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SECTION I: INTRODUCTION

In February 1998, the Canadian Institute for Environmental Law and Policy (CIELAP) released a report entitled *Hazardous Waste Management in Ontario: A Report and Recommendations*. The report outlined concerns about the province's management of hazardous waste, specifically gaps in available information and the underlying regulatory framework for the generation, handling and fate of hazardous wastes in Ontario. The report also presented recommendations for the overhaul and modernization of the Ontario's reporting and regulatory regime for the management of hazardous wastes.

Since the publication of that report, it has become apparent that the generation of hazardous wastes in Ontario by domestic sources has been rising significantly. As reported in the Institute's March 1999 study for the Environmental Agenda for Ontario Project, *Hazardous Waste and Toxic Substances*, data provided by the Ontario Ministry of the Environment showed a 50% increase in hazardous waste shipments from waste generators between 1994 and 1997. This represented a rate of growth nearly three times that of real Gross Domestic Product over the same period. At the same time, data obtained from Environment Canada indicated an alarming rise in imports of hazardous wastes into Ontario from other jurisdictions, principally the United States, with an increase from 56,000 tonnes in 1993 to 288,000 tonnes in 1998. Hazardous waste exports from Ontario remained unchanged over the same period.

In response to these findings, the Institute requested more detailed analyses of the available data from the Ontario Ministry of the Environment and Environment Canada, to identify the sources of this growth, the types of wastes involved, and their fates. In both instances the Institute was informed that no such analyses of the data had been performed, and that no information beyond the aggregate totals for manifested quantities and imports and exports was available.

Given the implications of the trends apparent in the aggregate data, the Institute decided to undertake its own analysis of the data available to it. This was, however, limited to the information contained in the Ontario Hazardous Waste Manifest tracking system, as the manifest data is the only detailed data made available to the public by either the Ontario Ministry of the Environment or Environment Canada. The manifest database records reported transfers of hazardous waste from generators to receivers within the province and from other provinces and the United States. It does not record total generation of hazardous wastes, as there is no regular reporting requirement in Ontario regarding hazardous wastes which are generated and disposed of on-site, through such means as disposal into municipal sewer systems, and on-site landfills and incinerators. These fates are thought to account for approximately 40% of hazardous waste generated in the province.

The last detailed analysis of the Ontario hazardous waste manifest data was completed for the purposes of the Environmental Assessment of the Ontario Waste Management Corporation's proposed hazardous waste treatment and disposal facility. This was undertaken in 1994 on the basis of 1991 data. A more up-to-date analysis was essential given the environmental and health implications of the trends apparent in the aggregate data available from the Ministry of the Environment and Environment Canada. It was also fundamental to members of the public's right to know the quantities, nature and fate of these wastes being generated and received in their communities.

PURPOSE OF THE REPORT

The purpose of this report is to present a comprehensive analysis of hazardous waste generation and receipts in the province of Ontario for the period 1994 to 1998.

OBJECTIVES OF THE REPORT

The major objective of this report is to address the information gap concerning the generation and receiving of hazardous waste in Ontario from 1994 to 1998. The specific goals of this report are as follows:

- Identify the quantities of hazardous waste being generated at generating sites in Ontario for the period 1994 to 1998;
- Identify the top generating sites of hazardous wastes in the province for 1998;
- Identify changes in the quantities of hazardous waste generated in Ontario from 1994 to 1998 by district and waste type;
- Identify the quantities of hazardous waste being transferred to receiving sites in Ontario for the period 1994 to 1998;
- Identify the top receiving sites of hazardous wastes in the province for 1998;
- Identify the changes in the quantities of hazardous waste received by Ontario sites from 1994 to 1998 by district and waste type;
- Identify the changes in the quantities of hazardous waste transferred to Ontario receiving sites from U.S. generating sites from 1994 to 1998, by district and waste type;
- Identify the top U.S. generating sites and top Ontario receiving sites of U.S. hazardous waste transfers for 1998.

METHODOLOGY

This report was prepared using the data tables from the 1994, 1996 and 1998 Ontario Hazardous Waste Manifest database. The manifest database tracks off-site hazardous waste transfers from generating to receiving sites within the province and from other provinces and the United States. The manifest database was used as the data source for this report as it provides the most meaningful data concerning hazardous waste quantities transferred within Ontario and from other jurisdictions.

The analysis of the data involved the following:

1) Transfer of the 15 manifest data tables from Dbase format to SPSS format;
2) Merging of the GENERATOR file and the MANGEN file, using the generator number as the key variable, in order to identify the quantities transferred from generating sites in all districts and in key jurisdictions (i.e. Ontario, U.S. other provinces);
3) Merging of the RECEIVER file and the MANREC file, using the receiver number as the key variable, in order to identify the quantities transferred to receiving sites in all districts and in key jurisdictions;
4) Aggregation of data columns (generator number, waste type, district, receiver district, receiver type) by quantity generated in the newly merged MANGEN file to identify the top generating sites, waste types generated, and generating districts in Ontario, and to identify waste transfers from one jurisdiction to another;
5) Aggregation of data columns (receiver number, waste type, district, generator district) by quantity generated in the newly merged MANREC file to identify the top receiving sites, waste types received, and receiving districts in Ontario;
6) Comparison of 1994, 1996 and 1998 data to identify any trends in hazardous waste transfers (generation and receipts) in Ontario over this time period.

In order evaluate hazardous waste transfers within Ontario and from the United States to Ontario, the "district" column data was used as the key location variable. Each generator and receiver in the Manifest is provided with a district number based on their location. There are roughly 25 districts in Ontario which include major cities and outlying areas, e.g.) Toronto is district 301, London is district 101. Each province and U.S. state (including the District of Columbia) has their own district number. By aggregating the quantities transferred by generating districts in one jurisdiction to receiving districts in another jurisdiction, it was possible to identify hazardous waste transfers to Ontario from within the province, from other provinces and from the United States.

Note: In some cases districts were numbered incorrectly in the Manifest GENERATOR and RECEIVER tables. For example, a generating site in Sault Ste. Marie was coded incorrectly as 506, when the correct code is 503. When these errors were identified, the correct code was entered, based on the city and province specified in the table for the specific generator or receiver.

DATA QUALIFICATIONS

This report is a compilation of the data available in the Ontario Hazardous Waste Manifest database. This report does not take responsibility for the accuracy of the data provided by the Ontario Ministry of the Environment (MOE). Any changes made to the Manifest data tables while analyzing the data are explained throughout this report, e.g.) merging of various tables explained previously. No changes were made to the data provided by the Ministry, other than corrections to "district" codes when errors were identified.

The Ontario Hazardous Waste Manifest database only captures reported off-site hazardous waste transfers from a "generating" site to a "receiving" site. Thus, the data presented in this report does not represent the total quantities of hazardous waste generated and received in Ontario. For example, hazardous waste that is generated at a site but stored or disposed of on-site, would not be recorded in the Manifest, and thus is not included in this report. The Ministry of the Environment has estimated that approximately 40%[1] of wastes are dealt with on the site of their generation. As a result, the data in this report captures the remaining 60% of hazardous wastes that that are shipped off-site. In fact, this report may capture less than 60% of hazardous waste quantities in the province, as the 40% estimate by the MOE is very uncertain, given that there are no regular reporting requirements for the on-site disposal of hazardous wastes in Ontario.

To get an estimate of the total quantities of hazardous waste generated in Ontario would require accurate recording of on-site storage and disposal, for which no good data source currently exists. In addition, the quantities of landfill leachate in the report represent only a portion of total leachate generation. Many landfills have direct sewer connections from their leachate collection systems. This waste is not reported in the Manifest database.

The terms "generator" and "receiver" are used throughout this report. The term generator refers to the site where a hazardous waste transfer has originated. The term receiver refers to the site where a hazardous waste transfer has been received and the receiver "signs off" on the Manifest. The term "quantity generated" refers to the quantity of waste transferred off-site of a generating site. The term "quantity received" refers to the quantity of waste received at a receiving site from a generating site.

A receiver may also appear as a generator in the Manifest database. For example, wastes received at transfer stations may be processed and sent on to another receiver for final disposal, e.g.) a landfill. This waste quantity may appear twice in the Manifest database, as the transfer station would also be considered a generator when it transfers the waste to another receiver, though it is the same waste that has been transferred. Therefore, there is "double counting" of waste quantities within the Manifest database. It is important to keep in mind that the receiving facility does not refer to the final fate of the hazardous waste in all cases, but refers to the point where the waste was received.

The term "district" is used throughout this report to identify areas in the province where hazardous waste transfers have originated (named generation districts), and where hazardous waste transfers have been received (named receiving districts). It is important to note that each district is comprised of many generating sites and receiving sites.

The manifest database has named each district by the major municipality located within it, however in most cases the district includes outlying municipalities, except for the City of Toronto, which is comprised of the City of Toronto only. In all cases, the district names appear as presented in the manifest database, with the exception of the following:

- Ajax district (district 306) was renamed York and Durham Regions as the district included facilities in both regions;
- The Ministry of the Environment changed district names from the 1994 dataset to the 1998 dataset; e.g.) Cambridge district was renamed Guelph district, North York district was renamed Toronto district, Oakville district was renamed Burlington district; the 1998 district names were used in all cases.

Appendix A presents the districts in Ontario and some of the municipalities within each district.

STRUCTURE OF THE REPORT

This report is presented in six sections. Section I presents the introduction to the report, and outlines the purpose and objectives of the report. This section also explains the methodology and the data qualifications that provide an understanding of how the analysis was conducted.

Section II presents hazardous waste generation in Ontario from 1994 to 1998. This section includes the quantity of hazardous waste generated in Ontario for this period by generating district, business type and waste type. This section also identifies the top generating sites in the province of leachate and non-leachate wastes for 1998.

Section III presents hazardous waste transfers to receiving sites in Ontario from 1994 to 1998. This section includes the quantities of hazardous waste received in Ontario for this period by receiving district, waste type and receiving facility. This section also identifies the top receiving sites in Ontario of leachate and non-leachate wastes for 1998.

Section IV presents hazardous waste transfers from the United States to Ontario from 1994 to 1998. This section includes the quantities of wastes transferred from U.S. generating sites to Ontario receiving sites for this period by generating district, receiving district, waste type and receiving facility. This section also identifies the top generating and receiving sites of U.S. hazardous waste transfers to Ontario for 1998.

Section V presents an analysis of the trends in hazardous waste generation and off-site transfers to receivers in Ontario from 1994 to 1998. The section identifies where the growth in hazardous waste generation has taken place by waste type, generating district, and jurisdiction. The section also highlights where the increasing quantities of hazardous wastes are being received in the province.

Section VI presents the conclusion to the report and comments on future studies and actions on the hazardous waste issue.

The Environmental Implications of Increasing Hazardous Waste Generation and Transfers to Receiving Sites in Ontario

The substances and materials constituting the hazardous waste generated and received in Ontario pose a range of potential threats to the environment and human health and safety. The most obvious problems are associated with wastes that are reactive, explosive, corrosive, infectious and radioactive.

In addition, a wide range of components of the waste stream in the province have properties that are harmful to human health or the environment in other ways. For example, steel making residues and other waste types have high metal concentrations. Many of these heavy metals, such as lead, mercury and cadmium, for example, are classified as "toxic" substances under the *Canadian Environmental Protection Act (CEPA)*[2] , and are known to be acutely toxic in high concentrations, and at lower levels may have deleterious effects on various human organs. Other metals, such as arsenic are classified as "toxic" under CEPA and are listed as human carcinogens by the International Cancer Research Centre (ICRC).[3]

The Hazardous Waste Manifest database identified the generation and receiving of organic compounds at sites in the province from 1994 to 1998. A number of organic compounds are also on the ICRC list of human carcinogens including chloroform, tetracholoroethylene, carbon tetrachloride and benzene.[4] Other persistent organic compounds have been linked to immune system dysfunction, adverse impacts on the nervous system, bone marrow damage, and have been implicated as endocrine disrupting substances.

As highlighted in Figure 31 (page 55), increasing quantities of hazardous wastes are being received by water pollution control plants (WPCPs), landfills and transfer stations (including processing) in Ontario. There are environmental concerns and risks associated with hazardous wastes being received at these facilities.

Hazardous wastes being received at water pollution control plants (WPCPs) pose a concern as these facilities are designed generally to deal with organic waste. As a result, many toxic substances pass intact through the plants to receiving waterways, where they contribute to overall contamination of the environment. Concerns have also been raised about the disruption of sewage treatment processes than can be caused by toxic substances, resulting in the release of large quantities of untreated or partially treated sewage to the environment. [5]

The increasing quantities of hazardous waste being received at landfills in Ontario raises numerous environmental and health concerns for neighbouring communities. Ontario has only one commercial landfill that is authorized to handle hazardous and solidified liquid industrial wastes. This is the Safety-Kleen facility near Sarnia, Ontario. The data from the manifest reports that this facility received almost all of the hazardous waste going to landfill in Ontario, with the exception of approximately 600 tonnes, which was received at other landfills in the province. Environmental concerns about hazardous waste receipts at landfills include the risk of off-site migration of leachate through the soil to waterways and to neighbouring properties.

Lastly, the increased transfer of hazardous wastes from generating facilities to receiving facilities in the province means that more wastes are being transported throughout the province via highways and railways. This raises the risk of accidents and spills, increasing the risk of exposure to hazardous wastes for communities through which these wastes are transported.

SECTION II: HAZARDOUS WASTE GENERATION IN ONTARIO, 1994 TO 1998

***Note*: The generation quantities presented in this section reflect the quantity of generated hazardous waste transferred off-site from generating sites, and do not represent the total quantity of hazardous waste generated by each generating facility.**

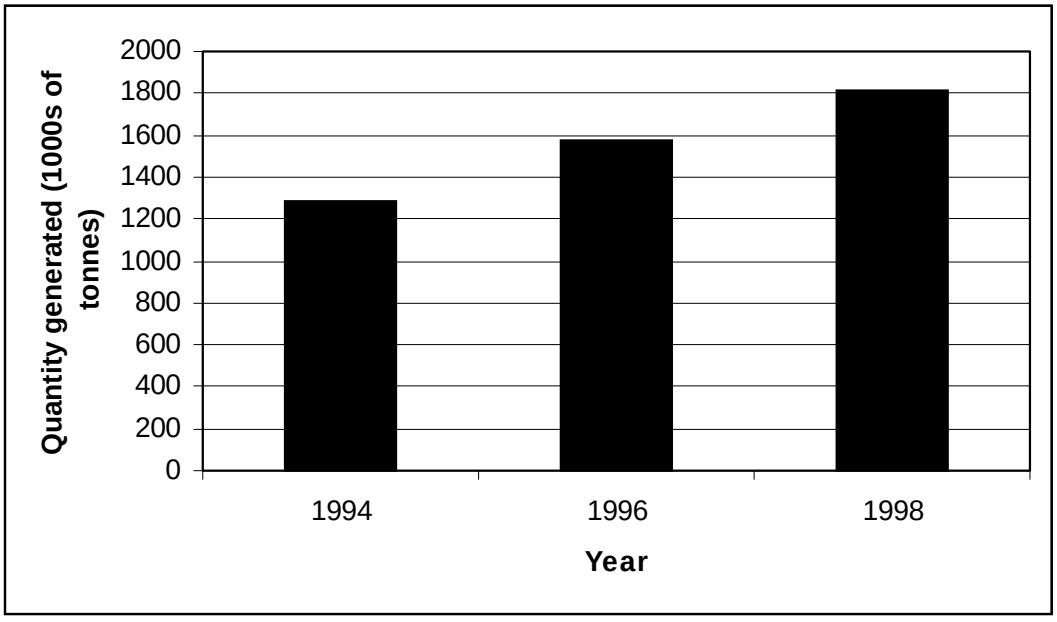
In 1998, 1,816,585 tonnes of hazardous waste was generated in the province of Ontario. The quantity of hazardous waste generated at generating sites in Ontario has increased from 1.28 million tonnes in 1994 to 1.82 million tonnes in 1998, which is an increase of 535,911 tonnes or 41.8% from the quantity generated in 1994. Table 1 presents the quantities generated by Ontario generating sites from 1994 to 1998.

Table 1: Quantity of hazardous wastes generated by Ontario generating sites, 1994 to 1998

Year	Quantity generated (tonnes)	Percentage change from 1994 base year
1998	1,816,585	+ 41.8%
1996	1,572,460	+ 22.8%
1994	1,280,674	-

Figure 1 illustrates the increasing trend of hazardous waste generation by Ontario generating sites from 1994 to 1998.

Figure 1: Quantity of hazardous waste generated by Ontario generating sites, 1994 to 1998



THE GENERATORS OF HAZARDOUS WASTE IN ONTARIO

In 1998, there were approximately 13,000 Ontario generating sites of hazardous waste that transferred waste off-site. The major generating sites for 1998 included municipal landfills, waste management company facilities, steel manufacturing facilities and chemical plants amongst others. The top generating site of hazardous waste in the province for 1998 was Landfill #3 operated by the Corporation of the County of Essex, located in Maidstone, Ontario. In 1998, this site alone generated 70,377 tonnes of hazardous waste, all of which was landfill leachate. Table 2 presents the top 25 generating sites of hazardous waste and their primary waste type generated for 1998.

Table 2: Top 25 generating sites of hazardous waste in Ontario, 1998

Rank	Generator [6]	Generating site	City	Quantity generated (tonnes)	Primary waste type generated
1	Corporation of the County of Essex	Landfill #3	Maidstone	70,377	Landfill leachates
2	Municipality of Ottawa-Carlton	Trail Road Landfill Site	Nepean	69,461	Landfill leachates
3	Huneault Waste Management Ltd.	3354 Navan Rd.	Gloucester	69,408	Landfill leachates
4	Philip Enterprises Inc.	799-800 Parkdale Ave N.	Hamilton	62,560	Steel making residues
5	City of London	Concession 7 R.R #1	London Township	53,969	Landfill leachates
6	Canadian Waste Services Inc.	Part Lot 3, south of 1/2 of Lot 4, Concession 3	West Carlton Township	51,129	Landfill leachates
7	Dow Chemical Canada Inc.	Dow Scott Road Landfill	Sarnia	48,881	Halogenated solvents
8	Innisfil Landfill Corporation	Lots 8 and 9, Concession 6	Innisfil Township	45,798	Landfill leachates
9	Regional Municipality of Hamilton-Wentworth	1500 Haldibrook Road	Glanbrook	45,354	Landfill leachates
10	Dofasco Inc.	Bayfront Plant	Hamilton	42,382	Steel making residues
11	General Motors of Canada Ltd.	570 Glendale Ave.	St.Catharines	32,837	Alkaline wastes - other metals
12	Taro Aggregates (Philip Services Inc.)	341 First Road West	Stoney Creek	30,860	Landfill leachates
13	Regional Municipality of Halton	5400 Highway 25	Milton	29,851	Landfill leachates

Table 2: Top 25 generating sites of hazardous waste in Ontario, 1998 *(continued)*

Rank	Generator [6]	Generating site	City	Quantity generated (tonnes)	Primary waste type generated
14	Corporation of the Township of Faraday	Faraday Landfill Site	Faraday Township	28,760	Landfill leachates
15	Safety-Kleen Canada Inc.	23 Regan Road	Brampton	28,204	Transfer station oils wastes
16	Regional Municipality of Halton	Closed Oakville Landfill Site	Oakville	27,863	Landfill leachates
17	Dofasco Inc.	Kenilworth Plant	Hamilton	27,335	Spent pickle liquor
18	Co-steel Lasco	Hopkins Street South	Whitby	23,988	Steel making residues
19	Laidlaw Environmental [7]	2258 River Road	London	21,381	Other specified organics
20	Imperial Oil	Area 1, Area 2, Research Buildings	Sarnia	19,118	Other specified organics
21	Lynx Environmental	4505 Fourth Street	Windsor	17,784	Transfer station oils wastes
22	Safety-Kleen Ltd.	2258 River Road	London	17,017	Other specified organics
23	Laidlaw Environmental	551 Avonhead Road	Mississauga	16,912	Non-halogenated rich organics
24	ICI Canada Inc.	ICI Forest Products, Cornwall Works	Cornwall	16,561	Inert organic wastes
25	Ridge Landfill Corporation Ltd.	20142 Erieau Road	Blenheim	16,453	Landfill leachates

In 1998, 622,179 tonnes of landfill leachate wastes and 1,194,406 tonnes of non-leachate wastes were generated in Ontario. Landfill leachate wastes made up 34.2% of all hazardous waste generated in the province and thus represent the largest waste type generated in 1998. Therefore in Table 2, landfill leachate generators, specifically municipally and privately owned landfill sites are prominent in the list of the top generating sites of hazardous waste in the province. Fully, seven of the top ten generators in the table are landfill sites. The other top generating sites on the list vary from steel manufacturing facilities to petrochemical facilities.

In order to get a more accurate picture of the top hazardous waste generators in the province it is useful to separate landfill leachate generation from non-leachate generation[8]. This report makes the distinction between leachate and non-leachate wastes because of the large quantities of leachate wastes generated in the province, and the types of wastes that comprise landfill leachate. Landfill leachate is a highly polluted liquid containing high concentrations of salts, nutrients, biodegradable organics, heavy metals, and trace amounts of numerous synthetic organic compounds.

Table 3 and Table 4 present the top generating sources of landfill leachate wastes and non-leachate wastes respectively.

