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1986-1987 SURVEY OF SELECTED FIRMS IN THE
COMMERCIAL HAZARDOUS WASTE MANAGEMENT INDUSTRY

FINAL REPORT

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This report has undergone a limited review by the EPA. Identification of specific firms or technologies in the report does not constitute endorsement or approval by the EPA. Questions about the report, or suggestions on survey topics and/or other firms to survey, should be addressed to: Mr. Ron Benioff, Office of Policy Analysis, (PM-220), U.S. Environmental Protection Agency, 401 M Street, S.W., Washington, D.C., 20460, or to Mr. Geoffrey G. Back, ICF Incorporated, 9300 Lee Highway, Fairfax, Virginia, 22031.

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EXECUTIVE SUMMARY

The purpose of this report is to communicate information to the EPA as supplied by the participating firms. Analysis of the data has been limited strictly to interpreting responses and to aggregating the data to avoid disclosure of confidential information. Follow-up interviews were conducted whenever necessary to verify information, to request additional detail, or to discuss discrepancies.

The small number of firms surveyed and the need to maintain the confidentiality of the responses received means that no specific information on regional markets can be presented. In addition, no statements can be made about the entire commercial hazardous waste management industry from this small sample. However, the firms surveyed this year are believed to operate at least 70 percent of the commercial facilities and control at least 40 percent of the revenue.

Expectations are that commercial thermal treatment capacity for hazardous wastes will be adequate to meet demand by 1991 if not sooner. Thermal treatment capacity among the 14 firms surveyed this year increased by 98 percent over the reported 1985 estimate and is expected to increase by 200 to 300 percent by the end of this decade. This year, the majority opinion seems to be that incineration capacity shortfalls are not real or, if they do exist, will be short-lived as more permits are issued between now and 1991. Several firms suggest a surplus in incineration capacity now exists or will exist by 1991 or 1992 and continue through the end of the century if the permit applications already in or soon to enter the pipeline are finalized fairly quickly. Several incineration firms report that their backlogs are down appreciably and that they are having trouble soaking up increased capacity already in place.

Respondents reported sixteen new fixed-based incinerator unit projects, most to be added to existing facilities and already in the permitting pipeline, that they expect will increase kiln capacity anywhere from 25 to 150 percent depending upon the facility. The majority of these new or replacement kilns had a thermal capacity of anywhere between 50 and 150 million Btu per hour. Significantly, about ten percent of the fixed incinerator unit projects were reported by firms not now in the commercial hazardous waste incineration business.

The move to increase incineration capacity has been a direct response to the cumulative effects of several major RCRA regulations, including the various land disposal restrictions. Even so, many of the commercial firms report it is difficult to predict market response to these regulations and that frequently their predictions are wrong. Part of the problem, these firms report, is what they feel to be the ever-changing rules and requirements under which they and their clients must operate, and the uncertainty attached to future regulatory decisions. Prime examples of the latter, they say, are how hard EPA will push for permanent cleanups and the use of on-site treatment technologies at Superfund sites, and whether more land disposal restriction variances will be issued and current variances extended. Survey participants

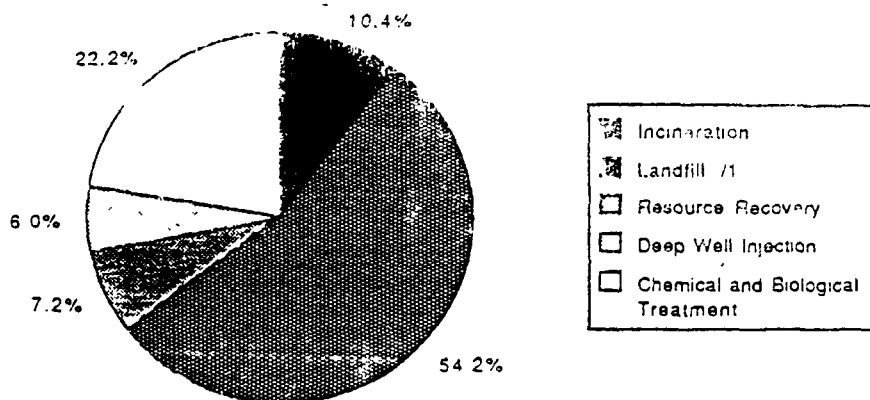
expect that future land disposal restrictions and the move to more "permanent" remedies will soon require that most or all corrective action soils and debris be treated before land disposal.

