

GAO

Report to the Chairman, Subcommittee
on Environment, Energy, and Natural
Resources, Committee on Government
Operations, House of Representatives

July 1993

HAZARDOUS WASTE EXPORTS

Data Quality and Collection Problems Weaken EPA Enforcement Activities



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United States
General Accounting Office
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Program Evaluation and
Methodology Division

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The Honorable Mike Synar
Chairman, Subcommittee on Environment,
Energy, and Natural Resources
Committee on Government Operations
House of Representatives

Dear Mr. Chairman:

You asked us to assess the quality of the Environmental Protection Agency's (EPA's) hazardous waste export data. EPA uses these data to identify and monitor exports of U.S. hazardous wastes to foreign facilities and countries. Consequently, the effectiveness of the program is directly dependent upon the quality of the data. Within this report, we examine the data and whether problems we identified could jeopardize either the EPA program or foreign importers' decisions to import U.S. hazardous wastes.

As agreed with your office, we plan no further distribution of this report until 30 days from its date of issue, unless you publicly announce its contents earlier. At that time, we will send copies to the Administrator of the Environmental Protection Agency. We will also make copies available to interested organizations, as appropriate, and to others upon request.

If you have any questions or would like additional information, please call me at (202) 512-2900 or Kwai-Cheung Chan, Director of Program Evaluation in Physical Systems Areas, at (202) 512-3092. Other major contributors to this report are listed in appendix IV.

Sincerely yours,

Eleanor Chelimsky
Assistant Comptroller General

Executive Summary

Purpose

The safe treatment, storage, and disposal of hazardous waste are environmental and public health issues that have become international concerns. U.S. waste generators may export their hazardous wastes, which could threaten human health and the environment in the receiving countries. These waste exporters must provide data to the Environmental Protection Agency (EPA) before, during, and after shipping waste. EPA then uses the data to monitor and review exports. Foreign facilities and countries may use the data to determine whether waste should be accepted. Concerned about the quality of these data and EPA's monitoring of hazardous waste exports, the Chairman of the Subcommittee on Environment, Energy, and Natural Resources of the House Committee on Government Operations asked GAO to examine these issues.

Background

In 1976, the Congress enacted the Resource Conservation and Recovery Act (RCRA) to regulate hazardous wastes within the United States (P.L. 94-580, 42 U.S.C. 6901 et seq.). The 1984 Hazardous and Solid Waste Amendments (HSWA) to the act added a new section to govern exports of hazardous waste (P.L. 98-616, 245a, 42 U.S.C. 6938), which established a program through which EPA monitors the export activities of U.S. hazardous waste generators and others and enforces export regulations. The program is designed to identify such violations as the export of unauthorized waste and to prosecute violators, and through its enforcement activities, it is expected to deter violations.

Rising concerns about transboundary shipments of hazardous waste and global awareness of the actual and potential impacts of hazardous waste on the environment and public health in importing countries have spurred negotiation of an international treaty (the Basel Convention), a U.S. national policy debate, and proposed legislation.

Previous GAO work indicated data quality problems in the information EPA obtained from U.S. generators on their hazardous waste operations. These problems included questionable measurement and data collection procedures, which produce data of uncertain validity and reliability. In this study, GAO extends its evaluation to the quality of hazardous waste export data; that is, the data used to describe both the hazardous waste exported and related export activities.

To study the quality of EPA's export data, GAO first interviewed EPA officials and analyzed export regulations to determine what data EPA collects and how the data are used. GAO then performed case studies of seven U.S.

companies chosen from the 216 that exported hazardous waste to Canada and Mexico in 1990. These companies were selected as a judgmental sample of the general hazardous waste exporter population, with exports generally reflective of the total population with respect to the quantities and number of waste types shipped in 1990.

GAO analyzed data obtained from the selected companies' 519 shipments and performed detailed analyses of 29 manifests, which covered 52 shipments, including an independent comparison of exporters' data with the foreign receiving facilities' analyses of the shipments. Finally, GAO interviewed officials from Canada, Mexico, and the four facilities that received wastes from the selected companies. From this evaluation, GAO identified problems in data quality and data collection and examined whether and how these problems could affect EPA's enforcement activities and importers' decisions on whether to accept and manage exports of hazardous waste.

Results in Brief

GAO's study of the 52 shipments revealed a number of data quality and collection problems relating either to exporters' activities or to the design and implementation of the hazardous waste export program. Although the first set of problems may exist only for the seven exporters studied, they are serious enough, when they do occur, to adversely affect many activities conducted within the program. The second set of problems identified, being inherent in the program, would occur in any cases selected and clearly jeopardize the effectiveness of the program. In addition to these, GAO found other problems, including 10 violations of export regulations that EPA had not detected. These violations and the fact they remained undetected are directly related to the other data and program problems identified.

GAO found that governments of importing countries and foreign receiving facilities generally did not rely on data from either the exporters or EPA for their decisions related to importing U.S. hazardous waste.

GAO's Analysis

Quality of EPA Export Data

EPA's primary responsibility under the hazardous waste export program is to monitor export activities and enforce its own regulations. To do this,

EPA requires exporters to submit documentation on their own enterprises, on transporters and receiving facilities, and on the types and quantities of waste being exported. This information is also provided to the foreign facilities receiving the wastes and to the governments of the importing countries.

GAO's review of seven exporters' documentation, including manifests, revealed six exporter- and six program-related problems. With regard to exporter problems, GAO found (1) unreliable hazardous waste quantity estimates; (2) exported waste quantities that went unreported, (3) shipment frequency not reported, (4) incomplete reporting of waste codes describing the type of wastes, (5) nonhazardous waste counted as hazardous, and (6) exception reports not submitted by exporters to EPA. With regard to program problems, GAO found insufficiently specific regulations that (1) allow unreliable narrative waste descriptions for a shipment of waste, (2) permit inconsistent units of measure to define a shipment, (3) use a coding system that is problematic for characterizing exported wastes, (4) do not require standardized documentation procedures for exporters, (5) do not mandate reporting formats for notifications or annual reports, and (6) are accompanied by only limited EPA reporting guidance for exporters to follow.

How Data Problems Affect EPA Activities

GAO's review of the seven exporters turned up 10 undetected hazardous waste export violations, all related to problems of data management. One was associated with misrepresenting waste types by omitting required waste codes. Five involved incomplete data reporting of waste quantities exported. One violation concerned misreporting total quantity of hazardous waste exported over a year, two other cases involved nonsubmission of required reports to EPA and one failure to provide a complete certification of truth statement in the annual report.

After examining the specific activities EPA conducts to enforce the program generally and identifying all data and process requirements, GAO determined that practically every one of these activities could be or is affected by the problems identified.

How Data Problems Affect Importers

GAO found that none of the four receiving facilities studied relied on the data provided to them either by EPA or by the exporters for their decisions about accepting wastes for treatment. Officials at the receiving facilities instead used their own analyses of the wastes proposed for shipment and

their own determinations of whether they were capable of treating and disposing of them. The importing countries' governments relied primarily on the information provided by the receiving facilities and on their own import monitoring systems.

Recommendations

Even though foreign governments and receiving facilities do not currently rely on EPA or exporter information to make their import decisions, sound data are needed to ensure that (1) shipments are limited to those for which consent has been obtained from foreign receivers, (2) hazardous waste export is proceeding in compliance with U.S. international commitments and agreements, and (3) congressional oversight of the program can be properly exercised. Given the problems found in the data management of the hazardous waste export program, and given also that some of these problems are not new, GAO recommends that the Administrator of EPA take the following actions:

- For the six systemic program problems, efforts should be initiated as soon as possible to render regulations specific enough for valid, reliable, and complete data to be obtained.
- For the exporter-related problems, an internal evaluation should be conducted to determine whether the problems are generalized among the overall exporter population. The Administrator should then examine what further monitoring or enforcement measures may be necessary; for example, conducting regular comparisons of exporters' and receiving facilities' hazardous waste quantity estimates.

Agency Comments

GAO discussed the results of its work, findings, and conclusions with responsible agency officials and revised the report where appropriate. General agency comments are provided and addressed in chapter 5.

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Abbreviations

DOT	Department of Transportation
EPA	Environmental Protection Agency
HSWA	Hazardous and Solid Waste Amendments
NEIC	National Enforcement Investigations Center
OWPE	Office of Waste Programs Enforcement (EPA)
RCRA	Resource Conservation and Recovery Act

Introduction

Imported hazardous waste has damaged the environment and adversely affected human health in various parts of the world. For example, the German Republic has been cited as importing more than a million tons of waste a year, resulting in serious environmental and public health problems.¹ These events have raised concerns, on a global scale, about the risks inherent in the international management of hazardous waste. Such concerns have resulted in a multinational agreement addressing control of shipments of hazardous waste among nations. The United States is a signatory to this agreement but has not yet ratified it. The Basel Convention is designed to ensure the safe treatment, storage, and disposal of hazardous waste, not only for waste generated and managed within a country, but also for waste generated within a country and transported to and managed within another.

The total amount of hazardous waste being transported across international borders has increased in recent years as the United States and other industrialized countries imposed stricter controls on domestic disposal of hazardous waste and disposal methods became limited and costly. U.S. hazardous waste generators have the option of exporting their wastes to foreign countries for treatment or disposal with the consent of the importing country's government; thus the Congress and EPA are concerned about the potential effects these wastes might have on the public health and environment in the receiving countries. Another concern in the Congress is that potential problems resulting from the exported wastes might tarnish the shipping country's image as a responsible trading partner and respected member of the international community.

To address these concerns and to ensure adequate and effective monitoring of hazardous waste shipped out of the country, EPA has implemented a hazardous waste export regulatory program. In administering the program, the agency collects hazardous waste export data and uses them to monitor exports and enforce program regulations. Foreign receiving facilities and governments receive the same data, which they may use in deciding whether to accept and manage U.S. hazardous wastes.

We have previously identified problems with the reliability and validity of data EPA collected to describe hazardous wastes generated and treated

¹Global Dumping Ground: The International Traffic in Hazardous Waste, Center for Investigative Reporting and Bill Moyers (Washington, D.C.: Seven Locks Press, 1990).

domestically.² Because these deficiencies existed and because of the importance of understanding the types and amounts of hazardous wastes exported in order to comply with international agreements, the House Subcommittee on Environment, Energy, and Natural Resources has asked us to examine the quality of the data collected and used to enforce the hazardous waste export program.

Background

Hazardous waste is a by-product of economic activity, which can pose a substantial hazard to human health or the environment if improperly treated, stored, transported, or disposed. EPA has classified wastes as hazardous according to four characteristics that may damage the environment and human health: ignitability, corrosivity, chemical reactivity, and toxicity, in addition to other criteria such as 40 CFR 261.11, Criteria for Listing Hazardous Waste.

Since 1984, U.S. environmental law has increased the stringency of regulations that ban or severely restrict domestic disposal of hazardous waste, thus causing disposal costs to increase rapidly.³ Moreover, under the current "cradle-to-grave" management system, waste generators are financially liable for any adverse effects of their wastes even after disposal in the United States.⁴ Partly in response to such issues, domestic companies exported about 140,000 tons of hazardous waste in 1989 and in 1990, according to EPA estimates.

In foreign countries, however, regulations for treatment, storage, and disposal facilities may be different or less stringent than those in the United States, and they may not adequately protect the environment and public safety or health. For example, differences in environmental laws have been the focus of debate as to whether treatment of U.S. waste in

²Hazardous Waste: EPA's Generation and Management Data Need Further Improvement (GAO-PEMD-90-3, Feb. 9, 1990) and Waste Minimization: EPA Data Are Severely Flawed (GAO-PEMD-91-21, Aug. 5, 1991).

³The Congressional Research Service has reported that the cost of burying one ton of hazardous waste in the United States escalated from \$15 in 1980 to \$250 in 1989. See "Waste Exports: U.S. and International Efforts to Control Transboundary Movement." CRS Issue Brief, Feb. 1, 1991.

