. Wemindji would have to import oil from other communities to make it functional. An agreement with Chisasibi could be possible if the Council made a request to obtain their used oil.

Used Batteries

Acid-lead (car) batteries can have a serious impact on the environment. *Car battery packs* could be purchased and stocked on hardwood pallets. Another storage possibility is to put the batteries in an open used oil tank. This way, batteries could be recuperated by metal recyclers (they contain lead!), when they come to the community for a metal clean-up.

Rechargeable batteries also contain heavy metals and have to be safely disposed of. These can be found in laptop computers, flashlights, etc. The Rechargeable Batteries Recycling Corporation (RBRC) runs a free program for the recycling of rechargeable batteries, whereby they pay for the shipping and processing of batteries. Wemindji has subscribed to this program³⁴. People should be able to drop off their used batteries at the shed, but also at various retailers like the Northern and the Community Store.

Spray Cans and Propane Tanks

A crusher for aerosol cans can be purchased. After emptying the can, it is not considered as hazardous and can be disposed of along with other recyclable metals.

³³ The four communities were chosen by the Cree Regional Authority in a special project back in 1997.

³⁴ Subscription form on-line at <http://www.rbrc.org/community/index.html>

Computer Monitors

Monitors' cathode ray tubes contain considerable quantities of lead, a carcinogenic heavy metal that has potential risk for the nervous system. Monitors should be shipped down south if possible. Wemindji's residents traveling south could put one or two monitors in their trunk (for a small monetary compensation). The monitors are not dangerous as such; they only become hazardous after some time at the landfill, or if crushed or burnt. Here are some addresses of computer salvagers and recyclers in Rouyn.

CFER La Renaissance

230, avenue Marcel-Baril
Rouyn-Noranda, J9X 7C1
Telephone number : (819) 762-8161
Fax number : (819) 762-5054

Écocentre Arthur-Gagnon

220, av. Marcel-Baril
Rouyn-Noranda, J9X 7C1
Telephone number : (819) 797-6614
Fax number : (819) 797-1882³⁵

Finally, before throwing away these computers, one should assure himself that no one in the community is interested in recuperating their old parts. Run a message on the radio to see if anyone is interested in acquiring these parts.

Fluorescents

A "fluorescent tube crusher" can be purchased to manage the used tubes safely. Activated carbon filters for mercury vapours accumulate the contaminants, and the residual glass can be landfilled. However, these crushers are very expensive (\$7,200). Special boxes are available for the shipping of fluorescents.

Used Tires

Since the adoption, in 2000, of regulations forbidding the landfilling or incineration of tires, and the imposition of an environmental fee of \$3 on every tire sold in the province, Recyc-Quebec is responsible for the collection of used tires. A first initiative was launched in 2004 on the Cree territory, but communications and weather problems limited the collection to mainland communities (Oujé-Bougoumou, Waswanipi, Mistissini). However, tires should be picked up this year.

Tires are already segregated together at the disposal site. This best practice should be maintained in the future.

³⁵ All recyclers are described and presented in the James Bay Advisory Committee on the Environment's website at <http://www.ccebj-jbace.ca/francais/publications/recycleurs/Recyclers-Directory.pdf>

Other

Other hazardous waste includes pesticides and herbicides, acids and bases, propane tanks, etc. These should be stored together in the shed and collected by ONYX once every three years.

ii) Door-to-door special collection

Special collections can be organized twice a year to assist people and help them to dispose of their hazardous waste in a safe way. This activity is also a key component of any awareness campaign. Information on hazardous waste could be distributed two weeks before the collection to educate people about the dangers associated with hazardous waste. Wemindji could hold one in the spring and one in the fall. Garbage collection employees would gather the products door-to-door with their pick-up and take them to the hazardous waste shed.

3) Costs

Since the Recyc-Québec and the Rechargeable Battery Recycling Corporation programs are offered for free to communities, the costs associated with this part of the program are mainly for equipment. However, Wemindji does not have to buy this equipment all at once. After assessing the community's priorities, the LEA could suggest what must be purchased.