These firms also admit, however, that predicting trends and market response depends ultimately on an ability to predict behavior, especially the behavior of waste generators. For example, one must predict how quickly and strongly generators will invest resources in waste minimization. Many of the firms surveyed report that generators are taking significant steps to minimize their waste volumes sent to off-site treatment/disposal facilities. One must also predict the behavior of regulators in enforcing the regulations and predict how and when the current impasse in siting new hazardous waste management facilities will be resolved.

A total of at least 4.2 million wet metric tons (WMT) of hazardous wastes was received for treatment and/or disposal in 1986 by the 14 firms surveyed. This volume was down 8 percent from the adjusted 1985 Survey total of 4.6 million WMT (1985 total volume was adjusted to exclude volumes for firms not participating in the survey this year and to reflect corrected 1985 results provided to ICF). In 1987, these same firms received a total waste volume of at least 4.6 million WMT, an increase of 6.5 percent over 1986. Only the waste volume incinerated did not experience a decline in volume in 1986 as compared to 1985. Respondents reported that their volumes incinerated increased by 30.5 percent in 1986 over 1985 (adjusted). Waste volumes sent to deep well injection in 1986 experienced the largest decline (-34 percent).

The decline across most of the technologies in waste volumes handled in 1986 was reversed in 1987. Again, the volume of waste incinerated experienced the largest growth in volume (36 percent) over the reported total for the previous year, but volumes sent to resource recovery also went up significantly (25 percent). Waste volumes sent to landfills or wastewater treatment facilities both rose by about 5 percent in 1987 versus 1986. Waste volumes sent to commercial injection wells increased by less than 1 percent. Waste volume managed in 1987 by technology for the 14 firms surveyed is shown below.

1987 VOLUMES BY TECHNOLOGY
Total Volume = 4.6 Million WMT



(Note: A total of 75 thousand WMT of waste was reported as stabilized and/or solidified in 1987 by these firms and has been counted in the volume landfilled estimate.)

Market services listed by respondents this year as growing, static, or declining business areas differed little from their listing for the 1985 Survey. Once again, the incineration of solids and sludges was mentioned consistently as a clear growth market for the commercial waste management industry. Close seconds in the growth market category were the various site remediation/field services (remedial cleanups, UST cleanups, drum management, mobile treatment, and lagoon closures), waste minimization consulting services, and various pretreatment technologies like sludge dewatering and waste stabilization and solidification. Their candidates for service markets in decline were deep well injection, PCB liquids treatment and disposal (peaking by 1990), treatment or disposal in surface impoundments, and land treatment. Most respondents predicted that the future of surface impoundments or land treatment is "bleak" and that these technologies will be stringently regulated or phased out. Otherwise, opinions differed on nearly every other market or service sector: secure landfills, fuels blending, chemical and biological wastewater treatment, and solvent recycling.

There was significant movement in service prices in 1986 as reported by these 14 firms. Quoted prices for some services in 1986 increased as much as 174 percent (oil recovery), while prices for other services decreased by 54 percent. In 1987, prices appear to have steadied for some services. The average nominal price increase for chemical and biological treatment, deep well injection, transportation, and PCB incineration services rose less than 5 percent over their 1986 levels. The average nominal price increases for other waste management services was somewhat greater: 10 to 48 percent for landfills; 13 to 34 percent for incineration; and 16 to 97 percent for resource recovery.

Respondents were asked for their comments on a variety of special topics. The majority of firms surveyed believe that most commercial waste management firms do not yet have adequate capacity to perform the Toxicity Characteristic Leaching Procedure and may not be able to develop adequate capacity in time. If the capacity of commercial laboratories to perform the test is considered, however, these firms believe any potential shortfall in testing capacity is likely to be small.