⁴The Resource Conservation and Recovery Act (P.L. 94-580, 42 U.S.C. 6901 et seq.) establishes a system for controlling and monitoring hazardous waste from its generation through its ultimate disposal, in effect, from "cradle to grave."

Canada meets U.S. environmental standards.⁵ Such problems are compounded when the importing country does not have adequate technology and resources to manage hazardous waste safely.

Regulation of Hazardous Waste Exports

In 1976, the Congress enacted the Resource Conservation and Recovery Act to regulate hazardous waste within the United States. The Hazardous and Solid Waste Amendments of 1984 (HSWA) added a new section to RCRA to oversee lawful exports of hazardous waste from the United States.⁶ This law provides that export of a hazardous waste is prohibited unless the generator or exporter notifies EPA of its intent to export the waste, EPA forwards a copy of the notification to the intended receiving country, and that country consents to accept the waste.⁷ The law also provides that each shipment is to be accompanied by a manifest and the receiving country's written consent. The waste shipment must conform to the terms of the consent. Once a year, the exporter must summarize and report all of its hazardous waste export activities for the previous year to EPA.

The regulatory program under this law was implemented in November 1986 and is administered by EPA with assistance from the Department of State and the U.S. Customs Service.⁸ Through the program, EPA regulates the export of wastes defined as hazardous under RCRA and subject to federal manifest requirements; this totals about 450 substances. EPA monitors the export activities of hazardous waste generators, reviewing the data submitted by the exporters and looking for violations of regulatory requirements. In addition, EPA conducts periodic site visits to the generators' facilities, which at times include inspection of export documentation to ensure that all exports were reported and met the regulatory requirements. Facilities inspected are usually those suspected of being in violation. EPA also uses the export data to develop statistics describing the amounts and types of hazardous waste exported annually.

The hazardous waste export program is not designed to control the export of hazardous waste; rather, to ensure agreement among the exporter, the

⁵The treatment standards in the RCRA land disposal restrictions are technology-based, while Canada utilizes a risk-based system for controlling land disposal to protect human health and the environment. See "Waste Export Control," Hearings Before the Subcommittee on Transportation and Hazardous Materials of the House Committee on Energy and Commerce, 101st Cong., July 27, 1989, pp. 49-50 and 60-61.

⁶P.L. 98-616 245a, 42 U.S.C. 6938.

⁷In some cases, generators do not export their hazardous wastes directly; rather, the waste is sent to a management operation, which can choose to export the waste.

⁸40 CFR 262.50 through 262.57.

foreign management facility, and the receiving country to accept the waste and to monitor and review the export. When EPA identifies violations of the agreement or the regulatory requirements, the agency may take enforcement actions, and the exporter may be prosecuted. Identification of violations and prosecution are conceived as measures of deterrence to keep unauthorized wastes from being exported and ensure that exporters adhere to the regulatory requirements.

The U.S. exports hazardous waste to a number of countries; however, we have bilateral agreements to regulate the movement of hazardous waste across borders with only two: Canada and Mexico. Both agreements require that (1) the exporter provide advance notification of intent to export, (2) the receiving country provide written consent, and (3) the shipments conform to the regulations of the receiving country. Both agreements include provisions for import of waste into the United States. Mexican law allows the import of U.S. hazardous waste only for recycling and prohibits imports of waste for other treatment methods or disposal. The United States is also in the process of codifying an agreement with the Organization for Economic Cooperation and Development (OECD) concerning waste management.

In March 1989, as already noted, the United States and 115 other countries adopted the U.N.-sponsored Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal. The United States signed the convention of March 22, 1990, and will need to amend current environmental law to mirror the convention's provisions in order to ratify it. At the time of our analysis, 21 countries had already ratified the convention, and it became international law on May 5, 1992, for those and any subsequently ratifying countries.⁹ Provisions of the convention include a prohibition on shipments of Basel wastes between parties and nonparties absent a bilateral agreement, control of household wastes and residues from the incineration of household wastes, consideration of adopting a legal and financial liability protocol abroad, and technology transfer.

To address these issues and expand U.S. control over hazardous waste exports, legislation to implement the Basel Convention was introduced in the 102d Congress in four bills.¹⁰ The bills proposed to increase EPA

⁹Article 25 established that the convention would enter into force after it was ratified by 20 nations.

¹⁰S.1082 and H.R. 2398: The Hazardous and Additional Waste Export and Import Control Act; H.R. 2580: The Waste Export and Import Prohibition Act; H.R. 2358: The Waste Export Control Act; and S. 1643: International Hazardous Waste Disposal and Enforcement Act of 1991.

authority in administering the hazardous waste program, strengthen the hazardous waste export law, and include provisions of the Basel Convention. Those provisions would have required:

- entering into bilateral agreements with all countries expected to receive hazardous waste from the United States,
- giving EPA authority to prohibit shipments of hazardous waste from the United States if there is any doubt that the waste can be managed in an environmentally sound manner at the foreign receiving facility,
- adding other solid wastes to the definition of hazardous for export purposes, and
- having exporters accept legal responsibility and financial liability for their hazardous waste in the receiving country.

The Congress held hearings on the ratification of the Basel Convention and on the proposed bills to implement it, but none of the bills has been passed. Nonetheless, the pending ratification and bills that were introduced underscore the increasingly global perspective in U.S. environmental policy with respect to actions aimed at protecting the environment and public health in other countries.

Data Quality Problems

As mentioned earlier, we have previously found serious problems in the quality of data describing trends in the magnitude of U.S. domestic hazardous waste generated and treated. In addition, an EPA audit has cited specific problems with data collected through the hazardous waste export program. Our earlier findings were that the quality of EPA's domestic hazardous waste information was diminished by problematic measurement and data collection procedures and that the process for developing information systems did not ensure complete and integrated data collection. Subsequently, we evaluated the quality of EPA's data on hazardous waste minimization efforts—the attempt to produce only the minimum amount of hazardous waste possible—and found the data to be fraught with measurement problems. These included uncertain data validity due to inappropriate measurement, uncertain data reliability due to inadequate data collection methods, and inability of the system to integrate data. This earlier work evaluated hazardous waste data in general.¹¹ The present study examines the data specifically collected by EPA under its hazardous waste export program.

¹¹By that we mean technical data on hazardous waste generation, management, and minimization provided by EPA's hazardous waste information system.

EPA internal audits have also examined the hazardous waste export program and found weaknesses in its implementation that rendered export data inaccurate. A 1988 EPA Inspector General's report stated that hundreds of tons of hazardous waste were exported without adherence to the required documentation and process, and as a result, the agency did not know the amount of hazardous waste actually exported.¹² The audit report cited cases of incomplete or inaccurate data on exports. Recommendations focused on improving compliance and enforcement activities, coordinating with U.S. Customs agents, and educating waste generators about requirements. A 1990 follow-up audit showed that EPA was taking steps to implement the recommendations and that, in EPA's opinion, the previously identified weaknesses were somewhat improved.¹³ Our current effort goes beyond EPA's previous work in that we examine the methodological quality of the data and also assess data quality effects on EPA's monitoring, detection, and enforcement activities.

Objectives, Scope, and Methodology

Objectives

The Chairman of the Subcommittee on Environment, Energy, and Natural Resources of the House Committee on Government Operations asked us to assess the quality of EPA's hazardous waste export data. Through subsequent discussions with the Subcommittee staff, we formulated the following four evaluation questions.

1. What data does EPA collect on exports of hazardous waste, and what decisions or activities by EPA and importers are based upon (or use) the data?
2. What is the quality of hazardous waste export data?
3. What effect could existing data quality problems have on EPA's monitoring and enforcement of the hazardous waste export program?

¹²EPA's Program to Control Exports of Hazardous Waste, Report of Audit E1D37-05-0456-80855 (Washington, D.C.: Mar. 31, 1988).

¹³Follow-up on EPA's Program to Control Export of Hazardous Waste, Report of Audit E1DSG0-05-5003-0400011 (Washington, D.C.: Mar. 30, 1990).

4. Which aspects of importers' decisions to import U.S. hazardous wastes could be affected by data problems?

Scope

Our study included the data collected and used by EPA in the hazardous waste export program for shipments in 1990. We focused on 1990 because it was the most recent year for which complete data were available when we were conducting our evaluation. The data base contained data submitted to EPA by hazardous waste exporters, including information on exporters, transporters, and importers and the types and quantities of hazardous waste exported.

Canada and Mexico receive 96 percent of all U.S. hazardous waste exports by volume, and therefore, we selected exporters who shipped wastes to these two countries for our evaluation of the export data. These exporters are, for the most part, located in northeastern and southern states. We selected exporters in Massachusetts, Connecticut, and Texas as a result of our case selection process, which is described below. The receiving facilities were in Quebec, Canada, and Monterrey, Mexico.

We held meetings with EPA officials to discuss the findings and conclusions of our evaluation. Our evaluation was conducted between August 1991 and March 1993 in accordance with generally accepted government auditing standards.

Table 1.1 shows total 1990 U.S. hazardous waste exports, shipments, and exporters as indicated by the EPA data.¹⁴ Other importing countries included Belgium, Finland, Japan, Sweden, the United Kingdom, and Germany.

Table 1.1: 1990 U.S. Hazardous Waste Exports

Receiving country	Number of			Percent of total tons
	U.S. exporters	Shipments exported	Tons from U.S.	
Canada	205	5,306	89,827	67.0
Mexico	11	485	39,209	29.3
Other	18	310	5,007	3.7
Total	234	6,101	134,043	100.0

¹⁴The term "shipment" refers to a load of a specific type of hazardous waste transported to a foreign receiving facility.

Methodology

To answer the first evaluation question about what data EPA collects on exports of hazardous waste and what decisions or activities by EPA and importers are based upon the data, we conducted a literature review; analyzed U.S. hazardous waste export law and regulations; interviewed program officials at EPA headquarters, EPA's National Enforcement Investigations Center (NEIC), and EPA's Boston regional office; and analyzed the export documentation process.¹⁵ We also reviewed the environmental agreements with Canada and Mexico and interviewed environmental officials of both countries' governments and of the receiving facilities.

We reviewed the required export documents and related regulations and identified the data elements on each document that EPA uses to monitor exports. This analysis was a crucial step for relating the data quality problems addressed in evaluation question 2 with affected activities identified in answering evaluation question 3.

Answering the second evaluation question—about the quality of the export data—required a combination of methods: case studies, structured interviews, and content analysis. We used the case studies to assess the quality of the data describing specific hazardous waste shipments; that is, the reliability, validity, and completeness of the data reported to EPA. This approach allowed us to compare data from different sources on type and quantity of exported wastes and to obtain detailed information on the procedures exporters used to develop and submit export data.

For our case studies, we used EPA's data describing 1990 exports to Canada and Mexico to judgmentally select companies that represented variation in export attributes such as number of shipments, number of waste types exported, types of waste, annual quantity exported, and location of the exporting company. First, we grouped the 216 exporters to Canada and Mexico according to number of shipments and waste types into four categories as shown in figure 1.1. High and low values for these attributes were determined by identifying natural breaks in the data. As shown, no company fell into the category describing high number of waste types and low number of shipments.

¹⁵NEIC is the lead office with overall enforcement coordination responsibilities for the hazardous waste export program.

Figure 1.1: Exporters by Number of Shipments, Number of Waste Types Exported, and Country of Destination

Number of waste types	Number of U.S. exporter shipments	
	High	Low
High	Canada (5) ^a Mexico (0)	Canada (0) Mexico (0)
Low	Canada (40) Mexico (8)	Canada (160) Mexico (8)

^aNumber of exporters sending waste to the country within each category.

From the remaining three categories, we selected two companies that had large numbers of shipments to Mexico, and we selected five companies with shipments to Canada that represented the remaining selection attributes. These companies generally reflect the population of hazardous waste exporters for quantities exported in 1990. They averaged 11 and 92 tons per shipment to Canada and Mexico, respectively, as compared with 17 and 81 tons per shipment for all exports to each country. Table 1.2 presents the selected companies' total exports to Canada and Mexico and their share of the total U.S. hazardous waste exported to the two countries.

