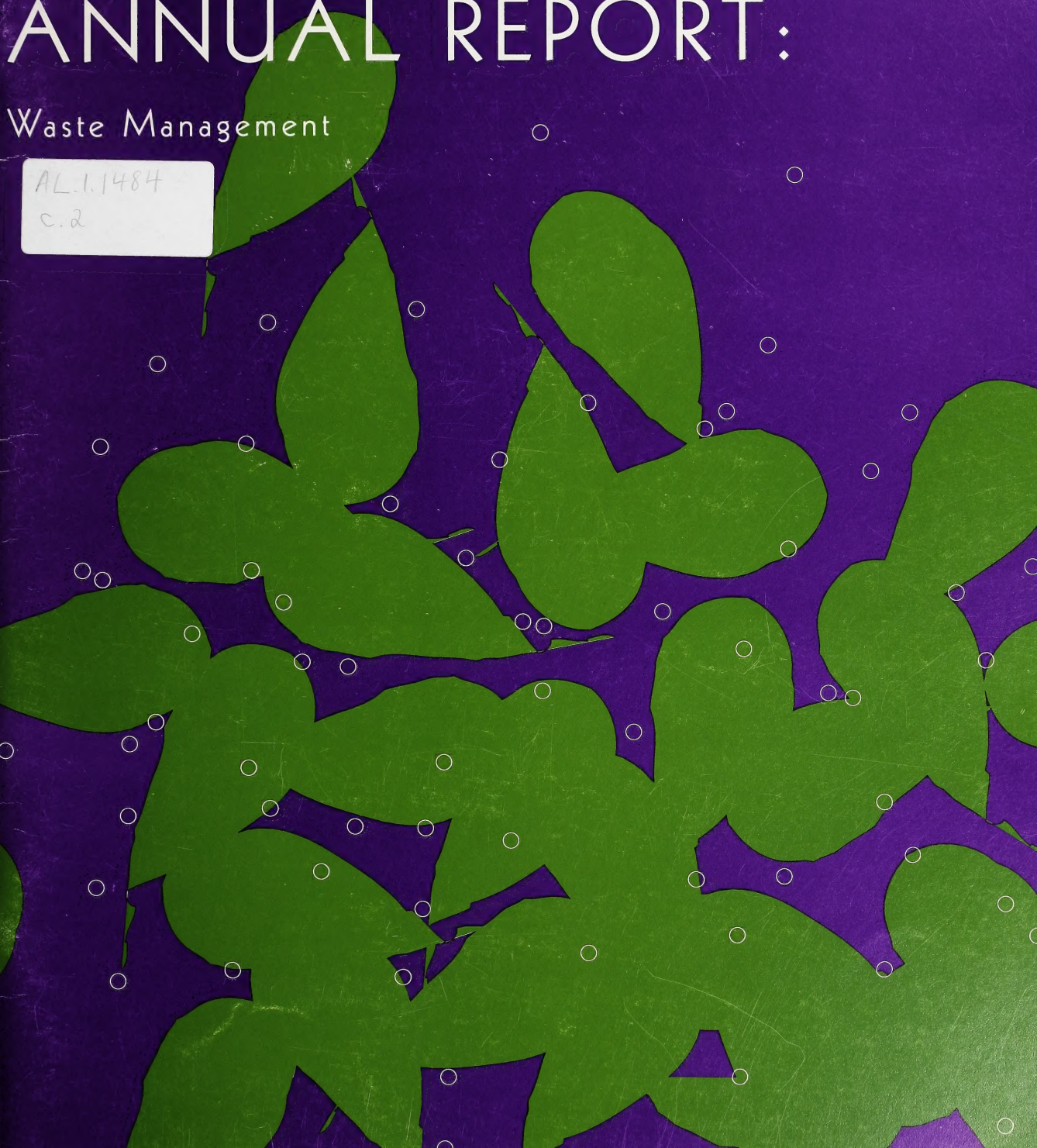
1995 Alberta State of the

ENVIRONMENT ANNUAL REPORT:

Waste Management



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For copies of this report, please contact:

Information Centre
Alberta Environmental Protection
Main Floor, Bramalea Building
9918 - 108 Street
Edmonton, Alberta T5K 2M4
Telephone: 403-422-2079
Facsimile: 403-427-4407

MESSAGE FROM THE MINISTER

I am pleased to present the 1995 State of the Environment Report for Alberta.

The focus of the 1995 State of Environment Report is waste management. This report offers an overview of the history, roles and responsibilities of waste management in Alberta including information about municipal, industrial, biomedical and pharmaceutical waste. It also details waste reduction initiatives currently operating in Alberta.

Waste management is an important environmental and economic issue for all Albertans. Accordingly, the Government of Alberta participates in a number of innovative partnerships and strategies based on the "4Rs" of waste management - reduce, reuse, recycle and recover. For example, Alberta's response to a national challenge to reduce municipal waste is the Action on Waste initiative. This initiative addresses everything from recycling to the adoption of environmentally sound waste management systems. Through initiatives like Action on Waste, the Government of Alberta is committed to achieving the goal of a 50% reduction in municipal solid waste by the year 2000. Alberta was also the first Canadian province to implement beverage and pesticide container collection and recycling programs, to address the problem of scrap tires through tire recycling and to encourage the development of a hazardous waste management industry. Perhaps most importantly, Albertans themselves have become leaders in developing and following an integrated regional approach to solid waste. In addition, in 1993 approximately 500 million beverage containers and 750,000 pesticide containers were recycled. As of April 1995, 1 million scrap tires had been diverted from the waste stream. These efforts are important to ensuring Albertans can continue to enjoy a healthy, sustainable environment that is the envy of the world.

State of the Environment Reporting is useful to schools, businesses and individual Albertans. It provides relevant and meaningful information about waste management so the public and private sectors can work with individual Albertans to chart Alberta's progress to a sustainable future.

I would like to thank everyone for their efforts in preparing this document. Assistance was provided by the departments of Environmental Protection, Energy, Health and Agriculture, Food and Rural Development. The Tire Recycling Management Board and Action on Waste also provided information and expertise to the project. At the end of this Report, a survey is available so readers can comment on the document. I encourage you to complete this form as your comments are important to improving future State of the Environment reports.

Ty Lund

Honourable Ty Lund,
Minister of Environmental Protection

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PREFACE

The Alberta *Environmental Protection and Enhancement Act* states that the Minister shall report annually on the state of the environment. This is Alberta's second State of the Environment Report.

The purpose of State of the Environment (SOE) Reporting is to provide timely, accurate and accessible information on ecosystem conditions and trends, their significance and societal responses, emphasizing the use of indicators. This information should increase public understanding and education and contribute to priority setting and decision-making by providing objective and scientifically valid information. The information should also establish linkages between environmental conditions and socio-economic factors, reflecting the holistic and integrative nature of the relationship that should exist between humans and the environment.

SOE Reporting attempts to answer five key questions:

- What is happening in the environment?
- What environmental trends are occurring?
- Why are they occurring?
- Why are they significant?
- What is being done about it?

Wherever possible, SOE Reporting uses indicators. These are key measurements that can be used to monitor, describe and interpret change. Indicators can help us to answer some of the above questions. They can also help us to better manage aspects of our environment by allowing us to set targets and track progress toward them. We can see what works best and adjust our programs where needed.

A comprehensive State of the Environment (SOE) Report will be published once every five years, beginning with the 1994 Alberta State of the Environment Comprehensive Report. The next comprehensive SOE report will be forthcoming in 1999. In the intervening years, SOE reports will focus on particular themes. The theme of this year's report is waste management. Each year, quarterly fact sheets will accompany SOE reports. Readers are invited to provide comments on this year's report or any aspect of SOE Reporting to Alberta Environmental Protection at the address below. A Reader Survey form is enclosed at the end of this report. Your feedback would be greatly appreciated.

Alberta Environmental Protection
Strategic and Regional Support Division
Corporate Management Service
9th floor, Oxbridge Place
9820 - 106 Street
Edmonton, Alberta T5K 2J6

1.0 INTRODUCTION

Albertans have long shown their commitment to the effective management of waste through initiatives like the Alberta Special Waste Management System, the Beverage Container Management System (the first of its kind in Canada), Action on Waste (our provincial program to reduce municipal solid waste by 50% by the year 2000) and the Household Toxic Round Up Program. These and other initiatives have left Alberta well positioned to manage waste responsibly for the benefit of present and future generations.

The theme of the 1995 Alberta State of the Environment (SOE) Report is waste management. In particular, this report focuses on wastes that are disposed of on land, as opposed to those that are treated or discharged into water or air. Future SOE theme reports on water and air will address waste water effluent and air emissions.

Why focus on waste management?

We all use products and materials in our homes, schools, farms, businesses and industry and then discard them. This waste, when improperly managed, may pose a hazard to human health and the environment. Even when properly managed, it carries with it economic, environmental and social costs.

As waste generators, we can all do something about the waste problem–we can take steps to reduce the amount of waste that we generate and the amount that we put in the garbage bin. Here are some reasons why this is in our best interests:

- ***Reducing waste means reducing disposal costs.*** Municipal waste collection and disposal services cost Albertans a half billion dollars each year (ECA 1994). Higher standards for new landfills are resulting in increased landfill, and hence disposal, costs.
- ***Reducing waste increases landfill lifespan.*** Reducing waste can extend the life of the new, improved and more expensive landfills and lessen the need to build new ones.
- ***Nobody wants to live next to a waste site.*** The "NIMBY (Not In My Back Yard) Syndrome" refers to the negative reaction on the part of residents who live near a proposed waste management facility site. Aesthetic values, increased traffic and decreased property values are a few of the concerns often raised.
- ***Waste processing creates economic opportunities.*** Recycling, composting and recovering waste materials spur the development of new technologies and improved processes to produce value-added materials. This in turn results in employment opportunities. •

  Reducing waste conserves resources and energy. Producing materials and goods requires natural resources and energy. Reusing and recycling existing goods and materials lessen this demand.
- ***Reducing waste reduces hazards to human health and to the environment.*** By creating less waste, we lessen the chance that improperly managed wastes will contaminate our air, soil or water. Pollutants in the environment can affect a wide range of living organisms, including humans.
- ***Reducing waste eases the burden on our public resources.*** Developing, operating and regulating new waste management facilities place considerable demands on our public resources at a time when provincial and local governments are striving to do more with less resources.

Scope and Organization of This Report

This report examines the kinds and quantities of waste generated in Alberta. It describes the methods and programs in place to deal with this waste and identifies some environmental, social and economic aspects of waste and waste management. Where available, data are presented to show trends in waste quantities and management.

The report begins with a brief overview of waste and waste management in Alberta. Separate chapters deal with the three major types of waste and their management. Some programs directed toward particular waste problems are described. A summary of trends and future directions concludes this report.

Information for this report has been provided by

the Action on Waste and Chemicals Assessment and Management divisions of Alberta Environmental Protection; Alberta Health; Alberta Energy; the Alberta Energy and Utilities Board; Alberta Transportation and Utilities; Alberta Agriculture, Food and Rural Development; the Tire Recycling Management Board; the Alberta Pharmaceutical Association and Northern Coordinated Action for Recycling Enterprises (Northern CARE).

2.0 OVERVIEW

2.1 Types of Waste

Waste can be classified by its composition, source, degree of hazard, or many other aspects. For this report, waste is classified by its source into three major categories: municipal, industrial and biomedical/pharmaceutical. It is then further classified as hazardous or non-hazardous.

- ***Municipal solid waste*** can be broadly defined as any waste managed by a municipality. In addition to waste from urban or rural households, it may include waste from businesses, institutions, industries and construction and demolition activities. Waste from industrial processes is not included in this category.
- ***Industrial waste*** can be defined as an unwanted material, hazardous or not, that is generated by industrial processes or service activities. Industrial wastewater effluents and gaseous emissions are excluded from this category for the purposes of this report.
- ***Biomedical waste*** is waste that is generated by human health care facilities, medical research and teaching establishments, microbiology/clinical laboratories and animal research establishments.
- ***Pharmaceutical waste*** consists of prescription drugs or medicinal products which have expired or are unused.
- ***Hazardous waste*** can be defined by its properties. For example, it includes waste that ignites easily and burns persistently; reacts with other things to produce harmful substances; or contains toxic substances that can contaminate food, land, water or air. Thus it requires extraordinary care during transportation, storage, treatment and disposal to prevent harm to humans or the environment. Examples of hazardous waste are PCBs, oil-based paints and paint thinners, lead-acid automotive batteries, drain cleaning chemicals, bleach, spent lubricating oil and antifreeze from car radiators. The Waste Control Regulation under the *Environmental Protection and Enhancement Act* and the *Alberta User Guide for Waste Managers* (Alberta Environmental Protection 1995) specify how one determines which wastes must be managed as hazardous waste.

2.2 A Brief History of Waste Management in Alberta

Issues and actions concerning waste in Alberta grew out of efforts to prevent litter and pollution. In the early 1970s, public attention focused on waste during public hearings to develop a hazardous waste treatment plant. At about the same time, the process of evaluating the environmental risk posed by the hundreds of unsupervised local municipal landfills throughout Alberta was begun. As a result, the province began to work with local governments to plan and develop regional landfills and upgrade existing ones. Financial assistance for this work came from the Waste Management Assistance Program established in 1976 by Alberta Environment (now Alberta Environmental Protection). The first regional systems established were in Crowsnest Pass and Pincher Creek.

The need for a system to provide Alberta farmers with disposal facilities for empty pesticide containers became evident in 1979 when pesticide containers were removed from the St. Mary River in southern Alberta by staff of Alberta Environment. In 1980, the department set up a pesticide container collection program throughout the agricultural part of the province (see Section 6.1).