Table 3: Top 25 generating sites of landfill leachate wastes in Ontario, 1998

Rank	Generator	Generating site	City	Quantity generated (tonnes)
1	Corporation of the County of Essex	Landfill #3	Maidstone	70,377
2	Huneault Waste Management Ltd.	3354 Navan Rd.	Gloucester	69,406
3	Municipality of Ottawa-Carlton	Trail Road Landfill	Nepean Site	69,020
4	City of London	Concession 7 R.R #1	London Township	53,969
5	Canadian Waste Services Inc.	Part Lot 3, south of ½ of Lot 4, Concession 3	West Carlton Township	51,129
6	Innisfil Landfill Corporation	Lots 8 and 9, Concession 6	Innisfil Township	45,798
7	Regional Municipality of Hamilton-Wentworth	1500 Haldibrook Road	Glanbrook	45,354
8	Taro Aggregates (Philip Services Inc.)	341 First Road West	Stoney Creek	30,790
9	Regional Municipality of Halton	5400 Highway 25	Milton	29,194
10	Corporation of the Township of Faraday	Faraday Landfill Site	Faraday Township	28,760
11	Regional Municipality of Halton	Closed Oakville Landfill Site	Oakville	27,863
12	Ridge Landfill Corporation Ltd.	20142 Erieau Road	Blenheim	16,441
13	Corporation of the County of Essex	Essex County Landfill #1	Township of Colchester North	12,938
14	Town of Cobourg	Cobourg Landfill Site	Haldimand Township	12,477
15	Owens-Corning Canada Inc.	Scott Road at Imperial Avenue	Sarnia	11,418
16	Green Lane Landfill	Lot 22, Concession 3	Southwold Township	9,883
17	County of Simcoe	Wasaga Beach Landfill Site - Site #15	Town of Wasaga Beach	7,979

Table 3: Top 25 generating sites of landfill leachate wastes in Ontario, 1998 *(continued)*

Rank	Generator	Generating site	City	Quantity generated (tonnes)
18	Dow Chemical Canada Inc.	Dow Scott Road Landfill	Sarnia	6,542
19	Regional Municipality of Haldimand-Norfolk	Tom Howe Landfill Site	Nanticoke	6,022
20	Bowater Pulp & Paper Canada Inc.	DND Rifle Range (Mt. McKay Landfill)	Thunder Bay	5,184
21	County of Simcoe	Concession 5 West, 1/2 Lot 13	Essa Township	2,479
22	Canadian Waste Services of Ontario Ltd.	S.W. 1/2 Lot 7, Townline Range	Harwich Township	1,963
23	County of Simcoe	West Half Lot 30, Concession 1	Nottawasaga Township	1,786
24	Bayer Rubber Inc.	Landfill Site, Scott Road	Sarnia	1,123
25	Courtice Auto Wreckers Ltd.	1515 Thornton Road North	Oshawa	879

The top generating sources of landfill leachates in the province for 1998 were municipally and privately owned landfill sites. The majority of these landfills are actively receiving waste, while others have closed down, but are still producing landfill leachates. These landfills tended to be scattered throughout the province with a greater concentration in southern Ontario around major urban centres, specifically Ottawa, Windsor and Hamilton.

Table 4: Top 25 generating sites of non-leachate wastes in Ontario, 1998

Rank	Generator	Generating site	City	Quantity generated (tonnes)
1	Philip Enterprises Inc.	799-800 Parkdale Ave N.	Hamilton	62,560
2	Dofasco Inc.	Bayfront Plant	Hamilton	42,382
3	Dow Chemical Canada Inc.	Dow Scott Road Landfill	Sarnia	42,339
4	General Motors of Canada Ltd.	570 Glendale Ave.	St.Catharines	32,837
5	Safety-Kleen Canada Inc.	23 Regan Road	Brampton	28,204
6	Dofasco Inc.	Kenilworth Plant	Hamilton	27,335
7	Co-steel Lasco	Hopkins Street South	Whitby	23,988
8	Laidlaw Environmental	2258 River Road	London	21,356
9	Imperial Oil	Area 1, Area 2, Research Buildings	Sarnia	19,118

Table 4: Top 25 generating sites of non-leachate wastes in Ontario, 1998 *(continued)*

Rank	Generator	Generating site	City	Quantity generated (tonnes)
10	Lynx Environmental	4505 Fourth Street	Windsor	17,784
11	Safety-Kleen Ltd.	2258 River Road	London	17,017
12	Laidlaw Environmental [9]	551 Avonhead Road	Mississauga	16,912
13	ICI Canada Inc.	ICI Forest Products, Cornwall Works	Cornwall	16,561
14	Uniroyal Chemical Ltd.	25 Erb Street	Elmira	14,063
15	Office Specialty	67 Toll Road	East Gwillimbury	14,029
16	Philip Enterprises Inc.	55 Vulcan Street	Etobicoke	13,794
17	Dofasco Inc.	Main Plant Facilities - Gage Avenue and Beach Rd.	Hamilton	13,371
18	Canadian National Railway Company	Cargoflo, 8820 Keele St.	Vaughan	13,365
19	Safety-Kleen Ltd.	551 Avonhead Road	Mississauga	13,311
20	Stelco Inc.	Hilton Works	Hamilton	12,257
21	Nova Chemicals Ltd.	Styrene II Unit, east of Tashmoo Avenue	Sarnia	12,250
22	Abitibi-Consolidated Inc.	Fort Frances Division, 145 Third Street West	Fort Frances	12,195
23	Philip Enterprises Inc.	1731 Pettit Road	Fort Erie	11,391
24	Dow Chemical Canada Inc.	1425 Vidal Street South	Sarnia	11,245
25	Canflow Environmental Services Corp.	4164 Discovery Line Road	Petrolia	10,176

As highlighted in Table 4, the top generating sources of non-leachate hazardous wastes in the province for 1998 included environmental services (waste management) firms such as Philip Environmental Services and Laidlaw Inc., petrochemical producers (e.g. Dow Chemical and Imperial Oil), and steel producers such as Dofasco and Stelco. The top producers of non-leachate hazardous wastes were concentrated in southwestern Ontario and in the Hamilton-Wentworth Region.

The HW manifest database classifies hazardous waste generators by business type. Table 5 presents the top 25 business types that generated hazardous waste in 1998. The top generators of hazardous waste were businesses related to waste management (i.e. municipal corporations operating landfill sites), and businesses related to the chemical, steel producing and automobile industries.

Table 5: Top 25 business type generators of hazardous waste in Ontario, 1998

Rank	Business type	Quantity generated (tonnes)
1	Other Services	268,622
2	Environmental Administration	178,096
3	Other Utility Industry	161,029
4	Other Construction Services	96,959
5	Industrial Organic Chemical	84,646
6	Ferro-Alloys Industry	80,543
7	Transportation Administration	70,542
8	Other Primary Steel	64,611
9	Regulatory Services	57,870
10	Vehicle Engine Industry	51,279
11	Bulk Liquid Trucking	48,872
12	Industrial Inorganic Chemical	47,543
13	Coating of Metal Processing	36,130
14	Other Truck/Transportation	31,384
15	Limestone Quarries	31,225
16	Other Waste Materials	30,393
17	Lubricants Oil and Grease	25,638
18	Plastic and Synthetic Resins	24,741
19	Motor Vehicle Industry	23,658
20	Pulp Industry	18,935
21	Other Vehicle Accessories	18,428
22	Other Petroleum and Coal	16,999
23	Railway Transportation Industry	16,984
24	Vehicle Stampings Industry	15,971
25	Other Stamped Metal	14,065

HAZARDOUS WASTE GENERATING DISTRICTS IN ONTARIO

Hazardous waste generation in Ontario for 1998 varied amongst the various districts[10] in the province. Appendix A provides a list of the districts classified in the HW manifest and the municipalities that fall within each district. Table 6 presents the quantity of hazardous waste generated by sites in each Ontario district and the primary waste type generated in each district.

Table 6: Top hazardous waste generating districts in Ontario, 1998

Rank	Generating district [11]	Quantity generated (tonnes)	Primary waste type generated
1	Hamilton	299,660	Landfill leachates
2	Ottawa	227,698	Landfill leachates
3	Burlington	217,797	Landfill leachates
4	Windsor	177,059	Landfill leachates
5	Sarnia	143,517	Halogenated solvents
6	London	137,153	Landfill leachates
7	St.Catharines	111,920	Alkaline wastes - other metals
8	York and Durham Regions	110,901	Steel making residues
9	Barrie	87,447	Landfill leachates
10	Guelph	86,335	Emulsified oils
11	Toronto	82,604	Oil skimmings and sludges
12	Kingston	41,720	Landfill leachates
13	Cornwall	30,165	Inert inorganic wastes
14	Peterborough	21,349	Landfill leachates
15	Kenora	12,860	Other specified inorganics
16	Thunder Bay	12,826	Landfill leachates
17	Sudbury	8,643	Transfer station oils wastes
18	South Porcupine	2,595	Waste oils and lubricants
19	Owen Sound	2,324	Inert inorganic wastes
20	Sault Ste. Marie	1,124	Waste oils and lubricants
21	North Bay	886	Waste oils and lubricants

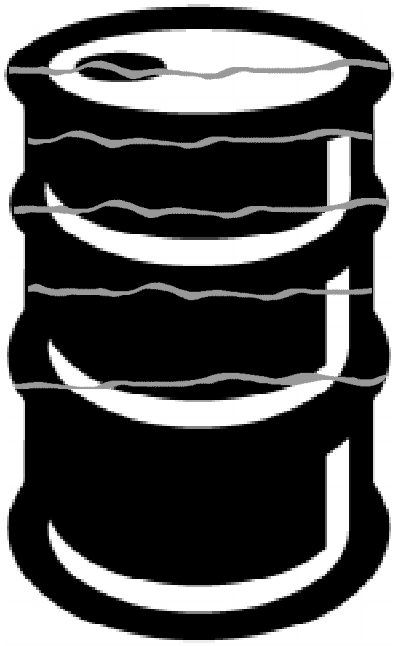


Figure 2: Percentage of hazardous waste generation in Ontario by district, 1998

As seen in Table 6, generating sites in the Hamilton district generated the greatest quantity of hazardous waste in 1998, having generated almost 300,000 tonnes of hazardous waste, representing 16% of hazardous waste generation (as seen in Figure 2) in the province in 1998. This is due in part to the siting of solid waste landfills in the district in addition to the concentration of industries such as steel producers. A more detailed description of hazardous waste generation in the Hamilton district is provided in the following box.

Hazardous Waste District Profile: HAMILTON DISTRICT

Location: located in southern Ontario, on the western corner of Lake Ontario

Municipalities: Hamilton district includes the City of Hamilton and surrounding municipalities, including2 Ancaster, Dundas and Stoney Creek

Hazardous waste generation in 1998: 299,660 tonnes, which ranks the district as the #1 generator of hazardous waste in Ontario, generating 16% of hazardous waste in the Province

Top generating sites in the district: Hamilton district has four of the top 25 generators of hazardous waste in the Province, they are:

1) Philip Enterprises Inc., facility located at 799-800 Parkdale Ave N. in Hamilton
- Generated 69,408 tonnes of hazardous waste in 1998
- Ranked #4 of top generating sites in Ontario
- Landfill leachate is the primary waste type generated

2) Region Municipality of Hamilton-Wentworth, facility located at 1500 Haldibrook Road in Glanbrook
- Generated 45,354 tonnes of hazardous waste in 1998
- Ranked #9 of the top generating sites in Ontario
- Landfill leachate is the primary waste type generated

3) Taro Aggregates (Philip Services Inc.), facility located at 341 First Road West in Stoney Creek
- Generated 30,860 tonnes of hazardous waste in 1998
- Ranked #12 of the top 25 generators in Ontario
- Landfill leachate is the primary waste type generated

4) Dofasco Inc., the Kenilworth Plant located in Hamilton
- Generated 27,335 tonnes of hazardous waste in 1998
- Ranked #17 of top 25 generators in Ontario
- Primary waste type generated is spent pickle liquor

Types of hazardous waste generated: the top waste types generated in the Hamilton district in 1998 are as follows:

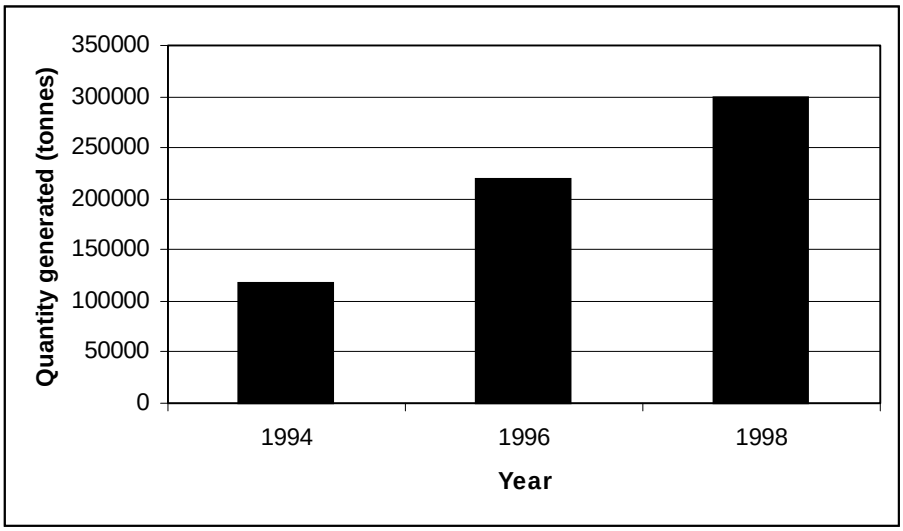
Table 7: Top waste types generated in Hamilton district, 1998

Rank	Waste type	Quantity generated (tonnes)
1	Landfill leachate wastes	82,226
2	Steel making residues	58,431
3	Transfer station oils wastes	38,426
4	Other specified inorganics	30,064
5	Spent pickle liquor	23,645
6	Emulsified oils	16,734
7	Oil skimmings and sludges	9,864
8	Waste oils and lubricants	9,692
9	Halogenated solvents	8,950
10	Heavy fuels	4,358

Hazardous Waste Profile: HAMILTON DISTRICT

Hazardous waste generation trend: from 1994 to 1998, the quantity of hazardous waste generated in Hamilton district has increased by 155% from 117,394 tonnes generated in 1994 to 299,660 tonnes in 1998

Figure 3: Hazardous waste generation in Hamilton District, 1994 to 1998



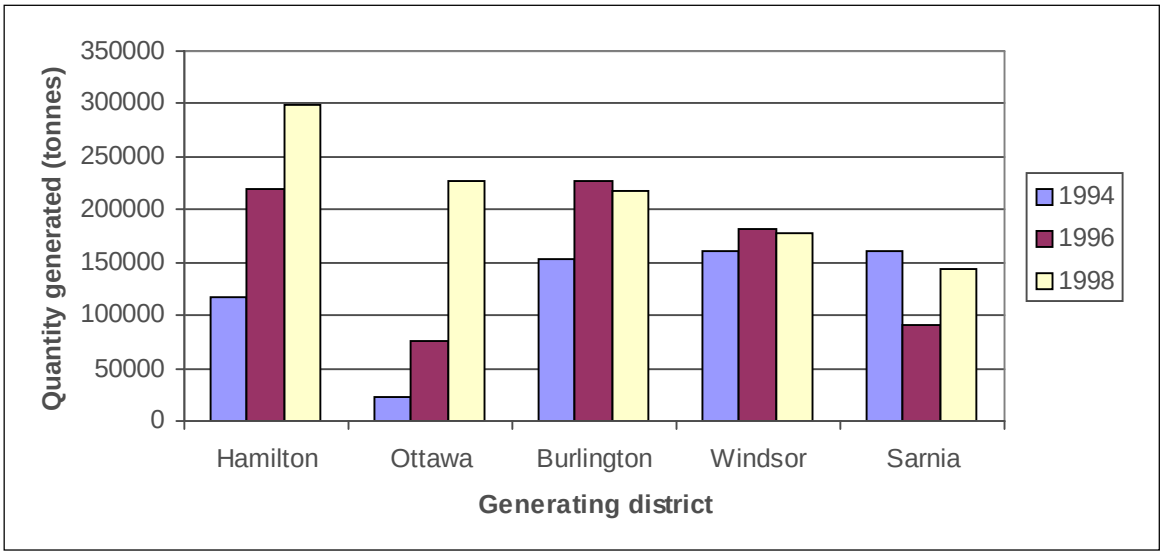
The industrial composition of each region was also an important factor in determining the quantity of waste generated. Hazardous waste generation in 1998 was higher in southwestern Ontario and the Greater Toronto area (including the Golden Horseshoe) and lower in northern and central Ontario. This is not surprising given the concentration of petrochemical producers in southwestern Ontario and the concentration of industrial manufacturers in the GTA and the Golden Horseshoe.

Four of the top five generating districts in the province have experienced an increase in hazardous waste generation from 1994 to 1998. This is highlighted in Table 8 and Figure 4. Overall, hazardous waste generation has increased by 10% to 914% in these four districts. The greatest increase in generation was in the district of Ottawa, which is primarily due to an increase in landfill leachates generated in the district by solid waste landfills. Amongst the major generating districts, the only district that showed a decrease in its generation levels was the district of Sarnia.

Table 8: Quantity of waste generated in each of the top five 1998 generating districts, 1994 to 1998

Generating district	Quantity generated in 1998 (tonnes)	Quantity generated in 1994 (tonnes)	Quantity change in generation from 1994 to 1998	Percentage change in generation from 1994 to 1998
Hamilton	299,660	117,394	+ 182,226	+ 155%
Ottawa	227,698	22,471	+ 205,227	+ 913%
Burlington[12]	217,797	153,741	+ 64,056	+ 42%
Windsor	177,059	161,140	+ 15,919	+ 10%
Sarnia	143,517	161,424	- 17,907	- 11%

Figure 4: Hazardous waste generation in the top five generating districts in Ontario, 1994 to 1998



The top generating districts change considerably when landfill leachate waste generation is separated from non-leachate waste generation. As stated previously, much of the hazardous waste produced in the top generating districts is from solid waste landfills. By separating out the leachate waste and the non-leachate waste, we gain a better understanding of districts in which hazardous waste generation is high due to high quantities of landfill leachate, and districts where generation is high due to industrial generating sources other than landfills. Table 9 and Table 10 present the top generating districts in Ontario for 1998 of non-leachate wastes and landfill leachate wastes, respectively.

Table 9: Top generating districts of non-leachate hazardous waste in Ontario, 1998

Rank	Generating district	Quantity generated (tonnes)
1	Hamilton	217,434
2	Burlington	160,739
3	Sarnia	124,127
4	St.Catharines	110,814
5	York and Durham Regions	108,798
6	Guelph	86,194
7	Toronto	82,560
8	Windsor	75,267
9	London	73,276
10	Ottawa	38,142
11	Cornwall	30,165
12	Barrie	29,405
13	Kingston	12,960
14	Kenora	12,860
15	Peterborough	8,872
16	Sudbury	8,643
17	Thunder Bay	7,219
18	South Porcupine	2,595
19	Owen Sound	2,324
20	Sault Ste. Marie	1,124
21	North Bay	886

As highlighted in Table 10, the top generating districts of non-leachate wastes are concentrated in south-central and southwestern Ontario. The Golden Horseshoe, which is comprised of the Greater Toronto Area, Hamilton-Wentworth, and the Niagara region, has a high concentration of non-leachate hazardous waste generators. The Windsor-Sarnia corridor, which has a high concentration of petrochemical industries, is another area in the province where non-leachate hazardous waste generation is very high.

Table 10: Top generating districts of landfill leachate waste in Ontario, 1998

Rank	Generating district	Quantity generated (tonnes)
1	Ottawa	189,555
2	Windsor	101,793
3	Hamilton	82,226
4	London	63,878
5	Barrie	58,042
6	Burlington	57,057
7	Kingston	28,760
8	Sarnia	19,390
9	Peterborough	12,477
10	Thunder Bay	5,607
11	York and Durham Regions	2,103
12	St.Catharines	1,106
13	Guelph	141
14	Toronto	44

The top generating districts of landfill leachate wastes in the province for 1998 include municipalities with one or more landfill sites. For example, the Ottawa district contains the Trail Road landfill site in Nepean, and the Windsor district contains Landfill #3 operated by the County of Essex. In most cases, these landfills were located in suburban and rural areas surrounding the urban municipality. Urban districts that did not include outlying regional municipalities, e.g.) the City of Toronto, had minimal generation of landfill leachates, as few landfills are sited within urban municipal boundaries.

HAZARDOUS WASTE TYPES GENERATED IN ONTARIO

In 1998, 52 different types of hazardous wastes were classified in the hazardous waste manifest database. Examples of wastes in each waste type are provided in Appendix B. Table 11 lists the top 25 (by quantity generated) waste types generated in 1998. Figure 5 highlights each waste type as a percentage of the total hazardous waste quantity generated in Ontario for 1998.

Table 11: Top 25 waste types generated in Ontario, 1998

Rank	Waste type	Quantity generated (tonnes)	Percentage of total hazardous waste generated in 1998
1	Landfill leachate wastes	622,179	34.2%
2	Transfer station oils wastes	185,445	10.2%
3	Steel making residues	98,265	5.4%
4	Oil skimmings and sludges	94,049	5.2%
5	Emulsified oils	71,055	3.9%
6	Other specified inorganics	70,731	3.9%
7	Waste oils and lubricants	66,912	3.7%
8	Halogenated solvents	66,880	3.7%
9	Alkaline wastes - other metals	61,565	3.4%
10	Other specified organics	58,573	3.2%
11	Aromatic solvents	40,357	2.2%
12	Paint, pigment, coating residues	35,948	2.0%
13	Acid waste - heavy metals	32,210	1.8%
14	Spent pickle liquor	31,170	1.7%
15	Aliphatic solvents	26,482	1.5%
16	Non-halogenated rich organics	23,857	1.3%
17	Neutralized wastes - heavy metals	23,768	1.3%
18	Alkaline wastes - heavy metals	18,599	1.0%
19	Inert inorganic wastes	18,426	1.0%
20	Alkaline phosphates	16,040	0.9%
21	PCBs	15,976	0.9%
22	Neutralized wastes - other metals	13,957	0.8%
23	Non-halogenated lean organics	13,713	0.7%
24	Light fuels	10,956	0.6%
25	Petroleum distillates	10,948	0.6%

As seen in Table 11 and Figure 5, landfill leachate wastes made up the largest percentage , 34.2% of hazardous waste generated in Ontario for 1998. Transfer station oil wastes, steel making residues, and oil skimmings and sludges made up another 20% of hazardous waste generation. These waste types reflect hazardous waste generation from solid waste landfills, the steel making industry, the petrochemical industry, and various manufacturers that utilize petrochemical products in the province.