Table 1.2: Amounts of Hazardous Waste Exported by Selected Companies in 1990

Receiving country	Number of			Percent of total tons
	U.S. exporters selected	Shipments	Tons	
Canada	5	431	4,764	5.3
Mexico	2	88	8,134	20.7

For our review and analysis of hazardous waste export data, we selected from EPA's files up to five manifests and related documents for each company.¹⁶ To test the reliability of the exporters' data, we compared each manifest with the corresponding confirmation of delivery from the receiving facility to identify any differences in the data. This test allowed a comparison of two independent determinations of hazardous waste export

¹⁶An exporter's "manifest" is a document that describes the wastes being exported.

data, particularly the waste type and quantity reported as shipped and received. Table 1.3 shows the sample of exports to Canada and Mexico that we reviewed.

Table 1.3: Sample of Exports Chosen for Review

Receiving country	Number of		
	Manifests reviewed	Shipments	Total tons
Canada	24	42	277
Mexico	10	10	935

To examine the validity and completeness of the export data, we conducted structured interviews with exporting companies' officials to determine the overall relationships between the documented export data and the methods they used for developing, reporting, and processing the data. We used content analysis of the structured interviews, discussions with EPA officials, and review of selected export documents and U.S. law and regulations to develop a preliminary list of data quality issues before analyzing the data.

To answer questions 3 and 4, about how the identified data problems could compromise EPA's enforcement program and importers' decisions to accept U.S. hazardous wastes, we analyzed the information developed in evaluation questions 1 and 2. We matched identified problems and data elements with the activities and decisions that involve the use of those data. From our literature review; discussions with EPA officials, exporters, and importers; and review of environmental regulations, we identified EPA's and importers' activities that could be affected by the problems.

Strengths and Limitations

Our case study method included reviewing the literature, analyzing the pertinent laws and regulations and environmental agreements with the two receiving countries, conducting structured and in-depth interviews, tracking and flow-charting the data collection process for hazardous waste exports, checking the detail of each selected shipment's documentation, and testing the data reliability. This detailed review of information, including the use of data by importers, enabled us to identify problems in the EPA data collection activities and regulatory violations that EPA had failed to detect.

Because we selected the cases judgmentally, our findings cannot be generalized to the entire population of hazardous waste exporters.

Because our resources would not have permitted the same depth and detail if we had used a scientifically drawn representative sample, we chose a smaller number of cases, which varied systematically. This means that further study is required to determine the generalizability of those findings dealing with the behavior of the entire hazardous waste exporter population in our sample.

At the same time, data quality is also a result of the management and monitoring processes implemented by EPA. Where those program processes give rise to problems, they would necessarily affect all cases in the program. That is, regulations and program processes are uniformly applied across the universe of hazardous waste exporters.

GAO, in an exit conference attended by responsible officials of the Environmental Protection Agency, acquired comments on a draft of this report. The general comments are presented and evaluated in chapter 5; specific comments have been incorporated into the report as appropriate.

EPA and Importer Uses of Hazardous Waste Export Data

In this chapter, we provide descriptive information that answers the first evaluation question concerning what data EPA collects on exports and what general decisions or activities by EPA and importers are based on the data. EPA obtains and uses hazardous waste export data to make decisions and perform activities associated with its program responsibilities—to monitor exports and enforce the regulations of the hazardous waste export program.

Hazardous Waste Export Program Data

The hazardous waste export program acquires information on hazardous waste descriptions, codes, quantities, and other items through several documents:

- notification of intent to export,
- acknowledgment of consent,
- uniform hazardous waste manifest,
- confirmation of delivery,¹
- exception report, and
- annual report.

The following sections describe these documents and their uses. Table 2.1 presents the data elements required by EPA regulations on each document.

Table 2.1: Hazardous Waste Export Documents and Their Required Data Elements

Data elements	Export document ^a				
	NOI	AOC	MAN	COD	ANR
Exporter name, address, telephone, EPA identification number	x	x	x		x
Description of hazardous waste	x	x	0		x
EPA hazardous waste code	x	x	0		x
Total quantity in units for each waste type ^b	x	x	x		x
Consignee's name, address	x	x	x		x
Total number of shipments exported					x
Transporter name, address, EPA identification number			x		x
Port, date of exit from United States			x		
Description of treatment, storage, or disposal method	x				
Calendar year covered by annual report					x
DOT shipping name and identification number	x	x	x		
DOT hazard class	x	x	x		x

(continued)

¹Exporters are required to obtain a confirmatory statement (confirmation of delivery) from the receiving facility, but are not required to provide a copy to EPA.

**Chapter 2
EPA and Importer Uses of Hazardous Waste
Export Data**

Data elements	Export document ^a				
	NOI	AOC	MAN	COD	ANR
Period of time, estimated export rate, frequency	x	x			
Port of entry, exit transit country	x				
Description of transportation means	x				
Description of type of container	x		x		
Alternate consignee's name, address	x		x		
Transit country's name, time period, waste handling	x				
Number of containers			x		
Special handling transport instructions			x		
Certification of truth, accuracy			x		x
Transporter acknowledgment of receipt			x		
Consignee's acknowledgment of receipt to exporter				x	
Waste minimization efforts, volume, toxicity changes from prior year					x
Significant discrepancies				x	

Legend

x = Data element required
 0 = State requirement only
 NOI = Notification of intent
 AOC = Acknowledgment of consent
 MAN = Manifest
 COD = Confirmation of delivery
 ANR = Annual report

^aAn exception report is to be submitted by exporting officials to EPA or states when the former do not receive a copy of the signed manifest or other confirmation of delivery from an importer, or when the shipment is returned to the exporter.

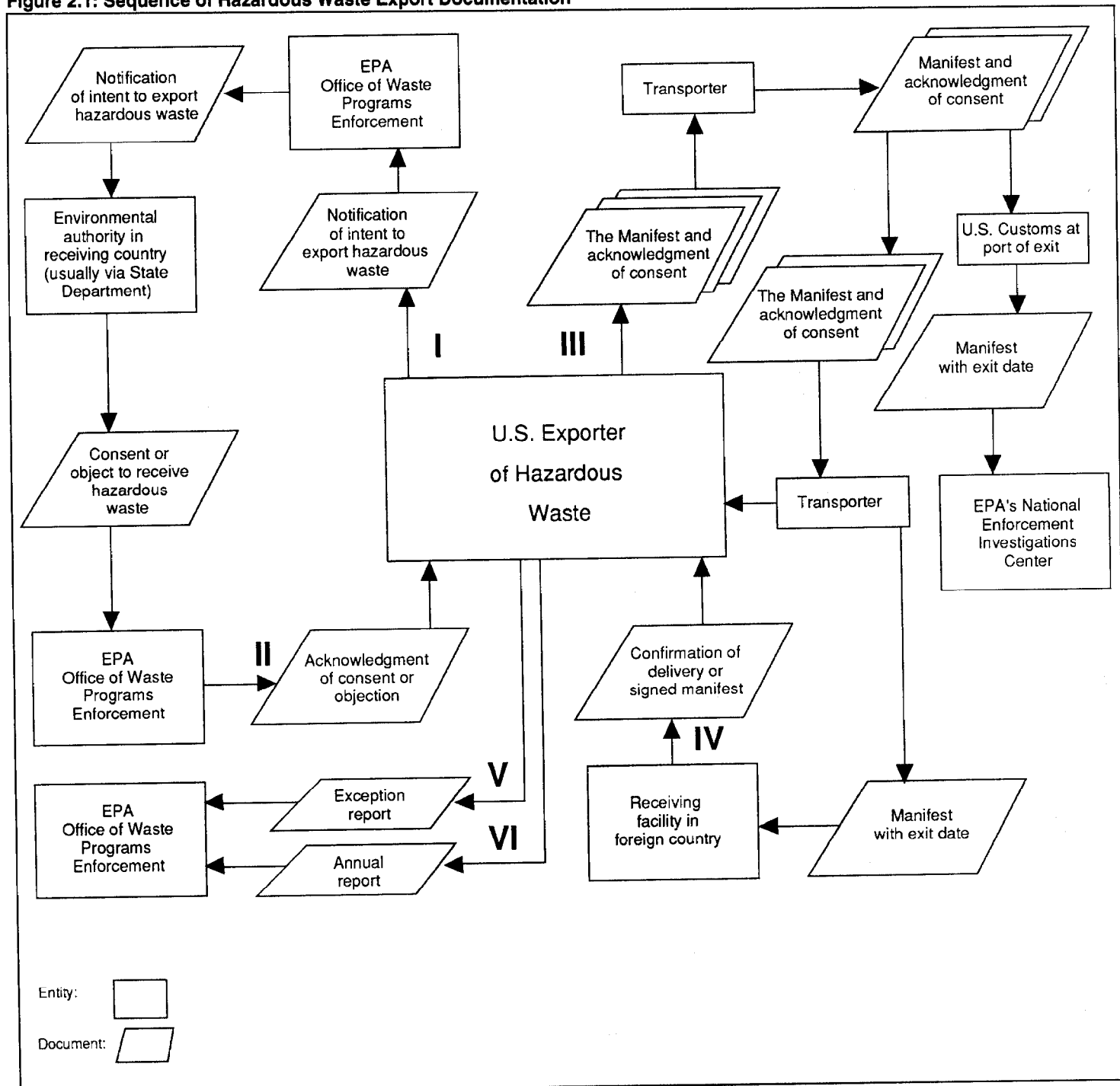
^bEstimated for notification of intent.

Notification of Intent to Export

EPA uses the "Notification of Intent to Export" to begin identifying and monitoring proposed hazardous waste exports from the United States. This is the first step in collecting data on exports as shown by (I) in figure 2.1 below, which summarizes the flow of information and documents through EPA's process. After receiving the notification from a hazardous waste exporter, EPA submits the information, through the State Department, to the government of the receiving country for a determination of whether to accept the waste.² The notification includes information on the wastes the exporter estimates it will ship to a foreign facility during a specified time period of up to 1 year.

²For exports to Canada, EPA transmits the notification information directly to the Canadian environmental authority.

Figure 2.1: Sequence of Hazardous Waste Export Documentation



Acknowledgment of Consent

Once the government of the receiving country decides whether to accept a hazardous waste export, it notifies EPA of its decision (II on figure 2.1). If the country consents, EPA forwards to the exporter an "Acknowledgment of Consent," which documents the receiving country's consent and describes the terms and conditions (such as the time period) of the consent. Exporters must attach copies of the acknowledgment to every manifest accompanying each shipment of hazardous waste.

Manifest

The manifest (III on figure 2.1) is prepared by the exporter and must accompany each shipment of hazardous waste to the border. The manifest describes shipments and is the document used to track shipments of hazardous waste from their point of origin through arrival and acceptance for final treatment, storage, or disposal. The manifest includes information on the receiving facility, transporter, waste type, quantity, and number and type of containers.

The transporter is required to sign the manifest and submit copies to the exporter and to the U.S. Customs Service at the U.S. port of exit. By memorandum of agreement, Customs is required to forward this manifest copy to EPA. Exporters are required to use the manifest form supplied by the state in which they operate. These approved state manifest forms include all the EPA requirements.

Confirmation of Delivery

The exporter must acquire a "Confirmation of Delivery" (IV on figure 2.1) from the receiving facility to confirm in writing that the hazardous waste was received and to describe any significant discrepancies between the manifest and the waste received.³ Accordingly, the receiving facility submits the confirmation directly to the exporter; regulations do not require that a copy of the confirmation be submitted to EPA. Regulations specify that a copy of the manifest, signed by the receiving facility, may be used as a confirmation of delivery.

³EPA defines significant discrepancies in waste type as differences detectable by inspection or analysis of the waste. Significant discrepancies in waste quantity are variations of more than 10 percent in weight for bulk containers (such as tank trucks, rail cars, or roll-offs), and any variation in piece count for nonbulk containers (such as drums, plastic boxes, or cartons). A roll-off is a steel container, with the size and shape of a truck's bed, which is emptied by tilting toward the rear.