Here are the detailed costs for each item of the hazardous waste management program:

- Shed:
 - Certified non-combustible shed: **\$10,000 plus shipping**
 - Or
 - Locked conventional shed: **\$2,000**
- Can crusher: **\$1,000 plus shipping**

D. Other Residual Materials

Other categories of residual materials include refundable containers (soft drink containers), textiles, compostables and bulky waste.

1) Refundable containers

Even if refundable containers are recyclable, we can put them in a distinct category because of their value and a specially designed recycling program. Refundable containers are made of glass, aluminum or plastic. The refund value for soft drinks is usually five cents a can.

The organization **ConsignAction (Boisson Gazeuses Environnement)** reimburses communities a value of seven cents for every refundable container sent. They provide boxes for stores and restaurants, as well as bags for the shipping of cans and bottles. The bags would be distributed in different institutions and businesses (Council, school, restaurants, coffee shops), be stored in a container and then shipped to Montreal. The money earned from the cans and bottles would be used to pay the transportation costs of the operation.

Since Cree communities generate many soft drink containers³⁶, such a program is interesting for Wemindji. Indeed, it would allow for the diversion of a good proportion of its metal and glass waste volume (two non-combustible materials) for a small investment. Also, it could be managed by one of the local stores (Northern or the community store). The business is responsible for remitting to residents five cents per container and is reimbursed by ConsignAction once the containers are shipped to Montreal.

The community of Kuujjuaq has been dealing with ConsignAction for the past five years. Mr. **Erik Pearson**, manager of the Newviqvi department store, said the service from B.G.E. was very good overall. The store has a “gobbling machine”³⁷, which reimburses customers five cents per can deposited. After being compacted in the machine, cans are put in a bag and placed in containers behind the store. Twice a year (in July and September), cans are shipped to Montreal with the local boat transport company. The store recovers around 25% of the can waste generated in Kuujjuaq. The revenue from these cans is sufficient to reimburse their transportation cost, but does not result in a profit-making venture³⁸.

Given that the ConsignAction program requires a great deal of coordination between participating organizations, it would also be possible to collect the aluminium cans in

³⁶ Based on Kuujjuaq data, Wemindji is estimated to produce between 1 and 1.3 million of cans per year.

³⁷ This type of machine cost between \$10,000 (used) and \$20,000 (new).

³⁸ One truck can take 150 bags each containing about 750 cans, for a total of 112,500 cans per haul. The store gets two cents per can for a total value of \$2,250. For Wemindji, shipping to Montreal would cost \$2,928 per truck load. This recycling program would result in a net loss of about \$700 per year, assuming Wemindji only needs one full shipping load per year (half the size of Kuujjuaq).

order to store them in a given area of the in-trench disposal site. Trans-Métal could then pick them up in the course of its annual metal collection. Obviously, this would preclude benefiting from the deposit charge as Trans-Métal is not qualified under the ConsignAction program.

2) Textiles

Textiles represent about 2% of Quebec's Municipal waste stream. The *Quebec Action Plan on Residual Materials* has set an objective of reducing by 50% the elimination of textiles. In Wemindji, the wellness centre could accept used clothing from the community and open a small used clothing store. If not, they could just ship the used clothing to this store in Amos:

La Petite Boutique

161, rue Principale Sud

Amos, J9T 2J5

Telephone : (819) 732-2721

Fax : (819) 732-2999

3) Compostables

From the survey conducted in 2000, it can be inferred that about 40% of the waste stream in Wemindji is compostable organic materials or food waste. This was the single most important residual materials category in volume for the community. If the Council wishes to reduce the number of burnings per week, the composting of food waste is one solution that must be carefully entertained. Indeed, transportation would not be an issue anymore since composting would be managed locally. Residents would only have to separate their food waste from the rest of their residual materials. However, the climatic barrier to composting has to be assessed before the issue is further discussed. *Solarair Consultant Inc.* and their greenhouse project should be involved in the discussions to find out about their solutions for northern environments.