As to the present availability of liability insurance, respondents noted that, in general, the availability of liability insurance "is no longer a problem if you have the money to pay for it." When asked if they had heard of commercial firms being approached to operate fixed, initially dedicated, treatment or disposal facilities at a generator's site, six out of the eleven firms responding to this question had never heard of this type of service arrangement. Five firms, however, had heard about the idea and two firms reported they had held discussions with three generators though all were unsuccessful. Still another firm reported a different twist on this idea: generators had inquired if the commercial operator would build and operate a dedicated, off-site waste management facility that would not go commercial.

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

This is the seventh year the U.S. Environmental Protection Agency (EPA) has sponsored a survey of business activity and trends for selected firms in the commercial hazardous waste management industry. This survey examines calendar year 1986 and 1987 for 14 firms, and follows similar surveys completed annually since 1981.¹

Each survey is designed to keep EPA aware of industry's concerns and developments in the commercial hazardous waste management market. For this year's survey, EPA was interested in these firms' assessment of whether there are existing shortfalls in commercial hazardous waste management capacity, especially for thermal treatment. The data collected through this survey are expected to prove useful to the EPA in evaluating possible impacts of RCRA regulations.

Office of Management and Budget (OMB) approval of the commercial industry survey was obtained this year. The OMB information collection request form approval code for the survey is 2020-0017.

1.2 METHODOLOGY

The first industry survey in 1980 was a census of as many commercial hazardous waste management firms as could be identified from service directories and other sources. The subsequent update surveys of 1981 and

¹ Review of Activity of Major Firms in the Commercial Hazardous Waste Management Industry: 1981 Update. Environmental Protection Agency. Prepared by Booz, Allen and Hamilton, Inc. May 1982.

Review of Activity of Major Firms in the Commercial Hazardous Waste Management Industry: 1982 Update. Final Report. Environmental Protection Agency. Prepared by Booz, Allen and Hamilton, Inc. August 1983.

Review of Activities of Firms in the Commercial Hazardous Waste Management Industry: 1983 Update. Final Report. Environmental Protection Agency. Prepared by Booz, Allen & Hamilton, Inc. November 1984.

Survey of Selected Firms in the Commercial Hazardous Waste Industry: 1984 Update. Final Report. Prepared by ICF Incorporated. September 1985.

1985 Survey of Selected Firms in the Commercial Hazardous Waste Management Industry. Final Report. Prepared by ICF Incorporated. November 1986.

1982, however, concentrated on interviewing just the top nine firms² based on industry data collected during 1980.

For the 1983 and 1984 update surveys, the list of interview candidates was expanded to include "major firms" on a technology-by-technology basis. This approach was followed in developing the survey candidate list for the 1985 Survey and again for this year's survey. Exhibit 1-1 has been provided to help track survey participants since 1981.

Out of the 18 firms selected as candidates for the 1986-1987 Survey, the following 14 firms agreed to participate and responded to all of the survey questions:

- Chemical Waste Management;
- Browning-Ferris Industries/CECOS International;
- GSX Corporation;
- Rollins Environmental Services;
- ENSCO, Inc.;
- Envirosafe, Inc.;
- U.S. Pollution Control, Inc.;
- Chem-Clear;
- Enviroite;
- Ross Incineration;
- Environmental Waste Resources;
- W.J. Lamberton/Chemical Resources, Inc.;
- Safety-Kleen; and
- Systech.

Two firms, International Technology (IT) Corporation and DuPont Environmental Services (DES), chose not to participate in the 1986-1987 survey. U.S. Ecology, a participant in last year's survey, agreed to participate again this year, but could not complete the survey in time for inclusion in this report. All three firms, therefore, are not represented in this year's results and have been backed out of the results for the 1985 Survey in order to isolate the true year-to-year volume and capacity trends. McKesson EnviroSystems, also a participant in last year's survey, is still included in the survey as their operations were acquired by Safety-Kleen.

Firms were interviewed by telephone or provided written responses concerning four general topics:

- Wastes managed, by technology and type, in 1986 and 1987;

² In the 1981 and 1982 Update Surveys, these nine firms were: Chemical Waste Management, Browning-Ferris Industries, SCA Chemical Services, Rollins Environmental Services, IT Corporation, US Ecology, CECOS International, Conversion Systems, and Chem-Clear.