From 1994 to 1998, quantities of the top generated waste types have increased in the province. Table 12 presents the 1994 and 1998 generation quantities for the top five waste types generated in 1998. As demonstrated in Table 12, and Figure 6 landfill leachate wastes have increased by 306,436 tonnes, which represents a two-fold increase over four years. On a percentage basis, steel-making residue wastes generation increased by the greatest amount – 247% – from 1994 levels.

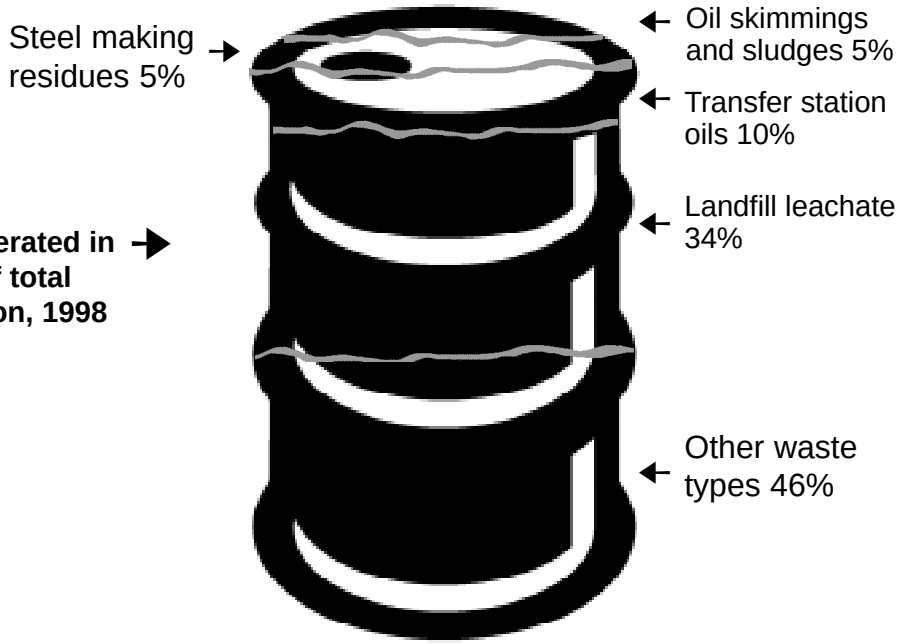
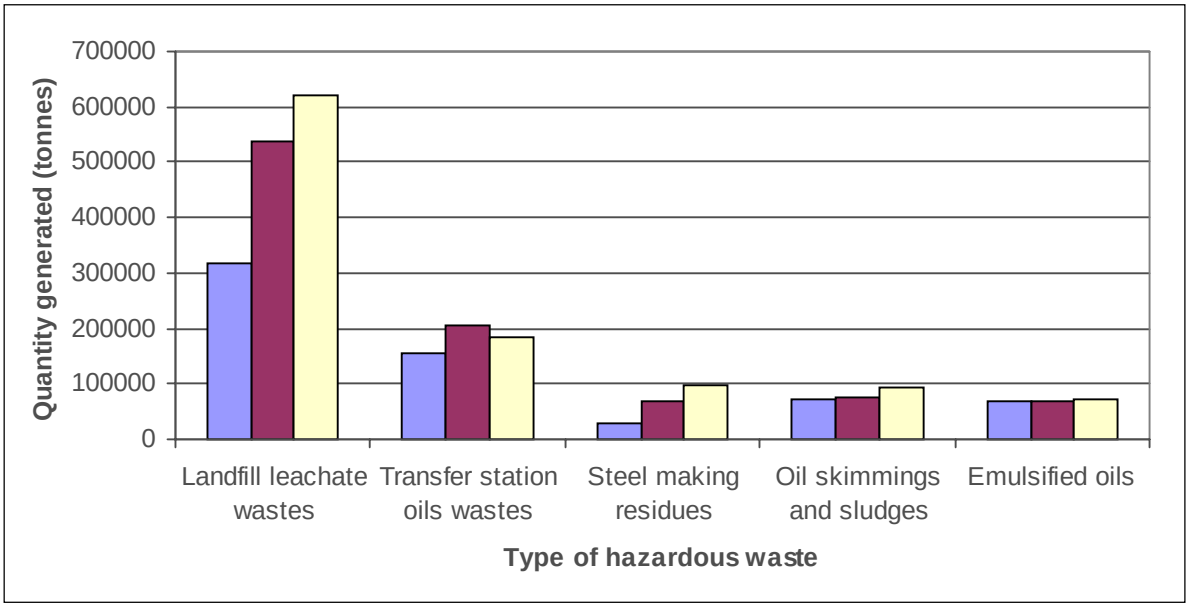


Figure 5: Waste types generated in Ontario as a percentage of total hazardous waste generation, 1998

Table 12: Quantity of waste generated for the top five 1998 generated waste types, 1994 to 1998

Waste type	Quantity generated in 1998 (tonnes)	Quantity generated in 1994 (tonnes)	Quantity change from 1994 to 1998 (tonnes)	Percentage change from 1994 to 1998
Landfill leachate wastes	622,179	315,743	+ 306,436	+ 97%
Transfer station oils wastes	185,445	154,791	+ 30,321	+ 20%
Steel making residues	98,265	28,324	+ 69,941	+ 247%
Oil skimmings and sludges	94,049	70,701	+ 23,348	+ 33%
Emulsified oils	71,055	66,812	+ 4,243	+ 6%

Figure 6: Quantity of waste generated for the top five 1998 generated waste types, 1994 to 1998



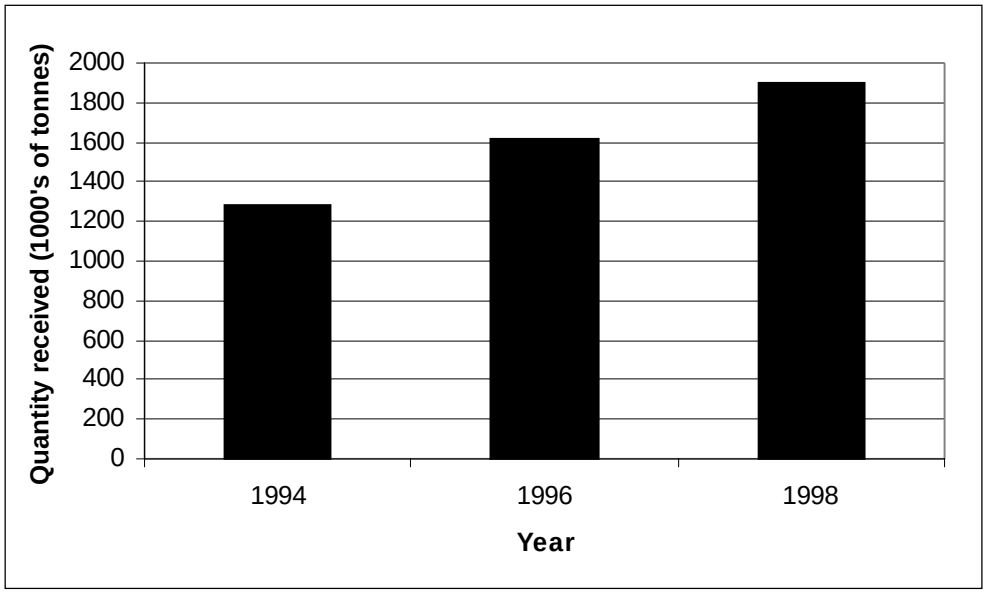
SECTION III: HAZARDOUS WASTE TRANSFERS TO RECEIVING SITES IN ONTARIO, 1994 TO 1998

In 1998, receiving sites in the province of Ontario received 1,901,059 tonnes of hazardous waste, which is an increase of 614,298 tonnes or 47.7% from 1994 to 1998. This increase is highlighted in Table 13 and Figure 7.

Table 13: Quantity of hazardous waste received by sites in Ontario, 1994 to 1998

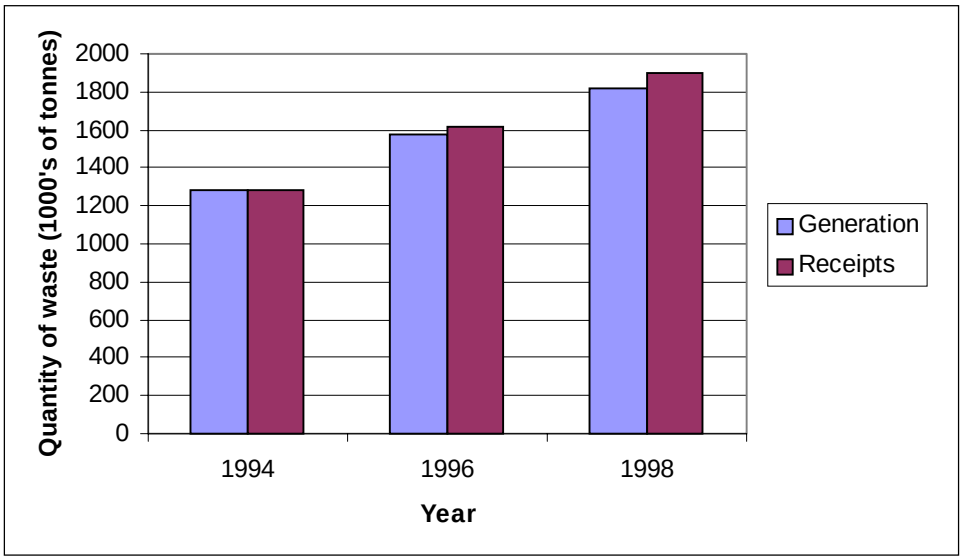
Year	Quantity received (in tonnes)	Percentage increase from 1994 base year
1998	1,901,059	47.7%
1996	1,615,461[13]	25.6%
1994	1,286,761	-

Figure 7: Quantity of hazardous waste received by sites in Ontario, 1994 to 1998



The increase in hazardous waste receipts in the province closely matches the increase in hazardous waste generation during the same period. Figure 8 compares hazardous waste generation and receipts in Ontario from 1994 to 1998, and highlights the similar increase in both. It is also interesting to note that from 1994 to 1998, Ontario has received more waste than it has generated, which indicates that Ontario receives hazardous wastes from outside the province.

Figure 8: Hazardous waste generation and receipts in Ontario, 1994 to 1998

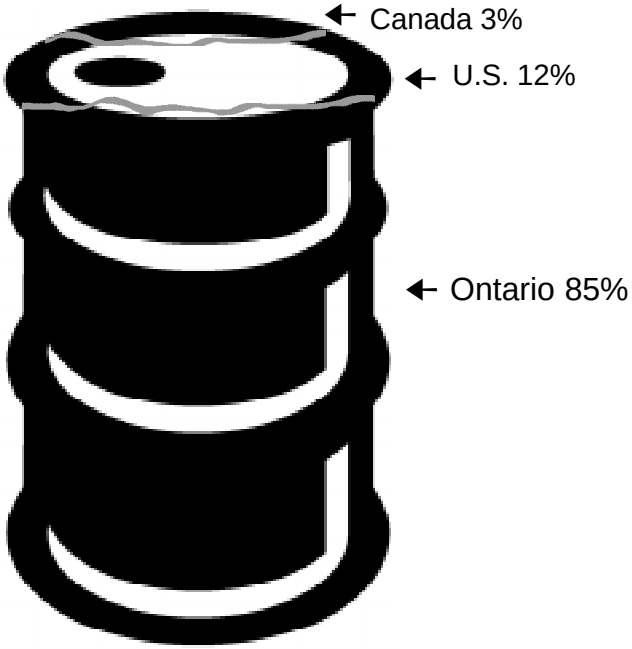


Most of the hazardous waste received by sites in Ontario is "home grown", i.e., it is transferred from generating sites within the province. In 1998, roughly 85% of hazardous waste received in Ontario was transferred from generating sites in the province. Hazardous waste transfers from the United States accounted for 12% of waste received by Ontario sites, and hazardous waste transfers from other provinces accounted for 3%. The quantities and percentage of waste received from within and outside of the province is presented in Table 14 and Figure 9.

Table 14: Quantity of hazardous waste received by Ontario sites from various jurisdictions, 1998

Generating jurisdiction	Quantity of waste received in Ontario (tonnes)	Percentage of waste received in Ontario
Ontario	1,612,131	84.8%
United States[14]	235,495	12.4%
Canada (other provinces)	53,433	2.8%

Figure 9: Quantity of hazardous waste received by Ontario sites from various jurisdictions, 1998

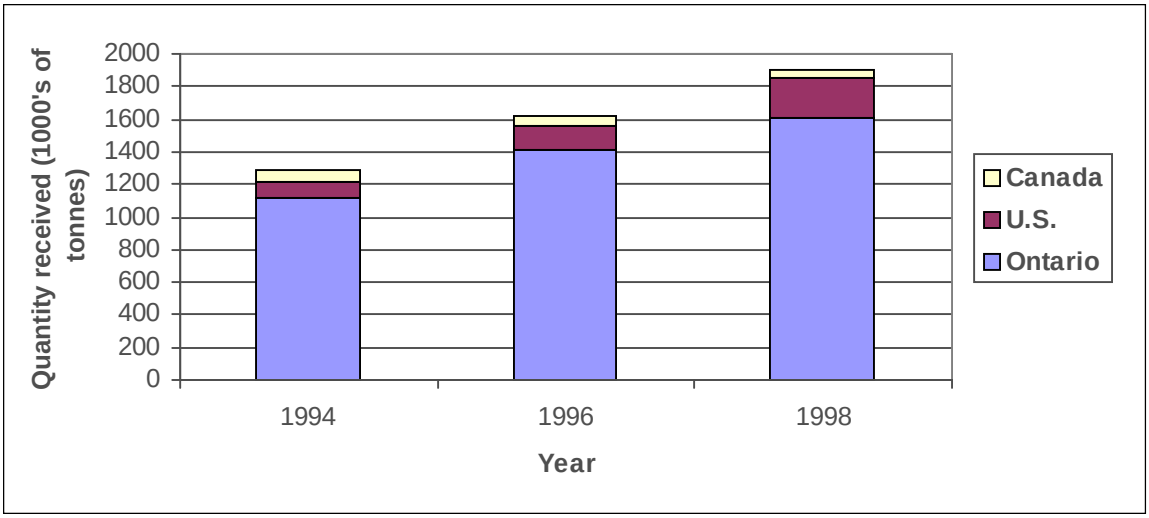


From 1994 to 1998, Ontario has received increasing quantities of hazardous waste from generating sites within the province. During this period, waste received by sites in Ontario from provincial generating sites increased by 492,074 tonnes. As seen in Table 15 and Figure 10, the quantity of hazardous waste transferred to Ontario sites from U.S. generators also has increased, by 135,523 tonnes since 1994, which represents a 135.6% increase from 1994 to 1998.

Table 15: Quantity of hazardous waste received by Ontario sites from various jurisdictions, 1994 to 1998

Generating jurisdiction	Quantity received in 1998 (tonnes)	Quantity received in 1994 (tonnes)	Quantity change from 1994 to 1998 (tonnes)	Percentage change from 1994 to 1998
Ontario	1,612,131	1,120,057	+ 492,074	+ 43.9%
United States	235,495	99,972	+ 135,523	+ 135.6%
Canada (other provinces)	53,433	66,732	- 13,299	- 19.9%

Figure 10: Quantity of hazardous waste received by Ontario sites from various jurisdictions, 1994 to 1998



ONTARIO RECEIVING SITES OF HAZARDOUS WASTE

In 1998, there were approximately 300 sites in Ontario that received hazardous waste. The receiving sites that received the greatest quantities of hazardous waste included water pollution control plants (WPCPs) and landfill sites. Waste management companies, including Philip Services Inc. and Safety-Kleen Ltd. owned many of these receiving facilities. The top receiver of hazardous waste in the province for 1998 was the Safety-Kleen facility in Moore Township, near Sarnia. This facility alone received 254,295 tonnes of hazardous waste in 1998, the primary waste type received being organic wastes. Table 16 presents the top 25 receiving sites in Ontario of hazardous waste for 1998 and their primary waste type received.

Table 16: Top 25 Ontario receiving sites of hazardous waste, 1998

Rank	Receiver	Receiving site[15]	City	Quantity received (tonnes)	Primary waste type received
1	Safety-Kleen Ltd.	Landfill, Lot 9/Pt. Lot 8, Concession 10	Moore Township (Sarnia district)	254,295	Other specified organics
2	Regional Municipality of Ottawa Carlton	Robert O. Pickard Environmental Centre	Gloucester	191,296	Landfill leachate wastes
3	Safety-Kleen Canada Inc.	300 Woolrich Street South	Breslau	129,613	Transfer station oils wastes
4	Philip Enterprises Inc.	52 Imperial Street	Hamilton	85,029	Steel making residues
5	Philip Enterprises Inc.	55 Vulcan Street	Toronto	76,628	Landfill leachate wastes
6	West Windsor WPCP	4155 Ojibway Parkway	Windsor	75,559	Landfill leachate wastes
7	Safety-Kleen Ltd.	Incinerator, Lot 9, Concession 10	Moore Township (Sarnia district)	69,430	Non-halogenated lean organics
8	London (Greenway) WPCP	Greenside Avenue	London	62,866	Landfill leachate wastes
9	Barrie WPCP	249 Bradford St.	Barrie	57,606	Landfill leachate wastes
10	Philip Environmental Services	800 Parkdale Ave.	Hamilton	52,099	Steel making residues
11	Dow Chemical of Canada Ltd.	Scott Road Landfill	Sarnia	51,964	Halogenated solvents
12	Hamilton-Wentworth WPCP, Philip U.M.C.	700 Woodward Ave.	Hamilton	46,019	Landfill leachate wastes
13	Philip Enterprises Inc.	112 Adams Blvd.	Brantford	45,314	Emulsified oils
14	General Motors of Canada Inc.	285 Ontario St.	St.Catharines	38,441	Alkaline wastes - other metals
15	Safety-Kleen Ltd.	Part Lot 1, Concession A	Middlesex County	32,091	Steel making residues

Table 16: Top 25 Ontario receiving sites of hazardous waste, 1998 *(continued)*

Rank	Receiver	Receiving site	City	Quantity received (tonnes)	Primary waste type received
16	Oakville Southwest WPCP	1385 Lakeshore Road West	Oakville	31,965	Landfill leachate wastes
17	Safety-Kleen Ltd.	551 Avonhead Rd.	Mississauga	29,581	Paint, pigment and coating residues
18	Bancroft WPCP	Hasting St. South	Bancroft	28,760	Landfill leachate wastes
19	Quantex Technologies Inc.	260 Shoemaker Street	Kitchener	26,533	Transfer station oils wastes
20	Dofasco Inc.	1330 Burlington St. East	Hamilton	23,454	Spent pickle liquor
21	Philip Enterprises Inc.	4505 Fourth St.	Windsor	22,816	Oil skimmings and sludges
22	Skyway WPCP	1125 Lakeshore Rd.	Burlington	22,352	Landfill leachate wastes
23	Dofasco Inc. (Dust)	-	Hamilton	20,425	Transfer station oils wastes
24	Chatham WPCP	100 Irwin St.	Chatham	18,403	Landfill leachate wastes
25	Dofasco Inc.	#2 Cold Mill, WWTP, Trucked West R. Site	Hamilton	18,074	Emulsified oils

Again, it is useful to separate the receivers of landfill leachate wastes from the receivers of non-leachate wastes in order to get a better understanding of where landfill wastes and wastes from industrial processes are being received in the province. Table 17 and Table 18 present the top 25 receivers of landfill leachate wastes and non-leachate wastes, respectively.

Table 17: Top 25 Ontario receiving sites of landfill leachate wastes, 1998

Rank	Receiver	Receiving site	City	Quantity received (tonnes)
1	Regional Municipality of Ottawa Carlton	Robert O. Pickard Environmental Centre	Gloucester	191,296
2	West Windsor WPCP	4155 Ojibway Parkway	Windsor	75,559
3	London (Greenway) WPCP	Greenside Avenue	London	62,866
4	Barrie WPCP	249 Bradford St.	Barrie	57,606

Table 17: Top 25 Ontario receiving sites of landfill leachate wastes, 1998 *(continued)*

Rank	Receiver	Receiving site	City	Quantity received (tonnes)
5	Hamilton-Wentworth WPCP, Philip U.M.C.	700 Woodward Ave.	Hamilton	46,019
6	Philip Enterprises Inc.	55 Vulcan Street	Toronto	42,222
7	Oakville Southwest WPCP	1385 Lakeshore Road West	Oakville	31,965
8	Bancroft WPCP	Hasting St. South	Bancroft	28,760
9	Skyway WPCP	1125 Lakeshore Rd.	Burlington	22,352
10	Chatham WPCP	100 Irwin St.	Chatham	18,403
11	Town of Cobourg	WPCP #2	Cobourg	12,477
12	City of Windsor	Little River Pollution Control Plant	Windsor	7,935
13	Dow Chemical Canada Inc.	Vidal St. South, Wastewater and Sewage Treatment Plant	Sarnia	6,315
14	PSG	Regional Road #9 West	Hagersville	6,022
15	Avenor Inc/Bowater Pulp & Paper	2001 Neebing Avenue	Thunder Bay	5,598
16	Oakville S.E. WPCP	2497 Lakeshore Rd. East	Oakville	2,740
17	London Pottersburg WPCP	1145 Hamilton Rd.	London	1,250
18	Bayer Rubber Corp./Polysar	1265 Vidal St.	Sarnia	1,124
19	Harmony Creek WPCP	919 Farewell Ave.	Oshawa	879
20	Region of York	Aurora Pumping Station	Aurora	850
21	Port Colbourne Seaway WPCP	30 Prosperity Avenue	Port Colbourne	656
22	Regional Municipality of Niagara	Fort Erie WPCP	Fort Erie	450
23	Town of Collingwood WPCP	3 Birch Street	Collingwood	436
24	Metro Toronto Works Department	Highland Creek Treatment Plant	Toronto	374
25	Dow Chemical of Canada Ltd.	Scott Road Landfill	Sarnia	270

As highlighted in Table 17, water pollution control plants receive the greatest quantities of landfill leachate wastes in the province, making up 20 of the top 25 receivers of these types of wastes.