Until then, local composting could be proposed to households by the LEA. Indeed, "vermicomposting" could be started at the school and at the Council to inform people and enhance the population's interest in this matter. In fact, it is so easy to implement that a project has been successfully run in a Quebec kindergarten class!

4) Bulky waste (appliances)

Bulky waste (white goods) like appliances is already segregated together at the disposal site. This best practice should be maintained in the future. A special collection should be organized twice a year to assist residents in getting rid of their bulky waste materials, and this way, avoid fly-tipping.

E. Source reduction (abatement)

Source reduction is an important part of a waste management program because it reduces the volume of waste that has to be recycled or eliminated. These measures are the most difficult to implement since they require a change in people's consumption habits. To be successful, source reduction measures must be combined with a strong awareness campaign. In Wemindji, source reduction should be part of the waste management program. If recycling is too complex because of geographical barriers, reducing is local and does not depend on any external factors. The LEA should try, with the "recycling team", to find ways to reduce the waste stream and promote the reuse of goods in Wemindji.

1) Proposed measures

- The two main target institutions for the reduction campaign are the school and First Nation offices. Indeed, these two bodies are important generators of garbage in the community. Examples of measures that should be considered are as follows:
 - "Recto-Verso" Campaign to use paper sheets on both sides
 - Reusable cups for coffee (no more throwaway cups)
 - Sell biodegradable grocery bags and forbid free distribution of plastic bags (50 cents charge per bag)
 - Try to reuse some materials for art projects with the school (e.g. bottles)
 - Build note pads with used paper (with one-sided sheets)
- Promotion of household composting
- Encourage the re-use of items (clothes, construction materials, toys for kids).

V - INFORMATION, EDUCATION, AWARENESS CAMPAIGN

Running an awareness campaign is essential for a recycling program to be successful. In order to take part in the program, Wemindji's households and institutions have to be convinced of the importance of recycling. Even if some people know a little about recycling³⁹, most households will have to be encouraged and supported to change their habits and start sorting their garbage.

At the present time, the Local Environment Administrator is responsible for public announcements about environmental issues. He can run messages on the radio, or post them on the billboard. In the summer of 2005, recycling stands were erected during events held in Wemindji, like the firefighter competition. During these events, waste was source-sorted and a green-patrol, comprised of the LEA and his assistants, answered people's questions about recycling. Also, the local LEA, Mr. Johnny Mark, made a presentation on recycling at the Wemindji First Nation General Assembly. A question period followed. Most residents strongly supported the idea of recycling in the community. Two questionnaires, one for businesses and a second for households, also confirmed that trend⁴⁰.



Table 8: Household Recycling Questionnaire Results⁴¹

Question	Yes	No
1. Do you know what recycling is?	96%	4%
2. Would you support a recycling program, if one were to be started in Wemindji?	99%	1%
3. Would you participate in a recycling program by sorting your own waste?	95%	5%
4. Would you like to have someone explain to you what recycling is?	39%	61%
5. Would you like to see a recycling program started?	94%	6%
6. Do you currently recycle?	54%	56%
7. Would you be willing to be part of a "recycling discussion group" that would meet once a month?	38%	62%

Involving all the actors from the community in the decision-making process regarding the project is one of the priorities for Wemindji. To accomplish this, a "recycling discussion

³⁹ See results from the household questionnaire on recycling in Table 8.

⁴⁰ These questionnaires are presented in Appendix 4.

⁴¹ Questionnaire distributed door-to-door to 120 households in July 2005 (51 % of the population)

group” should soon be organized. This group would be formed of different stakeholders interested in environmental issues. They will meet once a month with the LEA to discuss what has to be done or changed in the program. Ideally, this group would include members of these nine groups: youth, communications, health, public safety, social development, CTA, economic development, community services, elders. The idea is to develop new local initiatives based on local knowledge and creativity. 38 % of the population showed some interest in participating in this discussion group.

Wemindji’s environmental leaders will continue to educate the population on the importance of recycling. Many measures have been planned to increase people’s awareness. These are presented in the following table. The leaders know that proposed measures for future waste management will require important changes in people’s habits, and that a good communication strategy is essential for a recycling program to be successful.