A COMPARISON LIST OF SURVEY PARTICIPANTS
SINCE THE 1981 UPDATE SURVEY

	UPDATE SURVEY FOR:				
	1981 and 1982	1983	1984	1985	1986-87
THE 1980 CENSUS "MAJOR" FIRMS GROUP	Chemical Waste Management Browning-Ferris Industries SCA Chemical Services CECOS International Rollins Environmental IT Corporation US Ecology Conversion Systems/ Envirosafe Chem-clear	Chemical Waste Management Browning-Ferris Industries SCA Chemical Services Rollins Environmental IT Corporation US Ecology Envirosafe, Inc. d/ Chem-Clear	Chemical Waste Management Browning-Ferris/CECOS g/ GSX Corporation b/ Rollins Environmental (IT Corporation g/) US Ecology Envirosafe, Inc. Chem-Clear	Chemical Waste Mgmt. Browning-Ferris/CECOS GSX Corporation Rollins Environmental (IT Corporation g/) US Ecology Envirosafe, Inc. Chem-Clear	Chemical Waste Mgmt. Browning-Ferris/CECOS GSX Corporation Rollins Environmental Envirosafe, Inc. Chem-Clear
ADDED FIRMS	NONE	Envirote McKesson Envirosystems Ross Incineration DuPont Environmental Serv. ENR W.J. Lambertson Safety-Kleen Systech	Envirote McKesson Envirosystems Ross Incineration ENSCO ENR W.J. Lambertson Safety-Kleen Systech	Envirote McKesson Envirosystems Ross Incineration ENSCO ENR W.J. Lambertson Safety-Kleen g/ Systech U.S. Pollution Control Dupont Environmental Serv.	Envirote g/ (McKesson Envirosystems) Ross Incineration ENSCO ENR W.J. Lambertson Safety-Kleen g/ Systech U.S. Pollution Control

g/ Browning-Ferris Industries acquires CECOS International in January 1983.

b/ Chemical Waste Management acquires portions of SCA Chemical Services. Genstar Corporation establishes GSX Corporation from its acquisition of other SCA Chemical facilities. GSX later was acquired by Inasco, Ltd., and then by Iaidlaw Industries in 1986.

g/ IT Corporation, though not a formal respondent to the 1984 and 1985 surveys, is accounted for in the volume received data for 1985 by utilizing data provided by the U.S. EPA, Office of Solid Waste, and in 1984 by using data from the State of California, as well as IT's responses to the 1983 survey.

d/ Envirosafe Inc. becomes sole operating division of IU International to handle hazardous wastes.

g/ Safety-Kleen acquires McKesson Envirosystems in 1987

Source: ICF Incorporated.

- Capacity, by technology, in 1986 and 1987;
 - Prices charged, by technology and waste type, in 1986 and 1987; and
 - Views of the hazardous waste management market and significant business or regulatory trends.

Participants were provided with a list of questions prior to the interview and were asked questions applicable only to their operations, or that were consistent with established confidentiality agreements. Responses to each of the questions were compiled and are presented in the aggregate to avoid disclosure of any company's response, unless the information was already available to the public (e.g., number of operating facilities).

1.3 DEFINITIONS

Considerable time is spent with each respondent explaining and defining terms used in the survey that readers also should keep in mind when interpreting the survey results. For example, in the update surveys through 1982, commercial facilities were defined as those "engaged in the treatment and/or disposal of hazardous waste for a fee," but did "not include recovery operations...or storage and transfer stations." This definition was changed, starting with the 1983 Update Survey, to include recovery operations and transfer stations. Also note that a firm does not have to be engaged solely or principally in the treatment and/or disposal of hazardous wastes for a fee to be considered commercial. That is, a facility that is dedicated mostly to handling a generator's own waste (from a single or several production plants), but processes some wastes from other generators for a fee, can be considered a "commercial" facility for this survey.