Exception Report

The exporter is required to submit an "Exception Report" (V on figure 2.1) to EPA when any problem with an export arises, such as when any part of a shipment of hazardous waste is returned to the United States. An exception report is also required to document instances where the exporter did not receive a signed copy of the manifest from the transporter or confirmation of delivery from the receiving facility within specific time limits. Each year, in all, EPA receives about 15 exception reports for exports to Canada and none for exports to Mexico.

Annual Report

The exporter's "Annual Report" (VI on figure 2.1) documents all hazardous waste exports for the previous calendar year. The annual report includes data on the waste types and quantities and the total number of shipments. It also includes the exporter's certification of truth and a description of the exporter's waste minimization efforts for that year.⁴ The report must be submitted to EPA by March 1.

EPA's Decisions or Activities Based on Data Collected

The purpose of the hazardous waste export program is to monitor those exports and enforce the hazardous waste export regulations, which are designed to (1) ensure consent among the exporter, foreign management facility, and receiving country; (2) require the submittal of information and data related to the export during the export process; (3) require the exporter to submit an exception report when shipments do not reach their destination or when the waste is not processed and is returned; (4) require renotification and reexport when the original consent agreement is violated; and (5) require the submittal of annual reports on exports to EPA. To meet its responsibilities, EPA performs eight broad types of activities using hazardous waste export data obtained from the export documents. EPA maintains the data within an automated data base. The activities and related documents and the data elements required are summarized in table 2.2.

⁴Submission of a description of waste minimization efforts is not required if the hazardous waste generator submitted the information with the EPA Biennial Report required by 40 CFR 262.41.

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**Table 2.2: Data Elements Required on
Export Documents, by EPA Activity**

Data element	1	2
	Administrative processing and tracking of NOIs	Technical review of export documents (NOI, MAN, ANR)
Exporter name, address, phone, identification number	x	x
Description of hazardous waste	x	x
EPA hazardous waste code	x	x
Total quantity each waste type	x	x
Consignee's name, address	x	x
Total number of shipments exported		x
Transporter name, address, identification number		x
Port, date of exit from United States		x
Description of treatment, storage, disposal method	x	x
Year of annual report		x
DOT shipping name and identification number	x	x
DOT hazard class	x	x
Period of time, estimated export rate, frequency	x	x
Port of entry, exit transit country	x	x
Description of transportation means	x	x
Description of type of container	x	x
Alternate consignee's name, address	x	x
Transit country's name, time period, waste handling	x	x
Number of containers		x
Special handling transport instructions		x
Certification of truth, accuracy		x
Transporter acknowledgment of receipt		x
Consignee's acknowledgment of receipt to exporter		
Waste minimization efforts, volume, toxicity changes from prior year		x
Significant discrepancies		

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Activity and export document					
3	4	5	6	7	8
Coordination with U.S. Customs (MAN, AOC)	Reconciliation of data from export documents (AOC, MAN, ANR, EXR)	Informal checks and analyses (MAN)	Compliance inspections (NOI, AOC, MAN, EXR, ANR)	Development of statistics (ANR)	Development of and referral to enforcement actions (NOI, AOC, MAN, EXR, ANR)
X	X	X	X	X	X
X	X	X	X	X	X
X	X	X	X	X	X
X	X	X	X	X	X
X	X	X	X		X
	X		X	X	X
X	X	X	X		X
X	X	X	X		X
			X		X
			X		X
	X		X	X	X
X	X	X	X	X	X
X	X	X	X	X	X
X	X		X		X
			X		X
			X		X
X	X	X	X		X
	X		X		X
			X		X
X	X	X	X		X
X	X	X	X		X
X	X	X	X	X	X
X	X	X	X		X
			X		X
	X		X	X	X
			X		X

Chapter 2
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Export Data

Legend

x = Data element required
NOI = Notification of intent
AOC = Acknowledgment of consent
MAN = Manifest
COD = Confirmation of delivery
EXR = Exception report
ANR = Annual report

Eight EPA activities are presented in the table, with 25 data elements relating to those activities. In general, the first six columns in table 2.2 represent supporting activities that result in the development of statistics on exports of hazardous waste (activity 7) and the enforcement of the hazardous waste export regulations (activity 8).

First Activity:
Administrative Processing
and Tracking of
Notifications

EPA's Office of Waste Programs Enforcement (OWPE) processes and tracks notifications from submittal by exporters through approval. As notifications are received, the office reviews them for completeness and any obvious errors. These processing and tracking activities allow EPA to know in advance the estimated quantities and types of proposed hazardous waste exports, as well as the originating and receiving facilities.

Second Activity: Technical
Review of Export
Documents

EPA's National Enforcement Investigations Center (NEIC) receives copies of notifications, consents, manifests, exception reports, and annual reports; records the data from these documents into the data base; and reviews the data for completeness and consistency (along with OWPE for notifications). These reviews include comparing EPA and Department of Transportation (DOT) waste codes (which are used to describe the hazardous waste streams) and verifying that the waste codes match the waste descriptions. This is important since the ability to compare data is prerequisite to many of the enforcement activities, such as comparing waste approved for export to what was reported as actually shipped on exporters' annual reports.

Third Activity:
Coordination With U.S.
Customs

U.S. Customs, through an interagency agreement with EPA, assists in the hazardous waste export program by (1) collecting manifests at the border and submitting them to EPA, (2) verifying the completeness and consistency of data on the export documents, and (3) watching for illegal exports (i.e., those without the proper export documents). EPA provides training to Customs officials and occasionally asks them to stop and

inspect a specific shipment if EPA suspects a violation. Customs does not collect a copy of every manifest of hazardous waste shipped across the border, and it does not consistently forward them to EPA.

EPA's NEIC and regional offices conduct occasional spot checks at U.S. ports of exit with the greatest volume of hazardous waste. The border checks verify the adequacy of U.S. Customs procedures in collecting manifests and identifying violations. EPA also uses these checks to identify areas needing improvement in the training process of Customs inspectors. EPA noted that the main purpose for spot checks is the deterrent effect on exporters.

NEIC, OWPE, and regional staff also respond to questions telephoned from the U.S. Customs inspectors at ports of exit concerning problems with data or missing shipping documents. For example, the inspectors might find a different number of containers in a shipment than the number indicated on the manifest, or might find that the acknowledgment of consent is not attached to the manifest as required. Such shipments would be held at the border while EPA staff research the problem by referring to data provided by the exporter or calling the exporter for additional information. EPA provides instructions to the inspectors on whether to stop the export at the border or require additional information from the transporter.

**Fourth Activity:
Reconciliation of Data
From Export Documents**

EPA reconciles the data on various export documents in order to track hazardous waste exports, ensure that exporters comply with the terms of the consent, and identify violations. For example, a manifest for a particular waste should also have a corresponding acknowledgment of consent for that waste, showing the maximum quantity that can be exported during the year. Similarly, if an exporter files an annual report of actual shipments of waste, EPA should have received at least one manifest for each waste listed in the report. EPA also checks annual report quantities against consent quantities to identify exporters who shipped more waste than authorized. NEIC is currently attempting to computerize these comparisons: most are still performed manually.

**Fifth Activity: Informal
Checks and Analyses**

EPA's NEIC performs informal analyses to identify unusual exporter activities or trends in export data, such as reviewing manifests to identify unexplained changes in the quantities or types of hazardous waste crossing a particular port of exit. NEIC also occasionally compares its data

with similar manifest data maintained by states to verify or gain additional information.

Sixth Activity: Compliance Inspections

EPA regional offices and state environmental agencies conduct inspections of hazardous waste exporters' facilities to verify compliance with all applicable EPA regulations, including whether export documents have been completed and submitted to EPA. The inspections are conducted as part of the overall hazardous waste inspection process that EPA implements. Facilities inspected are usually those suspected of being in violation.

Inspections are the only activity in which EPA has an opportunity to review confirmations of delivery submitted by receiving facilities to the exporters. This review enables EPA to identify hazardous wastes that receiving facilities shipped back to the exporter because they were unacceptable for treatment, or did not conform with terms of the consent. Otherwise, EPA would only know of such returned waste shipments if exporters submit exception reports.

Seventh Activity: Developing Statistics

In response to specific requests, such as those submitted by congressional committees, EPA's NEIC uses data on waste quantity and type to develop statistics on the amount and type of hazardous waste exported by the United States and to provide information on individual exporters and receiving countries. In addition to the Congress, EPA headquarters and regional offices, other government agencies, and private sector individuals and organizations have made specific requests.

Eighth Activity: Development of and Referral to Enforcement Actions

The end result of the activities outlined above are enforcement actions taken by EPA against hazardous waste exporters. Enforcement actions are taken against exporters for violations such as shipping hazardous waste without a manifest and failing to submit annual reports or manifests. To detect violations, EPA's NEIC compiles and analyzes data from its hazardous waste data base to profile specific exporters suspected of violating EPA export regulations. NEIC considers the severity of the possible violations and the exporter's compliance records to decide whether to take informal action or refer violations to the regions. NEIC's actions consist of informal phone calls or letters, or referral to the regions. NEIC refers these actions to the regional offices for enforcement, including formal notices of violation, administrative and compliance orders assessing penalties, and civil and criminal prosecution.

Importers' Decisions or Activities Based on Data Collected

Two hazardous waste export documents—the notification of intent and the manifest—are used, to a limited extent, by the Canadian and Mexican governments and the receiving facilities that we reviewed. The receiving facilities develop their own data from waste stream samples and their chemical analysis and evaluation of the exporter's production processes to determine whether each waste type could be accepted for treatment. In deciding whether to consent to the imports, the governments used data provided by their own receiving facilities and conducted administrative review of the U.S. notifications of intent to export.

Initial Consent Decisions

Even before a U.S. company submits a notification of intent to export, it contacts the potential receiving facility to discuss the types and quantities of hazardous waste the company wants to export and the required treatment process. These initial discussions allow the receiving facility to assess its ability to treat the waste.

During this initial data-gathering effort, if a waste in question is likely to be accepted, the receiving facility gets samples of the proposed waste for analysis and characterization of the waste. This effort includes in-depth chemical and physical analyses to determine such characteristics as specific hazardous components, heat value, and organic content. Based on this information, the facility then verifies that (1) the proposed waste is compatible with the facility's specific process and (2) the treatment of the proposed waste would be in compliance with the facility's certification. Once the receiving facility agrees to accept the proposed waste, the exporter enters into the export process by submitting the notification to EPA. At the same time, the receiving facility initiates required paperwork with its own government, including a notification of intent to import the waste.⁵

Canadian Consent

The Canadian government verifies the notification submitted by the receiving facility for completeness and consistency with the U.S. notification sent by EPA. The Ministry of Environment of Quebec also verifies both the U.S. and the Canadian notifications for compliance with the facility's permit to treat hazardous waste (and when necessary, Quebec requests additional information, such as laboratory analyses, from

⁵Canadian receiving facilities submit a "Notification to Transport Waste" to Transport Canada, the Canadian equivalent of the U.S. Department of Transportation. The notification not only allows transport of the waste through Canada, but is also the permit that allows the importation of the waste. A Mexican receiving facility submits (1) an application for a permit to import, (2) waste analyses, and (3) waste samples to the Secretariat de Desarrollo Social. If approved, then the import permit is provided the facility.

the receiving facility). If the provincial and Canadian governments consent to accept the waste, Canada notifies both the receiving facility and EPA, which then issues the acknowledgment of consent to the exporter along with any conditions or restrictions imposed by Canada on the movement of the hazardous waste. A copy of the acknowledgment is sent to NEIC.