Table 18: Top 25 Ontario receiving sites of non-leachate wastes, 1998

Rank	Receiver	Receiving site	City	Quantity received (tonnes)
1	Safety-Kleen Ltd.	Landfill, Lot 9/Pt. Lot 8, Concession 10	Moore Township (Corunna)	254,270
2	Safety-Kleen Canada Inc.	300 Woolwich Street South	Breslau	129,613
3	Philip Enterprises Inc.	52 Imperial Street	Hamilton	85,012
4	Safety-Kleen Ltd.	Incinerator, Lot 9, Concession.10	Moore Township (Corunna)	69,430
5	Philip Environmental Services Corp.	800 Parkdale Avenue	Hamilton	52,099
6	Dow Chemical of Canada Ltd.	Scott Road landfill	Sarnia	51,695
7	Philip Enterprises Inc.	112 Adams Blvd.	Brantford	45,314
8	General Motors of Canada Ltd.	285 Ontario St.	St.Catharines	38,441
9	Philip Enterprises Inc.	55 Vulcan St.	Toronto	34,406
10	Safety-Kleen Ltd.	Part Lot 1, Concession A	Middlesex County (London district)	32,071
11	Safety-Kleen Ltd.	551 Avonhead Rd.	Mississauga	29,581
12	Quantex Technologies Inc.	260 Shoemaker St.	Kitchener	26,533
13	Dofasco Inc.	1330 Burlington St East	Hamilton	23,454
14	Philip Enterprises Inc.	4505 Fourth St.	Windsor	22,816
15	Dofasco Inc. (Dust)	-	Hamilton	20,425
16	Dofasco Inc.	#2 Cold Mill W.W.T.P. Trucked Wst.R. Site	Hamilton	18,074
17	Esso Petroleum Canada	Pt. Lots 10 and 11	Lambton County (Sarnia district)	17,247
18	St.Lawrence Cement Company	2391 Lakeshore Rd. West	Mississauga	16,950
19	Philip Enterprises Inc.	Lot 6, Concession 5	Fort Erie	15,638
20	Region of York	Aurora Pumping Station	Aurora	13,525
21	Aquatech Blue Ltd.	309 Cherry St.	Toronto	13,431
22	Safety-Kleen Canada Inc.	23 Regan Road	Brampton	12,964
23	Abitibi-Consolidated Inc.	Parcel 12, 712, Rainy River	Rainy River	12,159
24	Fielding Chemical Technologies Inc.	3549 Mavis Rd.	Mississauga	11,858
25	Aimco Solrec Ltd.	425 Morobel Drive	Milton	11,396

The top 25 receiving sites of non-leachate wastes in the province for 1998 were primarily facilities owned by environmental services (waste management) companies, petrochemical producers and steel producers. In particular, two companies, Safety-Kleen, Philip Services and their subsidiaries had the greatest number of facilities that received high quantities of non-leachate hazardous waste in 1998.

Having identified the individual receivers of hazardous waste in the province for 1998, it also important to examine the types of facilities that receive these wastes transfers. Table 19 and Figure 11 present the quantities of hazardous waste transfers received by various types of facilities for 1998.

These facilities do not necessarily represent the final fate of the hazardous waste, but are the facilities where the waste was received and "signed-off" on the manifest. In the case of transfer stations, the hazardous waste may be processed or unprocessed and transferred to another receiving facility (e.g. landfill). Processing of the waste may result in the waste being categorized as non-hazardous before it is transferred. In this case the transfer station is considered the final receiving facility for the hazardous waste. Processing may also affect the quantity and composition of hazardous waste transferred to another type of facility for final disposal.

Table 19: Quantities of hazardous waste received in Ontario by receiving facility, 1998

Receiving facility	Quantity of hazardous waste received (tonnes)	Percentage of hazardous waste received in Ontario
Water pollution control plant	626,706	33.0%
Transfer station - processing	366,432	19.3%
Transfer station	346,100	18.2%
Landfill	254,918	13.4%
Reclaim	131,569	6.9%
Incineration	86,386	4.5%
Private landfill & sludge farms	68,520	3.6%
Dust control	20,424	1.1%

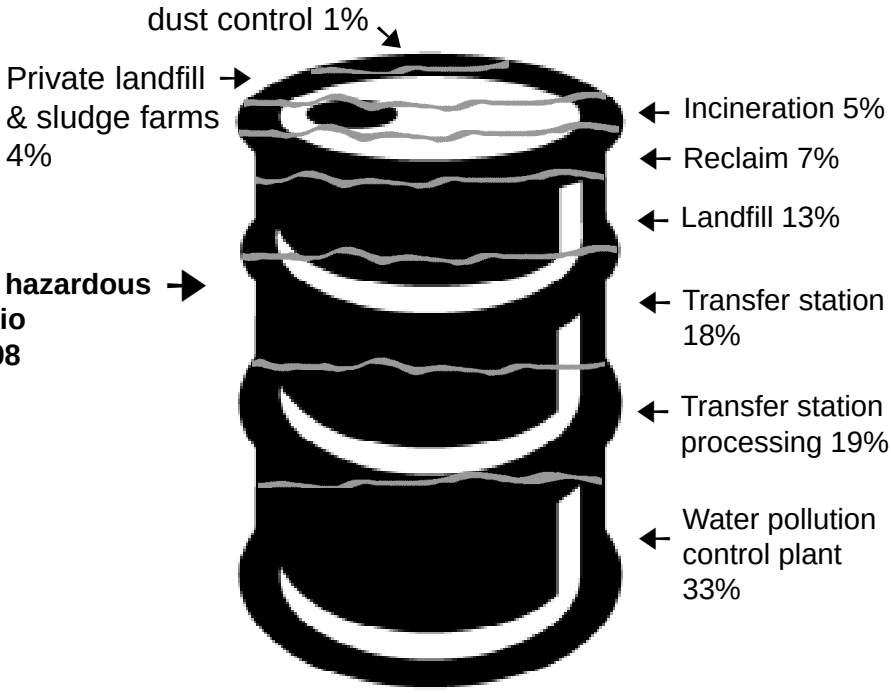


Figure 11: Quantities of hazardous waste received in Ontario by receiving facility, 1998

Table 19 and Figure 11 illustrate that in 1998, water pollution control plants in the province received one third of hazardous waste transfers from generating sites. These plants are unable to treat all of the toxic contaminants in these hazardous wastes and as a result some of these contaminants eventually end up in the Great Lakes and in watersheds throughout Ontario.

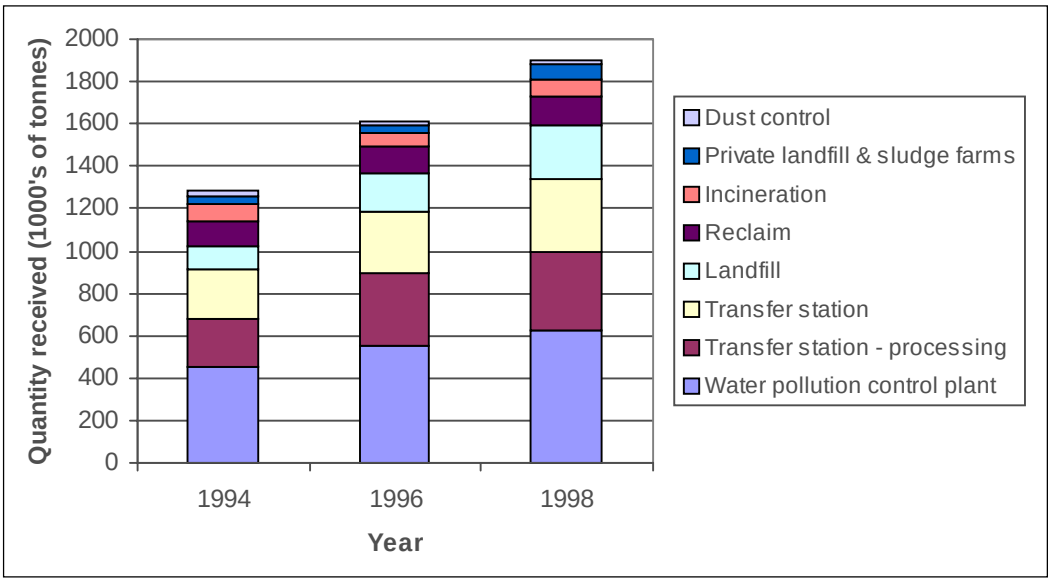
From 1994 to 1998, the quantities of hazardous waste received by various facilities across the province have increased. Table 20 and Figure 12 highlight the changes in the amounts of hazardous waste received by these facilities from 1994 to 1998.

Table 20: Quantity of waste received by facility type, 1994 to 1998

Receiving facility	Quantity received in 1998 (tonnes)	Quantity received in 1994 (tonnes)	Quantity change from 1994 to 1998 (tonnes)	Percentage change in quantity received from 1994 to 1998
Water pollution control plant	626,706	452,926	+ 173,780	+ 38.4%
Transfer station - processing	366,432	227,091	+ 139,341	+ 61.4%
Transfer station	346,100	233,967	+ 112,133	+ 47.9%
Landfill	254,918	112,018	+ 142,900	+ 127.6%
Reclaim	131,569	116,861	+ 14,708	+ 12.6%
Incineration	86,386	82,945	+ 3,441	+ 4.1%
Private landfill & sludge farms	68,520	30,766	+ 37,754	+ 122.3%
Dust control	20,424	29,865	- 9,441	- 31.6%

The increasing quantities of hazardous waste being received in Ontario are being received in all of the receiving facilities listed in Table 20. Water pollution control plants and transfer stations have received most of the increased waste quantities. Water pollution control plants received 173,780 more tonnes of hazardous waste in 1998 than in 1994, which represents a 38.4% increase. Landfill sites experienced a 142,900 tonne or 128% increase of hazardous waste receipts from 1994 to 1998. These trends in hazardous waste receipts by facility types are further highlighted in Figure 12.

Figure 12: Hazardous waste receipts by receiving facilities in Ontario, 1994 to 1998



HAZARDOUS WASTE RECEIVING DISTRICTS IN ONTARIO

The quantity of hazardous wastes received in Ontario for 1998 varied amongst the receiving districts in the province. Table 21 presents hazardous waste receipts by Ontario district and the primary waste type received in each district in 1998.

Table 21: Hazardous waste quantities received in Ontario by district, 1998

Rank	Receiving district	Quantity received (tonnes)	Primary waste type received
1	Sarnia	424,084	Other specified organics
2	Hamilton	269,901	Steel making residues
3	Guelph	221,516	Transfer station oils wastes
4	Ottawa	213,865	Landfill leachate wastes
5	Burlington	162,454	Landfill leachate wastes
6	Windsor	142,694	Landfill leachate wastes
7	London	100,744	Landfill leachate wastes
8	Toronto	93,600	Landfill leachate wastes
9	Barrie	78,465	Landfill leachate wastes
10	St.Catharines	73,942	Alkaline wastes - other metals
11	York and Durham Regions	36,787	Alkaline phosphates
12	Kingston	31,912	Landfill leachate wastes
13	Peterborough	24,462	Landfill leachate wastes
14	Kenora	12,289	Other specified inorganics
15	Thunder Bay	8,396	Landfill leachate wastes
16	Sudbury	4,101	Waste oils and lubricants
17	South Porcupine	1,204	Waste oils and lubricants
18	Cornwall	394	Light fuels
19	Owen Sound	137	Light fuels
20	Sault Ste. Marie	108	Oil skimmings and sludges

Figure 13: Percentage of hazardous waste receipts in Ontario by district, 1998

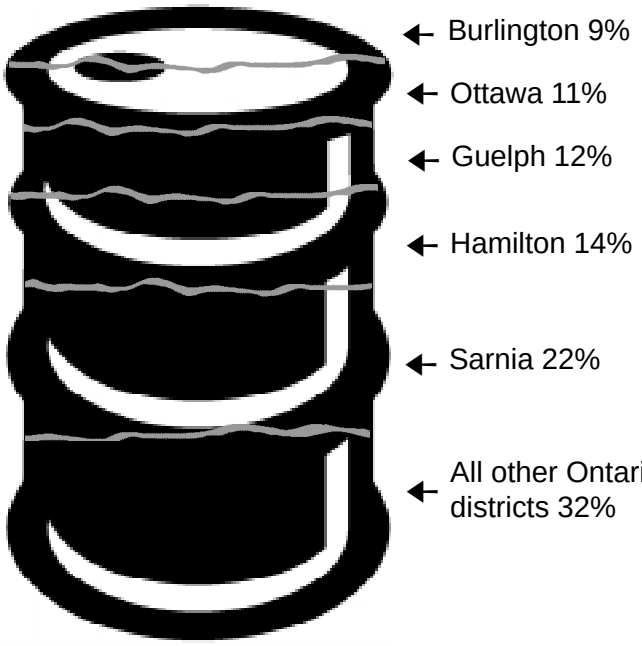


Table 21 shows that receiving sites in Sarnia district received the greatest quantity of hazardous waste in 1998, having received 424,000 tonnes of hazardous waste, representing 22% of hazardous waste receipts (as seen in Figure 13) in the province in 1998. The largest receiver of hazardous waste in the province, the Safety-Kleen facility in Corunna, is located within the Sarnia district. A more detailed description of hazardous waste receipts in the Sarnia district is provided in the following box.

Hazardous Waste District Profile: SARNIA DISTRICT

Location: located in southwestern Ontario, along the St.Clair River

Municipalities: Sarnia district includes the City of Sarnia and surrounding municipalities including Lambton County, Moore Township, Enniskillen Township, and the towns of Corunna, Petrolia, etc.

Hazardous waste receipts in 1998: 424,084 tonnes, which ranks the district as the #1 receiver of hazardous waste in Ontario, receiving 22% of hazardous waste in the Province

Top receiving sites in the district: Sarnia district has three of the top 25 receivers of hazardous waste in the Province, they are:

1) Safety-Kleen Ltd., facility (landfill) located in Lot 9 and Pt. Lot 8, Concession 10 in Moore Township near Corunna
- Received 254,295 tonnes of hazardous waste in 1998
- Ranked #1 of the top receiving sites in Ontario
- Other specified organics is the primary waste type received

2) Safety-Kleen Ltd., facility (incinerator) located in Lot 9, Concession 10 in Moore Township near Corunna
- Received 69,430 tonnes of hazardous waste in 1998
- Ranked #7 of the top 25 receiving sites in Ontario
- Non-halogenated lean organics is the primary waste type received

3) Dow Chemical of Canada Ltd., Scott Road Landfill located in Sarnia
- Received 51,964 tonnes of hazardous waste in 1998
- Ranked #11 of the top 25 receivers in Ontario
- Halogenated solvents is the primary waste type received

Types of hazardous waste received: the top waste types received in the Sarnia district in 1998 are as follows:

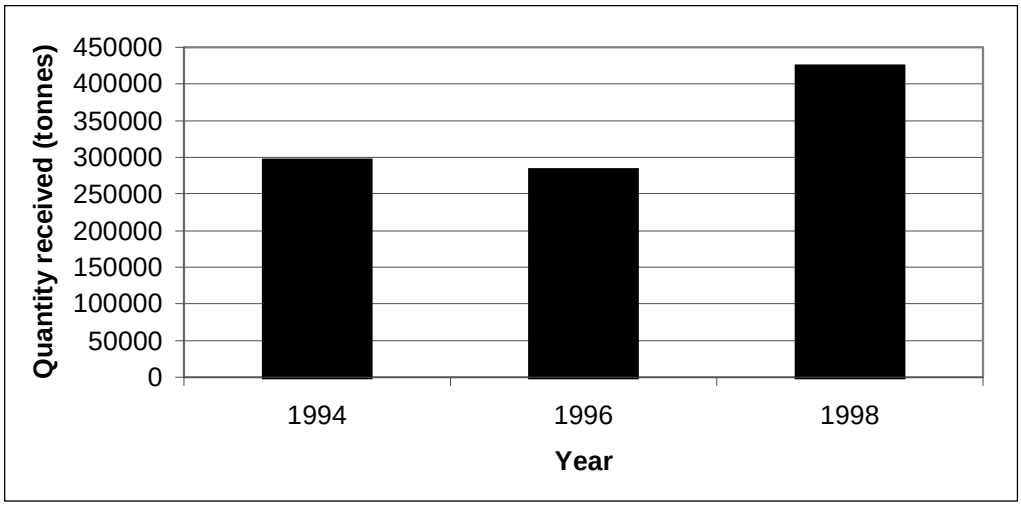
Table 22: Top hazardous waste types received in Sarnia district, 1998

Rank	Waste type	Quantity received (tonnes)
1	Other specified organics	93,958
2	Other specified inorganics	72,053
3	Halogenated solvents	60,214
4	Oil skimmings and sludges	37,684
5	Steel making residues	36,550
6	Aromatic solvents	35,020
7	Non-halogenated lean organics	20,189
8	Neutralized wastes - heavy metals	9,440
9	Transfer station oils wastes	7,026
10	Alkaline wastes - other metals	6,796

Hazardous Waste District Profile: Sarnia District

Hazardous waste receiving trend: from 1994 to 1998, the quantity of hazardous waste received in Sarnia district has increased by 44% from 294,953 tonnes generated in 1994 to 424,084 tonnes in 1998

Figure 14: Hazardous waste receipts in Sarnia District, 1994 to 1998

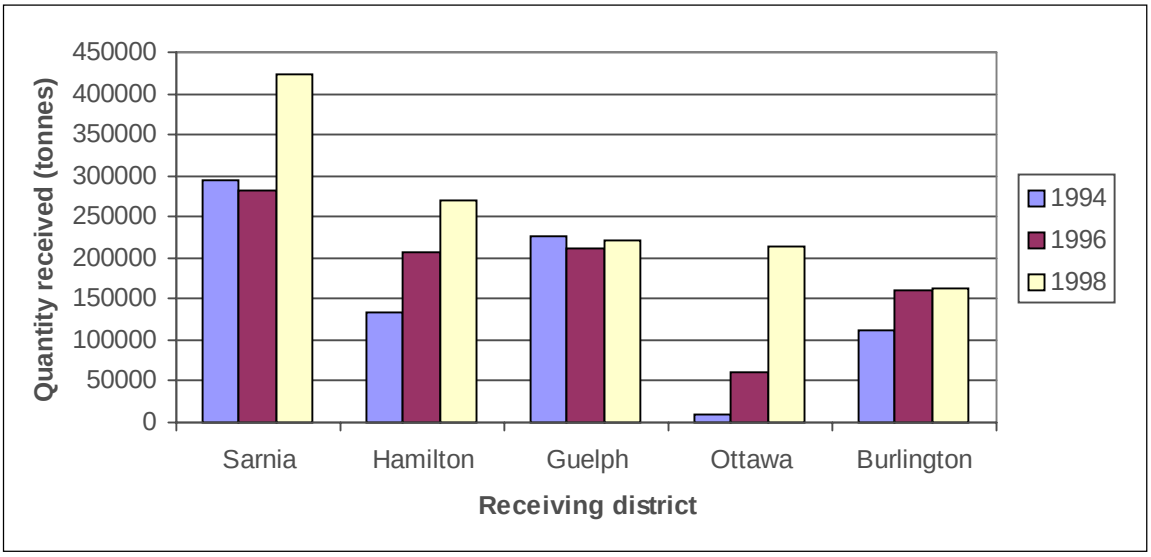


Four of the top five receiving districts in the province have experienced an increase in hazardous waste receipts from 1994 to 1998. This is highlighted in Table 23 and Figure 15. Overall, hazardous waste receipts have increased by 44% to 1927% in these four districts. The greatest increase in waste receipts is in the district of Ottawa, which is primarily due to an increase in landfill leachate received in the district from solid waste landfills. The district of Guelph showed a small decrease in its hazardous waste receipts over this time period.

Table 23: Quantity of waste received in each of the top five 1998 receiving districts, 1994 to 1998

Receiving district	Quantity received in 1998 (tonnes)	Quantity received in 1994 (tonnes)	Quantity change from 1994 to 1998 (tonnes)	Percentage change in receipts from 1994 to 1998
Sarnia	424,084	294,953	+ 129,131	+ 44%
Hamilton	269,901	134,079	+ 135,822	+ 101%
Guelph	221,516	225,306	- 3,790	- 2%
Ottawa	213,865	10,550	+ 203,315	+ 1927%
Burlington	162,454	112,866	+ 49,588	+ 44%

Figure 15: Hazardous waste receipts in the top five receiving districts (for 1998), 1994 to 1998



It is necessary to separate hazardous waste receipts by the types of waste received in each district in order to identify those districts that received primarily landfill leachate wastes and those districts that received all other wastes (from industrial processes and manufacturing). Table 24 and Table 25 present the top receiving districts in Ontario for 1998 of non-leachate and leachate wastes, respectively.

Table 24: Top receiving districts of non-leachate hazardous waste in Ontario, 1998

Rank	Receiving district	Quantity received (tonnes)
1	Sarnia	422,665
2	Guelph	221,436
3	Hamilton	218,449
4	Burlington	105,397
5	St.Catharines	72,836
6	Toronto	50,990
7	London	36,608
8	York and Durham Regions	35,020
9	Windsor	34,567
10	Ottawa	24,286
11	Barrie	20,432
12	Kenora	12,289
13	Peterborough	11,985
14	Sudbury	4,104
15	Kingston	3,152
16	Thunder Bay	2,789
17	South Porcupine	1,204
18	Cornwall	394
19	Owen Sound	137
20	Sault Ste. Marie	108

Similar to hazardous waste generating districts, the top receiving districts of non-leachate wastes are concentrated in south-central (Golden Horseshoe) and southwestern Ontario. The district of Sarnia by far received the greatest quantity of non-leachate wastes. In 1998, Sarnia district received nearly double the amount of non-leachate wastes than the second highest receiving district, Guelph. Again, the districts receiving the greatest quantities of non-leachate hazardous wastes were municipalities with an industrial base that included petrochemical, steel making and automobile manufacturing facilities. In addition, many facilities owned by environmental services (waste management) companies were located in these districts and received primarily non-leachate wastes.