One of the more important terms used in the survey is "effective capacity" (along with the instructions given to firms on calculating and reporting capacity information). Initially, each firm was asked to calculate their "effective capacity" firm-wide (by technology or service offered) accounting for such factors as downtime for repairs and maintenance or limits imposed by on-site storage capacity or discharge permits. Each firm was also able to provide capacity estimates in the units they prefer to use, for example, millions of Btu per hour for a rotary kiln incinerator or gallons per day for a chemical treatment facility. As is discussed below, ICF staff then worked with each firm to convert their estimates into a common unit of measure: metric tons per year.

Several technologies/services are given special attention in developing a consistent definition of "effective capacity" due to the potential for

misinterpretation. One such technology is secure landfills.³ Different commercial firms in the survey prefer to express landfill capacity solely in terms of the air space volume remaining in the cell they are operating currently, as the number of years left of permitted air space for disposal assuming current fill rates, or as the total volume of air space available assuming they are able to develop and permit (in accordance with all state and/or federal requirements) all of the land area they plan to commit to landfilling operations. Using each of these measures, however, generates a very different picture of available commercial landfill capacity. The most conservative estimate of available capacity would be one based upon the remaining air space in an active cell since there are no assurances that additional cells would be permitted for construction and operation. Alternatively, the total land area-based measure provides the best estimate of potential capacity for the disposal of wastes and treatment residuals.

To date, most of the landfill operators participating in the annual survey have calculated landfill capacity estimates using the total land area measure. As a result, this measure has been chosen as the standard form for each firm to report their commercial landfill capacity, i.e., with some firms, ICF staff must discuss converting a alternative capacity measure to the selected total land area measure. ICF staff also convert the total land area-based capacity estimates to a single remaining lifetime estimate (in years) assuming the total current annual fill rate reported by these firms.

ICF staff also had to discuss conversion methods in order to standardize a response with EPA's preference that capacity numbers be reported in mass throughput units (see Appendix A for several conversion factors used). For example, incineration capacity estimates reported in millions of Btu per hour were converted to metric tons per year units using factors for the average Btu per pound of waste and number of operating hours per year. Each respondent was given the opportunity to choose conversion factors they believed to be applicable to their operation. Each firm, therefore, may have selected a different conversion factor.

Appendix B lists several other terms and their definitions as used in the report or as communicated to participants as guidance in developing their responses.

1.4 LIMITATIONS

The purpose of this report is to communicate information to the EPA as supplied by the participating firms. Analysis of the data has been limited

³ Another technology for which alternative capacity estimates were debated included wastewater treatment where firms could express capacity as either a hydraulic capacity, as a function of tank storage capacity, or as a function of permit discharge limits. In this case, firms were asked to standardize their response on the basis of hydraulic capacity.

strictly to interpreting responses and to aggregating the data to avoid disclosure of confidential information. As such, the accuracy of the information presented is a function of the respondent's understanding of the questions asked, the accuracy of the data they choose to provide, and ICF's interpretation of their answers. Follow-up interviews were conducted whenever necessary to verify information, to request additional detail, or to discuss discrepancies (e.g., waste volumes reported handled exceeded the reported effective capacity).

The small number of firms surveyed and the need to maintain the confidentiality of the responses received means that no specific information on regional markets can be presented. In addition, no statements can be made about the entire commercial hazardous waste management industry from this small sample. However, the firms surveyed this year are believed to operate at least 70 percent of the commercial facilities and control at least 40 percent of the revenue.

The detail of the responses received varied. Some firms provided considerable detail in their responses while other firms did not. As a general rule, the least detailed response controlled the degree of detail presented from responses to any individual question. Relative changes in the survey results from year to year, therefore, may also reflect the quality of responses received in any one year, although this variability cannot be measured.

Ensuring comparability with the results of earlier surveys is a primary concern for each new survey. There were generally two sources of comparability problems this year: (1) differences in the participants list from 1985 to 1986-87, and (2) firms' modifying earlier survey responses due to reporting errors or miscalculations. Of these two, the first had the greater impact and required adjustments to the analysis. As noted earlier, the absence of IT Corporation and US Ecology (both members of the original 1981 "major" firms group) and DuPont Environmental Services in this year's survey was compensated for by not including past estimates for their operations in the results shown for the 1985 Survey.