Mexican Consent

Mexico's government verifies the information in the receiving facility's permit application by having the submitted waste samples analyzed by a government laboratory. It reviews both the application and the exporter's notification provided by EPA for consistency with its own data and verifies the receiving facility's authorization to treat the proposed waste. The government then consents or refuses to accept the waste and notifies both the receiving facility and the State Department through the U.S. Embassy, which in turn, communicates the decision to EPA in a cable. EPA then adds a note to the cable specifying the importing country's terms and conditions and issues the cable to the exporter as the acknowledgment of Mexico's consent.

For both Canada and Mexico, we found that the initial consent process described above, including the receiving facility's analysis of the waste, takes place the first time an exporter proposes to ship a type of waste to a receiving facility. However, when the exporter continues to ship the same waste to that facility in subsequent years, only the formal notification-acknowledgment portion of the consent process is repeated. That is, unless the waste production process or materials change, the receiving facility does not request additional waste samples. Rather, the facility relies on the original analysis of the waste and experience with the exporter's previous shipments to initiate the notification process.

Individual Shipment Decisions

To determine whether to accept individual hazardous waste shipments, the receiving facilities analyze samples of each waste listed on the accompanying manifest and verify that it matches the facilities' initial characterizations of the waste and the government's consent. Wastes that do not match the exact specifications of the exporter's contract, but could still be treated by the facilities, are either treated under renegotiated agreements for additional fees or returned to the exporters. For accepted wastes, the facility determines the quantity of waste in the shipment. Differences in quantity are considered by receiving facilities to be discrepancies if the number of containers or the weight of bulk shipments differ from the entries on the manifest.

EPA may, through the U.S. Customs, stop a shipment if it does not have the accompanying export documents, does not conform to the documentation, or otherwise violates the hazardous waste export regulations. The importing governments generally make no decisions about accepting individual shipments of waste as they are shipped.

Summary and Conclusions

In this chapter, we addressed our first evaluation question: "What data does EPA collect on exports of hazardous waste and what decisions or activities by EPA and importers are based upon or use the data?" EPA implements a hazardous waste export program that is designed not to control, but to monitor hazardous waste exports and identify regulatory violations. The system that EPA has established requires the development and reporting of data by exporter officials throughout the process of exporting hazardous waste to a foreign receiving facility. The various reports that the exporters submit to EPA contain data that is designed to characterize, in general, the type, amount, transport and delivery of the waste. By having this monitoring process, EPA tries to ensure, within the limits of its authority, that the waste is managed in an environmentally acceptable manner. EPA uses the data to identify violations of hazardous waste export regulations. We have identified eight EPA activities that are conducted to implement the hazardous waste export program; six are prerequisite to its enforcement efforts.

Canadian and Mexican receiving facilities do not rely on data provided by U.S. exporters to make a decision about whether they can manage a waste. Instead, they analyze samples of waste and reach their own conclusions concerning whether it is manageable. Before a waste is exported, both Canadian and Mexican governments conduct reviews to verify that the receiving facilities are permitted to manage that type of waste. In the Canadian case, the government uses the data developed by the receiving facility rather than the U.S. exporter's data to determine whether the facility is permitted to manage the waste. The Mexican government analyzes the waste stream sample itself and uses the exporter's notification provided by EPA and the receiving facility's permit application to reach a decision on whether to allow import.

Generally, neither the Canadian nor the Mexican government makes subsequent decisions about individual shipments after the initial consent process. EPA does not participate in the importer's determinations to consent or reject U.S. hazardous waste. Once a country has consented and the shipment complies with U.S. regulations, EPA does not have the

authority to stop the shipment, even if it has reason to believe that the waste will not be managed in an environmentally acceptable manner.

Quality of EPA Hazardous Waste Export Data

Data of poor quality would affect EPA's ability both to monitor and detect hazardous waste irregularities or violations and to enforce the hazardous waste export regulations. In this chapter, we address the second evaluation question concerning the quality of the data EPA collects on U.S. hazardous waste exports.

As mentioned in chapter 1, we used a judgmental sample to generate our case studies. (We discuss the cases below.) In analyzing our case study data, we identified a number of data quality problems. Some were dependent on the sample that we chose, and so we cannot say that these are pervasive across all exporters.

However, others that surfaced from the case studies are, in fact, not dependent on the sample; that is, they would exist in any sample we selected. These are systemic problems, problems that are endemic to the current program and affect all hazardous waste exporters. An example of this second type of problem is invalid reporting of waste type by using the EPA hazardous waste coding system. The coding system itself is problematic for characterizing wastes.

Tables 3.1 and 3.2 exhibit these two types of problems we found, respectively. The problems themselves are discussed in the rest of this chapter.

Table 3.1: Summary of Problems Identified Through Case Studies

Data quality characteristic	Problem	Exporters exhibiting problem^a
Reliability	Individual shipment waste quantity estimates inconsistent with reported quantity of waste received	7
Validity	Counting nonhazardous waste as hazardous	3
Completeness	Waste quantities not reported for individual waste streams and total volumes	3
	Incomplete reporting of shipment frequency	3
	Reported waste codes incomplete	1
	Renotification and re consent not submitted	2

^aWe studied seven exporters.

Table 3.2: Summary of Systemic or Program Problems

Data quality characteristic	Problem
Reliability	Regulations allow inconsistent narrative waste descriptions across documentation for a shipment.
	Regulations allow inconsistent units of measure to be used when reporting a shipment.
Validity	Hazardous waste code system is problematic for categorizing wastes.
Collection	Standardized documentation requirements for exporters do not exist.
	Required reporting forms for notifications or annual reports are lacking.
	EPA reporting guidance is limited.

In addition, we discovered 10 violations of EPA export regulations that the agency had not detected through its monitoring and enforcement activities. These are also described in this chapter.

Use of Cases to Assess Data Quality

Of the seven U.S. companies we selected for in-depth study, five were generators of hazardous waste and two were transfer stations that receive multiple types of hazardous wastes from generators, group the wastes by compatibility, and ship them to a treatment, storage, or disposal facility.¹ The two transfer stations exported their wastes to Canada. Summary descriptions of the selected companies are presented in appendix I.

Five of the companies exported their hazardous wastes to three different receiving facilities in the province of Quebec, Canada. Two companies exported their wastes to one facility in Mexico. Brief descriptions of these four facilities are presented in appendix II.

As mentioned earlier, to evaluate data quality, we reviewed up to five manifests per exporter of their total 1990 shipments; these manifests were chosen to ensure variation in range of quantities and waste types. The result was an evaluation base of 34 manifests (one exporter had only four shipments in 1990), and their accompanying documents. The 34 manifests covered 52 shipments of hazardous waste. These shipments included 23 different hazardous wastes. The waste types exhibited one or more of the characteristics that define wastes as hazardous—ignitability, corrosivity, reactivity, and toxicity. For example, metal hydroxide sludge, a

¹In these cases, the transfer stations were facilities that can treat wastes; in the export shipments we reviewed, transfer stations simply transferred these wastes to foreign facilities.

wastewater treatment by-product from electroplating operations, is a toxic waste that was exported by four of the selected companies. Another export, fly ash and debris (waste incinerator ash and spent solvents) exhibited all four hazard characteristics. Appendix III lists the hazardous wastes shipped under the manifests we reviewed.

Case Study Problems

Data Reliability Problem

To examine data reliability, we looked at whether exporters' and receiving facilities' quantity estimates agreed. We compared all the data from each manifest with the data on the corresponding confirmation of delivery from the receiving facility. This test provided us with a comparison of two independent determinations. EPA does not routinely perform this comparison.

For exports to Canada, the confirmations of delivery consisted of copies of the exporters' manifests signed by the receiving facilities, with notations of the differences found in the quantity or number of containers. One Canadian receiving facility noted the weight received.

For exports to Mexico, the receiving facility's invoice, which stated the type and weight of waste received and treated, served as confirmation of delivery for our comparison. In these cases, although the exporters considered their returned copy of the manifest to be the confirmation of delivery, the manifest did not contain data on the amount or type of waste that arrived at the facility. The manifest copy was provided by a customs broker who accepted responsibility for the waste at the border, did not weigh or analyze it, but sent the waste on to the receiving facility.

Exporters are required to record on their manifests the quantity of waste being shipped in weight or volume. Five of the exporters did not always weigh their wastes before shipping. For our evaluation, when the exporter did not record weight on the manifest, we converted volume to pounds using a factor the exporter had used in similar conversions. When the exporter had not used a conversion factor, we used the exporter's report of kilograms from the Canadian or Quebec manifests to calculate pounds.²

²Exporters are required to submit a Canadian manifest and, when applicable, a Quebec manifest with their shipments into Canada. The Canadian manifest requires the quantity of the waste being exported to be reported in kilograms or liters.

For exports to Mexico, we compared the weight acknowledged by the receiving facility in its invoice with the weight recorded by the exporter. Quantities of hazardous waste recorded on the manifests differed from those on the confirmations of delivery. Differences for the eight Mexico manifests were small (a maximum of 7.5 percent), and these were primarily owing to adjustments for moisture content performed by the receiving facility.³ Of the remaining 21 Canadian manifests for which comparisons could be made, the range between the estimate provided by the exporters and the quantity reported by the foreign facility was from minus 48.4 percent to plus 120 percent.⁴ Table 3.3 presents detailed conclusions on the comparisons. We found that there was significant variation between manifest estimates provided by exporters and the quantities as measured by the receiving facilities.

³The hazardous waste exported to Mexico is recycled for its zinc content. The Mexican facility calculates a dollar credit for the value of the zinc content, which partly offsets the cost of waste processing. The receiving facility uses accurate measurements of weight and moisture to determine and discount the water content from each shipment before the zinc credit is calculated.

⁴Comparisons could not be made for five manifests. Two manifests had units of measure that could not be compared with the units on the confirmation of delivery. Three confirmations of delivery did not include quantity received.

Chapter 3
Quality of EPA Hazardous Waste Export
Data

Table 3.3: Differences in Waste Quantities Recorded in Manifests and Confirmations of Delivery

Exporter ^a	Manifest	Quantity (pounds)		Percent difference
		Exporter estimate	Receiving facility measurement	
A	1	4,000	5,380	-25.7
	2	30,000	37,240	-19.4
	3	11,000	13,600	-19.1
	4	31,967	46,080	-30.6
	5	7,650	13,780	-44.5
B	1	16,049	15,900	0.9
	2	14,398	7,760	85.5
	3	10,000	12,330	-18.9
	4	10,000	8,200	22.0
C	1	27,081	20,940	29.3
	2	29,983	13,640	119.8
	3	18,500	15,500	19.4
	4	30,000	15,540	93.1
	5	16,253	15,370	5.7
D	1	21,000	22,120	-5.1
	2	26,385	27,040	-2.4
	3	3,118	6,040	-48.4
E	1	30,064	29,079	3.4
	2	31,273	29,652	5.5
	3	22,178	22,222	-0.2
	4	9,143	11,620	-21.3
F	1	167,100	165,565	0.9
	2	195,600	191,295	2.2
	3	193,600	187,951	3.0
	4	169,100	164,673	2.7
	5	172,500	170,744	1.0
G	1	195,520	181,818	7.5
	2	189,300	176,807	7.1
	3	191,840	181,483	5.7

^aExporters F and G shipped wastes to Mexico.

Data Validity Problem

Three exporters reported wastes on their manifests and annual reports that were nonhazardous by EPA's definition. EPA entered these

nonhazardous wastes into its hazardous waste data base and did not subtract them before developing statistics on quantities of exported hazardous wastes. EPA did not know how much nonhazardous waste was included, but one official considered the impact of nonhazardous wastes to be too minor to justify identifying and deleting them. He stated that nonhazardous waste is included in the data base when such waste is regulated by a state or by Canada.

However, the exporters said they reported the nonhazardous wastes because they had always reported them in the past and were afraid of changing their procedure, or they believed they were required to report all exported waste, whether hazardous or not. EPA accepted the data for these wastes and included them in their hazardous waste data base.