Table 25: Top receiving districts of landfill leachate waste in Ontario, 1998

Rank	Receiving district	Quantity received (tonnes)
1	Ottawa	189,579
2	Windsor	108,108
3	London	64,136
4	Barrie	58,042
5	Burlington	57,057
6	Hamilton	51,452
7	Toronto	42,609
8	Kingston	28,760
9	Peterborough	12,477
10	Thunder Bay	5,607
11	York and Durham Regions	1,767
12	Sarnia	1,419
13	St.Catharines	1,106
14	Guelph	80

The top receiving districts of landfill leachate wastes in the province for 1998 include municipalities with one or more landfill sites. The landfill leachate being produced by these sites is collected and transfered to local water pollution control plants in these districts. Ottawa and Windsor districts received the greatest amounts of landfill leachate wastes in 1998, reflecting the siting of landfill sites in those districts and the receipt of landfill leachate wastes at local WPCPs and hazardous waste handling facilities. For example, Ottawa district contains the Robert O. Pickard Environmental Centre, which is the main waste water treatment plant for the Region of Ottawa-Carlton, received the greatest quantity of leachate wastes in Ontario for 1998.

HAZARDOUS WASTE TYPES RECEIVED IN ONTARIO

In 1998, Ontario received all of the 52 hazardous waste types categorized in the hazardous waste manifest database. Table 26 lists the top 25 waste types received by receiving sites in the province during 1998. Figure 16 highlights each waste type as a percentage of the total hazardous waste quantity received by receiving sites in Ontario for 1998.

Table 26: Top 25 waste types received in Ontario, 1998

Rank	Waste type	Quantity received (tonnes)	Percentage of total hazardous waste received in 1998
1	Landfill leachate wastes	622,199	32.7%
2	Transfer station oils wastes	197,122	10.4%
3	Other specified inorganics	129,585	6.8%
4	Oil skimmings and sludges	114,264	6.0%
5	Other specified organics	100,086	5.3%
6	Steel making residues	98,742	5.2%
7	Halogenated solvents	78,718	4.1%
8	Emulsified oils	68,656	3.6%
9	Waste oils and lubricants	67,822	3.6%
10	Alkaline wastes - other metals	56,394	3.0%
11	Aromatic solvents	55,576	2.9%
12	Paint, pigment and coating residues	37,408	2.0%
13	Spent pickle liquor	30,392	1.6%
14	Aliphatic solvents	28,162	1.5%
15	Neutralized wastes - heavy metals	22,217	1.2%
16	Non-halogenated lean organics	22,118	1.2%
17	Alkaline phosphates	15,959	0.8%
18	Alkaline wastes - heavy metals	14,997	0.8%
19	Acid wastes - heavy metals	13,475	0.7%
20	Neutralized wastes - other metals	11,110	0.6%
21	Light fuels	11,045	0.6%
22	Non-halogenated rich organics	10,435	0.5%
23	Heavy fuels	8,372	0.4%
24	Organic laboratory chemicals	8,066	0.4%
25	Petroleum distillates	7,379	0.4%

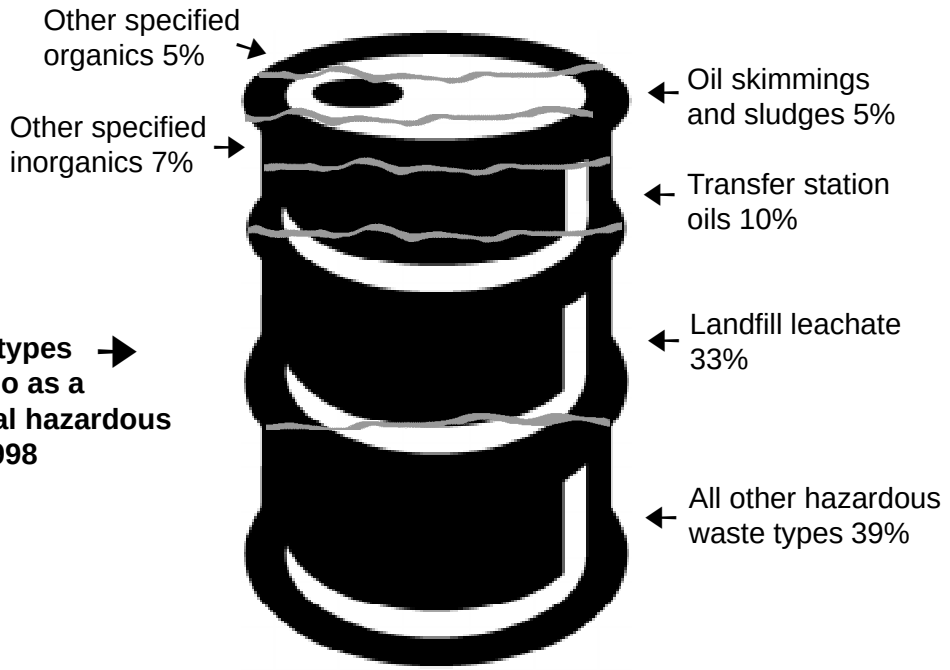


Figure 16: Waste types received in Ontario as a percentage of total hazardous waste receipts, 1998

As seen in Table 26 and Figure 16, landfill leachate wastes made up the largest percentage (33%) of hazardous wastes received at Ontario receiving sites in 1998. Transfer station oil wastes, other specified inorganics, and oil skimmings and sludges made up another 22% of hazardous waste receipts. These waste types reflect hazardous waste transfers from solid waste landfills, electrical transfer stations, and manufacturers that utilize petrochemicals and inorganics.

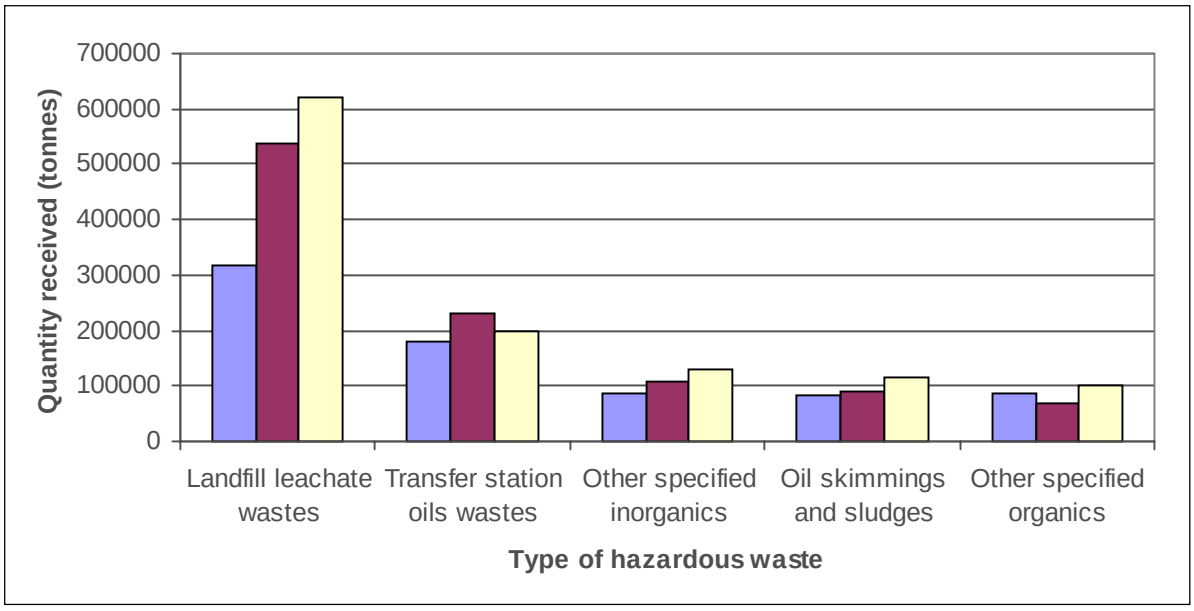
Other specified inorganic wastes include flue gas scrubber wastes, wet fly ash, metal dust and abrasives wastes amongst others. Other specified organic wastes include mixed sludges from waste screening, tank bottoms from mixed organic waste bilking tanks at waste transfer stations, etc. Each waste type is described in further detail in Appendix B.

From 1994 to 1998, the quantities of the most received waste types in the province have increased. Table 27 presents the 1994 and 1998 quantities received for the top five waste types (received in 1998). As demonstrated in Table 27 and Figure 17, quantities of landfill leachates being received at receiving sites in Ontario have nearly doubled from 1994 levels.

Table 27: Quantity of waste received for the top five 1998 received waste types, 1994 to 1998

Waste type	Quantity received in 1998 (tonnes)	Quantity received in 1994 (tonnes)	Quantity change from 1994 to 1998 (tonnes)	Percentage change in quantity received 1994 to 1998
Landfill leachate wastes	622,199	315,743	+ 306,456	+ 97%
Transfer station oils wastes	197,122	180,856	+ 16,266	+ 9%
Other specified inorganics	129,585	87,931	+ 41,654	+ 47%
Oil skimmings and sludges	114,264	84,187	+ 30,077	+ 36%
Other specified organics	100,086	85,559	+ 14,527	+ 17%

Figure 17: Quantity of waste received for the top five 1998 received waste types, 1994 to 1998



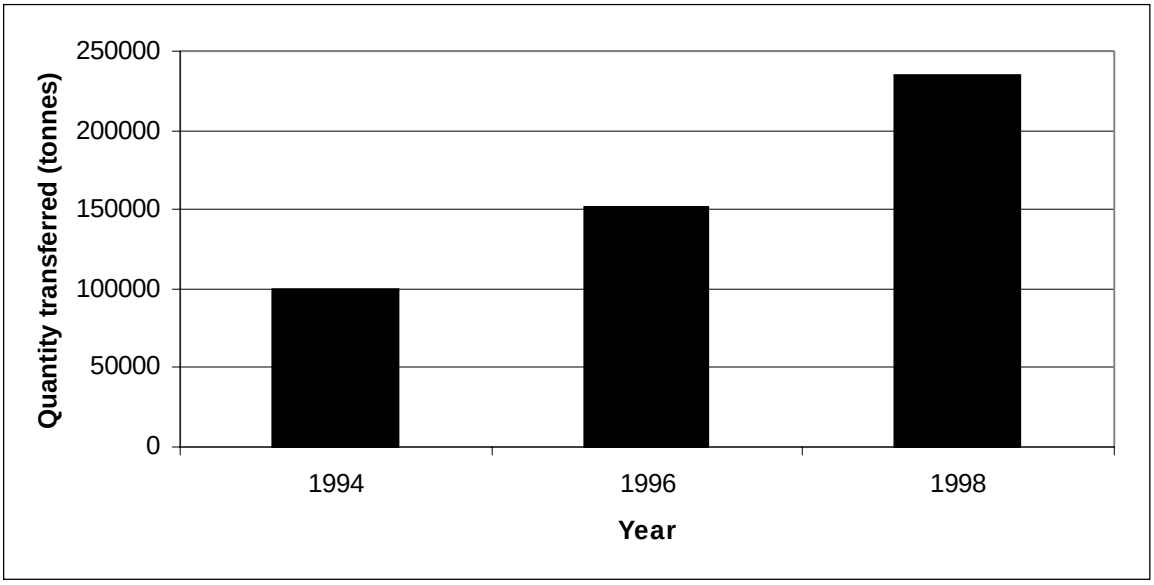
SECTION IV: U.S. HAZARDOUS WASTE TRANSFERS TO ONTARIO RECEIVING SITES, 1994 TO 1998

In 1998, 235,495 tonnes of hazardous waste was transferred from U.S. generating sites to receiving sites in Ontario, accounting for 12.4% of hazardous waste transferred to receiving sites in the province. Since 1994, the amount of waste exported from the U.S. to Ontario has increased from 99,972 tonnes to 235,495 tonnes, an increase of 135,523 tonnes or 135.6% over four years. This increase is highlighted in Table 28 and Figure 18.

Table 28: Quantity of U.S. hazardous waste transferred to Ontario receiving sites, 1994 to 1998

Year	Quantity of U.S. waste transferred (tonnes)	Percentage change from 1994
1998	235,495	+ 135.6%
1996	152,306	+ 52.3%
1994	99,972	-

Figure 18: Quantity of U.S. hazardous waste transferred to Ontario receiving sites, 1994 to 1998



U.S. GENERATING SITES THAT TRANSFER HAZARDOUS WASTE TO RECEIVING SITES IN ONTARIO

Through the data provided in the Ontario Hazardous Waste Manifest, it is possible to identify which generating sites in the United States transferred hazardous waste to Ontario receiving sites in 1998.

Table 29 presents the top 25 U.S. generating sites that transferred hazardous waste to Ontario in 1998. Most of the U.S. hazardous waste transferred to Ontario sites in 1998 came from generating sites in the northeastern and midwestern U.S. states. Ontario received hazardous waste from numerous U.S. generating sites and in generally small quantities from each site. While many U.S. sites transferred hazardous waste to Ontario sites in 1998, one U.S. company stood out as a key exporter to Ontario, Safety-Kleen Systems Inc. In 1998, eight of the top 25 U.S. generating sites that transferred hazardous waste to Ontario sites were owned by Safety-Kleen.

Table 29: Top 25 U.S. generating sites that transferred hazardous waste to Ontario sites, 1998

Rank	Generator	Generating site	City	Quantity transferred (tonnes)
1	Safety-Kleen Systems Inc.	60 Katherine St.	Buffalo, NY	31,678
2	Dynecol Inc.	6520 Georgia St.	Detroit, MI	30,808
3	LWD Inc.	2475 Industrial Parkway	Calvert City, KY	9,958
4	Dow Agrosciences Inc.	305 N. Huron Ave.	Harbor Beach, MI	9,360
5	Lomac LLC	5025 Evanston Ave.	Muskegon, MI	8,608
6	Safety-Kleen Inc. (Bridgeport)	Route 322 and I-295	Bridgeport, NJ	8,505
7	Cyanokem Inc.	12381 Schaefer Highway	Detroit, MI	8,378
8	Michigan Recovery Systems Inc.	36345 Van Born Rd.	Romulus, MI	7,335
9	Chevron Products Co.	Route 128 & US Bypass 50	Hooven, OH	6,597
10	Brodson Properties	Taylortown Road	Montville, NJ	6,422
11	Ross Incineration Services Inc.	36790 Giles Road	Grafton, OH	5,337
12	Safety-Kleen Inc. (Pecatonica)	6125 North Pecatonica Rd.	Pecatonica, IL	5,023
13	Zinc Corporation of America	Route 248	Monaca, PA	4,469
14	BP Oil Company	4001 Cedar Point Rd.	Oregon, OH	3,983
15	Ford Motor Company	Rouge Steel Co.	Dearborn, MI	3,756
16	Petro-chem Processing Group	421 Lycaste	Detroit, MI	3,654
17	Michigan Disposal	49350 N. I-94	Belleville, MI	3,143
18	Mobil Oil Corporation	East Providence Terminal 1001	Riverside, RI	3,095
19	Bethlehem Steel Corp.	2558 Hamburg Turnpike	Lackawanna, NY	2,883
20	Century Aluminum of West Virginia Inc.	Kaiser Road	Ravenswood, WV	2,686
21	Safety-Kleen Inc. (NE)	300 Canal St.	Lawrence, MA	2,460
22	Safety-Kleen Systems Inc.	751 Orchard Lake Rd.	Pontiac, MI	2,420
23	Safety-Kleen Systems inc.	10480 Harrison Rd.	Romulus, MI	2,297
24	Safety-Kleen Systems Inc.	10 Industrial Park Dr.	Wheeling, WV	2,228
25	Safety-Kleen Inc. (TS)	2815 Old Greenbrier Pike	Greenbrier, TN	2,219

All of the U.S. generating sources identified in Table 29 transferred non-leachate hazardous waste to receiving sites in Ontario in 1998. Only one U.S. generator, CWM Chemical Services Inc. located in Model City, NY transferred landfill leachate wastes to Ontario in 1998. In total, only 20 tonnes of landfill leachate wastes were received in Ontario from U.S. generating sites.

U.S. GENERATING DISTRICTS THAT TRANSFER HAZARDOUS WASTE TO ONTARIO RECEIVING SITES

Table 30 presents the top U.S. generating districts that transferred hazardous waste to receiving sites in Ontario in 1998. The quantity transferred for each district is the aggregate value for all U.S. generating sites within the district that transferred hazardous waste to receiving sites in Ontario.

Table 30: Top U.S. generating districts that transferred hazardous waste to Ontario sites, 1998

Rank	Generating district	Quantity transferred (tonnes)
1	Michigan	87,492
2	New York	36,888
3	Ohio	32,629
4	New Jersey	19,941
5	Pennsylvania	14,869
6	Kentucky	12,453
7	Illinois	5,395
8	West Virginia	4,914
9	Tennessee	3,333
10	Rhode Island	3,192
11	Massachusetts	2,817
12	Maryland	2,006
13	North Carolina	1,961
14	South Carolina	1,806
15	Kansas	1,616
16	Indiana	1,600
17	Florida	668
18	Texas	327
19	California	303
20	Missouri	127
21	Maine	112
22	Utah	40
23	Wisconsin	31

Table 30 illustrates that Michigan (generating sites) transferred the greatest quantities of hazardous waste to Ontario receiving sites in 1998. The 87,492 tonnes of hazardous waste transferred to Ontario from Michigan generating sites accounts for 37.1% of all waste transferred to Ontario sites from the U.S. Most of U.S. generating districts that transferred hazardous waste in the greatest quantities to Ontario in 1998 were located in the U.S. midwest bordering the Great Lakes, and in the eastern U.S.

ONTARIO RECEIVING SITES OF U.S. HAZARDOUS WASTE TRANSFERS

In addition to identifying the U.S. generators of hazardous waste transferred to Ontario, it is also useful to identify the Ontario sites that received these U.S. hazardous waste transfers. Table 31 presents the top 25 Ontario receiving sites of U.S. hazardous waste transfers in 1998.

Table 31: Top 25 Ontario receiving sites of U.S. hazardous waste transfers, 1998

Rank	Receiver	Receiving site	City	Quantity received (tonnes)
1	Safety-Kleen Ltd.	Lot 9 & Pt. Lot 8, Concession 10 (Landfill)	Corunna	120,934
2	Safety-Kleen Canada Inc.	300 Woolwich St. South	Breslau	49,831
3	Safety-Kleen Ltd.	Lot 9, Concession 10 (Incinerator)	Corunna	32,978
4	Philip Environmental Services Corp.	800 Parkdale Ave.	Hamilton	7,464
5	Dofasco Inc.	1330 Burlington St. East	Hamilton	6,030
6	Safety-Kleen Ltd.	1829 Allanport Rd.	Thorold	3,886
7	Safety-Kleen Ltd.	Part Lot 1, Concession A	Middlesex County (London)	3,241
8	Safety-Kleen Ltd.	551 Avonhead Rd.	Mississauga	2,870
9	Safety-Kleen Ltd.	5369 Maingate Dr.	Mississauga	2,263
10	Canadian National Railways	Intermodal Cargoflo, Pt. Lot 13, Concession 4	Vaughan	2,115
11	Hotz Environmental Services Inc.	239 Lottridge St.	Hamilton	866
12	Philip Enterprises Inc.	E1/2 Lot 14, Concession 5	Township of Springwater (Barrie)	787
13	Safety-Kleen Canada Inc.	65 Woolwich St.	Breslau	464
14	Dofasco Inc.	1330 Burlington St. E., #2 A.R.P.	Hamilton	413
15	Raw Materials Corp.	Pt. O Lot 28, Concession 3	Port Colborne	384
16	Philip Enterprises Inc.	Lot 6, Concession 5	Fort Erie	236
17	Quantex Technologies Inc.	260 Shoemaker St.	Kitchener	176
18	Philip Enterprises Inc.	1579 Burlington St. E.	Hamilton	157
19	Stelco Hilton Works East Lagoon	-	Hamilton	150
20	Fielding Chemical Technologies Inc.	3549 Mavis Road	Mississauga	101

Table 31: Top 25 Ontario receiving sites of U.S. hazardous waste transfers, 1998 *(continued)*

Rank	Receiver	Receiving site	City	Quantity received (tonnes)
21	1210825 Ontario Ltd.	29 Trillium Park Place	Kitchener	46
22	Philip Enterprises Inc.	4505 Fourth St.	Windsor	29
23	City of Stratford	Stratford WPCP	Stratford	23
24	City of Toronto	Main Plant WPCP	Toronto	23
25	Hotz Environmental Services Inc.	239 Lottridge St.	Hamilton	13

All but 20 tonnes of the hazardous waste transferred to Ontario receiving sites from U.S. generating sites in 1998 was non-leachate hazardous waste. As highlighted in Table 31, the main receiver of U.S. hazardous waste in Ontario is Safety-Kleen Ltd./Safety-Kleen Canada Inc. Safety-Kleen facilities in Ontario received 216,448 tonnes of U.S. hazardous waste in 1998, which accounts for approximately 92% of all hazardous waste transferred to receiving sites in the province from U.S. generating sites.

Various types of facilities in Ontario received U.S. hazardous waste transfers in 1998. Table 32 and Figure 19 present the quantities of U.S. hazardous waste received by various types of facilities in Ontario for 1998.