Communication program: Wemindji Starts Recycling			
Event	Cost	Deadline	Things to do
Recycling stands	\$40 for the bins and the garbage bags	Refer to the Summer events sheet	Sensitize people to sorting waste materials; provide information to those interested
Questionnaire on recycling	None	July 25	Go door-to-door to assess population's awareness about recycling
Announcement concerning door-to-door collection of bulky waste and metals	None	August 1	Inform residents that Wemindji is hiring a metal recycler to clean the dump and that all metals will be collected on a specified date (for example August 1 with a pick-up)
General Assembly presentation	None	July 30	Presentation on what has been done and what will be done with the waste management issues of Wemindji; justify the idea (cost of maintenance, growing population, cost of landfill for ashes)...
Prepare flyers	None	August 15	Explain what and how to sort, the collection days, and how the sticker system works
Posters (design by a marketing company like Indiana)	\$150	When ready	Posters for local businesses and institutions (arena, sport centre, Council, school)
Information booklet for volunteers	None	A month before the collection	Explain the importance of recycling and what is recyclable (one for household and one for businesses and institutions)
Letter from Johnny Mark to residents to announce the launching of the collection	None	A week before the first collection	Thank people for participating in the project for the good of the community's future
Distribution of equipment (sticker, coloured bags, or wheeled carts)	None	A week before the first collection	Door-to-door awareness campaign with the distribution of equipment to every household
Local announcement on the radio; Interview in the Nation	None for the radio/Nation?	A week before the first collection and every day for the first month or so	Humoristic radio sketches on recycling; short article on the project presenting the ideas from Johnny
School and Council campaigns	None	When the program is launched	These are the two most important institutions to sensitize about recycling issue. THEY will become the recycling ambassadors of the Wemindji First Nation; they need to be involved and consulted as much as possible (paper bins in every room, drop-off locations for other recyclables like soda cans and tins... and even composting if desired!!!)
Recycling day	Travelling expenses for Eva Johnson's conference (Ms. Johnson launched the recycling program in Kahnawake)	When the program is launched	Workshops on recycling, presentation by Eva Johnson preferably hosted by the school (parents invited + drawing contest)
Short movie for the school	None, if a camera is available	When the collection begins	Prepare a movie on how to sort at home and on the impact of putting metals in the incinerator or landfill. Use local kids and teachers for ideas
Caution letter	None	When the collection begins	Just to remind people how to sort their waste and use the equipment
Prize	\$50	After the month	Households sorting their waste are eligible

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APPENDIX 1

Definitions

Category I Lands are tracts of land set aside for the exclusive use of the eight Cree communities that signed the James Bay and Northern Québec Agreement (JBNQA) in 1975⁴². These lands cover approximately 2,158 square miles (5,589 km²). Most of this land is considered Category IA, meaning they remain under federal jurisdiction. The remainder of Category I Lands (IB) are under provincial jurisdiction.

Category II Lands, comprising 25,130 square miles (65,083 km²) in James Bay are crown lands. However, the James Bay Cree have exclusive wildlife harvesting rights on these lands.

Category III Lands, covering the rest of the James Bay Territory, are also crown lands and subject to provincial jurisdiction. On these lands, the James Bay Cree have exclusive trapping rights over certain fur-bearing animals.

⁴² The boundaries of Category I Land for the Oujé-Bougoumou Cree are currently under negotiation.

APPENDIX 2

Options for the door-to-door collection

The door-to-door collection of recyclables can be done in many different ways. Every technique has its own pros and cons. Wemindji will have to reach a decision regarding the selection of the tool used to source-sort recyclables. Here is a list of options for Wemindji with their related costs, as well as their respective pros and cons.