Data Completeness Problems

Waste Quantities and Shipment Frequencies

Three exporters submitted notifications to EPA with incomplete data on proposed waste quantities and frequencies of shipments. Two of these exporters did not provide specific quantities and number of shipments for each waste as required by the regulations, and EPA did not obtain the missing information. For example, one of the exporters requested consent to ship a total of 440,000 gallons of 12 different wastes. EPA divided this total by 12 and indicated in the acknowledgment of consent that the exporter should consider 36,700 gallons to be an approximate distribution among the wastes. An EPA official said that exceeding these approximate quantities would not be considered a violation. In another case where EPA divided a cumulative total of 500,000 gallons in this manner, the exporter shipped 360,984 gallons of a single waste, exceeding EPA's approximate distribution of 167,000 gallons. In both cases, the exporter did not intend for such limits to be placed on the quantity of any particular waste.

Submitting incomplete notifications led to differences between EPA's and Canada's consent documents. Parallel with the U.S. notifications, Canada issues its own acknowledgments of intent to import to its receiving facility, which in turn sends a copy to the exporters. EPA does not routinely receive a copy of this document. One of the three exporters submitted a notification without the "total volume for calendar year" for a particular waste. According to the exporter, someone at EPA wrote in 30 cubic yards; and consequently, EPA issued its acknowledgment of consent for that volume. For the same waste, Canada had authorized the receiving facility

to import 120 cubic yards from this exporter. The exporter did not notice the difference between the two documents and exported 40 cubic yards for the year, thus violating EPA's acknowledgment of consent. Since EPA did not detect this violation until gathering the export documents we requested for our study, the agency had not obtained more complete data from the exporter.

Two exporters submitted annual reports where waste quantities reported were incomplete, so that EPA did not have all information relevant to the exported wastes. One exporter failed to provide total quantities of each waste type exported.

Waste Codes

EPA did not obtain complete data on waste codes describing exports. Exporters are required to describe their proposed wastes on the notification using all designated waste codes. One exporter did not record all of these codes on the notification and manifest. In addition, even when exporters provided complete waste code data, the EPA data base allows the entry of only one code into the manifest and annual report portions of the data base. For example, one exporter reported a waste type using codes representing three wastes: cadmium, chromium, and lead. However, the EPA data base accepted only the code for the first waste, cadmium, so that EPA's knowledge of the hazardous components was incomplete.

Renotification and Reconsent

Two exporters exceeded the quantities of waste they were authorized to export under their acknowledgments of consent and did not submit updated notifications for the additional quantities. One exporter was authorized to export only 750 tons of a particular waste, but actually exported over 1,600 tons. The data on their export documentation was accurate, but these exporters did not comply with the regulation requiring an updated notification. EPA did not detect the violations, although they were readily apparent through reconciliation of data among the export documents. Thus, more of a particular type of waste was shipped to Canada than the government and the receiving facility had agreed to accept.

EPA could identify exporters that ship more waste than authorized by reconciling the data on individual manifests with exporters' acknowledgments of consent and annual reports—if exporters report all of their shipments and if EPA receives all the manifests from U.S. Customs. However, U.S. Customs does not collect or forward all of the manifests to EPA; thus, EPA cannot reconcile the data from these documents.

One exporter shipped two different wastes to Canada with components that the receiving facility would not treat. In one instance, the exporter shipped "waste cyanide mixture dry" that was too high in concentration of organics for the receiving facility to treat. The same exporter also shipped a waste that the receiving facility claimed was a very inflammable solvent. However, the exporter subsequently sent this waste to a domestic facility that did not consider it inflammable and disposed of it. In both cases, the Canadian receiving facility rejected the wastes based on their analyses and returned them to the exporter. This additional movement of wastes across the border increased the risk of an accident occurring or some other danger inherent in the transportation process.

The exporter did not realize exception reports were required for these returned wastes and did not provide them. This in itself is a violation of the regulations. Because EPA relies on the exporters to report any returned waste, the agency had no knowledge of either the returned wastes or the underreporting.

Four of the five exporters shipping waste to Canada did not perform periodic analyses of waste to (1) verify that the wastes were hazardous, (2) determine their hazardous components, or (3) determine the concentrations of these components. Rather, exporters relied on analyses of their wastes performed by the receiving facilities both at the start of the notification process or upon receipt of waste shipments, or they relied on their knowledge of the process that led to generation of the waste. Officials at one of the receiving facilities said that not all exporters know the hazardous components of their wastes until analyzed.

RCRA regulations do not require generators to analyze their wastes before shipping domestically or before exporting. Instead, the regulations classify certain categories of wastes as hazardous by the nature of the production process or the materials used in it. For example, wastes generated by electroplating processes are generally assigned the EPA code F006, regardless of the actual types or amounts of hazardous contaminants contained in the waste. EPA has established concentration limits for some wastes not covered by these process-related codes, but the agency does not require that exporters determine concentration levels for every shipment or that exporters report these data.

Systemic Problems

Data Reliability

Narrative Waste Descriptions

Three exporters provided inconsistent descriptions of the same waste on different documents. This increased the difficulty of comparing wastes across documents, such as determining that wastes described on manifests and the annual report corresponded with those on the acknowledgment of consent.

Export regulations do not require the same waste descriptions on the various export documents. For example, the notification requires the EPA waste code, a general description, and the Department of Transportation (DOT) shipping name while the manifest requires only the DOT shipping name and the annual report requires the general description and the waste code. Some states require an EPA waste code, but those we reviewed provided space for only one code.

In one case, the exporter entered the DOT shipping name "Waste Corrosive Liquid NOS" and the EPA waste code of D002 and the description "copper sulfate liquid" on the manifest. However, the notification and acknowledgment of consent listed three wastes with that same DOT shipping name and EPA waste code, all with different general descriptions and different allowed quantities. None of these matched the wastes described on the manifest. Consequently, the waste listed on the manifest, which contained no description, could not be matched with any specific waste on the notification or consent. The data were not sufficient to identify which waste had been exported. Further, three shipments of the waste described on the manifest appeared on the exporter's annual report, indicating that this specific waste may have been exported without consent.

In addition, EPA regulations do not specify what the general description should be (for example, the proper chemical name) or that this description should be used consistently when referring to the same waste in different documents. The same exporter described a waste on the notification as zinc phosphate sludge. Using other information developed from the exporter's annual report, we determined that this waste did not

correspond with any one of nine wastes on the exporter's report submitted to EPA.

An official at EPA's NEIC agreed that it would be easier to track the data across documents if the waste descriptions were consistent. The description requirements differ because EPA developed the annual report requirements from the more general hazardous waste regulations without considering the special requirements of exports.

Shipment Units of Measure

EPA regulations do not specify that the same units of measure should be used when describing the same waste quantity on different export documents. Consequently, four exporters developed quantities using different units of measure on different documents for the same hazardous waste shipments, making EPA's comparisons of waste quantity across the documentation extremely difficult if not impossible. Exporters use units of measure most appropriate for their operations. For example, one exporter develops data on waste quantity in gallons for its notification, but in pounds for its manifest. In this case, the exporter prefers to use gallons on the notification, but the receiving facility requires that the waste on the manifest be specified in pounds. Variation in units of measure for the same waste volume can result in unnecessary errors owing to conversion.

Data Validity

Exporters had difficulty determining the appropriate EPA waste codes to use to describe their wastes. The export regulations require exporters to report to EPA all waste codes associated with every hazardous component of a waste exported. Two exporters believed that EPA waste codes were not specific enough for them to use the proper code. They were uncertain about which EPA waste codes to assign to three particular wastes: unspent (unused) solvents, corrosive liquids, and contaminated concrete. For example, unspent solvents are generally assigned "U" or "P" category codes.⁵ However, one exporter believed that mixtures of these unspent solvents could not be assigned "U" codes. When no other codes could be found to describe these mixtures, the exporter classified the wastes as nonhazardous because no appropriate code could be applied. EPA's guidelines state that such mixtures of unspent chemicals cannot be assigned P or U codes. EPA would have acquired incomplete knowledge of the characteristics of the exported waste, and a potentially hazardous waste would have been reported as nonhazardous.

⁵EPA assigns "U" and "P" codes to unspent or "offspec" chemicals. Unspent acetaldehyde, for example, would correspond to the EPA waste code U001. If a waste is a mixture of two or more P or U wastes, the codes do not apply.

These problems with the EPA hazardous waste codes have already been reported. In our previous reports, we concluded that the RCRA waste codes will produce inaccurate counts of the volume of waste streams owing to misclassification.⁶

EPA Data Collection Problems

EPA Reporting Guidance

Six exporters told us they depended on trade publications, conferences, consultants, seminars, lawyers, the Federal Register, and word of mouth to remain informed about EPA regulations. Exporters said they needed better guidance because it was inadequate; the regulations were unclear and seemed to change without warning even though EPA indicated that the regulations have not changed since 1986. EPA officials said they addressed the concerns or questions of exporters who contacted the agency directly. NEIC recognizes the need to provide more guidance to exporters, but it has not done so because of resource constraints and uncertainty about who (within EPA or the states) should provide guidance. However, EPA does distribute an information packet on annual report requirements with each acknowledgment of consent it sends to exporters.

EPA provided indirect guidance to some exporters through a receiving facility. In this case, EPA asked the facility to inform its customers (U.S. exporters) of changes the exporters needed to make in providing data to EPA.

Two exporters were uncertain of when to file an exception report. On two separate occasions, one of the exporters failed to file exception reports that were required to document hazardous waste shipments of waste cyanide mixture dry and water soluble lacquer rejected by the receiving facility. The company officials did not understand the requirement and were unsure of where exception reports were covered in the regulations.

This exporter violated the regulation requiring exception reports for returned waste, but EPA failed to detect the violation. In fact, EPA has never cited an exporter for failing to file an exception report. The agency typically receives only a few exception reports each year. In 1990, EPA received 16 exception reports for exports to Canada and none for exports

⁶Hazardous Waste: EPA's Generation and Management Data Need Further Improvement (GAO/PEMD-90-3, Feb. 9, 1990).

to Mexico, for the 5,791 shipments to both countries.⁷ Yet we found two missing reports in our review of only 52 shipments.

The confirmations of delivery should contain information on rejected wastes, or problems with waste type or quantity, indicating that an exporter should submit an exception report. EPA regulations do not require exporters to provide a copy of the confirmation of delivery to EPA. Copies of the confirmations of delivery are available to EPA through site inspections and, in the case of five of the seven exporters, through the states' hazardous waste programs. An EPA regional official responsible for coordinating various export programs stated that the agency does not make regular use of these data to verify whether exception reports are filed or required.

Documentation on Data
Maintenance and Reporting
Process

All seven exporters exhibited varying degrees of inadequate documentation of their procedures for complying with the export process requirements described in chapter 2. Lack of adequate documentation can produce inconsistencies in the way data are developed and reported. In fact, an NEIC official believes that some violations of export regulations have resulted from companies failing to adequately document their procedures.

All seven exporting companies had only one employee each with primary responsibility for ensuring compliance with EPA regulations. One of these individuals stated that he was the only person at the company who had knowledge of the export program requirements and the company's undocumented export procedures.

Lack of Required Forms

EPA does not provide a standard form for the notification, but assisted one receiving facility in Canada in developing a U.S. notification form for use by its customers. Three Canadian facilities we contacted said they provided some form or guidance to U.S. exporters for providing data to EPA.

EPA developed a format for the annual report, but is not authorized to require its use. Four of the seven exporters used this form, while the others used their own formats. Lack of standard and required forms increases the likelihood that data are incomplete, incomparable or

⁷EPA receives about 15 exception reports on Canadian exports each year. In 1990, EPA actually received 75 reports with 60 of them from a single company. This was because of a technicality: the receiving facility repeatedly returned hardened waste residues left in the bottom of containers of one waste type, which had to be reported as returned waste.

incorrect, and an EPA official believes data entry problems have resulted from nonstandard forms.

EPA has not developed or required forms for the notification and annual report because of the perceived difficulties associated with getting approval for the forms from the Office of Management and Budget. Also, standard forms would require changes to the export regulations, and one EPA official responsible for maintaining the export data base stated that this would be difficult because there are many changes needed to other environmental regulations that are of higher priority. Moreover, proposed export legislation, if approved, would alter the existing requirements anyway.