Table 32: Quantities of U.S. hazardous waste received in Ontario by facility type, 1998

Facility type	Quantity of U.S. hazardous waste received (tonnes)	Percentage of U.S. hazardous waste received in Ontario
Landfill	120,934	51.3%
Reclaim	49,831	21.2%
Incineration	32,978	14.0%
Transfer station	17,818	7.6%
Transfer station - processing	13,737	5.8%
Water pollution control plant	196	0.1%

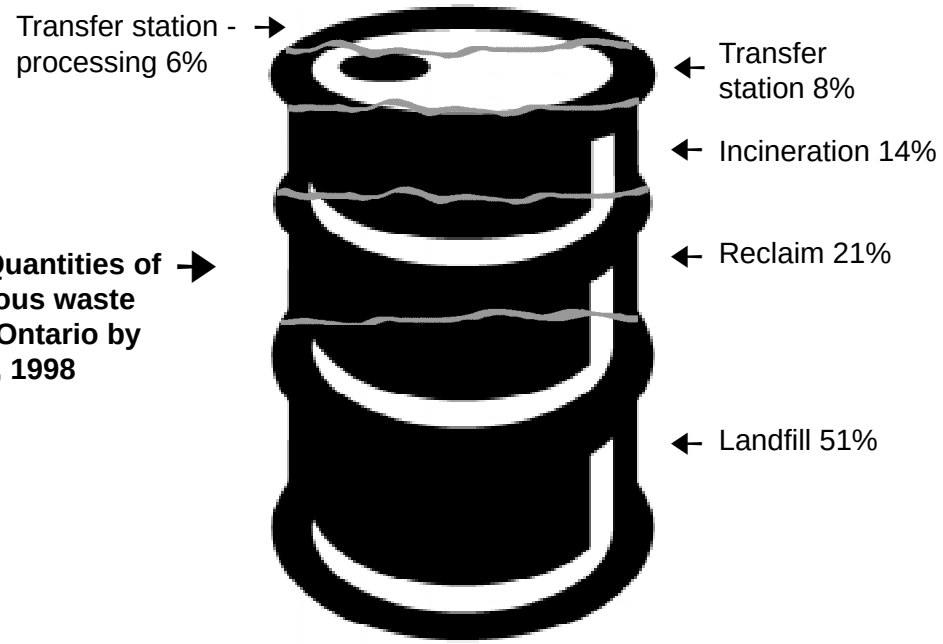


Figure 19: Quantities of U.S. hazardous waste received in Ontario by facility type, 1998

Table 32 and Figure 19 illustrate that just over half of U.S. hazardous waste transferred to Ontario receiving sites was received by landfill sites in 1998, while 21% was reclaimed, and 14% was incinerated in the province.

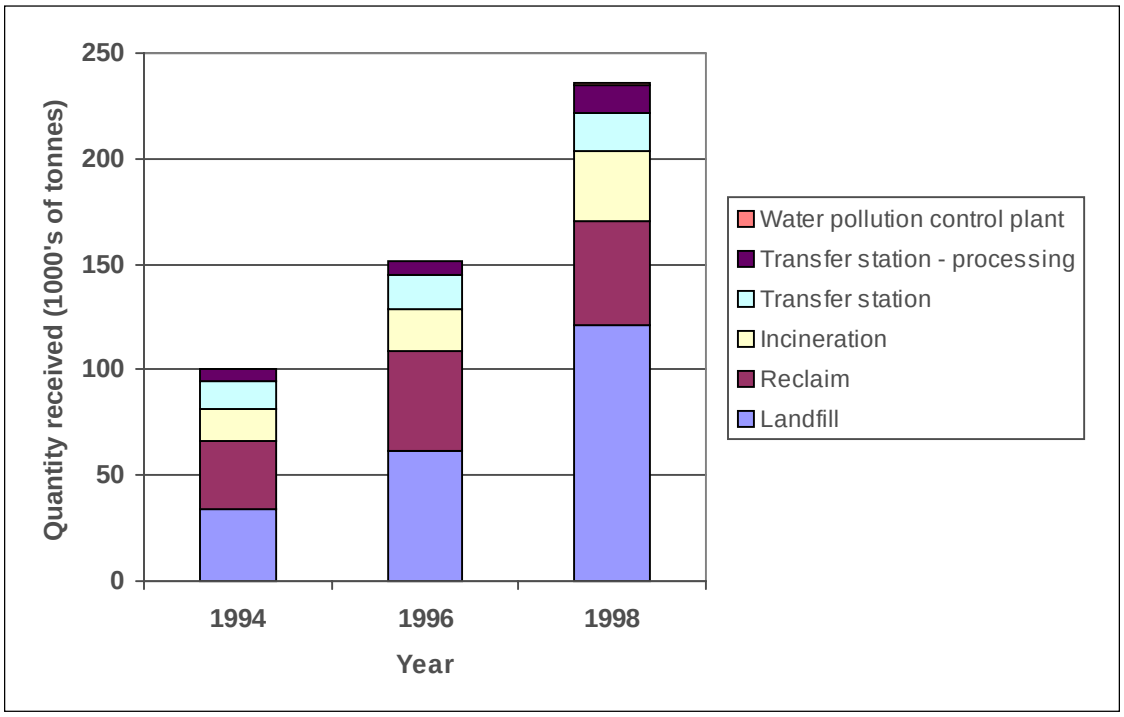
From 1994 to 1998, the quantities of U.S. hazardous waste received by various facilities across the province have changed. Table 33 and Figure 20 highlight the changes in the amounts of U.S. hazardous waste received by these facilities from 1994 to 1998.

Table 33: Quantity of U.S. hazardous waste received in Ontario by facility type, 1994 to 1998

Facility type	Quantity received in 1998 (tonnes)	Quantity received in 1994 (tonnes)	Quantity change from 1994 to 1994 (tonnes)	Percentage change from 1994 to 1998
Landfill	120,934	33,690	+ 87,244	+ 257%
Reclaim	49,831	32,407	+ 17,424	+ 54%
Incineration	32,978	15,491	+ 17,487	+ 113%
Transfer station	17,818	12,395	+ 5,423	+ 44%
Transfer station - processing	13,737	5,990	+ 7,747	+ 129%
Water pollution control plant	196	0	+ 196	-

The increasing quantities of hazardous waste being transferred from U.S. generating sites are being received in all of the facilities listed in Table 33 in increasing amounts. Landfills in the province have received most of the increased U.S. hazardous waste transfers in terms of quantity. Landfills received 87,244 more tonnes of U.S. hazardous waste in 1998 than in 1994, which represents a 257% increase. These trends in hazardous waste receipts by facility types in Ontario are further highlighted in Figure 20.

Figure 20: Trends in U.S. hazardous waste receipts by facilities in Ontario, 1994 to 1998



ONTARIO DISTRICTS THAT RECEIVE U.S. HAZARDOUS WASTE TRANSFERS

In 1998, ten districts in Ontario received hazardous waste generated in the United States. Of these ten districts, Sarnia district (i.e. receiving sites in the Sarnia district) received the greatest quantity of U.S. hazardous waste, having received 153,912 tonnes of U.S. hazardous waste in 1998, which accounts for 65.3% of U.S. hazardous waste transfers to Ontario receiving sites. Table 34 and Figure 21 present the quantity of U.S. hazardous waste received by Ontario districts and the corresponding percentage.

Table 34: U.S. hazardous waste received in Ontario by district, 1998

Rank	Receiving district	Quantity received (tonnes)	Percentage of U.S. hazardous waste received in Ontario
1	Sarnia	153,912	65.3%
2	Guelph	50,517	21.4%
3	Hamilton	15,094	6.4%
4	Burlington	5,236	2.2%
5	St.Catharines	4,507	1.9%
6	London	3,264	1.4%
7	York and Durham Regions	2,215	0.9%
8	Barrie	787	0.3%
9	Windsor	29	< 0.1%
10	Toronto	23	< 0.1%

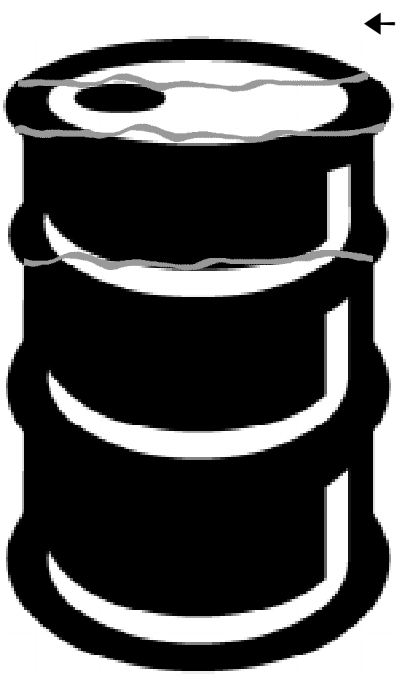


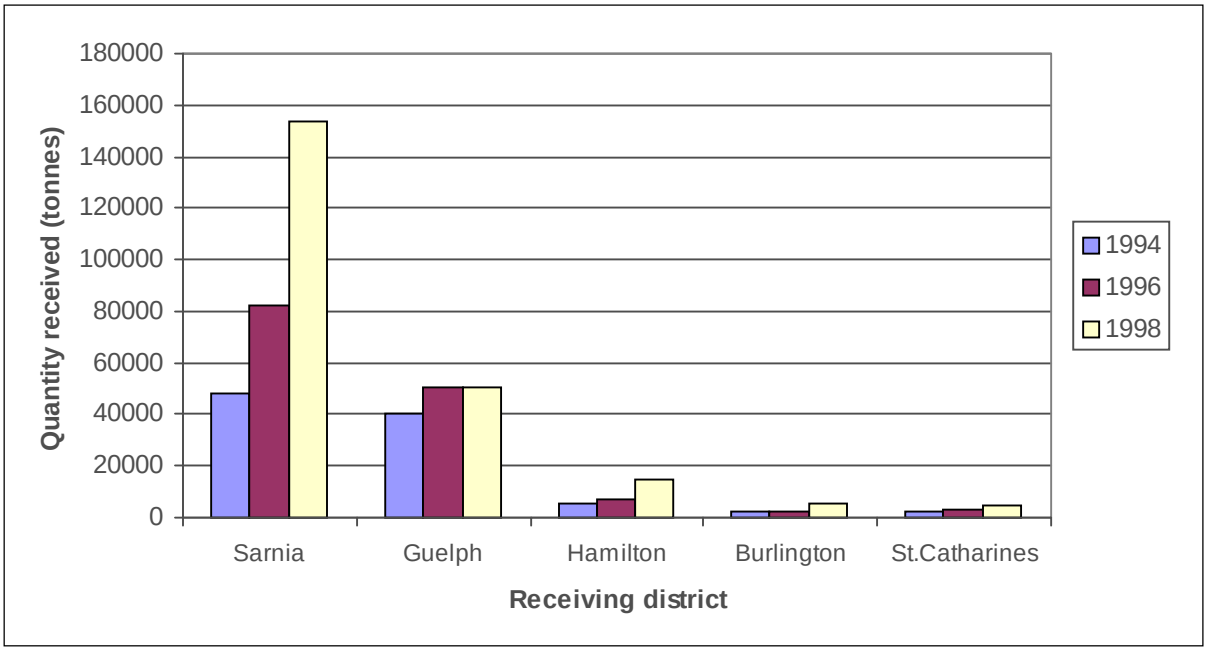
Figure 21: Percentage of U.S. hazardous waste received by Ontario districts, 1998

All of the top five Ontario receiving districts (of U.S. hazardous waste) have experienced an increase in U.S. hazardous waste receipts from 1994 to 1998. This is highlighted in Table 35 and Figure 22. Overall, hazardous waste receipts have increased by 26% to 220% in these five districts. The greatest increase in U.S. waste receipts is in the district of Sarnia, which received 105,869 more tonnes of U.S. hazardous waste in 1998 than in 1994, and which represents a 220% increase over four years. While quantity increases were not as significant in the other four districts, three of these districts have experienced a significant increase in U.S. hazardous waste receipts on a percentage basis. These three districts, Hamilton, Burlington and St.Catharines had at least a two-fold increase in the amount of U.S. hazardous waste received from 1994 to 1998.

Table 35: Quantity of U.S. waste received in each of the top five 1998 Ontario receiving districts (of U.S. hazardous waste), 1994 to 1998

Receiving district	Quantity received in 1998 (tonnes)	Quantity received in 1994 (tonnes)	Quantity change in U.S. waste receipts from 1994 to 1998	Percentage change in U.S. waste receipts from 1994 to 1998
Sarnia	153,912	48,043	105,869	+ 220%
Guelph	50,517	40,141	10,376	+ 26%
Hamilton	15,094	5,531	9,563	+ 173%
Burlington	5,236	2,062	3,174	+ 154%
St.Catharines	4,507	1,990	2,517	+ 126%

Figure 22: U.S. hazardous waste receipts in the top five Ontario receiving districts (of U.S. hazardous waste), 1994 to 1998



U.S GENERATED WASTE TYPES RECEIVED IN ONTARIO

In 1998, 41 of the 52 hazardous waste types categorized in the Hazardous Waste Manifest database were received in Ontario from U.S. generators. Table 36 lists the top 25 (by quantity received) waste types received in the province from U.S. generating sites during 1998. Figure 23 highlights each waste type as a percentage of the total hazardous waste quantity received in Ontario from U.S. sites in 1998.

Table 36: Top 25 waste types received in Ontario from U.S. generating sites, 1998

Rank	Waste type	Quantity received (tonnes)	Percentage of total U.S. hazardous waste received in 1998
1	Other specified inorganics	56,782	24.1%
2	Transfer station oils wastes	48,460	20.6%
3	Other specified organics	32,489	13.8%
4	Oil skimmings and sludges	24,775	10.5%
5	Aromatic solvents	20,187	8.6%
6	Non-halogenated lean organics	11,648	4.9%
7	Halogenated solvents	11,260	4.8%
8	Spent pickle liquor	6,710	2.8%
9	Paint, pigment and coating residues	3,920	1.7%
10	Aliphatic solvents	2,945	1.2%
11	Waste oils and lubricants	2,650	1.1%
12	Halogenated pesticides	2,312	1.0%
13	Neutralized wastes - heavy metals	1,999	0.8%
14	Emulsified oils	1,524	0.6%
15	Organic laboratory chemicals	1,376	0.6%
16	Phenolic wastes	1,120	0.5%
17	Acid waste - heavy metals	808	0.3%
18	Inorganic laboratory chemicals	769	0.3%
19	Heavy fuels	727	0.3%
20	Alkaline wastes - heavy metals	416	0.2%
21	Amines	395	0.2%
22	Non-halogenated rich organics	343	0.1%
23	Alkaline wastes - other metals	223	< 0.1%
24	Other polymeric wastes	175	< 0.1%
25	Latex washes	118	< 0.1%

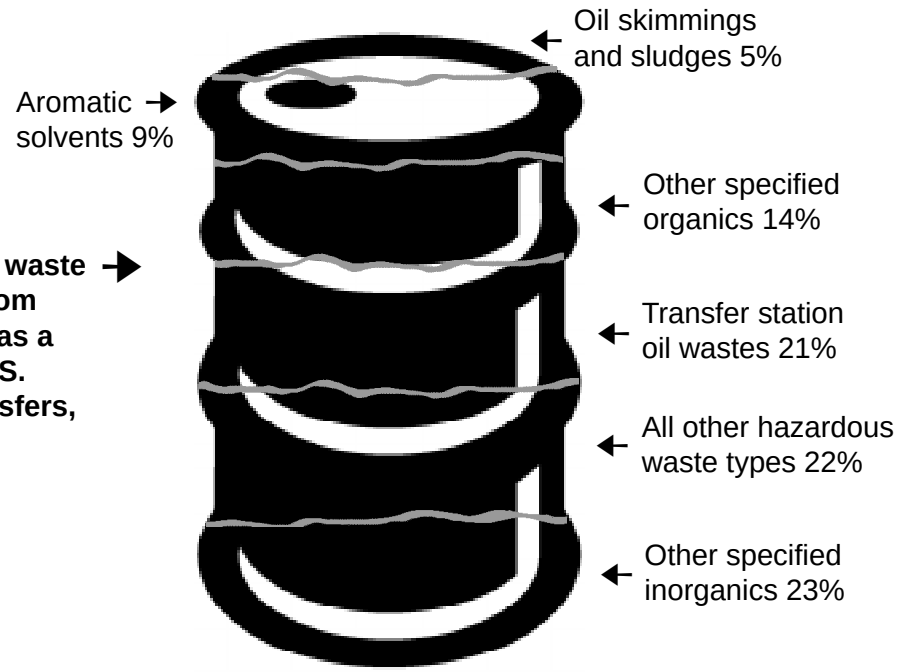


Figure 23: Hazardous waste received in Ontario from U.S. generating sites as a percentage of total U.S. hazardous waste transfers, 1998

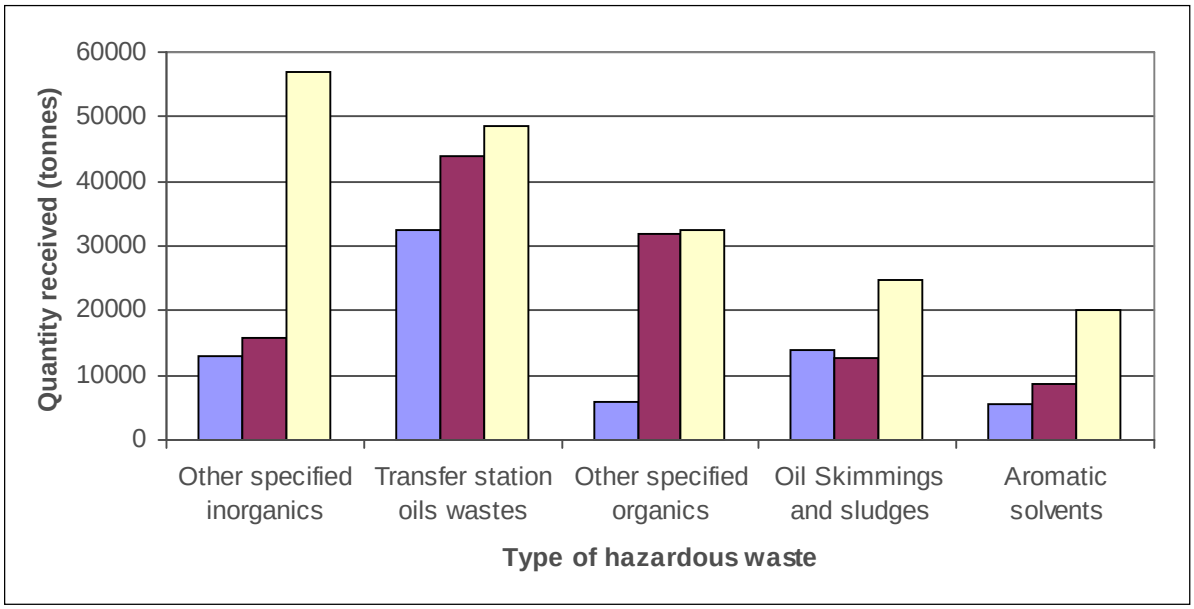
As seen in Table 36 and Figure 23, inorganic wastes made up the largest percentage (23%) of U.S. hazardous wastes transferred to Ontario receiving sites in 1998. Transfer station oils wastes, other specified organics, and oil skimmings and sludges made up another 40% of hazardous waste receipts.

Table 37 presents the 1994 and 1998 quantities received in Ontario for the top five waste types received (from U.S. generating sites in 1998). As shown in Table 37, receipts of organic and inorganic wastes have increased by 460% and 333% respectively. All of the top five waste types received in Ontario from U.S. sites showed increases from 1994 to 1998.

Table 37: Quantity of hazardous waste received in Ontario from U.S. generating sites for the top five 1998 received waste types, 1994 to 1998

Waste type	Quantity received in 1998 (tonnes)	Quantity received in 1994 (tonnes)	Change in quantity received (tonnes)	Percentage change in quantity received from 1994 to 1998
Other specified inorganics	56,782	13,104	+ 43,678	+ 333%
Transfer station oils wastes	48,460	32,323	+ 16,137	+ 50%
Other specified organics	32,489	5,805	+ 26,684	+ 460%
Oil skimmings and sludges	24,775	13,952	+ 10,823	+ 78%
Aromatic solvents	20,187	5,530	+ 14,657	+ 265%

Figure 24: Quantity of hazardous waste received in Ontario from U.S. generating sites for the top five 1998 received waste types, 1994 to 1998



SECTION V: ANALYSIS OF HAZARDOUS WASTE GENERATION AND RECEIPTS IN ONTARIO FROM 1994 TO 1998

The data from the Hazardous Waste Manifest clearly demonstrates the trend of increasing hazardous waste generation and transfers to receiving sites in the province of Ontario from 1994 to 1998. In this four-year period, hazardous waste generation in the province has increased by 42%, while transfers to receiving sites have increased by 48%. This represents an average annual increase in hazardous waste generation and receipts of 10% and 12% (respectively) for the 1994 to 1998 time period.

THE GROWTH IN HAZARDOUS WASTE GENERATION IN ONTARIO

In order to understand why hazardous waste generation in the province has increased from 1994 to 1998, it is important to examine where this growth has occurred in terms of waste type and generating district.