Litter was also a concern in the 1970s. The Beverage Container Management System, still in operation today, began as a litter management program in 1972. Also in that year Pitch-In Alberta was founded by representatives of non-profit organizations interested in "keeping Alberta beautiful". Alberta Transportation's Annual Highway Clean Up Campaign to remove litter from highway rights-of-way began in 1977 (see Section 6.6).

After extensive public discussions related to hazardous waste treatment, the government established the Alberta Special Waste Management Corporation to oversee the development of the Alberta Special Waste Management System. One of its first major undertakings was a joint venture agreement which resulted in the construction and operation of Canada's first fully integrated hazardous waste treatment centre, which is located near Swan Hills, Alberta. Since its 1987 startup, the plant has undergone a number of expansions. Following completion of public hearings by the Natural Resources Conservation Board, the facility

was given approval in 1994 to also treat hazardous waste from other Canadian jurisdictions.

As a result of growing public awareness of environmental issues, standards for waste management increased. This led to increased costs, but also increased community action. A recycling incentive program was introduced in 1977 by Alberta Environment. Pilot recycling programs and local depots for recyclable materials (often just newspapers at first) were started by volunteers in many communities. In 1985, the Environment Council of Alberta (ECA) held public hearings on waste reduction and recycling. In the same year, the Alberta Research Council began operating a clearinghouse for industrial waste materials (the Alberta Waste Materials Exchange). Joint government-industry efforts to develop processes and markets for recyclable materials were also underway. In 1987 the non-profit Recycling Council of Alberta was formed to promote the development of waste reduction and recycling.

Markets for most of the collected materials were weak and volatile at first. Gradually however, a number of markets improved as volumes increased and supply became more reliable. Increased consumer demand for recycled products, including the Alberta Government's 1991 procurement policy favouring environmentally responsible products, contributed to the growth of markets.

In 1989 the Canadian Council of Ministers of the Environment (CCME) set a nationwide goal of a 50% reduction in the weight of municipal solid waste sent for disposal by the year 2000. As a member of the CCME, Alberta supported this goal and is now striving to achieve it provincially. To assist with this goal and to meet the growing demand on the part of communities for recycling programs, Action on Waste was formed in 1991. Its goal is to work in partnership with government, industry, and non-government organizations, providing information and assistance to businesses, municipalities and private individuals to promote waste reduction. Action on Waste has developed innovative tools to assist in the stewardship and management of waste. Some of the most recent tools include *A Full Cost Analysis Guide for Municipal Waste Managers, The Compendium of Alberta Waste Minimization Projects* and an improved system to track waste disposal and diversion information. Now a division of Alberta Environmental Protection, Action on Waste has provided assistance to over 200 local recycling facilities in the province.

The CCME also created the National Task Force on Packaging in 1988. The Task Force developed policies and targets to minimize the environmental effects of packaging and reduce the amount of packaging sent for disposal. Its target, adopted by the CCME in 1990, is to reduce the amount of packaging sent for disposal by 50% by December 2000.

2.3 Roles and Responsibilities

Much of the waste we generate is managed at the local level. Individual Albertans, community recycling groups, municipal councils and regional waste management authorities are in the front line when it comes to both managing and reducing waste in Alberta.

The private sector has also taken on responsibility for waste, as described later in this report. Partnerships between and among community, business and government sectors have brought about many new waste reduction initiatives.

Provincial legislation places the responsibility for various aspects of waste management and regulation on two levels of government and a number of government departments and agencies. These include municipal governments, regional health authorities, Alberta Environmental Protection, Alberta Health, Alberta Transportation and Utilities and the Alberta Energy and Utilities Board (EUB; formerly the Energy Resources Conservation Board). The legislation divides these responsibilities as follows:

- The responsibility for managing municipal solid waste lies with local municipal governments. The Waste Management Regulation (Alberta Regulation 250/85) under the *Public Health Act* requires that every municipality provide, operate and supervise one or more waste management facilities for the safe and sanitary disposal of all municipal solid waste created within the municipality. If the number of people served by the facility is 10 000 or more, this facility must be a sanitary landfill.

- The Waste Management Regulation also deals with approvals to develop and permits to operate waste management facilities. It prohibits the deposit of hazardous or industrial waste in landfills not designated for that purpose.
- The *Public Health Act* gives health units (now regional health authorities) the power to approve and inspect municipal landfills, dry waste sites, waste storage, waste sorting and waste transfer stations. The Act also regulates the disposal of biomedical waste and the approval of biomedical waste treatment facilities.
- On June 30, 1995 Cabinet approved the transfer of legislation for waste management facilities from Alberta Health to Alberta Environmental Protection. The transfer commenced July 1, 1995 and is to be completed by March 31, 1996. This period of time is necessary to allow amendments to legislation and to bring in a new program for approving and managing landfills under the Alberta *Environmental Protection and Enhancement Act*.
- The Alberta *Environmental Protection and Enhancement Act* (EPEA) confers many responsibilities regarding waste management and waste minimization on Alberta Environmental Protection. EPEA enables funds to be established to support waste minimization and recycling. It also provides for the control of waste and sets requirements for the handling, transportation, treatment and disposal of hazardous waste. Specified waste management activities must receive an approval under EPEA in order to operate. Alberta Environmental Protection is given the power to enforce the provisions of EPEA.
- The Waste Control Regulation (Alberta Regulation 129/93) under EPEA deals in detail with the identification of hazardous wastes. It sets out requirements for the handling, storage and disposal of hazardous wastes and the treatment, storage and recycling of hazardous recyclables. It also deals with the orders which may be issued for the control of waste.
- The *Transportation of Dangerous Goods Control Act* and Regulations administered by Alberta Transportation and Utilities provide for the safe transportation of hazardous waste and deal with requirements for labelling, packaging, vehicle standards and driver training.
- By arrangement between Alberta Environmental Protection and the EUB, the EUB regulates all wastes generated by the upstream oil and gas industry. As well, treatment and disposal facilities that handle solely oilfield wastes are regulated by the EUB.

3.0 MUNICIPAL SOLID WASTE

3.1 Defining and Measuring Municipal Solid Waste

Municipal solid waste is waste generated by communities, or put another way, the garbage one finds at the municipal landfill. The CCME defines it as *any material, product, or by-product for which the generator has no further use and which is discarded for management at waste disposal facilities.*

This waste comes from three major sources:

1. residences–urban and rural;
2. local industries, businesses and institutions (excluding waste from industrial processes); and
3. construction and demolition activity.

Figure 1. illustrates the proportion of different types of material that make up municipal solid waste. These percentages are provincial averages; actual waste composition varies greatly from place to place–especially between rural and urban areas–and from season to season.

Reducing the quantity of waste going into our landfills is the focus of much effort on the part of local governments and individuals. The CCME's goal of reducing the amount of municipal solid waste by 50% by the year 2000 is to be measured on a per person basis, using the year 1988 as the starting point (100%). In order to measure the progress of each province toward the 50% goal, it was necessary for the CCME to develop a standardized way of measuring municipal waste and a list of the types of waste to be measured. Based on these criteria and the 1988 rate of 1.08 tonnes per person, the 50% goal works out to 0.54 tonnes per person. An interim 25% waste reduction goal adopted by Alberta for 1996 is equal to 0.81 tonnes per person.

Alberta's performance since 1988 is shown in Figure 2. Clearly, substantial progress has been achieved toward both the 1996 and the 2000 waste reduction goals. A 21% reduction in waste per person has been achieved to date.

Data regarding the reduction of packaging waste are not available on a provincial basis. However, a nation-wide survey by Statistics Canada found that an overall 21% reduction in packaging had been achieved in 1992.

3.2 Managing Municipal Solid Waste

An integrated approach has been developed in Alberta for managing municipal solid waste. This approach consists of developing a waste management plan for the community or region and a system to meet the needs identified in the plan. This system may include educational programs, facilities and means for diverting waste from the landfill and waste disposal facilities.

In the integrated approach to waste management, different ways of handling waste are combined so that each type of waste is managed in the most environmentally and economically sound manner. The possible methods that may be combined include (in order of preference, from the most energy-efficient and effective waste-reducing options to the least):

- **reducing** the amount of waste generated;
- **reusing** waste materials;
- **recycling** waste, including composting organic waste; and
- **recovering** energy from waste.

Disposal of waste remaining after these processes have been employed is the final step in the integrated approach.

These "4Rs" are applicable to the management of any type of waste, not just municipal waste. They are referred to throughout this report based on the following definitions:

- **Reducing** waste is preventing a material or product from becoming a waste item. Reducing waste *at source* means generating less waste. Examples of this approach are double-sided photocopying and reducing the amount of packaging on consumer goods. Reducing waste at source is one way in which the CCME's targets for reduction in packaging will be met.

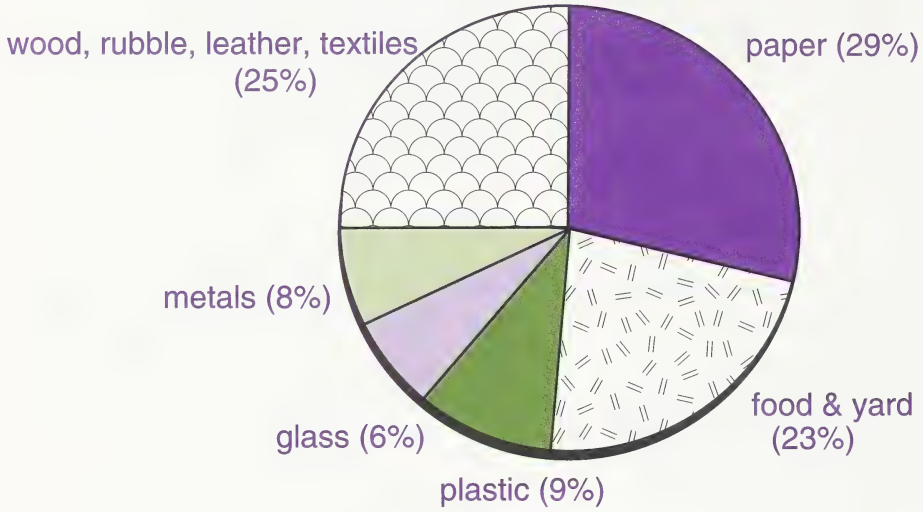

Figure 1. Municipal Solid Waste Composition (1994.)

Note: These figures reflect a provincial average for waste components, but will vary according to season and municipality.

Source: Alberta Environmental Protection, Action on Waste Division.

- **Reusing** waste means using it again in its original form without first making it into a raw material for remanufacturing. Refilling a bottle or having a tire re-treaded are examples of reuse. The reuse of building materials is becoming popular, as organizations such as Envirocycle Expediting International in Edmonton salvage and sell used building materials from renovated or demolished offices and buildings. Opportunities for reuse are provided by paint exchange bins at community recycling depots and by events such as the "Great Strathcona Exchange" during which County of Strathcona residents can drop off or pick up furniture and other large household items at no charge.
- **Recycling** waste means using it in the manufacturing or remanufacturing process. Recycling usually involves several steps, including collecting, processing, transporting, decontaminating and remanufacturing. Collecting tires, shredding them and using the rubber to make a new product is an example of recycling.

  Composting is a type of recycling involving organic waste materials such as grass clippings and leaves. In this naturally-occurring process, the organic materials are partially broken down (decomposed) by microorganisms into a soil conditioning substance ("humus"). Many gardeners compost their yard and garden wastes and use the resulting humus to improve their soil.
- **Recovery** refers to generating energy from a waste substance by some process such as burning and putting the energy to further use. For example at the Wainwright Regional Waste-to-Energy Facility, waste heat is recovered from the incineration of the region's municipal solid waste. This heat is used to provide steam for a nearby processing plant.

  Recovery can also refer to restoring a waste substance to its original condition. For example, in industry, oil may be recovered from oily waste.

Diverting Waste

The downward trend in municipal solid waste disposal rates evident in Figure 2. is a direct result of these "4Rs" being put into practice by individuals, businesses and institutions. While it is difficult to measure the amount of waste reduction and reuse that is occurring, a useful indicator for tracking progress is the quantity of materials collected for recycling. Trends in collection rates for several materials between 1987 and 1994 are shown in Figure 3. With the exception of metals, the trend is clearly upward. The paragraphs below describe how this activity is taking place.

Collecting and Processing Recyclable Materials

There are over 200 municipally-sponsored recycling collection programs throughout the province. In some communities, recycling initiatives and collection programs are run by community groups, small businesses or commercial waste haulers. The number of types of materials collected varies, as does the collection method. Some communities have curbside collection, while others have strategically located drop-off bins. The City of Edmonton, for example, has both systems, providing a blue box pick-up service as well as 16 drop-off recycling depots. The City of Calgary, on the other hand, collects recyclables from over 30 drop-off depot locations. Many communities share recycling facilities in order to reduce costs and increase quantities collected. By increasing quantities, they can improve the market potential for their materials.

As industry's demand for recycled materials increases, municipal and community recycling managers try to find markets that will give the best return for their materials. Revenue from the sale of the recyclables often offsets collection, processing and transportation costs.

Municipal collection systems are not the only means of collecting recyclable materials. Scrap metal dealers, for example, had a collection system in place for used metals long before recycling became popular. As a result, only about 30% of scrap metal generated in the province is considered part of municipal solid waste (food cans, small and large appliances and miscellaneous metal items). Other businesses offer collection services for a number of different recyclable materials.