Violations

The focus of our review was the evaluation of the quality of the hazardous waste data used by EPA. However, in the course of conducting our evaluation, we identified 10 violations not detected by EPA. Violations of the hazardous waste export regulations can be defined by a few broad categories: (1) exporting unauthorized waste; that is, exporting either unauthorized quantities of approved types of waste or exporting unapproved types of waste; (2) failing to provide correct or complete data on submitted documentation to EPA during the export process; and (3) failing to submit any required documentation to EPA during the export process. Every one of the 10 violations we identified were associated with either a data quality or process problem listed above. One violation was associated with misrepresenting waste type by omitting required waste codes. There were five violations of incomplete reporting of waste quantities to be exported, one violation of misreporting total quantity of waste exported, two cases where exception reports should have been but were not submitted to EPA and one failure to provide a complete certification of truth statement in the annual report.

Summary and Conclusions

In this chapter, we addressed our second evaluation question, "What is the quality of the hazardous waste export data?" Our seven case studies and in-depth reviews revealed 12 data quality and data collection problems. Six of the problems are dependent upon the judgmental sample we chose and therefore cannot be generalized to the entire hazardous waste exporter population. These problems are (1) unreliable hazardous waste quantity estimates made by exporters; (2) nonhazardous waste counted as hazardous; (3) exported waste quantities simply not reported; (4) shipment frequency information not reported; (5) incomplete reporting

of waste codes that describe the type of waste exported; (6) required exception reports not submitted by exporters to EPA. We also found six systemic problems that affect all exporters. In this group, we found (1) regulations that allow unreliable narrative descriptions for a shipment of waste, (2) regulations that allow inconsistent units of measure to describe a shipment of waste, (3) the hazardous waste coding system problematic for characterizing exported wastes, (4) limited EPA reporting guidance for exporters to follow, (5) a lack of standardized documentation requirements for exporters, and (6) a lack of required reporting formats for notifications and annual reports.

Although EPA cannot mandate what type and quantity of waste can be exported, it is critical for the agency to ensure that only waste that a receiving facility has consented to accept is shipped. EPA pursues violations of hazardous waste export regulations at least in part to deter future violations. The effectiveness of the monitoring of exports and the identification of violations is directly a function of the quality of the data that EPA receives. However, the problems we identified of data reliability, validity, and completeness are sufficient to render problematic, on many counts, EPA's ability to monitor hazardous waste exports.

EPA Enforcement and Importer Activities Affected by Data Quality Problems

In this chapter, we address our third and fourth evaluation questions, which ask about the EPA enforcement and importer activities that could be affected by the data quality problems we identified. First we describe the specific activities EPA conducts to implement or support its enforcement program. Then we identify those activities that could be adversely affected by the data quality and data collection problems. Finally, we report our conclusions concerning whether importers' activities and decisions could be affected.

Key EPA Program Activities

We identified eight key program activities that EPA conducts to enforce the hazardous waste export program. These activities are (1) ensuring that there is consent among exporter, receiving facility, and receiving country before shipment; (2) reviewing shipments, or determining that the waste actually shipped is consistent with the manifest, notification of intent, and acknowledgment of consent; (3) ensuring appropriate transport of the waste during its export; (4) ensuring that required documentation is submitted by exporters to allow effective monitoring and enforcement by EPA; (5) ensuring that renotification and reconsent occur for any substantive change in the waste exports beyond the consent agreement; (6) confirming that only authorized waste leaves at port of exit; (7) ensuring that waste delivery in the receiving country is consistent with authorizations; and (8) preparing statistical data on completed exports and conducting retrospective analyses. Each of these activities is discussed below.

Ensuring Consent on Proposed Exports

One of the most important activities conducted by EPA within the hazardous waste export program is ensuring that there is consent and coordination between the hazardous waste exporter, the receiving facility, the receiving country, and EPA before export of the waste. This is a function designed to ensure that the exporter specifies the type, amount, and other characteristics associated with the waste and that the receiving facility and country recognize the characteristics of the waste and consent to receive it.

Reviewing Shipments

Shipments of hazardous waste either being transported from one destination to another within the United States or exported must be accompanied by a manifest. In the case of exports, a manifest is the document used to technically describe the waste and to ensure that shipments are consistent with the consents acquired. Consequently, each

shipment manifest is accompanied by a copy of the related acknowledgment of consent and can be related back to the notification of intent. At any time during transport, EPA can request information on shipments and ensure that they are consistent with the manifest, notification of intent, and consent agreement.

Ensuring Appropriate Transport

During the export process, when individual shipments are being examined, EPA ensures that they are in fact being transported by the licensed, designated transporter and that the planned transport through any designated transit countries is consistent with the consent.

Ensuring Submittal of Required Documentation

Throughout the hazardous waste export process, EPA is constantly reviewing information and data to determine whether all required documentation was submitted by exporters; whether the documentation was complete and consistent for exported wastes; and whether information received from other sources, such as U.S. Customs, is in agreement with the information received from the exporters. These efforts are designed to allow EPA to track and monitor shipments of hazardous waste to ensure that they were authorized under the consent process. The information also allows EPA to identify violations, such as the export of shipments for which consent approval was not acquired or the more common case, where the exporter did not completely or adequately characterize the type, amount, or management of the waste.

Ensuring Renotification and Reconsent

When individual shipments or annual exports of hazardous wastes are found to be substantively different than what was agreed upon, such as when the chemical composition of the exported waste is different or when the volume of the waste changes significantly, the exporter is required to start the consent process again; that is, reinitiate the notification of intent and consent effort. EPA monitors and reviews exports to ensure that renotification and reconsent occur as required and to identify related violations.

Confirming at Port of Exit

Information is acquired by U.S. Customs at the port of exit on the type, amount, and destination of exported waste. This information is provided to EPA, whose officials then use it in their enforcement activities. The agency matches information on consent agreements with manifest

information to ensure that authorization was granted and that all required documentation was submitted by the exporters.

Ensuring Authorized Delivery

Receiving facilities in a foreign country provide exporters who ship hazardous waste to them with a confirmation of delivery notice reporting the amount and type of hazardous waste as well as other related information on the export shipment received. Through on-site inspections of the exporter facility, when they occur, EPA acquires that information and uses it to substantiate delivery at the facility designated through the export consent process. If the receiving facility cites on its confirmation of delivery information that substantive differences exist between the actual export and what was supposed to have been shipped, EPA could use this information to determine whether renotification and reconsent should have occurred as well as whether other violations exist.

Conducting Retrospective Analyses

The general objective of EPA's retrospective analyses is to provide basic information on exports and to characterize historical trends for congressional and other audiences upon request. This information is used to understand which wastes have been exported, in what amounts, and to which countries the waste was sent. The intent of such analyses is to inform the Congress and others for possible policy development. For example, estimates may be developed to determine whether certain waste streams are becoming more predominant than others and whether their domestic management may need attention to ensure that domestic capacity is available.

EPA Enforcement Activities Affected by Identified Problems

The data quality and collection problems we presented earlier were identified through the analysis of our cases. The final step in our evaluation was to determine whether EPA's enforcement and the importers' activities could be affected by the problems we identified. The following discussion presents our conclusions for the two groups of problems. Table 4.1 presents the detailed conclusions of our review.

Chapter 4
EPA Enforcement and Importer Activities
Affected by Data Quality Problems

**Table 4.1: Enforcement Activities
 Affected by Data or Process Problems**

Identified problems	Ensuring consent	Shipment review
Case study problems		
Unreliable shipment quantity		X
Nonhazardous waste included as hazardous		
Individual waste stream, total volume not reported	X	X
Incomplete shipment frequency	X	X
Incomplete waste codes		X
Renotifications, reconsents not submitted	X	
Systemic problems		
Unreliable narrative waste descriptions	X	X
Unreliable units of measure		X
Problematic waste coding		X
Limited EPA guidance on reporting requirements		
No standardized documentation requirements		
Lack of required reporting forms	X	

**Chapter 4
EPA Enforcement and Importer Activities
Affected by Data Quality Problems**

Ensuring appropriate transport	Ensuring submittal of required documentation	EPA activity			Conducting retrospective analyses
		Ensuring renotification and re-consent	Port-of-exit confirmation	Ensuring authorized delivery	
		X	X		X
					X
		X	X		X
		X	X		X
		X	X		X
		X	X		X
		X	x		X
	X	X			X
		X		X	X
					X

X = Affected activity

Case Study Problems

Unreliable Quantity Estimates

We found unreliable quantity data to be a consistent problem across the exporters' manifests we examined; yet unreliable hazardous waste export quantity estimates can affect a significant number of the EPA enforcement activities, and the manifest is the key document involved. Retrospective analyses can be jeopardized because one of the most critical variables estimated is waste quantity exported. Unreliable quantity estimates can affect the baseline data used to support analyses. Effective shipment review can be threatened, and again, the principal document that reflects the amount and type of waste being exported in each shipment is the manifest. The manifest is used to ensure compliance with the consent process and to monitor the quantity exported per shipment. Thus the manifest information is also important for identification of exports that require renotification and re-consent. Unreliable waste quantity data can affect the ability to identify such cases. Port-of-exit confirmation is designed to ensure that waste leaving the United States has been sanctioned through the EPA export process. Unreliable waste quantity

estimates entered into the manifest can damage the ability to ensure that the shipments are sanctioned.

Including Nonhazardous Waste
as Hazardous

We determined that some exporters reported nonhazardous waste on their manifests and annual reports, and this information was treated as hazardous waste information and included as such in the EPA data base. The effect this problem can have is to degrade the accuracy of analyses prepared by EPA on the quantity of hazardous waste exported.

Unreported Waste Quantity

Exporters submitted notifications to EPA with incomplete data on proposed waste quantities. Exporters also submitted annual reports where waste quantities reported were also incomplete. Providing incomplete data on quantities of waste either planned for export or actually exported can jeopardize the consent process, shipment review, renotification and re consent, port-of-exit confirmation, and retrospective analyses. These are all activities that require accurate data for the activity to be effective.

Unreported Shipping
Frequency

Exporters submitted notifications where the frequency of shipments (number of shipments per month, quarter, or year) was omitted. Frequency of shipment information is important for two reasons. The first is to provide the receiving facility during the consent process with information concerning when it will need to store, treat, or dispose of the waste. This is a capacity- planning issue. The second is to provide EPA with a sense of when shipments will be made, to facilitate the monitoring process. Consequently, not providing frequency of shipment information can affect these activities.

Incomplete Waste Codes

Exporters did not provide EPA with complete waste codes describing exports. Incomplete reporting of waste codes can lead to incomplete characterization of the wastes exported. This problem can affect those EPA activities that require data on hazardous waste type. The activities that could be affected by this problem are reviewing shipments, ensuring that only sanctioned wastes are shipped; ensuring renotification and re consent, where it is important to ensure that waste type exported is consistent with consent agreement; confirming at port of exit, where only sanctioned wastes are to leave the United States; and conducting retrospective analyses, where types of waste exported are reviewed.

Unsubmitted Renotification
and Reconsent

Exporters did not submit renotifications and re consents as required by EPA regulations. These activities should occur when there is a discrepancy between the waste that was sanctioned for export through the consent process and waste exports actually shipped. By not receiving these

renotifications and ensuring consent, the EPA is not notified that the exporter is shipping waste that was not agreed to through the consent process or that more waste than what was agreed to is being exported. Consequently, EPA cannot ensure consent among the exporter, receiving country, and receiving facility.

Systemic Problems

Unreliable Narrative Waste Descriptions

Exporters provided inconsistent narrative descriptions of the same waste across different reporting documents. This is a systemic problem since export regulations do not require the same waste descriptions on the various documents. Narrative waste descriptions, which are used to describe the wastes being exported, affect retrospective export analyses, consent assurance, shipment review, renotification and consent assurance, and port-of-exit confirmation. To be effective, all these activities require reliable characterization of waste types.