Option 1a: Coloured bags

Case study:

- Landrienne, Quebec, near Rouyn-Noranda (1 ½ hour by road).
- 1,100 residents

Operation:

In Landrienne, residents “source/sort” their residual materials as follows: waste in traditional black bags, recyclables in semi-transparent blue bags and finally compostables in a green bag. They organize their own in-home system for this collection. Twice a week, the garbage truck collects the municipality’s waste much like in any other town. The difference is that the municipality has hitched a trailer behind the truck to collect recyclables. So when it’s time to put the garbage bags in the truck, the waste collector puts the black bags in the garbage truck, the recyclables in the trailer and the compostables in a special compartment. This way, they recover the materials and minimize the contamination of recyclables. In the case of Wemindji, we could start a similar system with two different bags, one for recyclables (or dry waste), and another for non-recyclables or garbage (wet waste). The first year, Wemindji could provide coloured bags to residents. A special contest could encourage people to participate in the program (e.g. Get a chance to win \$100 every month if you have a blue bag for recyclables in your wood box). Otherwise, it would also be possible to oblige people to sort their waste by not collecting their bags when there is no blue bag in the wooden box.

Advantages:

- Very simple to use: dry in blue, wet in black.
- Cheap for the municipality (only pays for the first year).
- If the project does not work, we are not stuck with 300 wheeled carts.
- Easy for the garbage collection staff.
- Can leave the recyclables in the bag before sorting them.

Disadvantages:

- Risk of people not buying the blue bags the second year (or of them using the blue bags for other purposes during the first year).

Costs:

- A four-wheeled trailer: **\$2,500**, but possible to borrow one for the first year in the community.
- “Blue see-through” garbage bags: 1 per week for every household: 3 boxes of 20 bags (\$9.99 x 3 boxes x 320 households = **\$9,590.40**)
- **Total: \$12,090**

Further comments:

Landrienne does not operate a sorting centre anymore. A large recycling centre from Rouyn-Noranda (H. Perron) comes by every two weeks to collect their recyclables for a fee of \$400. This way, the municipality does not have to sort its residual materials.

Impact:

Since the project started, twelve other communities have started their own recycling initiatives based on the Landrienne-model. Landrienne diverts 80 % of its community waste. Within a month, the other communities starting a similar initiative achieved a 70% diversion rate.

Option 1b: Recycling stickers

This option is similar to option 1a. The difference is that people can use the bag of their choice for their recyclables (grocery bag, black bags, orange bags, whatever). They would identify the bags filled with recyclables by a sticker indicating “recyclables”. A marketing company, Indiana Marketing, could make the stickers. However, Dorothy, the Economic Development Agent of Wemindji, believes this could be an interesting project for the community’s youth (young entrepreneurs).

Advantages:

- People can choose their own bags.
- Very simple to use.
- If the project does not work, we are not stuck with 300 wheeled carts.
- Can leave the recyclables in the bag before sorting them.

Disadvantages:

- Who would pay for the stickers? The Council? Households?
- Who would distribute the stickers⁴³?
- In winter, would the stickers stay on the bags?
- Would the garbage collectors mind looking for the stickers?

Costs:

- A four-wheeled trailer: **\$2,500**, but possible to borrow one for the first year in the community.
- 2 stickers a week per household (2 x 52 weeks x 320 households) = 33,280 stickers per year = **\$1,500** per year (transport included⁴⁴)
- **Total: \$4,000**

⁴³ Could be a fund raising project for a community group.

⁴⁴ From the Quotation of Indiana Marketing

Option 2: Wheeled carts

Using 65-gallon (240 litres) wheeled carts for source sorting household residual materials is the chosen approach for most Canadian rural municipalities and could be another option for Wemindji. These wheeled carts would be located outside every household. Residents would put their recyclables directly into the bin (no need for bags). The waste collectors would roll and discharge the contained materials into the trailer attached to the truck.



Advantages:

- Create an incentive to recycle (shows the Council's commitment to recycling).
- Good capacity therefore can be picked up only once a week.
- Good investment in the long-term (life expectancy of about 15 years).

Disadvantages:

- Expensive starting costs (what if the program doesn't work, e.g. downturn in the market price for recyclables).
- Problems for garbage collection staff during winter (how to move the carts?).
- Risk of contamination in the truck when it's raining or snowing (paper).