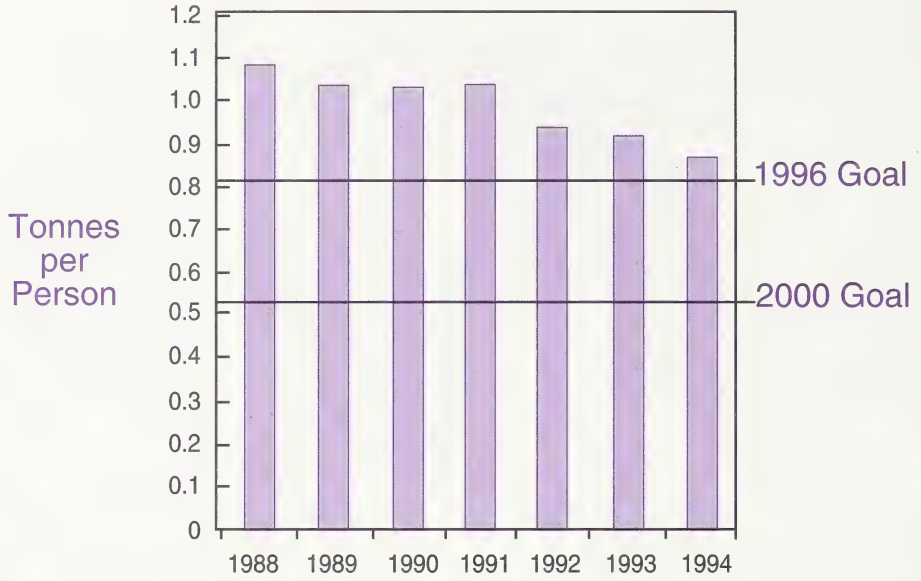

Figure 2 Municipal Solid Waste Disposal in Alberta (1988-1994).
(Measurements based on CCME definition for municipal solid waste, 1995).

Source: Alberta Environmental Protection, Action on Waste Division.

The collection of beverage containers has also been in place for many years. A provincially legislated program now ensures the collection and recycling of 500 million glass, plastic and metal beverage containers annually (see Section 6.4).

To be marketable, recyclable materials must be clean and separated into different grades. After sorting or separation, the material is usually crushed (baled) or shredded, depending on the requirements of the manufacturer. Materials that are processed to the requirements set out by the buyers and manufacturers bring the highest prices. For example, a higher price can be obtained for old (used) corrugated cardboard if it is baled in 1000-lb bales.

There are currently four large-scale regional sorting and processing centres in Alberta. These are located at Grande Prairie, Lloydminster, Lethbridge and Hanna. Other municipalities have smaller processing centres which handle smaller volumes but accept material from other communities in their region. Some of these include Barrhead, Olds, Camrose, Rimbey, Okotoks, Drayton Valley, Pincher Creek, Morinville, Westlock, Bonnyville and Sylvan Lake.

The broad range and quantities of materials diverted from municipal landfills in Alberta are shown in Table 1.

Paper

Waste paper is the single largest component of municipal solid waste. This category includes used newsprint, corrugated cardboard, mixed waste paper, office paper and boxboard.

Growth in numbers and size of residential recycling programs has led to increased paper collection for recycling. In 1994, the demand for waste paper soared to new heights due to greater demand for paper products with recycled content. Higher prices for waste paper have led to increased municipal and private collection of waste paper and cardboard for recycling.

While there has been an increase in the number of brokers and processors of waste paper in Alberta, the number of end users in the province remains limited to four major companies.

Organics

Organic materials often make up 50 to 70% of the total municipal solid waste stream. Plant wastes, grass clippings and food wastes together make up about 30%. Paper is also an organic material, and the types of paper for which there is no market can be composted.

Backyard composting of leaves, grass clippings, food wastes and wood has been encouraged through educational programs and materials by some municipalities and by Alberta Environmental Protection. In addition, the Composting Technology Centre at Olds College is a leader in research and education on composting methods for residents, municipalities and industry. The Centre opened in 1994.

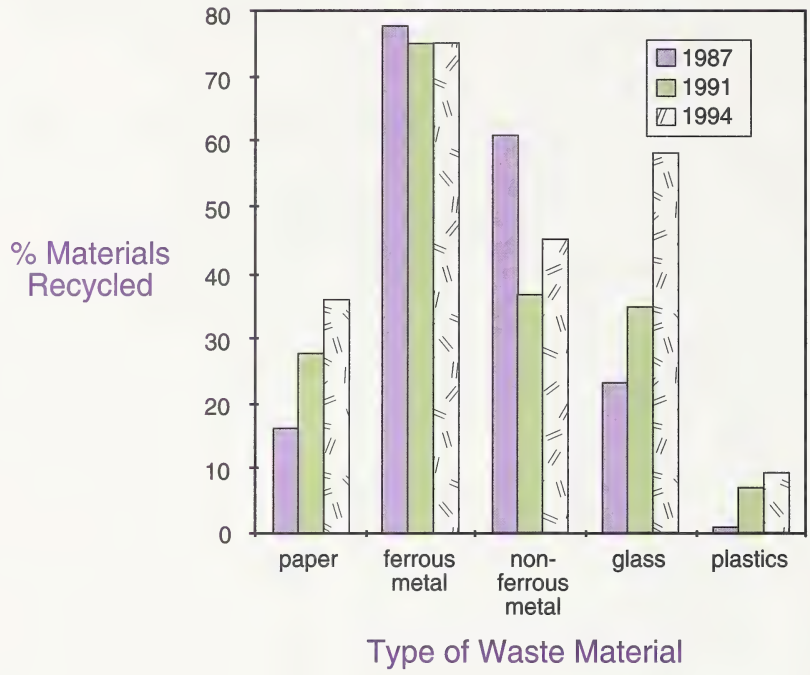

Figure 3. Recycling Rates (1987-1994).

Source: Alberta Recycling Markets Study 1992 and Alberta Recycling Market Profile Reports (1994/95). Alberta Environmental Protection, Action on Waste Division.

Table 1. Collection Rates for Recyclable Materials (1994).

Material	Amount generated (tonnes)	Collected for recycling (tonnes)	%
Paper (Total)*	586 000	211 000	36
newsprint	90 000	64 500	70
corrugated cardboard	152 000	85 000	56
mixed waste paper	156 336	39 084	25
office paper	115 776	22 770	20
Glass (Total)	173 800	101 169	58
beer bottles	61 577	55 420	90
deposit beverage containers	48 655	36 499	75
non-beverage containers and flat glass	61 666	9250	15
Metals (Total)	150 000	52 542	35
aluminum beverage cans	10 287	8230	80
steel beverage cans	390	312	80
appliances	40 000	30 000	75
household food cans	15 000	1500	10
other MSW metals	84 322	12 500	15
Plastics (Total)	130 000	11 994	9
Organics sewage sludge	76 000 dry tonnes	72 000 dry tonnes	95
Construction/Demolition	unknown	unknown	unknown

Source: Alberta Environmental Protection, Action on Waste Division.
*Note: Includes 67 000 tonnes of non-recyclable paper. All commodity totals have been rounded off.

In addition to composting by individuals, centralized composting by municipalities is on the increase. Thirty-one communities now have central facilities for composting of residential yard waste and some have curbside pick-up of these materials.

Another organic waste which municipalities manage is the residue generated from sewage treatment. This sludge is rich in nutrients and organic material but may also contain heavy metals and trace organics that limit its ability to be recycled. Following studies into the land application of sewage sludge, Calgary, Edmonton and a number of other smaller communities began applying it to land. As of 1995, almost 95% of all the sewage sludge generated in the province (76 000 dry tonnes) is applied to about 3000 hectares of land.

Construction/Demolition Materials

Construction and demolition materials such as wood waste, rubble, aggregate and building materials make up one-quarter of all municipal waste by weight. These items can take up a great deal of landfill space. As a result, some municipalities are now taking steps to keep construction and demolition materials out of their sanitary landfills by specifying that they be disposed of in dry waste sites. Furthermore, when separated at source, some of these materials can provide a clean source of reusable material. It is expected that the rising price of new wood will increase the markets for waste wood.

Currently, a number of recyclers of wood waste in the province produce landscaping chips, roofing materials, firelogs and animal bedding from the wood. Some municipalities recycle concrete rubble by crushing and using it for road repair.

Scrap Metals

Only a small portion of the scrap metal generated in Alberta ends up in landfills. Most scrap metal, because of its high value, is recycled by the metals recycling industry in Alberta. Alberta's scrap metal dealers prepare metals for sale to local and world markets. In most years, all of Alberta's ferrous metal goes to local industry. Non-ferrous metals such as aluminum are sold on the world market.

The scrap metal that does become municipal solid waste is from items such as steel and aluminum food cans, appliances and other miscellaneous items. Even with expanding residential recycling, the overall collection rate for these items has increased only slightly, largely through the collection of steel food cans.

Waste Plastics

Plastic is probably the most benign of materials sent to landfill because it does not break down and contribute to leachate or other water quality problems. However, because it does not decompose, it is often perceived to be a litter problem. The bulk and long life of many plastic items translates into a considerable amount of volume in a landfill.

There are seven generally recognized grades of plastic, each of which contains a different type of resin. Buyers of waste plastic require certain grades of plastic, depending on the manufacturer's needs. The market for waste plastic in Alberta has been fairly volatile, but now appears to be improving, particularly for certain grades of plastic (high density polyethylene and polyethylene terephthalate).

Generally, each grade of plastic is shredded separately and stored until a sufficiently large amount of material is on hand to sell to a manufacturer. Some of the used plastic from Alberta is used in the manufacture of plastic grocery and shopping bags. Other products include oil containers, fence posts, carpets, guardrails, parking curb stops, plastic pallets, report binders and fibrefill stuffing.

Waste Glass

The Beverage Container Management System accounts for the recovery of most beverage container glass. The increase in the recycling rate between 1991 and 1994 is largely due to an increase in the types of glass containers being accepted through that program.

Much of the glass is melted and reformed into glass bottles. However, this market is not large enough to make use of all the available glass. Non-container glass (plate glass, mirrors and windshields) and glass jars may be crushed and used in place of sand for paving or finely ground into an abrasive for use in sandblasting. This type of glass may also be added to silica sand, heated and spun into fibreglass insulation material, or it may be melted and "bubbled" into glass beads to be used in reflective road paint.

Disposing of Waste

Alberta's municipalities provide a variety of waste management facilities. Table 2. shows the types of municipal solid waste facilities in the province and their numbers.

Landfills

Developing a new landfill is costly and time-consuming. Unlike the old-style garbage dump, a modern sanitary landfill is designed to maintain clean groundwater, clean air and to meet certain aesthetic standards. Some of the costs involved are summarized below.

1. **Planning stage:** This stage may take years, as numerous sites may have to be considered before a satisfactory one is found. All waste management facilities must be approved prior to their development and operation. In the approval process, an environmental health risk assessment may be conducted to measure the potential health risk to the population through air, soil, water as well as any potential nuisance concerns. Public meetings may be held at alternative sites to receive input on concerns.
2. **Development stage:** There are many costs at this stage. Some of these include: acquiring the land, surveying, relocating utilities, landscaping and constructing roads, parking lots, and administrative buildings (Action on Waste Division 1995). Depending on site conditions, the landfill may require a synthetic lining material and/or a system for collecting or preventing leachate (liquid created when rainwater or groundwater enters the landfill and picks up pollutants from the decomposing garbage).
3. **Operational stage:** Once approved and operating, the facility must be operated according to the terms of the permit and the provisions of the Waste Management Regulation.
4. **Post-operational stage:** When the landfill is full, it must be properly covered and the surface area revegetated. In some cases, methane gas produced by decomposing material may have to be captured. Also, a system to remove leachate may have to be maintained. These costs are in addition to the costs of a new facility to replace the one that is full.

Landfill facilities are usually placed in areas that have deposits of clay till or other geologic features that restrict the movement of groundwater. In addition, the quality of the groundwater is presently monitored regularly at most regional landfills by Alberta Environmental Protection. At smaller municipal landfill sites, groundwater quality concerns are also addressed by the department.

To monitor groundwater, a network of wells is constructed along the perimeter of a portion (cell) of the landfill that has been filled and closed. Water level measurements are made to determine the depth to the water table and to calculate groundwater flow directions and velocities. Water samples are collected from these monitoring wells and analyzed at commercial laboratories. The groundwater quality is compared with background and previous water quality data. A significant change in water quality is generally considered a sign of groundwater contamination by the landfill. Information on the geology and groundwater flow patterns is used to determine the potential impact of the contamination on the surrounding area. To date, little contamination of groundwater has been found near any regional landfills.

Table 2. Types of Municipal Solid Waste Management Facilities in Alberta (1995).

Type and Number of Waste Management Facilities	Definition
Sanitary landfill - 43	Waste management facility where waste material is placed in trenches or on land, compacted by mechanical equipment and covered with earth.
Regional landfill - 25	Sanitary landfill serving more than one community. One or more waste transfer stations may be associated with it.
Modified sanitary landfill - 275	Waste management facility that, by reason of its location and intended purpose, is subject to less stringent operational requirements than a sanitary landfill.
Dry waste site - 64	Waste management facility restricted to non-offensive classes of waste such as construction or demolition rubble.
Waste sorting/processing station - 19	Waste transfer station where waste is compacted, shredded, ground, processed or sorted.
Waste storage station - 6	A facility that has been established to store one or more specific materials where there is an intended use for the material.
Waste transfer station - approx. 200	Specially designated drop-off depots from which waste is collected and transported to the regional landfill.
Waste-to-energy incinerator - 1	A facility designed for municipal waste having state-of-the-art combustion and waste heat recovery.

Source: Alberta Health and Alberta Environmental Protection.

Waste-to-Energy Incinerator

The Wainwright Regional Waste-to-Energy Facility is a new municipal facility which incorporates combustion, waste heat recovery and recycling. Recycling and composting programs divert some materials such as yard waste, glass and metals from the waste entering the incinerator. This improves the combustion performance. The heat is used to generate steam which is used by a nearby food processing plant. The solid waste remaining after incineration is put into the landfill.

Regional Waste Management Systems

Since 1976, regional waste management systems comprised of regional sanitary landfills and waste transfer stations have been steadily replacing the many smaller, scattered landfill sites throughout Alberta. By serving a larger area, regional systems save land and resources. Almost half of Alberta's municipal landfills have now been replaced by regional landfills and transfer stations (Figure 4). The locations of the regional waste management systems now in place are shown in Figure 5.