Unreliable Units of Measure

Exporters developed quantities using different units of measure on different documents for the same hazardous waste shipments. This is a systemic problem because EPA regulations do not require that the same units of measure be used when describing the same waste quantity on different export documents. Unreliable units of measure affect precisely the same activities as unreliable quantity estimates. Characterizing the same waste quantity by using several different measurement approaches results in estimation, conversion, and round-off errors. Consequently, those activities where an estimate of the amount of waste to be exported is important are compromised. These activities are retrospective analyses, shipment review, renotification and consent assurance, and port-of-exit confirmation.

Problematic Waste Codes

The EPA hazardous waste codes are problematic for characterizing hazardous waste streams. This is a systemic problem. Consequently, this problem jeopardizes EPA activities where characterization of the waste being exported is important. These are the same activities affected by the unreliable narrative waste description problem discussed above such as retrospective analyses and shipment review.

Limited EPA Reporting Guidance

Exporters reported that the guidance available to them on reporting requirements was unclear, changed without warning, and was inadequate. This is a systemic problem affecting all exporters. Not having complete and adequate reporting guidance affects three activities: exporters'

submitting the required documentation, ensuring renotification and reconsent, and EPA's retrospective analyses.

**Lack of Documentation on Data
Maintenance and Reporting**

We found that EPA has no guidance on what data the exporters need to maintain or how. The lack of standardized documentation requirements results in exporters' being unable to provide EPA with data and information on exports. This problem affects three EPA activities that rely on EPA's receiving data and information directly from the exporter: (1) ensuring renotification and reconsent, which is based upon the exporter acquiring, maintaining, recognizing, and reporting that a substantive discrepancy occurred; (2) developing retrospective analyses; and (3) ensuring delivery to receiving facilities.

**Lack of Required
Reporting Forms**

EPA has not established standardized reporting formats for the notification of intent to export and the annual report. Nonstandardization leads to incomplete data and information. Consequently, the assurance of consent and development of retrospective analyses are affected by this problem.

**Effects on Importer
Activities and
Decisions**

From our interviews with officials in the foreign governments and at three receiving facilities in Canada and one in Mexico, we found that the problems identified in chapter 3 did not affect importers' decisions to accept U.S. hazardous waste. The governments of Canada and Mexico relied on their own export monitoring and enforcement systems to ensure that the wastes being imported into their countries were properly tracked, treated, and disposed of. Also, receiving facilities relied on their own analyses of waste samples to determine whether they were capable of treating and disposing of the wastes according to their government's regulations and their certification to operate.

These receiving facilities' procedures for accepting individual shipments are the screening process that prevents the facilities from receiving and treating wastes they cannot or are not authorized to treat. In two instances, a receiving facility returned wastes after determining through its own analyses that the wastes' hazardous components had not been authorized for treatment and the facility could not safely treat them. Had the facility relied solely on the exporter's data provided on the manifest and treated the waste, its treatment process would have been contaminated and its operation permit violated.

Interestingly, a waste was rejected by the receiving facility because its concentration of organic components was too high, even though it was properly described and coded on the manifest. EPA's coding system allows for such differences in concentration levels. Therefore, the facility did not note a discrepancy on the confirmation of delivery for incorrect waste type, but simply returned the waste to the exporter.

Exporting untreatable wastes to receiving facilities creates additional and unnecessary risks inherent in the transportation of hazardous wastes if the shipment is returned. For this reason, the Quebec government has a policy that any waste received from the United States that is possible to treat, even if it is not the specific waste the receiving facility agreed to accept, should be treated at that facility rather than returned to the Canadian transportation system.

Summary and Conclusions

In this chapter, we addressed our third and last evaluation questions: "What effect could existing data quality problems have on EPA's monitoring and enforcement of the hazardous waste export program?" and "Which aspects of importers' decisions to import U.S. hazardous wastes could be affected by data problems?" We identified eight activities that EPA implements to support the hazardous waste export enforcement program. Each of these activities except "ensuring appropriate transport" of waste can be affected by the data quality and collection problems we identified.

Regarding our last evaluation question, the importers' decisions are not affected by these problems. We found that these decisions do not rely on data generated by the U.S. hazardous waste exporters, but rather those developed by the receiving facilities themselves.

Conclusions, Recommendations, and Agency Comments

Conclusions

We have described the EPA hazardous waste export program, identified data quality and collection problems, and determined that these problems affect the EPA enforcement activities. The current international concern about the environmental and health effects of hazardous wastes transported across international borders coincides with similar concerns raised within the United States. These concerns are reflected in the development and promulgation of the Basel Convention, the United States' signing of the convention, and efforts to enact legislation that would strengthen the existing U.S. program to exert more control over exports.

Consequently, EPA may need to ascertain the magnitude of potential risks to the environment and public health associated with exporting U.S. hazardous waste and ensure exporters' compliance with more stringent domestic laws and international agreements. To meet these responsibilities, EPA will need to obtain hazardous waste export data that are reliable, valid, and complete.

The current hazardous waste program is designed to monitor the export of hazardous waste to other countries. It relies on consent agreement among the exporter, receiving facility, and receiving country to attempt to ensure that the hazardous waste will be managed in a responsible manner. EPA's monitoring and review of export data provide a basis for identifying export violations and prosecuting violators. The data quality and collection problems we identified weaken the effectiveness of the current EPA hazardous waste export program. A more rigorous program, which EPA may be mandated to implement, would be even less effective if the data quality and data collection problems we identified continue.

Recommendations

Consequently, we make the following recommendations to the Administrator of EPA:

- For the six systemic program problems, efforts should be initiated as soon as possible to render regulations specific enough for valid, reliable, and complete data to be obtained.
- For the exporter-related problems, an internal evaluation should be conducted to determine whether the problems are generalized among the overall exporter population. The Administrator should then examine what further monitoring or enforcement measures may be necessary; for example, conducting regular comparisons of exporters' and receiving facilities' hazardous waste quantity estimates.

Agency Comments and Our Evaluation

After its review, EPA submitted several comments to us, both general and specific. The latter were the basis for revisions to the draft report, where appropriate. Here we provide the major comments and our evaluation of them.

EPA noted that there have been several changes since we conducted our evaluation. First, the Office of Waste Programs Enforcement, RCRA Enforcement Division, has taken over the responsibility for processing and tracking the hazardous waste import-export program from the Office of International Activities and NEIC. Additional staff who are more knowledgeable about hazardous waste management and technical issues are now involved in the program. In addition, a system is now in place whereby RCRA enforcement staff review and process all import-export notifications. RCRA enforcement staff deal directly with exporters and foreign governments to ensure that notifications are complete and conform to existing requirements. EPA also indicated that a large national data base is currently being developed that will expand upon the current activities of the agency's National Enforcement Investigations Center.

While these steps might assist in identifying problems, the findings of our evaluation indicate that data problems exist in documents other than notifications and that EPA needs to address the data requirements and how data are developed and submitted by exporters.

EPA also indicated that, currently, exports represent 0.1 percent of the total amount of U.S.-generated hazardous wastes. The amount of wastes being exported has been fairly stable over the last 2 years, with volumes to Canada decreasing slightly and volumes to Mexico increasing. In addition, EPA said many of the criticisms of the hazardous waste export program are not restricted to exports, per se, but could apply to the movement of domestic waste as well.

Presumably, EPA made the point about total wastes exported to suggest that agency resources and efforts dedicated to hazardous waste export monitoring should be placed in the context of all hazardous waste produced. As we indicated in our report, the importance of the hazardous waste export program is ensuring the appropriate management of U.S. hazardous waste, which if not properly managed could have serious effects in foreign countries. This issue is a growing international concern. If, as EPA suggests, these problems apply to the movement of waste within the United States as well, then our national hazardous waste management

regulatory process could also be jeopardized, since the system is designed around the philosophy of tracking hazardous waste from cradle to grave.

EPA commented that we make the statement that, where certain program processes give rise to problems, they would necessarily affect all cases. EPA disagrees. The agency went on to say that, although there are indeed problems with the RCRA export regulations, these problems do not necessarily mean that all exporters will be unable or unwilling to comply with them.

Our point was that we found systemic problems that affect all exporters. That is not to say that some exporters will not be able or willing to deal with them. However, their existence affects the ability of exporters to develop and report the data required and thus the ability of EPA to monitor exports.

EPA was concerned that our conclusion that foreign facilities conduct their own analyses of waste would be misinterpreted as a lack of faith in the quality of the data provided them by exporters. EPA made the point that it was perfectly understandable that the foreign facilities and governments would want to conduct independent analyses. We agree. Our findings in this area were provided to convey the point that foreign decisions are not affected by the data problems we identified.

Exporting Companies Selected for Study

Of the seven companies selected for study, three generated a single type of hazardous waste, two generated multiple types of waste, and two were transfer stations.

Two of the single-waste generators were mills that produced structural or reinforced steel and generated electric arc furnace emission control dust. A varying content of cadmium, lead, and chromium makes this dust hazardous. However, zinc content in the waste warrants the recycling of the waste for the recovery of commercial zinc. This is now the only legal hazardous waste exported to Mexico: Mexican law prohibits the import of hazardous waste except for recycling purposes.

The two multiple-waste and one single-waste generators exported their wastes to Canada and included one electroplating custom shop, one maker of small tape rules, and one producer of high-energy batteries. They generated and exported metal hydroxide sludge from wastewater treatment of metal finishing waters among other wastes inherent in their operations.

The transfer stations did not generate hazardous waste. They simply collected wastes from generators and arranged for export, even though they had treatment capabilities.

Foreign Receiving Facilities

The four foreign facilities that received waste from the companies selected for review are briefly described here.

One is a hazardous waste treatment and disposal facility that receives multiple types of waste from the United States. The facility uses a unique process to stabilize and reduce toxicity of inorganic hazardous wastes into a cement-like material that is buried in underground cells. No other facility offers this process.

Another is a liquid injection incinerator that receives numerous types of inorganic liquid hazardous waste for incineration. The residual ash is buried elsewhere in Canada.

The third is a recycling operation that receives spent solvents for recycling through a distillation process. The recycled solvents are sent back to the generator or sold in Canada. The blend of distillation residues resulting from the process are sent to U.S. companies for use as fuel for cement kilns.

The fourth facility is a zinc smelter in Mexico that treats zinc mining concentrates and electric arc furnace dust from steel plants (with zinc content) to produce zinc metal and oxides.

Hazardous Waste Types Exported by the Seven Companies Studied

Hazardous waste type	EPA hazardous waste code	Hazardous characteristic
100% ammonium persulfate	D002	Corrosivity
1-1-1 trichloroethane waste	F001	Toxicity
Acidic sludge with oxidizers	D001,2	Ignitibility, Corrosivity
Alkaline wastewater treatment sludge	D002	Corrosivity
Calcium hydroxide solid	F009	Reactivity, Toxicity
Copper sulfate liquid	D002	Corrosivity
Copper sulfate solids	D002	Corrosivity
Electric arc furnace dust	K061	Toxicity
Fly ash and debris	F001 & more	Ignitibility, Corrosivity, Reactivity, Toxicity
Metal hydroxide sludge	F006	Toxicity
Perchloroethylene and mixture	F001	Toxicity
Silicates and carbonates	D006,7,8	Toxicity
Spent developing solution	D002	Corrosivity
Sulfuric acid ferrous sulfate	D002	Corrosivity
Sulfuric acid waste	D002	Corrosivity
Waste cellophane separator	D009	Toxicity
Waste cyanide solution	F009	Reactivity, Toxicity
Waste potassium hydroxide	D002	Corrosivity
Wastewater with flammable solvents	D001,F003,5	Ignitibility, Toxicity
Waste-cyanide mixture dry	F008,D006	Reactivity, Toxicity
Wastewater soluble lacquer	D007	Toxicity
Zinc cyanide solution	F009	Reactivity, Toxicity
Zinc oxide web scrap	D009	Toxicity

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