Costs:

- A four-wheeled trailer costs **\$2,500** but it is possible to borrow one for the first year in the community.
- 320 wheeled carts (to start with, need to buy more in the future) at \$70 per cart. $320 \times \$70 = \mathbf{\$22,400}$.
- **Total: \$24,900**

APPENDIX 3: COSTS OF THE DIFFERENT SCENARIOS FOR WEMINDJI

Table 1: Low-cost option for Wemindji	
Requirements	Costs
Drop-off containers (6)	\$10,000 (\$6,000 + delivery)
Labour	None or little
Total	\$10,000

Table 2: Door-to-door collection (collection by PLB)

	STICKERS	COLOURED BAGS	WHEELED CARTS
Requirements	Costs	Costs	Costs
• Trailer	\$2,500	\$ 2,500	\$ 2,500
• Warehouse	30,000	30,000	30,000
• Wheeled Carts	--	--	22,400
Starting fixed costs (first year)	\$32,500	\$32,500	\$54,900
• Stickers	1,500	--	--
• Coloured bags	--	9,590	--
• Rented Baler	3,000	3,000	3,000
• Rented containers (for storage and shipping)	3,600	3,600	3,600
• Small lift	Free (Public Works)	Free (Public Works)	Free (Public Works)
• Labour	5,000	5,000	5,000
• Shipping	10,700	10,700	10,700
Cost for the first year	\$56,300	\$64,390	\$77,200
(Revenue from recyclables)	(3,500)	(\$3,500)	(\$3,500)
Net cost for the first year	\$52,800	\$60,890	\$73,700
O and M per year (after the first year – minus revenue) if Council pays for the bags	20,300	28,390	18,800
O and M per year (after the first year – minus revenue) if households pay for the bags	--	18,800	--
Net cost for the next four years	\$81,200	\$113,560	\$75,200
Net cost for five years (if Council pays for the bags)	\$134,000 or \$26,800 per year	\$174,450 or \$34,890 per year	\$148,900 or \$29,780 per year
Net cost for ten years (if Council pays for the bags)	\$235,500 or \$23,550 per year	\$316,400 or \$31,640 per year	\$242,900 or \$24,290 per year
Net cost for five years (if households pay for their bags)	--	\$136,090 or \$27,218 per year	--
Net cost for ten years (if households pay for their bags)	--	\$230,090 or \$23,009 per year	--

Table 3: Door-to-door collection with Kepa

	STICKERS	COLOURED BAGS	WHEELED CARTS
Requirements	Costs	Costs	Costs
• Trailer	\$2,500	\$ 2,500	\$ 2,500
• Warehouse	30,000	30,000	30,000
• New baler	21,000	21,000	21,000
• Storage area	5,000	5,000	5,000
• Wheeled Carts	--	--	22,400
Starting fixed costs (first year)	\$58,500	\$58,500	\$80,900
• Stickers	1,500	--	--
• Coloured bags	--	9,590	--
• Small lift	Free (Public Works)	Free (Public Works)	Free (Public Works)
• Labour	7,500	7,500	7,500
• Shipping	6,000	6,000	6,000
• Treatment of recyclables by Sanimos	6,000	6,000	6,000
Total cost for the first year	\$79,500	\$87,590	\$100,400
O and M per year (after the first year) if Council pays for the bags	21,000	29,090	19,500
O and M per year (after the first year) if households pay for the bags	--	19,500	--
Total cost for the next four years	\$84,000	\$116,360	\$78,000
Total cost for five years (if Council pays for the bags)	\$163,500 or \$32,700 per year	\$203,950 or \$40,790 per year	\$178,400 or \$35,680 per year
Total cost for ten years (if Council pays for the bags)	\$268,500 or \$26,850 per year	\$349,400 or \$34,940 per year	\$275,900 or \$27,590 per year
Net cost for five years (if households pay for their bags)	--	\$165,590 or \$33,118 per year	--
Net cost for ten years (if households pay for their bags)	--	\$263,090 or \$26,309 per year	--

APPENDIX 4: AWARENESS TOOLS

1. Wemindji Household recycling questionnaire

Name: _____ (Optional)

Address : _____

1. Do you know what recycling is?

Yes / No

2. Would you support a recycling program, if one were to be started in Wemindji?

Yes / No

3. Would you participate in a recycling program by sorting your own waste?

Yes / No

4. Would you like to have someone explain to you what recycling is?

Yes / No

5. Would you like to see a recycling program started?

Yes / No

6. Do you currently recycle?

Yes / No

7. When would you like your recyclables picked up?

A) The same day as the garbage pick-up.