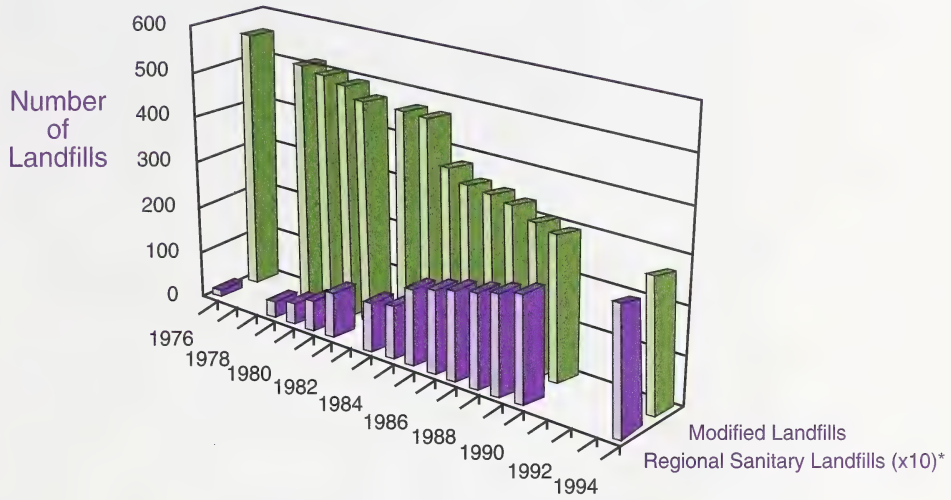

Figure 4. Growth of Regional Sanitary Landfills and Closure of Modified Landfills (1976-1995).

*Note: One regional sanitary landfill has been assumed to equal 10 modified landfills for the purpose of this graph. There are 25 regional landfills as of 1995.

Source: Modified from Public Health Division, Alberta Health.

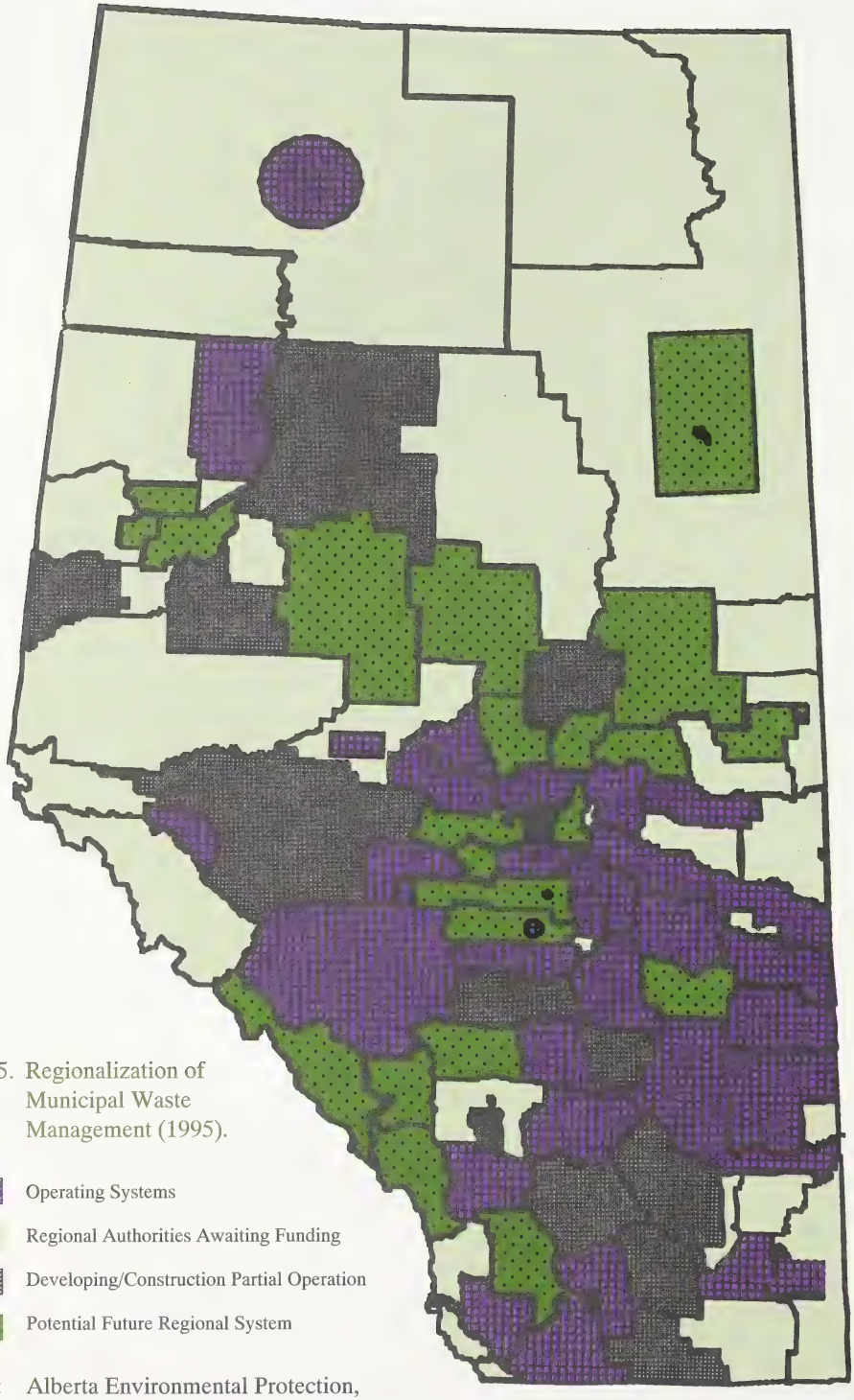

Figure 5. Regionalization of Municipal Waste Management (1995).

- Operating Systems
- Regional Authorities Awaiting Funding
- Developing/Construction Partial Operation
- Potential Future Regional System

Source: Alberta Environmental Protection, Action on Waste Division.

TARGETS, INDICATORS AND TRENDS

- CCME: A 50% reduction from 1988 levels in the per person weight of municipal solid waste by the year 2000. An interim 25% reduction by 1996.
- CCME: A 50% reduction from 1988 levels in packaging waste sent for disposal by the end of the year 2000. An interim 20% reduction by 1992.
- The 1996 target of 25% reduction of municipal solid waste is being approached, with a 21% reduction achieved to date in Alberta.
- The 1992 packaging target was exceeded on a Canada-wide scale (21% reduction).
- Recycling collection rates for paper, glass and plastic have risen steadily since 1987.
- There are over 200 municipally-sponsored recycling collection programs in Alberta today.
- Thirty-one Alberta communities now have centralized composting facilities.
- Application of sewage sludge to land now keeps approximately 95% of this waste from landfills or burial.
- A conversion program begun in 1976 has replaced almost half of Alberta's municipal landfills with regional landfill systems.

4.0 INDUSTRIAL WASTE

This chapter describes the industrial waste, hazardous waste and oilfield waste produced in Alberta. Industrial waste generally refers to waste that is produced in industrial processing and service activities. Hazardous waste, while often considered an industrial waste, can also be generated by institutions and households. It is discussed in the context of industry in Section 4.2. Oilfield waste is discussed separately in Section 4.3. However, the waste management practices discussed under Section 4.1, General Industrial Waste, also apply to oilfield waste.

This SOE Report does not include industrial wastewater effluents or gaseous emissions within the meaning of waste. The effects of these releases into the environment will be dealt with in future SOE reports.

4.1 General Industrial Waste

Quantity

The total amount of industrial waste produced in Alberta has not been quantified to date.

Industrial Waste Management Practices

Landfilling

Landfill disposal of industrial waste is an acceptable practice provided that the landfill has adequate natural or engineered barriers which prevent contamination of groundwater. Knowledge of the waste's behaviour in a landfill determines which wastes may be disposed to landfill safely.

Major industries, such as oil and gas, wood and pulp, and various manufacturing industries, operate about 50 landfill sites for disposal of their own waste. The document *Guidelines for Industrial Landfills* (Alberta Environment 1987) provides the basic framework for proper landfill disposal of industrial waste. Groundwater monitoring at landfills operated by the private sector is done by the owner and the results of the monitoring are sent to Alberta Environmental Protection. Little contamination has been found to date.

The Waste Control Regulation enacted in 1993 establishes siting and design standards for landfills that accept landfillable hazardous waste. These landfills must have leachate collection, leak detection and adequate groundwater monitoring. Currently, no off-site landfills are approved in Alberta to receive wastes classified as hazardous.

Deepwell Injection

Alberta has stable and porous layers of sedimentary bedrock that, once depleted of their hydrocarbon resources, are used for the disposal of brines and diluted industrial wastewaters. These geological formations, typically at depths between 1000 and 2000 metres, are isolated from groundwater resources and contain salt water and residual hydrocarbons. Some have been used in Alberta since the 1950s for disposal of industrial wastes.

Industries such as upstream oil and gas producers, refineries, fertilizer plants and chemical manufacturers rely on deepwell injection. This method of disposal is generally used for water-based wastes for which alternative treatment would be very costly.

There are five classes of injection wells. Two of these classes (Class Ia and Ib) are used for disposal of industrial wastes. There are about 92 Class Ia and Class Ib wells and five caverns operating in Alberta. These wells can receive a broad spectrum of industrial wastes including some hazardous wastes. These wells are subject to extensive monitoring and inspection. Class II wells are allowed to receive only produced water or brines.

Deepwell injection has been recently subject to public review, and a guidance document incorporating technical standards has been jointly developed by a working committee with representatives from the EUB, Alberta Environmental Protection, well operators and users and certain stakeholder groups.

Thermal Treatment

A wide variety of thermal processes are used to treat industrial organic sludges and wastes. Some

thermal treatment involves the recovery of the organic constituents. Others use high temperature incineration, resulting in the destruction of the organics.

Ten companies now operate thermal treatment facilities in the province, including the Alberta Special Waste Treatment Centre near Swan Hills. Some of these companies provide mobile facilities.

Physico-chemical Treatment

This treatment consists of physical and chemical processes to change the waste into harmless or non-hazardous substances. Some of these processes stabilize or immobilize the inorganic components in the waste material by adding cement-like substances or chemicals that react with a substance in the waste to stabilize it. There are three facilities in the province that provide this capability.

Contaminated soils are sometimes washed. The main drawback of this process is the generation of a large wastewater stream that in turn requires costly treatment or disposal.

Biological and Land Treatment

Biological treatment involves the use of naturally-occurring microorganisms to convert organic pollutants into carbon dioxide and water. Biological treatment processes are a cost-effective way to treat waste containing contaminants that are susceptible to biological breakdown.

There are two distinctly different approaches used to treat waste using microorganisms. One involves using the land surface as the treatment medium (called "land treatment"). The other involves using an aqueous medium (lagoon or mechanical plant). The more controversial of these two approaches is land treatment. As with other waste treatment options, this treatment option will not cause adverse environmental effects when conducted properly.

Twelve land treatment facilities treat approximately 30 000 tonnes of oil industry, chemical industry and pulp mill wastes annually. In some instances addition of industrial wastes to soil improves the soil characteristics. For example, pulp mill sludges are proving to be beneficial fertilizers. Unlike most municipal waste sludges, they do not contain heavy metals.

Lagoons and mechanical plants generally treat aqueous liquid waste, which is beyond the scope of this report.

Reducing, Reusing, Recycling and Recovering Industrial Wastes

Alberta Environmental Protection is currently identifying all industrial wastes produced in the province so that waste management strategies consistent with sound environmental policies can be clearly defined. A guidebook that can be used to select environmentally acceptable and cost-effective management options for industrial waste is being developed. The options will focus on pollution prevention, reduction of waste at source and management practices aimed at waste reduction, recovery, treatment and disposal (in this order).

A few industries have been recycling certain waste materials for decades. Today, this trend is increasing. Wastes that were once a liability have become an asset. A few examples are described below.

- **Automotive Batteries:** A collection system for automotive lead-acid batteries is well-developed in Alberta. Province-wide collection is available through the private sector. Some retailers apply a deposit system. The lead in the batteries is recovered, and recently, the plastic cases are being reused and the acid is being converted into useful products. The collection rate for batteries is estimated at 75%.
- **Solvents:** Dry cleaning fluid, paint thinner, degreasers and natural gas processing chemicals are some of the numerous solvents that are recycled in Alberta. Four large and several smaller companies recycle solvents in Alberta. Three companies re-refine solvents for reuse, while others use the solvents as fuel. Several million litres are recycled every year. The total amount of waste solvent generated in Alberta is unknown.
- **Antifreeze (glycol):** A small but growing cottage industry of antifreeze recyclers has recently started up in Alberta, in addition to two major recyclers and at least four mobile

recyclers. Some large generators (e.g., fleet operators) have purchased glycol recycling equipment of their own. Small amounts of glycol may be used as fuel, exported or reused in some other way. Unrecycled glycol is generally discharged into sanitary sewers and treated together with municipal wastewater.