ICF attempts each year to improve the accuracy of the survey results. For example, we have invested more time in providing specific guidance on defining effective capacity, and in reviewing capacity data and assumptions in the interview. The result, we believe, is at least a better understanding of participants' responses, if not a more accurate picture of available capacity among these firms. We also provided each participant with a summary of his 1985 response on waste volumes and effective capacity by technology. We received "corrected" data for 1985 in two cases. As a further check, we contacted each firm to confirm or correct a significant (50 percent or more) increase or decrease in their 1986-1987 results over 1985 for waste volumes, capacity, or both. Discrepancies between waste volumes reported received and capacity in 1986 or in 1987 were also investigated and resolved.

Users of the survey reports are advised to use caution in interpreting the results. While every attempt has been made to ensure the data are reported accurately and are reasonably consistent from year to year, there is a potential for error and misinterpretation, especially with respect to the capacity-related data. Changes in definitions and assumptions over time as well as in a respondent's efforts to provide accurate data must be considered.

* * * * *

The remainder of the report is organized into two chapters. Chapter 2 -- Industry Opinions and Predictions -- presents largely anecdotal information supplied by survey respondents on such issues as permitting delays, the reality of capacity shortfalls, siting difficulties, and the expected market impacts of the RCRA land disposal restrictions. Also covered are the views of these commercial firms on business trends in their industry including probable areas of market growth and decline.

Chapter 3 -- Waste Volumes, Capacity, and Prices -- highlights trends in the waste volumes handled, capacity by technology, and prices among all the firms surveyed, and compares reported results for 1986 and 1985 (adjusted) and for 1987 and 1986. Acquisitions and service expansions by these firms are also discussed.

CHAPTER 2

INDUSTRY OPINIONS AND PREDICTIONS

Predicting future trends and market response to major market-shaping legislation and regulations is even difficult for firms in the commercial hazardous waste management industry. Part of the problem, even given the resources some of the firms commit to market research, is the absence of reliable or usable data on waste volumes and types generated as has been noted in several recent studies by OTA, GAO, and others. Several efforts are now underway to improve data content and collection through the regulatory system that may improve the value of these data for market research questions.

Another part of the problem, these firms report, is what they feel to be the ever-changing rules and requirements under which they and their clients must operate, and the uncertainty attached to future regulatory decisions. Prime examples of the latter, they say, are how hard EPA will push for the permanent cleanups and the use of on-site treatment technologies at Superfund sites, and whether more land disposal restriction extensions will be issued and current extensions extended. Anyone who could answer these questions with a fair degree of certainty would settle some key variables in the strategic planning equations of commercial hazardous waste firms supplying either (or both) "live stream" waste management services or site remediation services.

These firms also admit, however, that ultimately the key to predicting trends and market response is the ability to predict behavior, especially the behavior of waste generators. For example, one must predict how quickly and strongly generators will react to regulatory, economic, and liability pressures towards investing resources in waste minimization. Many of the firms surveyed this year report that they can see direct and increasing evidence of waste minimization by generators. One must also predict the behavior of regulators in how stringently they enforce the regulations (e.g., pretreatment requirements for wastewater discharges) and predict how and when regulators, politicians, interest groups, and the public will resolve the current impasse in siting new hazardous waste management facilities.

Against this backdrop then, this chapter summarizes the opinions and predictions of the firms surveyed as to market trends, regulatory concerns and developments, and a variety of other issues. The information provided in this chapter is largely anecdotal and as stated by the firms interviewed. Both consensus and minority viewpoints have been presented to the extent possible without violating confidentiality arrangements. The topics covered in this chapter include:

- General changes in waste volumes and types between 1985 and 1986 and 1986 and 1987, and changes in the balance between on-site and off-site waste management;

- Observations on growth markets and factors affecting commercial firms' ability to respond to market growth;
- Commercial firms' perceptions of the reality of capacity shortfalls, their plans to expand capacity, and comments on the federal role in facility siting;
- Observations on the market effects of various land disposal restrictions;
- Handling of Superfund wastes and the market effects of the SARA amendments and RCRA Corrective Action regulations; and
- Viewpoints on several special topics, including the capacity to perform the TCLP, the availability of liability insurance, servicing small quantity generators, and the emergence of the "quasi-commercial" waste management industry.