B) Not the same day as the garbage pick-up.

C) It doesn't really matter.

8. Would you be willing to be part of a "recycling discussion group" that would meet once a month?

Yes / No

Wemindji Recycling Program

Recycling DOs

Paper

- newspapers
- brown bags
- office paper
- telephone books
- books
- cereal boxes
- magazines

Cardboard

- boxes
- egg boxes
- Kraft paper
- milk and juice cartons

Glass

- drinking bottles
- jars (no need to remove labels)

Plastic

- bottles of any sort of liquid including shampoo, laundry detergent, yoghurt...
- grocery bags
- bread bags

Metal

- tin cans
- aluminium pop cans
- clean aluminium plates and foil

Information

For more
 Information, please
 call Mr. Johnny Mark
 at 978-0264, ext. 202



How does it work?

Very simple, just put the recyclables in an orange Glad bag and the non-recyclables in a black bag.

When?

Orange bags (recyclables) will be picked up every Monday and Thursday morning.

Recycling DON'Ts

Paper and Cardboard

- soiled or greasy paper or cardboard
- wax paper, stickers, wallpaper
- photographic paper, gift wrap
- diaper

Glass

- windows
- mirrors
- fluorescents
- light bulbs
- porcelain, ceramics, Pyrex and dishes

Plastic

- chip bags (greasy)
- cracker bags (waxed)
- soiled bags
- rubber items
- toys, tools, etc.
- stretch wrap (saran wrap)
- oil containers

Metal

- paint and solvent containers, spray cans
- hardware, nails, screws
- pots and pans

Food Waste

Soda Cans and Drinking Bottles

$$\begin{array}{cc} \dot{b}\Gamma\sigma\cdot\dot{b}\omega^{\parallel\perp} & \dot{b}\sigma^{\perp} \rho\dot{b} \\ \dot{b}^{\perp}\rho\omega\cdot\Delta^c & \wedge\cdot\dot{b}\wedge^{\perp}d\dot{b}\rho^a_x \end{array}$$


FOOD WASTES

(Except fish bones and guts)

$$\Gamma \Gamma^{\perp} \cup \Gamma \cdot \dot{\Delta} \wedge \sigma^{\perp} \quad \dot{\Delta} \cap \cdot \dot{\Delta} \cap \rho_{\sigma} \cdot \Delta^{\perp} c_x$$

جاء في كتابه في بيان حاله في



RECYCLABLE

Other recyclables:
tins cans and plastic/glass packages

$$d\mathcal{N}^{\text{ab}} \quad \dot{\mathcal{L}} \cdot \dot{\mathcal{L}}^{\text{a}} \quad \dot{\mathcal{L}} \dot{\mathcal{L}} \quad \dot{\mathcal{L}} \quad \dot{\mathcal{L}} \quad \dot{\mathcal{L}} \wedge \sigma \dot{\mathcal{L}} \dot{\mathcal{L}}^{\text{a}}_x$$
[illegible]

FIBERS:

PAPER AND CARDBOARD

$$\Gamma\sigma\dot{\Delta}^{\parallel}\rho_{\perp}\Gamma^a \quad \rho\gamma \quad \Gamma\sigma\dot{\Delta}^{\parallel}\rho_{\perp}\Gamma^b\cdot\Delta^c_x$$