- **Aerosol Containers:** Although most used aerosol containers are disposed of in landfills, about 1% of those generated in Alberta are recycled. There is one commercial facility in Alberta that collects and recycles this waste. The metal cans are punctured and their contents sent to the Alberta Special Waste Treatment Centre for disposal. The cans are then shredded and the metal sent for smelting. The plastic caps are recycled. Several large generators of this industrial waste also have in-house recycling equipment.
- **Ash:** In the process of burning coal to generate electricity, ash is formed. This settles out in ash lagoons, but eventually builds up. In Alberta, some of this ash is now being used in the production of cement. Some is also used as fill material in land reclamation. More uses are being sought.
- **Drums:** Few drums go to landfill, except as containers for other waste. There are three facilities in Alberta dedicated to washing and reconditioning drums. Several other recyclers and waste handlers also wash their own drums for reuse. Metal drums that are too damaged for reuse are crushed and sent for smelting.
- **Rags:** Rags used for industrial wiping and washing are collected, washed and reused again and again.
- **Spent Shot Blast:** Spent silica sand used as an abrasive in the removal of paint from metal surfaces is often used as a fluxing agent in lead smelters.
- **Spent Pickle Liquor:** The electroplating industry generates spent pickle liquors from steel finishing, consisting of spent sulphuric and hydrochloric acid containing ferrous salts. Formerly this waste was directed to the Alberta Special Waste Treatment Centre. Now, it is used as a product to suppress hydrogen sulphide formation at sewage sludge digestors.
- **Lime Sludges:** Lime kiln dust, lime-treated sludge, calcium oxide from acetylene production and lime sludge from process water treatment are often used as a pollution abatement agent to neutralize acidic wastes. They are also applied to acidic agricultural soil as a soil conditioner.
- **Wood Residue:** Industry generates approximately 1.9 million oven-dried tonnes of wood residue each year. Of this amount, 530 000 tonnes, or 27%, is burned for energy production or is reused. Most of this goes into the power boilers of pulp and paper mills. The rest is used for making panelboard, agricultural uses or heating buildings. Some residue is burned in wood waste burners. Efforts are underway to find additional uses for these residues and reduce the use of wood waste burners.

  In the Whitecourt area, wood waste is now used to generate electricity for local residents. Similar plans are underway in the Drayton Valley area.

4.2 Hazardous Waste

Hazardous waste is defined by its properties, as discussed in Section 2.1. Generators of hazardous waste can be households and institutions as well as all types of industry. There are approximately 100 000 tonnes of hazardous waste produced and shipped offsite for recycling, treatment or disposal.

Management of Hazardous Waste

Much hazardous waste is recycled or reused. Some is treated at industrial waste treatment facilities as described in Section 4.1 or at the Alberta Special Waste Treatment Centre. The *Alberta User Guide for Waste Managers* (Alberta Environmental Protection 1995) assists those involved in the management of wastes to better understand the program administered by Alberta Environmental Protection.

Figure 6. shows the quantity and destination of hazardous waste manifested and shipped between 1991 and 1994. The quantity shipped rose steadily from 57 300 to 98 900 tonnes between these years.

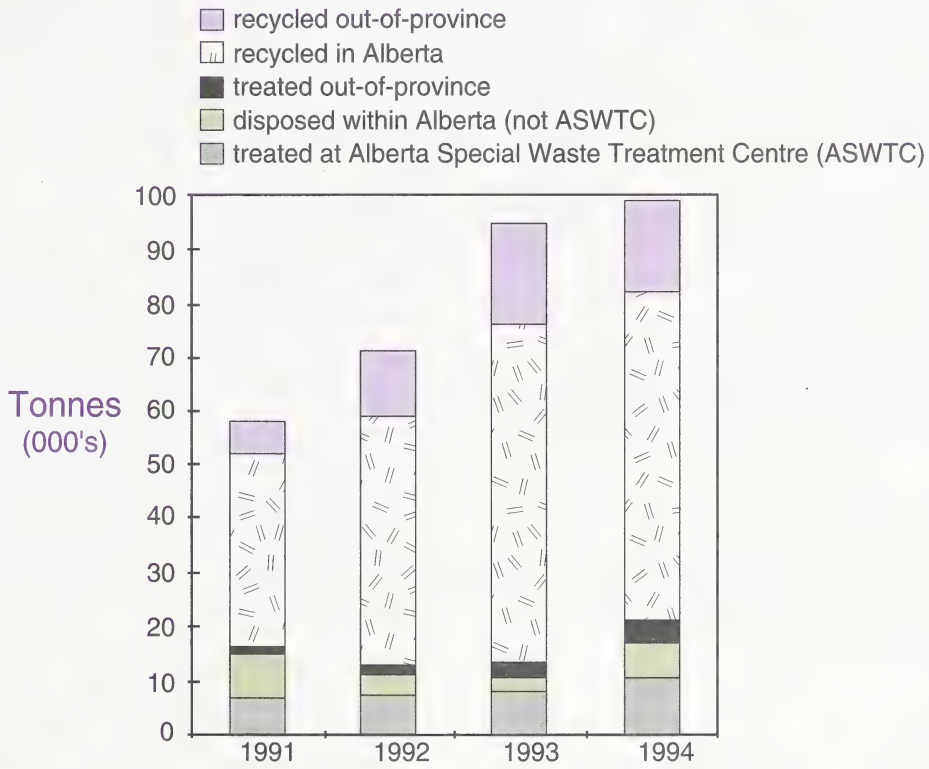

Figure 6. Destination of Alberta's Hazardous Waste (1991-1994).

Source: Alberta Special Waste Management Corporation.

Waste Administrative Watchdog–The Manifest Program

Under the *Environmental Protection and Enhancement Act* (EPEA), Alberta Environmental Protection administers a waste control system for tracking the movement of hazardous waste from its origin to a proper destination within Alberta, Canada or a foreign country. A waste manifest accompanies each shipment from the point of generation to its ultimate destination. (Household waste from community Toxic Round Ups is excluded). This form includes the generator, carrier, receiver, waste type, form, volume and shipping information. A database is maintained on all companies that send, ship or receive hazardous waste and on the movement of this waste.

The number of manifests received by Alberta Environmental Protection increased from 10 400 in 1991 to 24 000 in 1994. Since this system began in 1985, the department has issued 5136 personal identification numbers (PINs) for hazardous waste generators; 1316 PINs for transporters of hazardous waste; and 125 PINs for receiving facilities.

Recycling

Like other kinds of waste, hazardous waste can also be recycled. According to EPEA a "hazardous recyclable" is a "hazardous waste that is to be recycled". "Recycled" is used here in its broadest sense to mean reused, recovered or recycled.

The percentage of hazardous waste going for recycling in Alberta between 1991 and 1994 ranged from 61 to 68%. The percentage increased as the total amount of hazardous waste shipped increased (Figure 6.). Much of this was used lubricating oil, reflecting improved collection of this material. Glycol, lead-acid batteries and some of the other recycled materials described in Section 4.1 are also included in these figures.

4.3 Oilfield Waste

Oilfield waste has been defined by the oil and gas industry and government as *an unwanted substance or mixture of substances that results from the construction, operation or reclamation of a well site, oil and gas battery, gas plant, compressor station, crude oil terminal, pipeline, gas gathering system, heavy oil site, oil sands site or related facility* (Upstream Petroleum Waste Management Steering Committee 1993).

This waste is further classified as "dangerous" or "non-dangerous" based on a variety of properties with varying safety and environmental consequences. As with hazardous wastes, these properties include such factors as the ability to ignite easily, to corrode, to react with other things to produce harmful substances and so on.

Oilfield waste generators include any oil and gas operator, including drilling rigs and servicing rigs.

Waste Management

Oilfield waste is managed in a similar way to other industrial wastes in Alberta. The EUB has jurisdiction over the regulation of these wastes. Acceptable management practices for dangerous and non-dangerous wastes are identified in *Recommended Oilfield Waste Management Requirements* (Upstream Petroleum Waste Management Steering Committee 1993). The pathways for disposal of oilfield waste include: land treatment, landfill, deepwell injection, thermal treatment and physico-chemical treatment. Licensed oilfield waste processing facilities conduct these treatments.

Between 40 and 60% of oilfield waste generated goes to special oilfield waste management facilities. These facilities, scattered throughout the province, have different waste treatment "specialties". Each facility must submit monthly reports on how much oilfield waste it received. This information goes into a database maintained since 1993 by the EUB on the amount of waste received by oilfield waste management facilities.

The total volume of oilfield waste sent for treatment at oilfield waste management facilities in 1994 was 559 600 cubic metres, up 53% over 1993 and 110% over 1992 levels. Figure 7. shows the amount of oil wastes, water wastes and solid wastes treated at EUB-approved waste processing facilities in 1992-1994. The steady increase in waste being generated is largely attributable to the

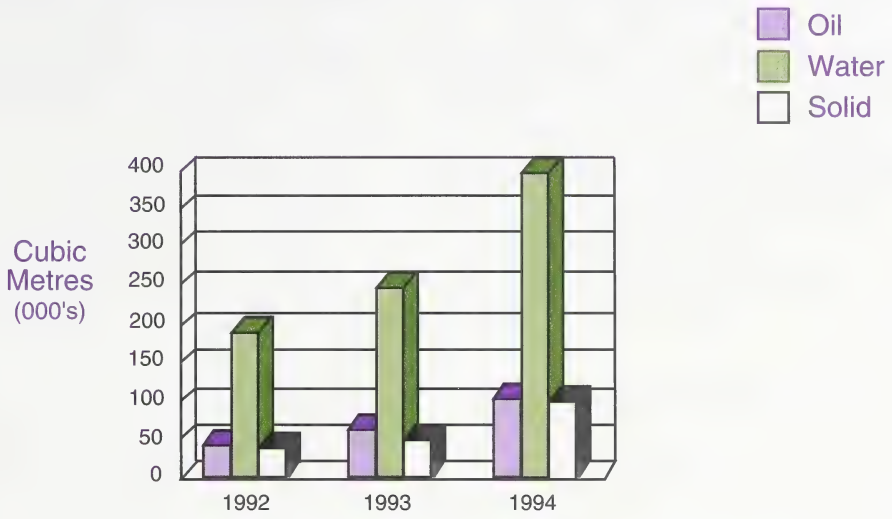

Figure 7. Total Oilfield Waste Treated/Disposed of at Approved Facilities (1992-1994).

Source: Alberta Energy and Utilities Board.

increase in drilling activity over the last few years. In 1994, 10 884 well licenses were issued. This was a record high and represents an increase of 32% over the number of licenses issued in 1993 and 160% over that of 1992. Other important factors include an increase in approved waste processing facilities throughout the province and an increased awareness of the options available for disposing of oilfield waste.

Recently, public and regulatory attention has focused on wastes which contain little or no recoverable oil but which still require appropriate treatment and disposal. Particular attention is on those wastes defined as having dangerous properties.

Reducing, Recycling and Recovering Oilfield Waste

The EUB supports the following order for waste treatment:

1. minimization of waste generated;
2. treatment of waste to recycle or recover resources; and
3. disposal, if neither of the above are possible.

Some oil and gas producers have set goals for reducing the amount of oilfield waste they generate. For these companies, increased activity no longer means a direct increase in waste generation.

In the 1980s it was recognized that a significant volume of oil could be recovered from oily wastes. This recovery is done by the oilfield waste treatment facilities using some of the methods described above.

Some oilfield wastes that are currently recycled are:

- **Produced oily sands:** This waste is finding increasing use as a raw material substitute in cement manufacture.
- **Bitumen and gravel solids:** These wastes are being used in road construction by some local governments and companies.
- **Amine filters and solution:** Amine solution is a mixture of water and nitrogen-containing compounds used to remove hydrogen sulphide and carbon dioxide from natural gas. Some companies are recovering this solution for reuse and are also extending the life of their amine filters.

TARGETS, INDICATORS AND TRENDS

- Recent government and industry efforts have aimed at providing clear guidelines for proper identification, treatment and disposal of general industrial and oilfield industry waste.
- The 12 land treatment ("farm") facilities in the province receive 30 000 tonnes of waste from the oil, chemical and pulp mill industries each year.
- Approximately 530 000 tonnes, or 27%, of wood residue wastes are currently recovered for heat or energy or recycled.
- The number of manifests received by Alberta Environmental Protection increased from 10 400 in 1991 to 24 000 in 1994.
- Since 1985, Alberta Environmental Protection has issued 5136 PINs (Personal Identification Numbers) to hazardous waste generators; 1315 PINs to transporters of hazardous wastes; and 125 to receiving facilities.
- The amount of hazardous waste transported in Alberta increased from 57 300 tonnes in 1991 to 98 900 tonnes in 1994. The percentage of this waste destined for recycling in Alberta ranged from 61 to 68%.
- Oilfield wastes sent for treatment or disposal at approved oilfield waste management facilities in 1994 were up 53% over 1993 levels and 110% over 1992 levels due to increased oil and gas activity.

5.0 BIOMEDICAL AND PHARMACEUTICAL WASTE

5.1 Biomedical Waste

Biomedical waste makes up only a small part of the total waste stream, but because of its potential hazard to health, it requires great care in handling and disposal.

Biomedical waste has been defined in a variety of ways. The Code of Practice for the Management of Biomedical Waste in Canada produced by the CCME defines biomedical waste as waste that is generated by:

a) human health care facilities, medical research and teaching establishments or clinical laboratories; or

b) animal research establishments, the activities of which are related to human health and which expose animals to cultured live or attenuated microorganisms or vaccines or to pharmaceuticals, or which expose animals to substances for the purpose of toxicity testing.

Biomedical wastes include:

- human anatomical waste;
- animal anatomical waste;
- microbiology laboratory waste;
- waste "sharps" (needles, blades, etc.);
- blood and body fluid waste;
- "Special Precaution Waste" as defined under Health Canada's "Infection Control Guidelines"; and
- animal bedding waste.

In Alberta, biomedical waste is understood to also include blood and body fluids from dental offices, veterinarian offices, home health care and funeral homes.

The Waste Management Regulation under the *Public Health Act* describes two categories of biomedical waste, "biological" and "pathological" waste, as follows:

> ***Biological waste*** is waste that is created in a hospital, necropsy facility or biological research laboratory and that contains or may contain pathogenic agents that may cause disease in persons exposed to the waste.
>
> ***Pathological waste*** is waste that is created in a hospital, necropsy facility or biological research laboratory and that consists of or contains body tissue, organs, body parts, blood or body fluids.

A biomedical waste standard is planned to reflect current definitions and disposal options for biomedical waste.