2.1 WASTE VOLUME TRENDS WERE MIXED FOR 1985 THROUGH 1987

The ability of firms to retain or expand their throughput was highly varied for the period of 1985 to 1987. Many firms were able to expand their marketing efforts and attract additional wastes to new or existing facilities. Voluntarily-imposed restrictions, regulatory suspensions, and permit limitations, however, caused an overall decline of 22 percent for waste volumes handled in 1986 as compared to 1985. This decline was only partially made up by the 13 percent increase in waste volume between 1986 and 1987.

Eleven firms experienced increases in waste volumes received. One firm attributed its increased business to their participation in a rapidly growing market: disposal of clean up wastes. Six of the firms attributed their growth to their ability to handle more of the available waste types because of increases in capacity (by construction or acquisition). Two firms attributed their growth to better marketing, including new sales offices to service a wider geographic region.

A common thread in the survey responses is that the amount of "clean" wastes, especially easy to treat aqueous wastes and the higher Btu-content liquids, has either declined overall or is less available because of competition for these wastes. Incineration firms increasingly emphasize the need to be able to handle wastes with higher solids, but lower heat content.

Several companies claim that generators of aqueous wastes, particularly the larger generators, are moving increasingly to on-site pretreatment to reduce the volume of waste sent off-site. Other trends noted were more in-house solvent recovery, on-site incineration, waste minimization efforts, and waste solidification. Most of the firms believe that the move to on-site treatment will be lead by the larger generators who want to exercise greater control

over the destination of the waste and avoid potential liability. Larger companies are also believed to be able to treat their wastes at lower overall costs. One firm remarked, however, that generators are still not very interested in waste delisting, and foresees that they will still need to use off-site services to dispose of their waste solids and treatment residues. Most firms expressed the belief that the smaller to mid-sized generators will make greater use of off-site waste management services in the face of costly regulatory requirements.

Three firms suffered major declines in the volumes treated and disposed because of voluntary limitations on the amount or type of waste they were willing to accept. One firm elected to stop accepting wastes containing any concentration of F001-F005 wastes and also stopped accepting used oil containing hazardous wastes. Another firm has chosen to reserve all of its available chemical treatment and a portion of its landfill capacity to service its own needs for incinerator ash disposal and leachate/rainwater treatment. A third suffered a contraction in the volume of wastes from remedial action sites when it elected not to deeply discount its service prices.

2.2 TREATMENT OF SOLIDS AND SLUDGES STILL SEEN AS PRINCIPAL GROWTH MARKET

Market services listed by respondents this year as growing, static, or declining business areas differed little from their listing for the 1985 Survey. Once again, the incineration of solids and sludges was mentioned consistently as a clear growth market for the commercial waste management industry. Close seconds in the growth market category were the various site remediation/field services (remedial cleanups, UST cleanups, drum management, mobile treatment, and lagoon closures), waste minimization consulting services, and various pretreatment technologies like sludge dewatering and waste stabilization and solidification. Several respondents also stated that, in general, waste treatment was a growth market, especially on-site waste treatment. Overall, these firms believe that commercial hazardous waste management services will continue to grow at historical rates (around 20 percent per year) with higher growth rates expected for remediation/field services. Their candidates for service markets in decline were deep well injection, PCB liquids treatment and disposal (peaking by 1990), treatment or disposal in surface impoundments, and land treatment. Otherwise, opinions differed on nearly every other market or service sector: secure landfills, fuels blending, chemical and biological wastewater treatment, and solvent recycling.

Growth Markets. The off-site incineration of solids and sludges is expected to be the strongest growth market driven by site cleanups, the land bans, and the push by generators to reduce waste volumes and to control future liability. Some firms stated that the growth of the incineration market would extend to even greater interest by generators towards building and operating on-site captive incinerators.

The generation of more sludge waste was also tied to several other growth markets by respondents. The stabilization and solidification of drummed sludges and solids and on-site dewatering of sludges were two such markets.