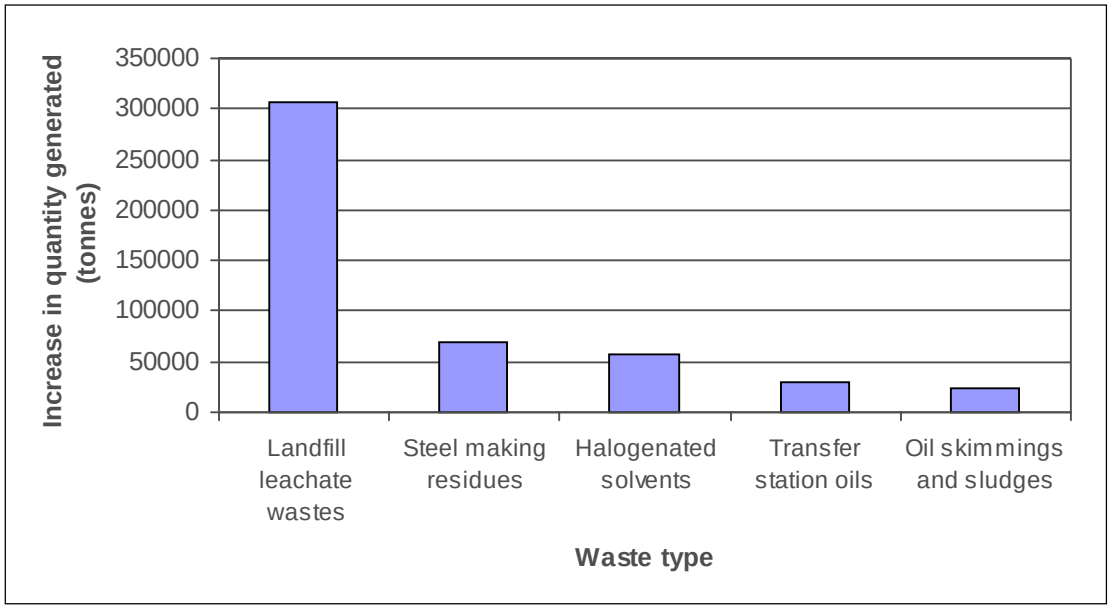
From 1994 to 1998, hazardous waste generation[16] in Ontario increased by 535,911 tonnes or 42%. The rate of growth in hazardous waste generation in the province is roughly three times the growth rate in the Gross Domestic Product (GDP). The majority of this increased generation was due to a significant increase in landfill leachate wastes generated in the province. During this period, landfill leachate waste generation increased by 306,436 tonnes. Table 38 and Figure 25 present the hazardous waste types that experienced the most significant increases in quantity generated from 1994 to 1998.

The significant contribution of municipally and privately owned landfill sites to hazardous waste generation in the province from 1994 to 1998 cannot be understated. Many of these landfills are active, while others are closed but continue to produce leachate wastes. It is anticipated that landfill leachate wastes generated in the province will continue to increase due to the long-term leachate generation of existing sites, and the approval of new landfill sites and landfill expansions within the past five years in the province.

Table 38: Top ten hazardous waste types with the greatest increase in quantity generated, 1994 to 1998

Rank	Waste type	Increase in quantity generated from 1994 to 1998 (tonnes)
1	Landfill leachate wastes	306,436
2	Steel making residues	69,941
3	Halogenated solvents	56,824
4	Transfer station oils	30,321
5	Oil skimmings and sludges	23,348
6	Acid waste - heavy metals	16,814
7	Inert inorganic wastes	16,027
8	Alkaline wastes - other metals	15,742
9	PCBs	13,639
10	Alkaline phosphates	13,386

Figure 25: Top five hazardous waste types with the greatest increase in quantity generated, 1994 to 1998



In addition to the increase in landfill leachate wastes, non-leachate wastes such as steel making residues, halogenated solvents, transfer station oils and oil skimmings, etc. increased by 229,475 tonnes from 1994 to 1998. The increase in various types of metal and chemical wastes highlights the increasing contribution of the steel, automobile and chemical sectors to hazardous waste generation in the province.

While hazardous waste generation has increased throughout the province between 1994 and 1998, the increase has varied amongst the various generating districts. Table 39 and Figure 26 present the generating districts with the greatest growth in hazardous waste generation from 1994 to 1998. Ottawa and Hamilton districts have experienced the greatest increase in hazardous waste generation in Ontario over the four-year period. Ottawa's increase in hazardous waste generation can be attributed to the growth in landfill leachate waste generation in the district, while Hamilton's increase reflects the growth in both landfill and non-landfill hazardous waste generation. Some districts in the province experienced decreases in hazardous waste generation including Guelph (decrease of 38,771 tonnes), Sarnia (decrease of 17,907 tonnes), City of Toronto[17] (decrease of 2,799 tonnes) and Kingston (decrease of 1,880 tonnes).

Table 39: Top ten generating districts in Ontario with the greatest increase in hazardous waste quantity generated, 1994 to 1998

Rank	Generating district	Increase in quantity generated from 1994 to 1998 (tonnes)
1	Ottawa	205,227
2	Hamilton	182,266
3	Burlington	64,056
4	Barrie	36,281
5	York and Durham Regions	30,474
6	St.Catharines	29,888
7	Cornwall	18,246
8	Windsor	15,919
9	London	15,413
10	Peterborough	7,254

Figure 26: Top five generating districts in Ontario with the greatest increase in hazardous waste quantity generated, 1994 to 1998

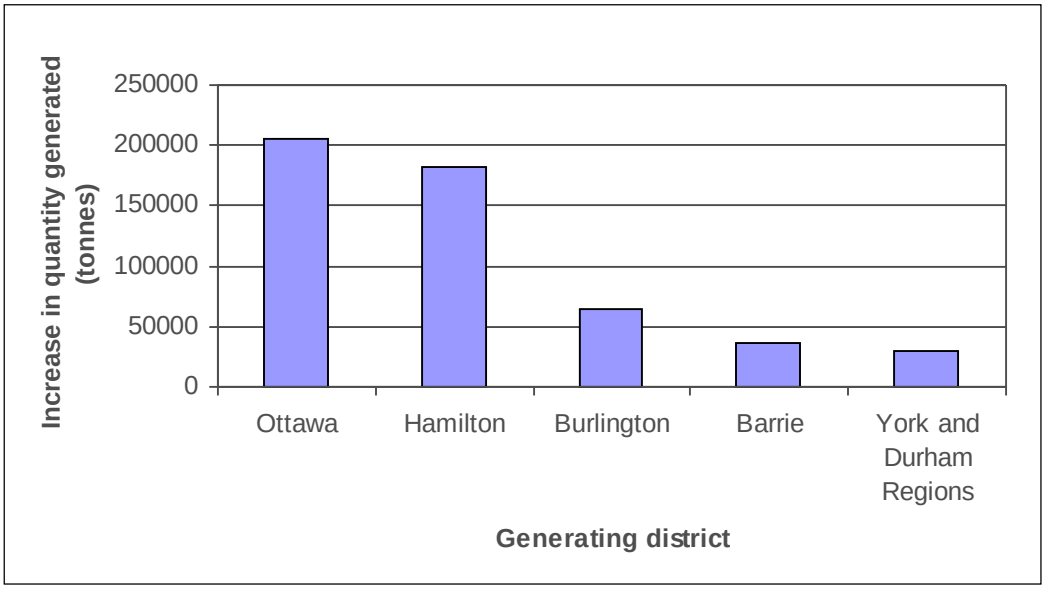


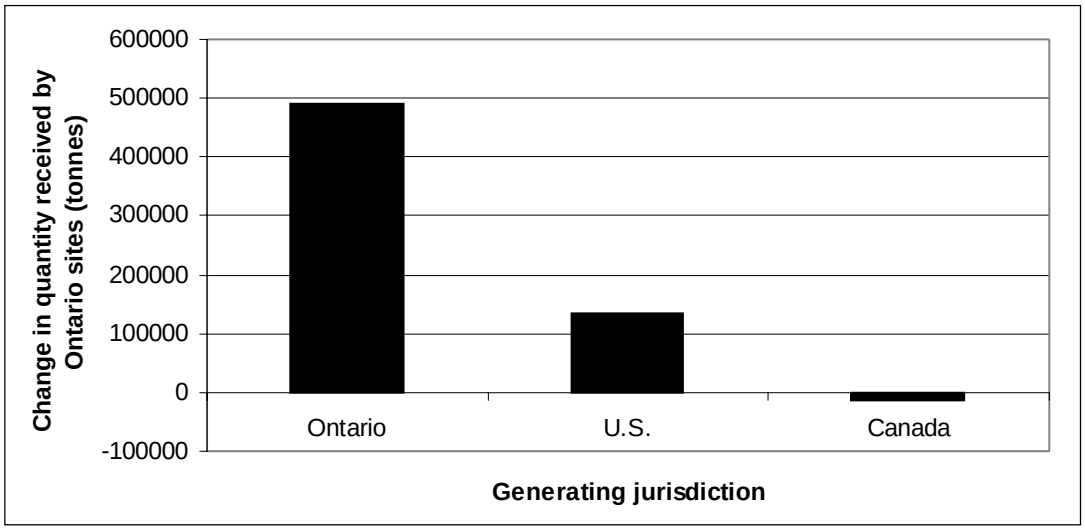
Table 39 and Figure 26 indicate that the growth in hazardous waste generation is concentrated in southern Ontario, specifically the Greater Toronto Area (not including the City of Toronto), which includes the Regions of York, Durham, Peel and Halton, and the Golden Horseshoe. Each of the generating districts having experienced major growth had one or more landfill sites within the top 25 generators of hazardous waste, and some districts such as Hamilton had several of the top generators of non-landfill leachate wastes.

THE GROWTH IN HAZARDOUS WASTE TRANSFERS TO RECEIVING SITES IN ONTARIO

The growth in hazardous waste transfers to receiving sites in Ontario from 1994 to 1998 has outpaced the growth of hazardous waste generation by generating sites in the province. From 1994 to 1998, hazardous waste receipts in Ontario increased by 614,298 tonnes or 48%.

The growth in hazardous waste received in the province is due primarily to increasing hazardous waste transfers from generating sites within the province. As shown in Figure 27, Ontario's receipts of hazardous waste transferred from Ontario generating sites increased by 492,074 tonnes, while receipts from U.S. generating sites increased by 135,523 tonnes from 1994 to 1998. Receipts from generating sites in other provinces decreased during this four-year period.

Figure 27: Change in hazardous waste received by Ontario receiving sites from various jurisdictions, 1994 to 1998



While hazardous waste transfers from Ontario generation sites have been the largest component of the increase in hazardous waste receipts in Ontario, waste transfers from the United States have also increased significantly during the 1994 to 1998 period. Figures 28a and 28b highlight that as a percentage of hazardous waste received by receiving sites in the province, U.S. hazardous waste has increased from 8% in 1994 to 12% in 1998. On a percentage basis, Ontario receipts of U.S. hazardous waste have more than doubled (135.6% increase) over the four years. The weakness of the Ontario regulatory regime for hazardous waste management relative to that in place in the United States appears to be a significant factor in this growth. Table 39b compares the legal requirements currently in place in the United States with those in place in Ontario.

Table 39b: Hazardous Waste Management in Ontario and the U.S.

ENVIRONMENTAL PROTECTION REQUIREMENT	U.S.	ONTARIO
Companies that produce or generate hazardous wastes must:		
⚛ register with environmental protection authorities	Yes	Yes
⚛ report annually or biannually to environmental protection authorities	Yes	No
⚛ follow strict and detailed on-site hazardous waste identification and storage requirements (including emergency planning requirements for large quantity generators)	Yes	No
Companies that transport hazardous wastes must:		
⚛ complete a manifest detailing materials being transported and destination	Yes	Yes
⚛ immediately take measures to contain an accidental spill and report accidental spills to authorities	Yes	Yes
Companies that store, treat, and dispose of hazardous wastes must:		
⚛ apply for permission (by permit or certificate of approval) to operate	Yes	Yes
⚛ provide financial assurance against environmental harm as part of permitting process	Yes	Yes
⚛ have insurance against accidental liability	Yes	No
⚛ analyse all incoming waste to ensure that it conforms both to the description on the waste manifest and to the categories of waste the site is permitted to receive	Yes	No
⚛ make biennial reports on quantities and kinds of wastes received	Yes	No
⚛ provide for groundwater quality monitoring in the area of the site	Yes	No
⚛ have a plan in place to deal with emergencies	Yes	No
⚛ control all dispersion by wind and rainwater of hazardous materials	Yes	No

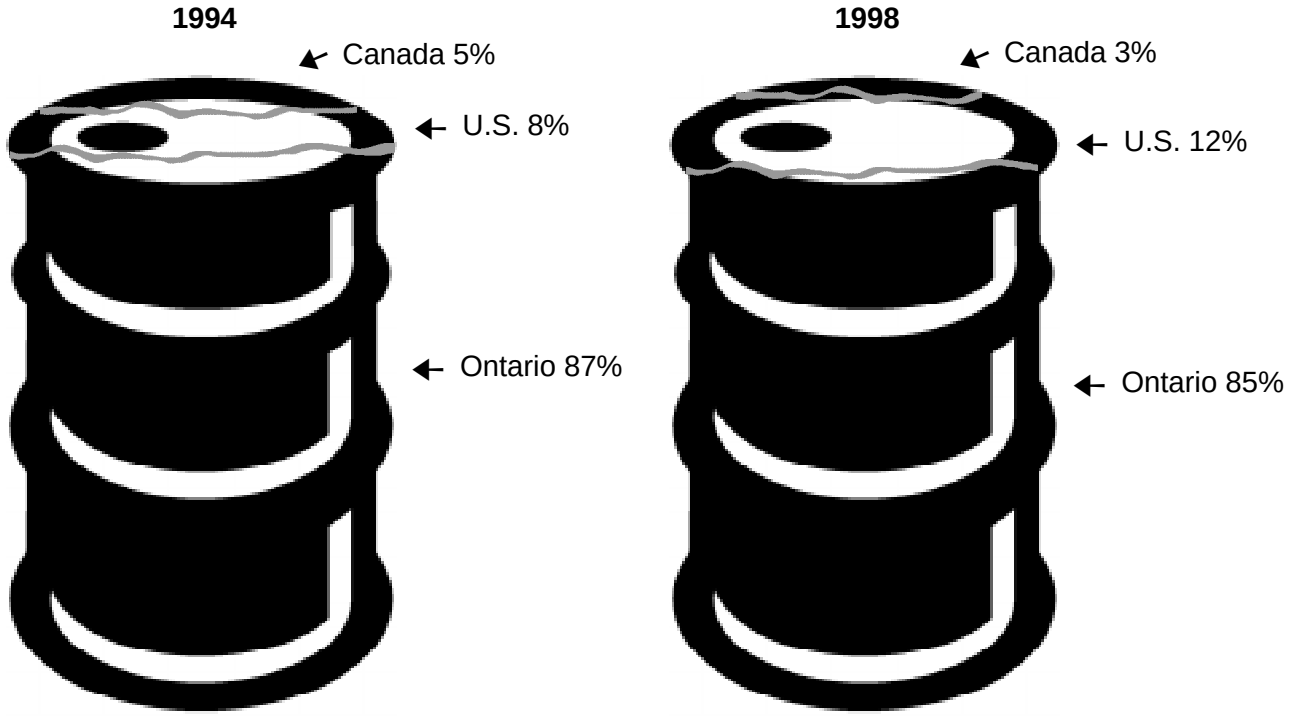
(continued on next page)

Table 39b: Hazardous Waste Management in Ontario and the U.S. *(continued)*

ENVIRONMENTAL PROTECTION REQUIREMENT	U.S.	ONTARIO
Environmental protection authorities require by law that:		
⚛ no permit is issued without full and ongoing public involvement in decision-making about the placement and operations of hazardous waste treatment storage and disposal sites	Yes	No*
⚛ hazardous wastes are treated before they are disposed in landfill	Yes	No
⚛ financial assurances reflect the cost of 'most expensive closure'	Yes	No
⚛ information received from waste generators and waste treatment facilities is published in publicly-available documents every two years	Yes	No
The environmental protection authority has legal standards for:		
⚛ Hazardous Waste Containers	Yes	No
⚛ Hazardous Waste Storage Tanks	Yes	No
⚛ Hazardous Waste Containment Buildings	Yes	No
⚛ Hazardous Waste Land Treatment Units	Yes	No
⚛ Hazardous Waste Surface Impoundments and Waste Piles	Yes	No
⚛ Hazardous Waste Incinerators, Boilers and Industrial Furnaces	Yes	No

** Public involvement in Ontario is limited to what rights may be available under environmental assessment legislation and/or the Environmental Bill of Rights*

Figures 28 a,b: Percentage of waste received by Ontario receiving sites from various generating jurisdictions, 1994 and 1998



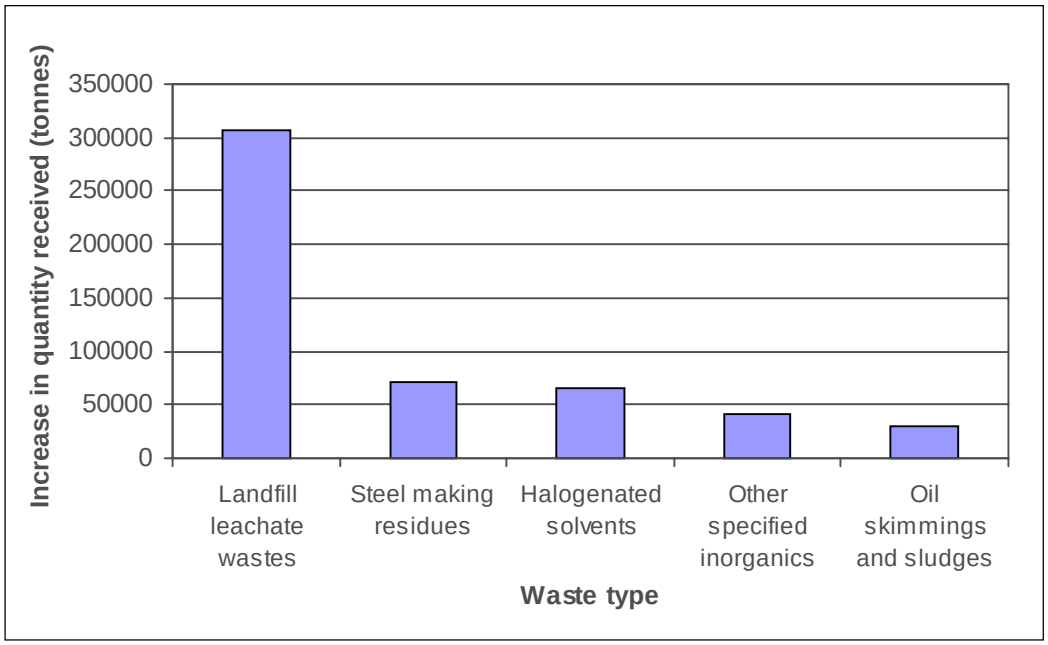
There has been growth in the various types of hazardous wastes received by Ontario receiving sites from 1994 to 1998. Table 40 and Figure 29 highlight the waste types with the greatest increase in quantity received by Ontario receiving sites from 1994 to 1998.

Table 40: Top ten hazardous waste types with the greatest increase in quantity received by Ontario receiving sites, 1994 to 1998

Rank	Waste type	Increase in quantity received from 1994 to 1998 (tonnes)
1	Landfill leachate wastes	306,546
2	Steel making residues	70,670
3	Halogenated solvents	66,252
4	Other specified inorganics	41,654
5	Oil skimmings and sludges	30,077
6	Alkaline wastes - other metals	16,692
7	Transfer station oils wastes	16,266
8	Waste oils and lubricants	15,159
9	Paint, pigment and coating residues	14,767
10	Other specified organics	14,527

As seen in Table 40 and Figure 29, increases in the transfer of landfill leachates from generating sites to receiving sites in Ontario were a significant factor in the increase in hazardous waste receipts from 1994 to 1998. Increased transfers of steel making residues, halogenated solvents and other specified inorganics to receiving facilities are also a significant component of the increasing amounts of hazardous wastes being received in the province.

Figure 29: Top five hazardous waste types with the greatest increase in quantity received by Ontario receiving sites, 1994 to 1998



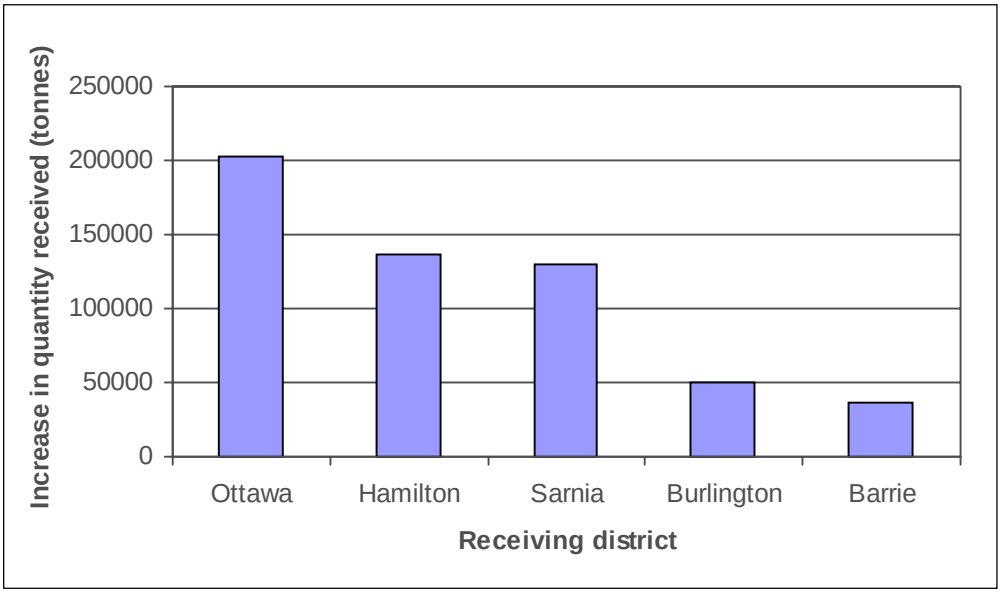
While hazardous waste receipts have increased throughout the province between 1994 and 1998, the increase has varied amongst the various receiving districts. Table 41 and Figure 30 present the receiving districts with the greatest growth in hazardous waste receipts from 1994 to 1998. Ottawa, Hamilton and Sarnia districts have experienced the greatest increase in hazardous waste receipts in Ontario over the four-year period. The increase in hazardous waste receipts by receiving sites in Ottawa district can be attributed to the off-site transfer of landfill leachate wastes from generating sites to the district's water pollution control plant.