Waste Quantities

In 1994, approximately 380 tonnes of biomedical waste were collected from 70 of 123 acute-care facilities. When this figure is adjusted to reflect all acute and long-term care facilities in the province, the total estimate of biomedical waste in the province is 2670 tonnes per year. Approximately 10% of hospital waste is biomedical.

No information is available on the amount of biomedical waste produced by all other medical, dental and veterinarian facilities or from private homes.

Management

The safe handling, transportation and disposal of biomedical waste is regulated under three acts in Alberta:

1. The Waste Management Regulation of the *Public Health Act* regulates the proper disposal of biomedical waste and the approval of biomedical waste treatment facilities. It is administered by the 17 Regional Health Authorities throughout the province.
2. The Alberta *Environmental Protection and Enhancement Act* regulates the approval and operation of incinerators. This act is administered by Alberta Environmental Protection.
3. The *Transportation of Dangerous Goods Control Act* and Regulation regulate the safe transportation of biomedical wastes in Alberta, including proper packaging, labelling and vehicle requirements.

This act and regulation are administered by Alberta Transportation and Utilities.

The Waste Management Regulation states that no person shall dispose of biological or pathological waste in a waste management facility unless the waste has been rendered non-pathogenic. In addition, all methods of disposal must be reviewed and approved by the local Regional Health Authority. In Alberta only one incineration facility has been approved to date for handling biomedical waste. This plant, in Beiseker, Alberta, is capable of reducing pathogenic waste solids to free ash.

Many professional medical associations have also developed biomedical waste policies to ensure the proper disposal of biomedical waste. The Alberta Veterinary Medical Association, the Alberta Medical Association and the Alberta Dental Association have all set standards for their members in this regard.

In 1992, Alberta Health introduced the *Alberta Health Waste Guidelines and Standards for Hospitals and Long Term Care Facilities* as well as an auditing program to:

1. reduce the amount of biomedical waste being disposed by strictly defining biomedical waste, assessing the use of disposable products, recovery of materials and other strategies; and
2. minimize potential risks to health care workers, the public and the environment.

Waste Sharps

The Waste Management Regulation requires that a person disposing of biological waste or pathological waste in a waste management facility shall ensure that all used sharps and plastics are rendered non-usable prior to disposal. An education program has been introduced through the Regional Health Authorities regarding the safe disposal of sharps produced in private homes.

Alberta Agriculture, Food and Rural Development is working with livestock producers to promote safety while working with agricultural sharps by developing a voluntary sharps disposal program. These producers generate a large number of waste sharps particularly in intensive livestock operations. The program will introduce proper sharps disposal containers at livestock facilities and assist the livestock producer in locating proper sites for final disposal.

5.2 Pharmaceutical Wastes

Pharmaceutical wastes are prescription drugs or medicinal products which have expired or are unused. This “dead medicine” can be a serious environmental hazard to humans and other living organisms both in the short and long-term if flushed down the toilet, thrown into the garbage or left in the home.

For several years, the Alberta Pharmaceutical Association has sponsored the “Great Drug Roundup”, a month during which Albertans could take outdated and unused medications to their pharmacy. Figure 8. shows the increasing quantities of medicine collected under this program since 1989. In 1994, Alberta pharmacists collected approximately 36 tonnes of “dead medicine” during the Roundup. This waste is collected and incinerated at an approved facility.

A research project is now underway to gather information on the causes for and types of drugs being returned. Sixty pharmacies across the province are taking part. Based on the results of this study and a public education program, Alberta pharmacists aim to reduce the amount of waste that is occurring.

In 1995, the Alberta Pharmaceutical Association and the Action on Waste Division introduced “ENVIRx”. This new program is aimed at reducing waste by educating Albertans about appropriate drug use and by increasing the public’s access to the program. ENVIRx enables Albertans to take their unused medicines to pharmacies throughout the year.

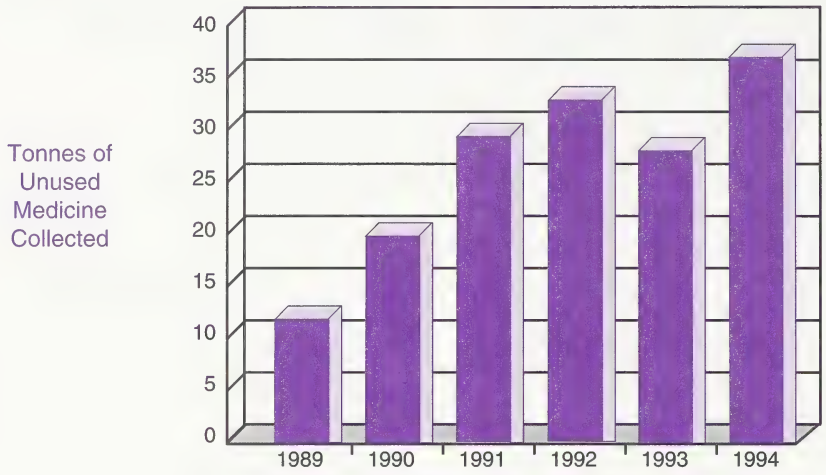

Figure 8. The Great Drug Roundup (1989-1994).

Source: Alberta Pharmaceutical Association.

TARGETS, INDICATORS AND TRENDS

- About 2670 tonnes of biomedical waste are generated in Alberta each year.
- Work is underway to determine whether the quantity of biomedical waste can be reduced by assessing the use of disposable products and other strategies.
- An increasing amount of unused medicine has been returned to pharmacies by Albertans during the "Great Drug Roundup" starting in 1989. In 1994, 36 tonnes were collected. Starting in 1995, Albertans have increased access to the ENVIRx collection program on a year-round basis.

6.0 A LOOK AT SOME WASTE REDUCTION PROGRAMS

In Alberta, certain materials have been the focus of special waste reduction and recycling programs and initiatives. Some of these materials, such as used oil, are potentially harmful to the environment. Others, such as materials collected in household toxic roundups, may pose a potential health or safety risk. Still others, such as beverage containers, occur in great numbers, resulting in littering and use of valuable landfill space.

Management of these programs often involves both government and industry. In some cases, an industry-run agency has taken over the programs completely. Quantities and trends are generally well-recorded, so that the programs' success can be evaluated. Some of these special initiatives are described below.

6.1 The Pesticide Container Collection Program

In 1980, Alberta Environment set up a pilot program in cooperation with rural municipalities to establish and operate pesticide container collection sites. At this time, the most common means for disposal of used pesticide containers were municipal landfills or on-farm sites. It was not uncommon to find empty pesticide pails being used on farms for livestock watering or feeding.

Over 80 000 containers were collected this first year at 122 sites set up around the province. Following this successful beginning, Alberta Environment funded the construction of additional municipal pesticide container collection sites and managed the collection and processing (shredding) of the containers. Early pesticide container collection sites were usually located at landfills and were protected by a chain-link fence and sign. Many of the earliest sites did not have an appropriate base or were not large enough to hold all of the containers brought to the sites. New construction guidelines developed in 1988 by the department addressed problems associated with water accumulation on the sites, proper base preparation, site sizing, site security, signage, location and maintenance. To enable municipalities to upgrade their existing sites or construct new ones, Alberta Environment provided grant funding to 69 municipalities in 1989.

About 100 permanent container collection sites are now located throughout the agricultural areas of Alberta. Another 150 temporary collection sites are located at landfills and transfer stations in rural municipalities. Municipal governments maintain the sites, removing non-pesticide container waste and transporting the containers from temporary drop-off locations to permanent sites within their municipality.

The Alberta Special Waste Management Corporation (ASWMC) managed the pesticide container collection program from 1989 until 1995 and looked after the hiring of contractors to process containers at the sites and transport the shredded containers to recycling facilities. The program was completely privatized in 1995 and is now managed by the Crop Protection Institute of Canada (CPI), an industry association comprised of pesticide manufacturing and distribution companies. The CPI also funds the processing of containers and the disposal of pesticide residues captured during shredding and processing.

Quantities Collected

The number of pesticide containers collected peaked in 1990 at over one million (Figure 9.). By 1993, this number had levelled off at about 750 000. It is estimated that about 75% of all containers entering the province were returned to the pesticide container collection sites in 1994. The industry has set a target container collection rate of 90% by the year 2000.

The decline in container numbers collected since 1990 is the result of a change in the size and type of containers on the market. Now it is possible to obtain large-volume, refillable containers. Also, more pesticide products are being manufactured in a dry form that allows for packaging in plastic liners supported by cardboard boxes. The cardboard can be recycled while the plastic liners, which have little bulk, can be landfilled. In some instances the liners are soluble, so only the outside container is left for disposal or recycling.

In 1980, metal containers made up over 94% of the total number of containers collected. By 1991, they made up only 10% of all containers collected and by 1994, only 2%. This trend is expected to continue.

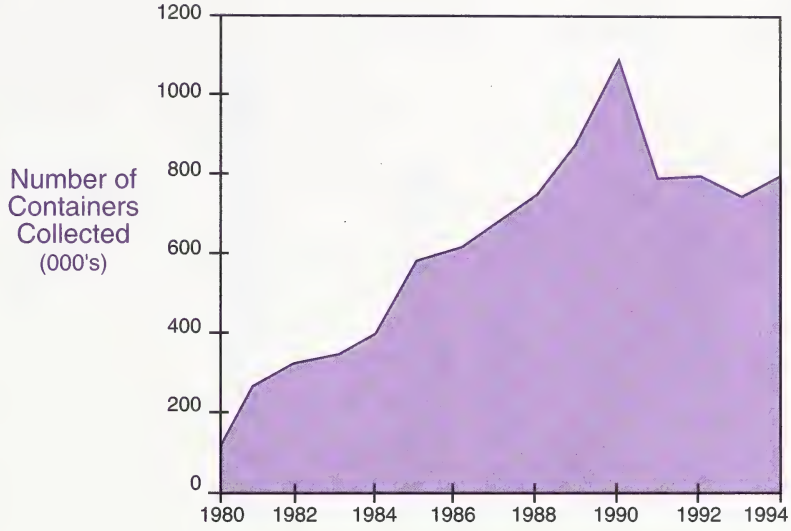

Figure 9. Pesticide Container Collection in Alberta (1980-1994).

Source: Alberta Special Waste Management Corporation.

In 1993, disposal of non-refillable plastic and metal pesticide containers at pesticide container collection sites became a required practice under the law. The Pesticide Sales, Handling, Use and Application Regulation (AR 126/93) under EPEA states:

> *No person shall dispose of a non-refillable plastic or metal container that held a pesticide listed in Schedule 1 or 2 except;*
>
> *(a) at a container collection site, or*
>
> *(b) in a manner authorized by the Director.*

Collecting the Liquid Waste

Another aspect of the collection program deals with liquid pesticide waste found in the containers at the collection sites. This can result from pesticide solution that has been left in a container or from water that has entered through openings in the container. This liquid is collected and shipped to the Alberta Special Waste Treatment Centre for treatment and disposal (Figure 10).

Groundwater is monitored at the upgraded and recently built container sites. To date, low levels of herbicides have been found in groundwater at 16% of the sites examined. It appears that this contamination occurred before the site upgrading when the sites were less secure and did not have roofed structures. Also, surveys conducted at container sites found that only about three-quarters of the containers dropped off had been properly rinsed. Failure to rinse the containers results in risk of groundwater contamination and increased waste disposal costs.

Recycling Containers

It has taken a number of years to find ways to recycle the pesticide containers. The metal containers have gone to steel mills in Alberta and Saskatchewan where they have been used in the production of reinforcing steel (rebar). The plastic containers have been recycled in a number of ways. After shredding, they have been transformed into plastic fence posts, guard rail posts and curbstops by companies in Alberta and Ontario. Energy recovery is another option that is being explored. The industry has assumed responsibility for finding appropriate end-uses for the containers and has set a target of recycling 100% of the collected material.

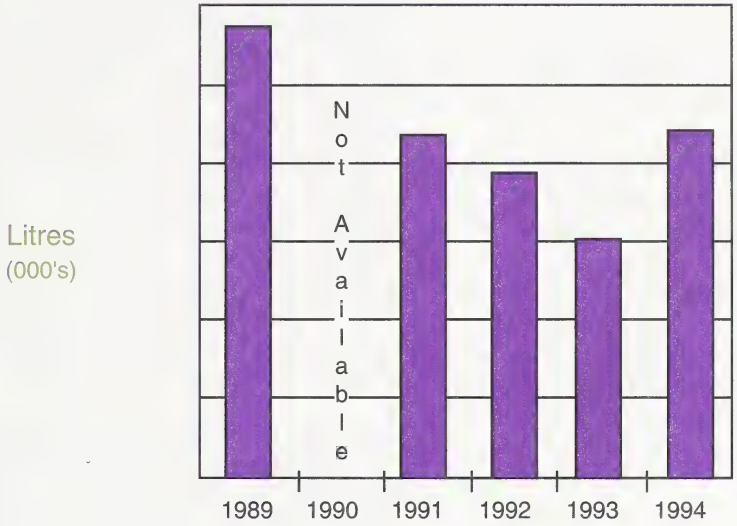

Figure 10. Liquid Pesticide Waste Disposed of at the Alberta Special Waste Treatment Centre (1989-1994).

Source: Alberta Special Waste Management Corporation.

6.2 Scrap Tire Recycling Program

Used tires have been piling up at landfills throughout Alberta for years. These tires represent a fire hazard and thus a threat of air and water pollution. Some municipalities have allowed them to be placed in the landfill, while others have kept them aside in special holding areas. With landfill space becoming scarce, other options have been badly needed.

The scrap tire problem in Alberta is large:

- Over two million tires are discarded annually.
- Approximately six million tires have been stockpiled in landfills.
- There are approximately 14 million tires on the road today. These are tomorrow's discards.