APPENDIX 5: CONTACT INFORMATION

Category	Operation	Company	Contact	Address	Phone Number	Fax Number	Additional Info
Metals							
Ferrous and non-ferrous metals	Collection of scrap metals	Trans-Métal	Bernard Villeneuve	860, route de l'Aéroport, Amos J9T 3A2	1-819-732-0283 1-866-732-0283	1-819-732-7752	Worked with Chisasibi and with Wemindji
Soda cans	Provide bags, collection of pop cans, refund, transportation	Boissons gazeuses environnement B.G.E.	Edward Darche	100, boul. Alexis-Nihon, bureau 406, Montréal, Québec H4M 2N9	1-877-226-3883 poste 22	n/a	Worked with the Inuits and the Kativik Environmental Advisory Committee
Equipment							
Baler	Supply, deliver, install	Maître Compacteur	Serge Therrien	500, rue Guindon, bureau 102, Saint-Eustache, Québec, J7R 5B5	1-450-623-9323 1-800-711-0700	1-450-623-9471	None
	Supply, deliver, install	Métallurgie des Appalaches	Ian Morin	2223, avenue des Érables, C.P. 275, Plessisville, Québec, G6L 2Y7	1-819-362-2424	1-819-362-7066	None
Storage Shelter (TEMPO)	Supply, deliver, install	Dynacar Industries	Yves Blackburn	250, boul. Ste-Rose Est, Laval, Québec, H7K 1A1	1-450-625-1931	1-450-624-1617	None
Curbside collect equipment							
Wheeled carts	Supplier	Nova Envirocom	Pierre Morency	69, route 143, North Hatley, Québec, J0B 2C0	1-819-842-4642 1-866-898-6682	1-819-842-4589 1-888-442-4589	None
Stickers	Design, Printing, Delivery	Indiana Marketing	Christian Houde	380, rue Chef Max Gros-Louis, Wendake, Québec, G0A 4V0	1-418-824-0230	1-418-842-5950	None

Category	Operation	Company	Contact	Address	Phone Number	Fax Number	Additional Info
Hazardous Waste Materials							
Used Oil	Organize the collect	Société de Gestion des Huiles Usagées (SOGHU)	Gilles Goddard	none	1-450-447-9996	n/a	The list of used oil recuperators operating in Eeyou Istchee is available at http://www.soghu.com/
	Collect the used oil	ONYX Industries	Daniel Hébert	200, de la Carrière, C.P. 54 Témiscaming, J0Z 3R0	1-819-627-1488	1-819-627-1487	None
Used Rechargeable Batteries	Provide containers and pay for the shipping	Rechargeable Batteries Recycling Corporation (RBRC)	Susan Antler	16 Northumberland, Toronto, ON M6H 1P7	1-888-224-9764	1-416-536-9892	Sign up on-line at http://www.rbrc.org/community/index.html
Hazardous Waste Equipment	Supply, deliver, install	Quatrex Environment Inc.		1345, Boul. Dagenais Ouest Laval, Québec H7L 5Z9	1-800-967-3002	1-450-622-5392	None
Transportation							
Long-distance transportation	Back-hauling, shipping	KEPA Transport Inc.	Ginette Colin	1957, 3 ^e avenue Val-d'Or J9P 7B2	1-819-874-0262	1-819-874-1093	None

Category	Operation	Company	Contact	Address	Phone Number	Fax Number	Additional Info
Recyclable Materials							
Metals, fibres, plastics, glass	Recyclers	Sanimos	Laurent Martineau	3239, Route 395 Nord C.P. 727 Amos J9T 3X3	1-819-732-8833	1-819-732-8648	Does not pick up recyclables; accept non-sorted bales
	Recyclers	Recyclaction P.L.B.	Philippe Girard and Yves Lapointe	925, 3e Rue Chibougamau G8P 1R4	1-418-748-2511	1-418-748-3035	Does transportation and provide containers
Consulting							
Materials Recycling Facility	Advice on setting up a recycling centre	Consortium Echo-Logique	Stéphane Leclerc	9705, rue Clément, LaSalle, QC H8R 4B4	1-514-323-2999	1-514-325-4888	None
Eco-Solutions							
Biodegrading plastic bags	Bags suppliers	Natursac	Normand Turgeon	Rouyn-Noranda	1-819-797-2481 ext.112	n/a	None