The Ontario districts that experienced the greatest increases in hazardous waste receipts between 1994 to 1998 are the same districts that experienced the greatest increases in hazardous waste generation during this period. This finding points to increased off-site transfers from generating to receiving sites within each district.

Table 41: Top ten receiving districts in Ontario with the greatest increase in hazardous waste quantity received, 1994 to 1998

Rank	Receiving district	Increase in quantity received from 1994 to 1998 (tonnes)
1	Ottawa	203,315
2	Hamilton	135,822
3	Sarnia	129,131
4	Burlington	49,588
5	Barrie	35,984
6	York and Durham Regions	32,415
7	St.Catharines	25,301
8	Windsor	7,361
9	Kingston	6,239
10	Peterborough	5,260

Figure 30: Top five receiving districts in Ontario with the greatest increase in hazardous waste quantity received, 1994 to 1998

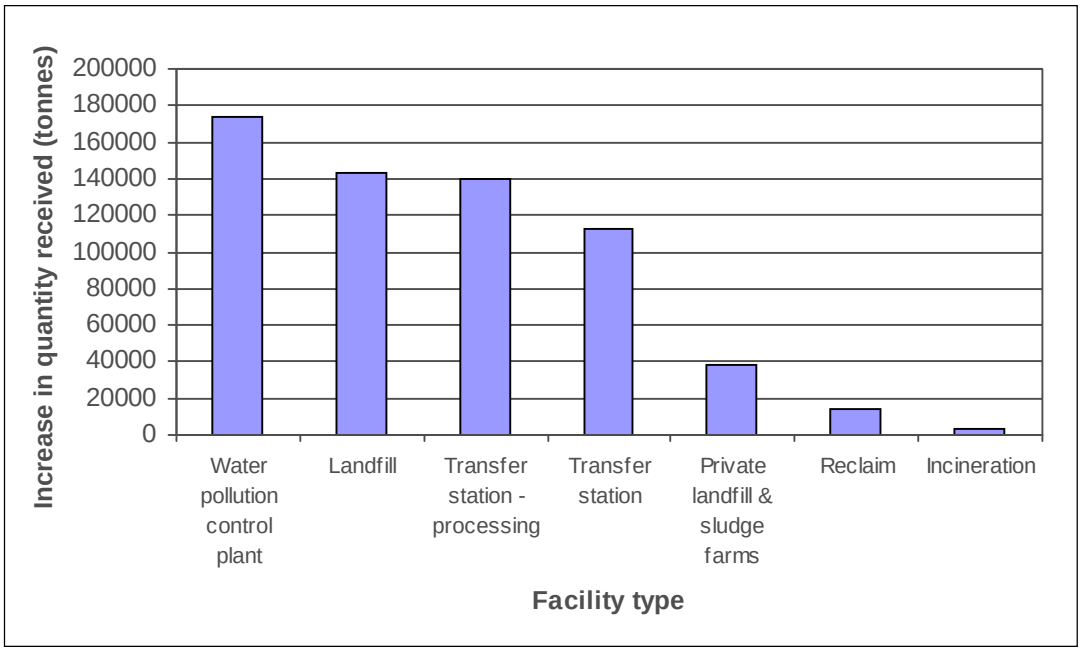


The growth in hazardous waste receipts in Ontario from 1994 to 1998 has occurred primarily in water pollution control plants, landfills and transfer stations in the province. These types of facilities received most of the increased waste transfers from 1994 to 1998 as highlighted in Table 42 and Figure 31.

Table 42: Increase in quantities of hazardous waste received in Ontario by facility type, 1994 to 1998

Receiving facility	Increase in quantity received from 1994 to 1998 (tonnes)
Water pollution control plant	173,780
Landfill	142,900
Transfer station – processing	139,341
Transfer station	112,133
Private landfill & sludge farms	37,754
Reclaim	14,708
Incineration	3,441

Figure 31: Increase in quantities of hazardous waste received in Ontario by facility type, 1994 to 1998



SECTION VI: CONCLUSION

From 1994 to 1998, Ontario has experienced significant growth in the generation and receipt of hazardous waste. In this four-year period, hazardous waste generation in the province has increased by 535,000 tonnes, which is equivalent to an average annual growth rate of 10%. Hazardous waste quantities received in Ontario have grown by 12% annually, so that 614,000 more tonnes of hazardous waste were received by Ontario sites in 1998 than in 1994. The growth rate for both hazardous waste generation and receipts in Ontario is well above the province's Gross Domestic Product (GDP) growth rate for this period.

In 1998, the top hazardous waste generators in the province included solid waste landfill sites, steel manufacturing facilities and the petrochemical industry. The top hazardous waste generating sites in the province were concentrated in southern and southwestern Ontario, specifically in Ottawa, the Golden Horseshoe and the Windsor-Sarnia corridor. Landfill leachate wastes, transfer station oils and steel making residues were the top waste classes generated in 1998, and accounted for approximately 50% of all hazardous waste generated in the province.

The growth in hazardous waste generated in Ontario from 1994 to 1998 was in large part due to the tremendous increase in landfill leachate generation, and increases in the generation of steel making residues and halogenated solvents. Ottawa and Hamilton districts experienced the greatest growth in hazardous waste generation in the province from 1994 to 1998.

In 1998, landfill leachate waste was the primary waste type received by Ontario receiving sites, followed by transfer station oil waste. Facilities owned by environmental services companies, including Safety-Kleen and Philip Services received the greatest quantities of non-leachate hazardous wastes, while water pollution control plants received the greatest quantities of landfill leachate wastes. Most of the hazardous wastes received in 1998 went to sites in the districts of Sarnia, Hamilton, Guelph and Ottawa, which cumulatively received 60% of the hazardous waste received in Ontario.

From 1994 to 1998, the quantities of landfill leachate wastes received by Ontario sites showed the greatest increase of all waste classes, followed by steel making residues and halogenated solvents. Three districts in the province, Ottawa, Hamilton and Sarnia experienced the greatest increase in hazardous waste received over the four-year period.

In 1998, the majority (85%) of hazardous waste received in Ontario came from generating sites within the province. Twelve percent came from U.S. generators, while three percent came from generators in other provinces. The growth in hazardous waste transfers to receiving sites in Ontario from 1994 to 1998 was due in great part to increased quantities of hazardous waste transferred from generating sites within the province. However, waste transfers from U.S. generators to Ontario receiving sites doubled within the four-year period. By 1998, hazardous waste transferred from U.S. generating sites accounted for 12% of hazardous waste received in the province. In 1994, U.S. waste accounted for only 8% of hazardous waste received in Ontario. Safety-Kleen Inc. was the main exporter and importer of U.S. hazardous waste in 1998, as this company transferred wastes from its U.S. generating facilities to receiving sites in Ontario.

The majority of hazardous waste received from U.S. generators came from generating facilities in Michigan, New York and Ohio, all of which was non-leachate waste. Just over 50% of U.S. generated waste was received by landfills in Ontario, while lesser quantities were sent for reclamation and incineration. The Safety-Kleen landfill and incinerator near Sarnia received most of the U.S. hazardous waste transferred to Ontario in 1998. As a result, Sarnia district received the greatest quantities of U.S. hazardous waste in 1998, followed by Guelph district.

In 1998, water pollution control plants, transfer stations and landfills received the greatest quantities of hazardous waste received in Ontario. Since 1994, increasing quantities of hazardous waste have been transferred to these receiving facilities, which raises concerns about the environmental and human health implications associated with transfers to these facilities.

The increase in the quantities of hazardous waste generated and received in Ontario from 1994 to 1998 is a disturbing trend. The growth rates in hazardous waste generation and receipts in Ontario experienced from 1994 to 1998 are unsustainable, as increasing quantities of hazardous wastes are a burden on the environment and pose increasing risks for Ontario communities. A strong response from the government of Ontario is required to reverse this trend in future years. Based on the findings of this report, it is vital that provincial government improves its monitoring and reporting of hazardous waste generation, handling and disposal, and strengthen its regulatory framework to prevent and control these activities.

APPENDIX A: DESCRIPTION OF GENERATING/RECEIVING DISTRICTS IN ONTARIO

The following Ontario generating/receiving districts were identified in the Ontario Hazardous Waste Manifest data for 1994 to 1998. The table below presents the district code, district name, and an example of municipalities that are located within each district.

District Code	District Name	Representative municipalities
101	London	City of London, St.Mary's, St. Thomas
102	Windsor	City of Windsor, Chatham, Leamington, Thamesville
103	Sarnia	City of Sarnia, Corunna, Petrolia, Enniskillen Township
104	Owen Sound	Owen Sound, Hanover, Tiverton
201	Hamilton	City of Hamilton, Ancaster, Dundas, Stoney Creek
202	Guelph	City of Guelph, Brantford, Breslau, Cambridge, Eden, Kitchener
203	St.Catharines	St.Catharines, Fort Erie, Grimsby, Niagara Falls, Port Colbourne, Thorold, Welland
301	Toronto	City of Toronto (including former local municipalities of Metro Toronto, i.e.) East York, Etobicoke, North York, Toronto, Scarborough, York)
302	Barrie	City of Barrie
304	Peterborough	Peterborough, Cobourg, Colbourne, Port Hope, Murray Township
305	Burlington	Burlington, Bolton, Halton Hills, Milton, Mississauga
306	York and Durham Regions**	Ajax, Bowmanville, Markham, Newmarket, Vaughan
401	Kingston	City of Kingston, Belleville, Brockville, Elginburg
402	Ottawa	City of Ottawa, Glouchester, Nepean
403	Cornwall	City of Cornwall
501	Sudbury	City of Sudbury, Chelmsford
502	South Porcupine	City of Timmins, Kaspuskasing
503	Sault Ste. Marie	City of Sault Ste. Marie
504	North Bay	City of North Bay
601	Thunder Bay	City of Thunder Bay
602	Kenora	Kenora, Fort Frances

*** This district was named Ajax in the Hazardous Waste Manifest*

APPENDIX B: LIST OF HAZARDOUS WASTE TYPES IN THE ONTARIO HAZARDOUS WASTE MANIFEST

***Source**: Ontario Ministry of the Environment, Waste Reduction Branch*

INORGANIC WASTES

Waste code	Waste Type	Examples
ACID SOLUTIONS		
111	Spent pickle liquor	Acid solutions of sulphuric and hydrochloric acids containing ferrous salts from steel pickling.
112	Acid solutions, sludges and residues containing heavy metals	Solutions of sulphuric, hydrochloric and nitric acids containing copper, nickel, chromium, zinc, cadmium, tin, lead or other heavy metals; chromic acid waste, acidic emission control sludges from secondary lead smelting.
113	Acid solutions, sludges and residues containing other metals and non-metals	Solutions of sulphuric, hydrochloric, hydrofluoric and nitric acids containing sodium, potassium, calcium, magnesium or aluminum; equipment cleaning acids; cation regenerant; reactor acid washes; catalyst acid and acid washes.
114	Other inorganic acid wastes	Off-specification acids, by-product hydrochloric acid; dilute acid solutions; acid test/residues
ALKALINE SOLUTIONS		
121	Alkaline solutions, sludges and residues containing heavy metals	Metal finishing wastes; plating baths; spent solutions containing metals such as copper, zinc, tin, cadmium, case hardening sludges; spent cyanide destruction residues; dewatered solids from metal and cyanide finishing wastes and cyanide destruction.
122	Alkaline solutions, sludges and residues containing other metals and non-metals, not containing cyanides	Alkaline solutions from aluminum surface coating and etching; alkali cleaner wastes; waste lime sludges and slurries; anion regenerants.
123	Alkaline phosphates	Bonderizing wastes; zinc phosphates; ferrous phosphates; phosphate cleaners
AQUEOUS SALTS		
131	Neutralized solutions, sludges and residues containing heavy metals	Metal finishing waste treatment sludges containing copper, nickel, chromium, zinc or cadmium; neutral salt baths sludges and washes; lime sludge from metal finishing waste treatment; dewatered solids from these processes.
132	Neutralized solutions, sludges and residues containing other metals	Aluminum surface coating treatment sludges; alum and gypsum sludges.

INORGANIC WASTES *(continued)*

Waste code	Waste Type	Examples
133	Brines, chlor-alkali sludges and residues	Waste brines from chlor-alkali plants; neutralized hydrochloric acid; brine treatment sludges.
134	Wastes containing sulphides	Petroleum aqueous refinery condensates.
135	Wastes containing other reactive anions	Wastes containing chlorates; hypochlorite, bromate, thiosulphate

INORGANIC WASTES

Waste code	Waste Type	Examples
MISCELLANEOUS INORGANIC WASTES AND MIXED WASTES		
141	Inorganic wastes from pigment manufacturing	Wastewaters and sludges from production of chrome yellow, molybdate orange, zinc yellow, chrome green and iron pigments; dewatered solids from these sources.
142	Primary lead, zinc and copper smelting wastes	Slurries, sludges and surface impoundment solids; treatment plant sludges; anode slimes and leachate residues; dewatered solids from these sources
143	Residues from steel making	Emission control sludges and dusts; precipitator residues from steel plants; dewatered solids from these sources.
144	Liquid tannery wastes sludges	Lime waste mixtures; chrome tan liquors, detanning solutions and sludges
145	Wastes from the use of paints, pigments and coatings	Paint spray booth sludges and wastes; paper coating wastes; ink sludges, paint sludges.
146	Other specified inorganic sludges, slurries or solids	Flue gas scrubber wastes; wet fly ash; dust collector wastes; metal dust and abrasives wastes; mud sediment and water; tank bottoms from waste storage tanks that contained mixed inorganic wastes; heavy sludges from waste screening/filtration at transfer/processing sites not otherwise specified in table.
147	Chemical fertilizer wastes	Solutions, sludges and residues containing ammonia, urea, nitrates and phosphates from nitrogen fertilizer plants.
148	Miscellaneous waste inorganic chemicals	Waste inorganic chemicals including laboratory, surplus or off-specification chemicals that are not otherwise specified in the table.
149	Landfill leachate	Surface runoff and leachate collected from landfill sites.
150	Inert inorganic wastes	Sand and water from catch basins at car washes; slurries from the polishing and cutting of marble.

ORGANIC WASTES

Waste code	Waste Type	Examples
NON-HALOGENATED SPENT SOLVENTS		
211	Aromatic solvents and residues	Benzene, toluene, xylene and residues
212	Aliphatic solvents and residues	Acetone, methylethylketone and residues, alcohols, cyclohexane and residues.
213	Petroleum distillates	Varsol, white spirits and petroleum distillates, thinners.
FUELS		
221	Light fuels	Gasoline, kerosene, diesel, tank drainings/washings/ bottoms, spill clean-up residues.
222	Heavy fuels	Bunker, asphalts, tank drainings/washings/bottoms, spill clean-up residues.
RESINS AND PLASTICS		
231	Latex wastes	Waste latexs, latex crumb and residues
232	Polymeric resins	Polyester, epoxy, urethane, phenolic resins, intermediates and solvent mixtures.
233	Other polymeric wastes	Off-specification materials, discarded materials from reactors.

ORGANIC WASTES

Waste code	Waste Type	Examples
HALOGENATED ORGANIC WASTES		
241	Halogenated solvents and residues	Spent halogenated solvents and residues such as perchloroethylene, trichloroethylene and carbon tetrachloride (dry cleaning solvents), halogenated still bottoms; residues and catalysts from halogenated hydrocarbon manufacturing or recycling processes.
242	Halogenated pesticides and herbicides	2,4-D 2.4.5-T wastes, chlordane, mirex, silvex, pesticide solutions and residues.
243	Polychlorinated biphenyls (PCBs)	Askarel liquids such as Arochlor, Pydraul, Pyranol, Therminols, Inerteen and other PCB contaminated materials.
OILY WASTES		
251	Waste oils/sludges (petroleum based)	Oil/water separator sludge; dissolved air flotation skimming; heavy oil tank drainage; slop oil and emulsions.
252	Waste crankcase oils and lubricants	Collected service station oils; industrial lubricants; bulk waste oils.
253	Emulsified oils	Soluble oils; waste cutting oils; machine oils.
254	Oily water waste oil from waste transfer processing sites	Waste oil and oily water limited to classes 251, 252, 253 that have been bulked/blended/processed at a waste transfer processing site.

ORGANIC WASTES *(continued)*

Waste code	Waste Type	Examples
MISCELLANEOUS ORGANIC WASTES AND MIXED WASTES		
261	Pharmaceuticals	Pharmaceutical and veterinary wastes other than biologicals and vaccines; solid residues and liquids from veterinary arsenical compounds.
262	Detergents and soaps	Laundry wastes.
263	Miscellaneous waste organic chemicals	Waste organic chemicals including laboratory surplus or off-specification chemicals that are not otherwise specified in this table.
264	Photoprocessing wastes	Photochemical solutions, washes and sludges.
265	Graphic arts wastes	Adhesives; glues; miscellaneous wastes; etch solutions.
266	Phenolic waste streams	Cresylic acid; caustic phenolates; phenolic oils; creosote.
267	Organic acids	Carboxylic or fatty acids; formic, acetic, propionic acid wastes; sulphamic and other organic acids that may be amenable to incineration.
268	Amines	Waste ethanoiamines; urea; Flexzone waste; Monex waste.
269	Organic non-halogenated pesticide and herbicide wastes	Organophosphorus chemical wastes; arsenicals; wastes from MSMA and cacodylic acid.
270	Other specified organic sludges, slurries and solids	Tank bottoms from mixed organic waste bulking tanks at waste transfer sites; mixed sludges from waste screening, filtration at waste transfer/processing sites not otherwise specified in this table.
PROCESSED ORGANIC WASTES FROM TRANSFER STATIONS		
281	Non-halogenated rich organics	Blended/bulked solvents, oils and other rich organics prepared at transfer/processing sites for incineration
282	Non-halogenated lean organics	Blended/bulked aqueous wastes prepared at transfer/ processing sites for incineration and contaminated with non-halogenated solvents, non-halogenated oils and other non-halogenated organics.
PLANT AND ANIMAL WASTES		
311	Organic tannery wastes	Fleshings, trimmings, vegetable tan liquors, Bate solutions.
312	Pathological wastes	Human anatomical waste; infected animal carcasses; other non-anatomical waste infected with communicable diseases; biologicals and vaccines.

OTHER WASTES

EXPLOSIVE MANUFACTURING WASTES		
321	Wastes from the manufacture of explosives and detonation products	Wastewater treatment sludges; spent carbon; red/pink waters from TNT manufacturing; residues from lead base initiating compounds.
COMPRESSED GASES		
331	Waste compressed gases, including cylinders	Methane (natural gas); nitrous or nitric oxide; propane; butane.

FOOTNOTES

SECTION I

[1] Ministry of the Environment and Energy, *1992 Status Report on Ontario's Air, Water and Waste* (Unpublished, released to the public January 1997), p.87.

[2] Section 11 of CEPA defines substances as toxic if it is "entering or may enter the environment in a quantity or concentration or under conditions:
a) having or may have an immediate or long-term harmful effect on the environment;
b) constituting or may constitute a danger to the environment on which human life depends; or
c) constituting or that may constitute a danger in Canada to human life or health."

[3] Environment Canada. *National Pollutant Release Inventory: 1994 Summary Report* (Ottawa: 1995), Table 7.

[4] *Ibid*.

[5] World Wildlife Fund Canada, *Toxics In, Toxics Out: Toxics from Sewage Treatment Plants in the Great Lakes & St.Lawrence River* (Toronto: Undated).

SECTION II

[6] In some cases, the generator listed in the HW manifest database may have changed since 1998.

[7] The Laidlaw Environmental facility (#19 in Table 2) in London, Ont. is the same facility as the Safety-Kleen Ltd. facility (#22 in Table 2), however this facility has been assigned two different generation numbers (ON1378700 and ON0039012 respectively) in the HW manifest database and thus appears twice in Table 2.

[8] Non-leachate landfill includes all other classifications of waste types listed in the HW manifest, e.g.) PCBs, acid wastes, alkaline wastes, etc.

[9] The Laidlaw facility (generator #ON1378704) is the same facility as the Safety-Kleen facility (#19 in the table, generator #ON0039015), however as each generator has its own generating number, they appear separately in the table

[10] The HW manifest database classifies hazardous waste generators by a district code. These district codes were isolated to identify hazardous waste generation in each district. Each district is assigned the name of a municipality within it, e.g.) District 101=London, Ont. However, the districts in many cases include surrounding communities.

[11] The names of the generating districts are those provided in the HW manifest database (except for York/ Durham Regions which was listed as Ajax in the manifest); see appendix A for a listing of the municipalities that fall within each of the district names listed, e.g.) Hamilton "district" includes the City of Hamilton, Stoney Creek, Dundas, etc.

[12] In the 1994 and 1996 HW manifest databases, Burlington was also referred to as Oakville; regardless the "Burlington" district consists of the municipalities of Burlington and Oakville (see appendix A)

SECTION III

[13] The 1996 value was derived from a merger of the RECEIVER and MANREC files in the Hazardous Waste Manifest. An aggregation of quantities received by district code was conducted to identify wastes received in Ontario districts. An analysis of wastes received in Ontario from the "receiving district" column in the MANGEN file was also conducted. The value for wastes received in Ontario from the MANGEN file was 1,624,833 tonnes. The MANREC value is presented in this report for 1996. There were no discrepancies between the MANGEN and MANREC files in the 1994 and 1998 data for quantities received in Ontario.

[14] The HW manifest database presented waste generated outside of North America in its MANGEN table, but did not present this data in the MANREC table "generating district" column; it was determined that this waste was included in the United States generating quantity in the MANREC table and accounts for 974 tonnes of waste (which has been included under U.S. generated waste)

[15] In some cases, the address provided may be the head offices of the receiver rather than the receiving site itself

SECTION V

[16] The increase in hazardous waste generation reflects the increase of off-site hazardous waste transfers from generation facilities in Ontario, and does not represent all hazardous waste generation in the province

[17] The City of Toronto district includes the former municipalities of Metro Toronto and does not include any areas outside of the City of Toronto borders.