To deal with the growing problem, the Alberta Government established the Tire Recycling Management Board (TRMB) in 1992. The TRMB's overall goal is to create a demand for scrap tires so they become a valuable resource rather than an economic and environmental burden. To achieve this, it is committed to developing a tire recycling industry within the province. The system it has established to handle the tires is based on two basic principles:

1. Consumer pay: The end-users who purchase the tires pay a $4 surcharge on the purchase of every new tire. Thus the consumer, who is the waste generator, is responsible for funding the solution.
2. A dedicated fund: The surcharge money is put into a dedicated fund which can be used only to solve the scrap tire problem. This makes the strategy financially viable.

Progress to Date

To date, the tires have been used in the following ways:

- as crumb to be used as a raw material in remanufactured products;
- as shred in civil engineering (for example in roadbed construction or as a landfill liner for leachate collection);
- as whole tires fabricated into new products; and
- as fuel in the form of whole tires or shredded material.

There are now several rubber recyclers and remanufacturers operating or starting up in Alberta (four processors and three manufacturers). In addition, about 25 small recycling operations throughout Alberta are fabricating products such as mats, composters, feeders and playground equipment from the rubber.

In 1994, the TRMB committed $10 million in performance-based incentives to enhance the development of Alberta's tire processing and recycling industry. A separate $3 million was committed to support research and development, technology upgrading and business development.

One million tires have been recycled as of April 1995. A project to shred one million tires in the Calgary Shepard landfill is also underway. The Board estimates that in 1995/96, over two million tires will be recycled. As this number is equal to the number of tires discarded annually, the backlog will then stop growing. The Board predicts that the backlog will begin to shrink in 1996/97 with the processing of 3.5 million tires annually (Figure 11).

Since more new tires have been purchased than recycled to date, more money is being collected than spent. This money is held in a special reserve fund until the tires are recycled. The reserve fund is not a "surplus"; rather it is being held to deal with the backlog as the capacity to process tires grows. It is estimated that there are about 15 million "unfunded" tires in landfills or still on the road. If average recycling costs were $2.50 per tire, this backlog would require over $37 million. The fund balance currently stands at less than half of this amount. Thus the TRMB must consider the per tire cost of each proposed recycling solution.

When recycled tires start to outnumber tire sales, both the stockpiles and the reserve fund will begin to go down. The challenge will then be to match declining volumes of scrap tires and declining funds until the backlog is gone. Once the goal of an economically sustainable tire recycling industry is reached, there will no longer be a need for the surcharge or the TRMB.

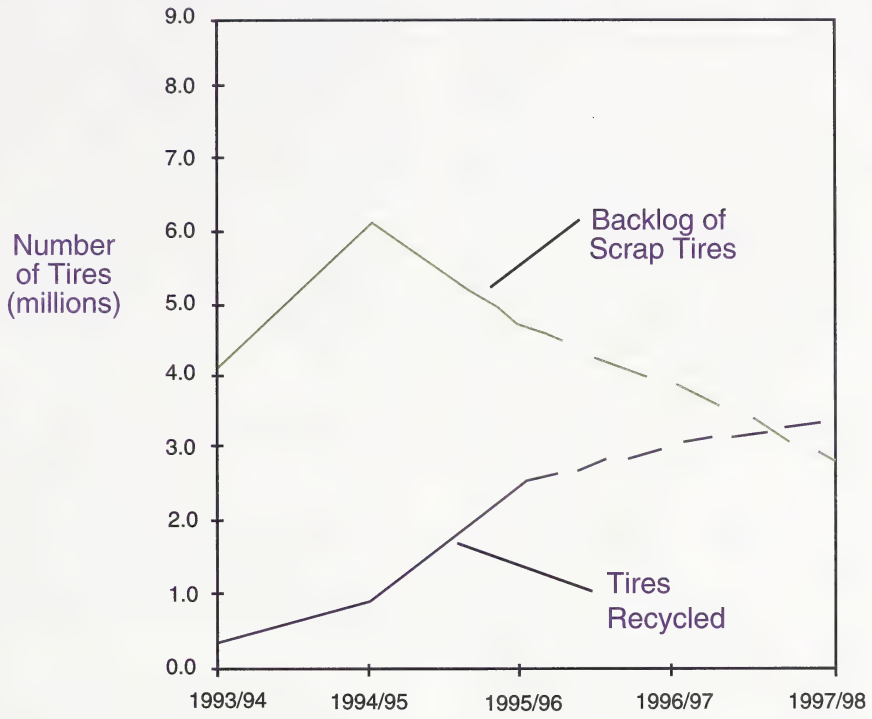

Figure 11. Scrap Tire Recycling (1993-1997).

Source: Tire Recycling Management Board.

6.3 Provincial Solid Waste Management

The Alberta government, through Environmental Protection's Action on Waste Division, works with municipalities and industry to improve waste reduction and disposal. In the past, financial assistance has helped municipalities develop recycling and improved waste disposal infrastructure. However, as many municipalities now have recycling programs and safe landfills well underway, and as markets for recycled goods improve, the role of Action on Waste is changing.

Action on Waste now works with its partners–municipalities, industry and community groups–to determine areas where there are common needs, and develops the tools required to meet these needs. For instance, a very innovative solution to a need identified by municipalities has led to the development of a *Full Cost Analysis Guide for Municipal Waste Managers*. The process outlined in this guide is the first in Canada to incorporate environmental, social and health considerations along with financial costs in a project analysis process.

In order to improve our common understanding of waste management issues, Action on Waste has also been working with a number of partners to develop guidelines and improve regulations. For example, Action on Waste has worked with the Canadian Council of Ministers' of the Environment (CCME) to harmonize solid waste management definitions and develop common guidelines for compost quality across Canada. Within Alberta, the Division is also contributing to the development of the new regulatory process for municipal waste management facilities.

6.4 Used Lubricating Oil

Anyone who drives or rides in a vehicle with an internal combustion engine generates a waste that is both hazardous and recyclable. Used lubricating oil is classified as a hazardous waste because it contains heavy metals, phenols and other substances which are harmful if released into the environment under uncontrolled conditions. However, used oil can be recycled by reprocessing or re-refining it to remove some or all of these contaminants. Depending on the process used, the resulting oil can then be used as an automotive lubricant or a raw material for certain other industrial applications. If properly applied, used oil can also be used on gravel roads to keep dust down or as a fuel in high-quality combustion processes.

The Canadian Petroleum Products Institute has estimated that approximately 127 million litres of oil lubricant were purchased in Alberta in 1990. This includes engine oil, industrial hydraulic oils, gear oils, automatic transmission fluids and other lubricating oils (CPPI 1990). Many different sectors of society-commercial, industrial and agricultural–as well residential use this oil. About one-half is consumed during use, while the other half is disposed of when replaced and is thus available for recycling or reuse.

A good collection system is important if this valuable resource is to be recovered and pollution avoided. Used oil from the commercial/industrial sector has the best developed collection system of any hazardous material. The problem lies with collection from the small commercial, farm and "do-it-yourself" sector. Of the used oil available for recycling, only about 50% is presently collected.

The collection system for the "do-it-yourself" sector consists of approximately 300 facilities, some located at municipal landfills and recycling depots and others at service stations and retail outlets. Annual community Household Toxic Round Ups also accept used oil. Even so, an estimated 30 million litres or more of used oil go unaccounted for each year.

Pilot Program

In 1993, the Alberta Used Oil Recycling Pilot Project was begun in six communities in central Alberta. Residents were encouraged to recycle their used oil, plastic oil containers and oil filters at participating bottle depots. Between November 1993 and January 1995, 94 000 litres of oil, 16 000 oil filters, and the equivalent of 122 000 one-litre plastic oil containers were returned. This industry-led initiative is currently being evaluated for a province-wide program. Industry is recommending the approach for all of western Canada.

Recycling

Alberta has two major facilities which re-refine used oil. The oils accepted by Alberta's re-refiners and reprocessors include engine oil, transmission oil, gearbox oil and hydraulic oil. One company offers a mobile recycling service for certain types of lubricating oils. Some oil is shipped to British Columbia and Saskatchewan. In addition, several smaller companies use the oil as fuel.

Used oil filters and small plastic oil containers can also be recycled. Although not as well developed as used oil recycling, a number of options are available in Alberta for the recycling of oil filters and containers. Interest in recycling these materials is growing and new technologies are currently under development.

6.5 The Beverage Container Management System

The earliest special program for recycling began in 1972 with the Beverage Container Act. Since then, returning beverage containers to one of the 200 depots across the province has become routine for most Albertans.

The Beverage Container Management System involves the payment of a deposit by purchasers of beverage containers. Container deposits apply to most refillable and non-refillable containers sold in Alberta. The full deposit is refunded by a depot operator or retailer upon the return of the containers to a depot. Depots act as the collection and sorting facility for empty beverage containers. Recovery and recycling of those containers is the responsibility of the manufacturers, who pay handling commissions to the depots for containers collected. Government does not subsidize the collection, recovery or recycling of beverage containers in any way.

As of 1993, manufacturers have established a common collection system which recovers their non-refillable beverage containers from Alberta depots. Disposal of recovered containers in landfills is no longer allowed. The material must be reused or recycled.

Discussions are underway with industry to develop an industry-led board to manage many aspects of the Beverage Container Management System. The board would be able to establish efficiencies and make fair decisions for all participants in this successful program.

Albertans returned 500 million containers for recycling last year. It is estimated that this represents approximately 75% of returnable beverage containers.

6.6 Household Toxic Round Up Program

The province-wide Household Toxic Round Up Program is designed to provide Albertans with an environmentally safe way of disposing of unwanted or surplus household chemicals. These potentially hazardous wastes are collected for treatment or recycling at the Alberta Special Waste Treatment Centre.

Since its beginning in 1988, the Household Toxic Round Up program has served an increasing number of communities, beginning with 8 and now up to 60. Initially, the provincial government, through the Alberta Special Waste Management Corporation (ASWMC), paid for the sorting, packing, transportation and treatment of the collected material. Gradually, the costs of operating the program have been transferred to the communities, while the provincial government continues to pay for treatment of the collected waste. Some communities reduce their operational costs by holding joint Toxic Round Ups. It is estimated that about three-quarters of Albertans have access to the program in their community.

The quantity of chemicals collected annually from 1989 to 1994 is shown in Figure 12. Paint, corrosive liquids, antifreeze, flammable liquids, aerosol cans and poisonous solids make up the majority of these chemicals. Antifreeze, used motor oil, aerosol cans and certain other materials are recycled.

In 1995, Action on Waste took over the program from the ASWMC. It is expected that the cost of the program will decrease as the manufacturers of these household materials assume greater product stewardship.

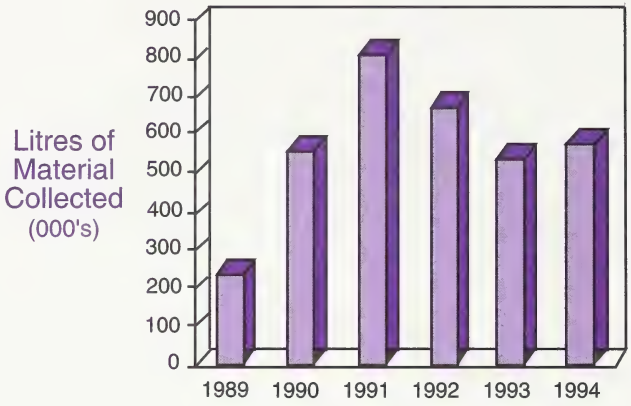

Figure 12. Household Toxic Round Ups (1989-1994).

Source: Alberta Special Waste Management Corporation.

6.7 Litter Clean-up

Litter along roads and highways is a type of waste that has more of an aesthetic than environmental impact. However, being so widely distributed, it represents a large waste control problem. There are several programs in Alberta that address this problem.

The new "Caring For Alberta's Highways" program of Alberta Transportation and Utilities allows a service group, company, family or individual to adopt a 3 to 5 kilometre section of highway for three years or more by agreeing to remove litter from the right-of-way at least once a year. In return, the department will erect a sign along the highway bearing the name of the group that has adopted that particular stretch of highway. Safety vests, litter bags, safety training information and accident insurance coverage are provided for the volunteers. Separation and recycling of materials such as beverage containers is encouraged. The remaining bagged refuse is then picked up by Alberta Transportation and Utilities. As of May 1995, 1619 km of highway have been adopted by 176 businesses, 151 groups, 64 families and five municipalities.

The annual Highway Clean Up Campaign, run by Alberta Transportation and Utilities since 1977, is specifically aimed at cleaning up the winter's accumulation of litter along Alberta's primary highways. Non-profit groups such as 4H Clubs, Junior Forest Rangers, Cubs and Scouts take part the first weekend in May each year, earning for their clubs $30 for each mile cleaned. In 1995, 411 groups participated in the Campaign.

Also in May, Pitch-In Week enlists thousands of volunteers in clean-up projects across Alberta. The non-profit organization behind this effort, Pitch-In Alberta, encourages municipalities to adopt litter control programs. In 1995, 219 269 volunteers carried out 2525 clean-up/beautification projects in 200 communities in Alberta.

6.8 Community Initiatives

A few of the diverse approaches taken by communities in Alberta to reduce their waste are described in this section. The *Compendium of Alberta Waste Minimization Projects* (Action on Waste Division 1994) gives a detailed look at the range of community waste management programs in existence.

Regional Programs: Northern CARE

In northern Alberta, communities face the dual challenge of a widely distributed population and large distances to transport their collected recyclable materials to market. As a result, some of these communities are getting together to develop regional waste management systems. One such region is the Peace Region of northwestern Alberta.

In 1991, communities in the Peace Region, with assistance from Alberta Environmental Protection, drew up a master plan to examine their waste management situation and options. This led to the conclusion that public education on waste reduction and backyard composting should be undertaken and that a regional committee to coordinate recycling activities was needed. The Peace Region Waste Reduction Action Committee was thus formed with representatives from 37 municipalities and two planning commissions.

Starting in 1993, the Committee merged with the Northern Coordinated Action for Recycling Enterprises (Northern CARE) project. Funded by the Northern Alberta Development Council and Alberta Environmental Protection, this agency was established to provide information and assistance to recycling programs, develop regional markets for recyclables and local economic opportunities based on recyclable materials. Today Northern CARE receives funding from municipalities, corporations and non-profit groups.

Northern CARE has developed a regional recycling program encompassing 19 communities and about 85% of all Peace Region urban households in an area encompassed by Swan Hills in the south, Rainbow Lake in the north, Beaverlodge in the west and Faust in the east. Some recyclables such as cardboard are collected by local waste collecting and hauling firms who sell to a major processing plant in Grande Prairie.

A feasibility study of hazardous waste transfer

stations for northern communities was also conducted by Northern CARE. This study led to a proposal to use a mobile hazardous waste collection firm to collect hazardous waste from small businesses and households in the region four times a year beginning in 1996.

Local uses for recycled glass, including drainage projects and sandblasting of oilfield tanks, have also been developed. A major public education campaign about waste reduction is being planned for northern Alberta newspapers and other advertising vehicles in 1996.

Centralized Composting: Town of Brooks

The Town of Brooks in southern Alberta is the first Alberta community to operate a central composting system successfully. The town began by experimenting with processing organic waste such as tree trimmings from its parks. With the help of a Resource Recovery Grant from the province in 1992, Brooks was later able to purchase specialized equipment such as a tub grinder so that residential yard wastes could be composted along with the town's. Two drop-off depots were set up for this yard waste. Woody material is chipped at the depots before being taken to the central facility at the edge of the industrial park.

The town uses a "cold start" process whereby materials are stockpiled over winter. In spring, they are mixed with cattle manure from nearby farms to hasten the composting process, put into windrows, turned and watered if required. The finished product is ready in six months.

In the first year of operation, the cost of the finished product was estimated to be $28 per tonne, in comparison to $24 per tonne for landfilling. However, the life of the municipal landfill is being extended, and a source of soil conditioner is available for use by the town. Operating costs are expected to fall as more residents contribute grass cuttings. An educational program is underway.

Airdrecycle

Airdrecycle is an example of a comprehensive system of reuse and recycling opportunities. This system was motivated by closure of the local landfill and increasing user fees at the Calgary landfills. Following research into waste reduction options, a committee of Airdrie citizens recommended that a limit be placed on the standard amount of waste collected from each household. Waste in excess of this limit could be set out for collection upon purchase of a sticker.

Waste reduction options were made available to residents when this limit was imposed. With a Resource Recovery Grant from Alberta Environmental Protection, the Airdrecycle depot was established and equipped with a baler, roll-off bins and an oil collection tank. In addition to bins for newspapers, metal, plastics and so on, the recycle depot is equipped with a bin for clothing and exchange areas for books, toys, paint, plastic buckets and various household items. A trailer at the depot serves as an office and educational centre with displays on backyard composting, recycled products and waste reduction methods.

The city estimates that in 1993, 450 tonnes of municipal waste were diverted from landfill, saving $32 000 in waste collection and disposal costs. The program's operating costs were below this amount due to sale of recycled materials. The city also estimates that while its population grew by about 13% between 1990 and 1993, the amount of municipal waste that ended up in the landfill did not increase but remained about the same during these years as a result of its waste reduction and recycling programs.

TARGETS, INDICATORS AND TRENDS

- The pesticide industry has set a target pesticide container collection rate of 90% by the year 2000 and a target of 100% recycling for all containers collected.
- Since 1980, over 100 specially-designed pesticide collection depots have been established in the province, along with 150 temporary sites at landfills and transfer stations.
- Since the advent of refillable pesticide containers and recyclable packaging in the early 1990s, the number of empty pesticide containers collected in Alberta has declined by one quarter million. Metal pesticide containers went from 94% of the total number collected in 1980 to 2% in 1994.
- The Tire Recycling Management Board (TRMB) has set the goal of an economically sustainable tire recycling industry in Alberta with consequent removal of the tire surcharge and disbanding of the TRMB.
- Over one million scrap tires have been recycled since 1992. Over six million are presently stockpiled in Alberta.
- Over 300 collection sites for used lubricating oil have been established in Alberta.
- Used oil collection rates in Alberta have increased to 75%.
- Approximately 25% of used oil in Alberta is not collected for recycling.
- In a pilot collection program in six central Alberta communities, 94 000 litres of used oil, 1000 used oil filters and the equivalent of 122 000 one-litre plastic oil containers were collected between November 1993 and January 1995.
- The number of communities holding Household Toxic Round Ups has grown steadily from eight in 1988 to 60 in 1995 in spite of the gradual transfer of operating costs to communities.
- The amount of material collected each year through Household Toxic Round Ups ranges from 550 000 to 800 000 litres.
- Albertans returned 500 million beverage containers for recycling in 1994, which represents about 75% of the returnable containers in the province.

7.0 CONCLUSIONS AND FUTURE DIRECTIONS

This is the first time a summary of waste quantities and waste management practices in Alberta has been prepared. In some areas, data on waste quantities are readily available. This is particularly true for the waste reduction initiatives described in Section 6. These special programs have data collection systems in place and often have established targets for the amounts of material to be collected or recovered. In other areas, data are available but methods of measurement have changed, making it difficult to examine trends. Recent work by the CCME toward standardization of recording waste will help in this regard. In other areas, measurements of waste quantities have not been made.

Measuring waste entails a cost to the measurer, be it government or industry. In the past, this cost may not have seemed justifiable. However, as the full costs of waste management become better known and treatment and disposal costs continue to escalate, this attitude is changing. Knowing how much waste is "out there" enables governments and industries to set measurable targets for reduction and to track progress toward them. It also reveals the most efficient ways of achieving reduction. For example, as many communities are discovering, removing organics and construction and demolition materials from the waste stream can make a real difference in the life of a landfill.

Measuring waste can also reveal problems not previously addressed. One example seen in this report is the amount of unused medication in households. Once the problem has been identified, its cause and solution can be sought.

Alberta has a system in place to deal with waste generated by Alberta industry and other sectors. We are capable of managing our industrial, hazardous and oilfield wastes through facilities which offer recovery, reuse, recycling, treatment and disposal options. In addition, the Alberta Special Waste Treatment Centre, the first fully integrated hazardous waste treatment facility in Canada, has recently been given approval to treat Canadian-generated hazardous waste. Our hazardous recycling industry continues to offer services to generators from outside of Alberta. Our challenge will be to continue to upgrade and improve the program and services while providing a well-defined program which continues to protect our environment.

Over the last 15 to 20 years, the transition has been made from local dumps to modern sanitary landfills to regional landfills and regional waste management systems. Future directions point clearly toward integrated waste management systems which incorporate methods for reuse, recycling, composting and recovery of waste. In addition, markets for recyclable materials have grown considerably stronger, resulting in a steady demand for the "resource" waste materials.

The experience of the past decade has shown that successful municipal waste reduction requires several basic ingredients. Firstly, it requires an inventory of the components and amounts of waste so that municipalities can identify target areas and also attract private sector investment. This inventory will also help us track provincial waste trends. Second, a full cost analysis of the waste management options is needed so that the merits of alternatives can be compared based on financial costs and environmental, social and health impacts. Third, the waste management system that is in place should be evaluated, and new systems established to meet target community needs. Lastly, once options for reduction (such as recycling or composting facilities) are in place, an economic instrument (such as collection fees based on amounts) can provide individuals with a personal incentive to reduce wastes.

Targets for reducing, collecting and recycling a variety of waste types in Alberta have been set by the government and by the private sector. This in itself is an indicator that the waste management situation is improving. Many of these targets are voluntary and have come from industry-run agencies. These organizations are in the forefront of a movement toward greater product stewardship. In many instances, these stewardship initiatives are replacing regulatory methods as an approach to waste management.

With collection systems now in place for a wide

variety of used materials, the recycling movement is beginning to experience some momentum. As markets for recyclables develop and diversify, demand for waste materials grows, providing greater incentive to collect materials. The trends in collection rates seen reflect this direction. Trends toward sustainable development, economic development opportunities, product stewardship and taking responsibility for waste are also evident in many of the programs described here.

There is still much to be achieved. There are clearly opportunities for obtaining more data to help us understand the amount of waste that we generate and treat and the trends in these variables over time. The responsible government departments and divisions should plan and implement the continual development and improvement of waste generation databases in keeping with performance measure objectives. As Alberta industry moves towards general self-regulation, formulation of private sector reporting guidelines on waste generation should begin.

GLOSSARY

attenuated - treated so as to weaken or make less infectious.

brine - a salt water solution.

boxboard - non-corrugated cardboard.

composting - the partial break down of organic wastes by microorganisms into a nuisance-free material of potential value as an organic soil conditioning material ("humus").

corrode - to dissolve metals or other materials.

decomposition - break down of a substance. Biological decomposition requires the presence of an agent such as bacteria, water and heat (oxygen is not required in the case of anaerobic decomposition).

dry waste site - a waste management facility which is restricted to construction/demolition rubble or other inert or non-putrescible materials.

ferrous metal - any type of metal that contains iron.

hazardous waste - waste that for example ignites easily and burns persistently, reacts with other things to produce harmful substances, or contains toxic substances that can contaminate our food, land, water and air. Thus it requires extraordinary care during transportation, storage, treatment and disposal to prevent harm to humans or the environment. Examples of hazardous waste are PCBs, oil-based paints and paint thinners, lead-acid automotive batteries, drain cleaning chemicals, bleach, used lubricating oil and antifreeze from car radiators.

leachate - liquid that drains through or from solid waste.

microorganisms - living organisms such as bacteria which are too small to be seen without the aid of a microscope.

necropsy facility - facility for dissecting dead animals.

pathogen - a microorganism that causes disease.

PCB - polychlorinated biphenyl.

produced water - water produced from an oil or gas formation.

pyrolysis - process by which a substance is broken down by heat in the absence of oxygen.

recyclable - any item or material that can be recycled.

recovery - the reclaiming of energy from post-collection solid waste by various methods including incineration, pyrolysis, distillation, gasification or biological conversion. Also, reclaiming material from a waste substance.

recycle - to collect a used item or material and reprocess it into the same or a different product.

reduction (of waste) - decreasing the volume, weight and/or toxicity of the discarded material. Includes activities that result in greater ease and efficiency of reuse of a product or recycling of materials.

reduction at source (or **source reduction**) - preventing waste from being generated.

reuse - the return of a commodity or product into the economic stream for use in the same form as before, without change in its identity.

sanitary landfill - a waste management facility where the waste material is placed in trenches or on land, compacted by mechanical equipment and covered with earth.

sharp - a blade or needle or other sharp instrument used for cutting biological material.

solid waste - any nonliquid, nongaseous material for which no further use is intended, excluding wastes from primary resource extraction or harvesting, sewage sludge, contaminated soil, nuclear and hazardous wastes.

thermal desorption - process by which an organic substance is separated from another substance by heating to evaporation followed by cooling.

toxic - poisonous.

toxicity - degree of ability to poison.

waste generator - group or individual discarding materials.

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1995 Alberta State of the Environment Annual Report - Waste Management Reader Survey

Check or circle the most appropriate response and mail this to:

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Strategic and Regional Support Division
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9820-106 Street
Edmonton, Alberta T5K 2J6

1. Is your interest in this report as a:

- ❑ secondary school student
- ❑ secondary school teacher
- ❑ post secondary student
- ❑ post secondary teacher
- ❑ professional organization
- ❑ environmental organization
- ❑ private citizen
- ❑ waste management/recycling business
- ❑ municipality
- ❑ government worker
- ❑ agriculture sector
- ❑ energy sector
- ❑ legal sector
- ❑ consultant
- ❑ health sector
- ❑ other (specify)_____

2. For what purpose have you used this report? (check as many as appropriate)

❑ general reference ❑ policy/decision-making ❑ research ❑ planning
❑ management ❑ personal use ❑ education ❑ other_____

3. How did you learn about the report? (check one)

❑ government sources ❑ policy/decision-making ❑ research ❑ planning
❑ browsing in a library ❑ personal use ❑ education ❑ other_____

4. How well does the report accomplish the following:
(circle the number that best describes your response)

	very well		somewhat		not at all
a) improves your general understanding of waste management in Alberta	5	4	3	2	1
b) increases your awareness of specific waste management issues in Alberta	5	4	3	2	1
c) explains waste management alternatives in Alberta	5	4	3	2	1
d) explains why waste management is important	5	4	3	2	1
e) informs you about what government is doing to address waste management in Alberta	5	4	3	2	1
f) answers your questions about the environment and waste management	5	4	3	2	1

5. Does the report provide sufficient information for you to assess the state of Alberta's environment with respect to waste management?

yes no

6. Are there any topics which should have been included?

yes no

Specify:

_____

_____

_____

_____

_____

7. How well do each of the following sections contribute to the report's overall value? (circle the number that best describes your response)

		very well		somewhat		not at all
a)	Preface and Introduction	5	4	3	2	1
b)	Overview	5	4	3	2	1
c)	Municipal Solid Waste	5	4	3	2	1
d)	Industrial Waste	5	4	3	2	1
e)	Biomedical and Pharmaceutical Waste	5	4	3	2	1
f)	Waste Reduction Initiatives	5	4	3	2	1
g)	Future Directions	5	4	3	2	1
h)	Glossary	5	4	3	2	1
i)	Index	5	4	3	2	1

8. In your opinion, how could the report content and design be improved? Specify.

_____

_____

_____

_____

9. How frequently do you expect you'll use this report?

❑ never ❑ occasionally ❑ frequently ❑ don't know

10. Has this report met your expectations?

❑ yes ❑ no ❑ somewhat

11. Additional comments that would help us meet your needs would be appreciated.

Alberta
ENVIRONMENTAL PROTECTION