Moderate growth in on-site wastewater treatment services, especially on a regional or local scale, was expected by some firms mostly in response to tightening categorical pretreatment standards. Not all firms agreed with this assessment, however, labeling aqueous treatment services as a declining market overall, given what they view as little enforcement of the pretreatment standards, although they expected their market share to increase. Smelting for the recovery of mixed metals from sludges was also mentioned as a likely growth area.

At least one respondent mentioned the following services as among their candidates for growth markets: in-house solvent recovery for waste minimization; the burning of waste fuels (moderate growth); secure landfilling; the incineration of PCB sludges and soils from waste site cleanups; services to small quantity generators; and waste collection, brokerage, and transfer in some regional markets. As will be discussed below, several other firms viewed some of these markets as flat or in decline.

Static Markets. There was no consensus among respondents as to the static market areas. One respondent believed fuels burning fell into this category predicting that volumes would stabilize and that there would be a lot of excess capacity. Another respondent labeled the wastewater treatment market as "at best, flat" because any growth due to local tightening of pretreatment standards would be short-lived.

Declining Markets. Most respondents continue to predict the decline of surface impoundments, land treatment, and deep well injection demand and capacity. A few firms are more upbeat on the future of deep well injection, however, based upon the belief that they can demonstrate "no migration" and continue operating. The treatment and disposal of PCB liquids is projected to peak by 1990 and decline rapidly thereafter. Off-site solvent recovery, especially for halogenated organic solvents, was listed by one respondent in this category due to the impact of generators substituting other solvents or taking steps to recover their solvents onsite. Fuels blending was also listed by one respondent as a declining market in the face of increasingly more stringent regulations and due to competition from the RCRA incinerators for the high-Btu waste liquids to support combustion of the low-Btu waste solids and sludges.

One firm was particularly confident that the total liquids treatment market has declined since 1985, even though this firm had increased its market share competitors failed to get Part B permits or had to close temporarily. This firm believes that enforcement of pretreatment standards under the Clean Water Act could slow the decline in the liquids treatment market by forcing more small- and medium-sized generators to discontinue discharging into sewers, but does not anticipate the rigorous enforcement needed to completely offset any general decline in this market.

Much as was the case in the 1985 Survey, the future of commercial sector landfills is viewed very differently by many of these firms. Some firms believe that waste volumes sent to landfills have declined and will decline even further as a function of waste minimization and the effects of land disposal restrictions. Some firms have even imposed commercial waste volume

limits on their own landfills to preserve air space for handling treatment residuals (e.g., incinerator ash) from their other facilities (or from other units at the same facility). Some respondents in this group also believe that EPA will not extend the CERCLA/RCRA soil and debris variance from the land disposal restrictions and will push successfully for on-site treatment at Superfund sites (both opinions, however, were contested by other firms).

Not all the firms believe the volume of waste landfilled at commercial facilities will go down, however. Their view is that site cleanup wastes will still need to go to off-site landfills, and that waste stabilization and solidification will prove acceptable to regulators as treatment for many wastes leading to greater waste volumes sent to commercial landfills.

Most agree, however, that landfills will play and have begun to play a different role in the waste management system. Asked whether they see secure landfills solely as "residual repositories", most respondents said yes, particularly if waste stabilization and solidification is counted among the treatment technologies. Other firms did not agree that secure landfills would solely function as residual repositories in the future believing that some hazardous wastes will meet the treatment standards without any treatment.

Ability to Respond to Market Growth. There has been little change also in the factors respondents list as limiting their ability to respond to market growth -- permitting delays, program authorization "flip-flops", regulatory constraints and uncertainties, public opposition to siting or expanding facilities. New members to this list (provided by one or more respondents) were: difficulties in obtaining financing; complications in developing new technologies in the face of changing regulations; the CERCLA program's unclear signals on how often on-site treatment technologies will be selected as part of the site remedy; regulators' unwillingness to act in less than black and white situations; and the difficulty of predicting or modeling market reactions to the land disposal restrictions.

Respondents were also asked specifically if any shortage of hazardous or nonhazardous landfill capacity had been a limiting factor for growth in waste treatment services. No firm reported that hazardous waste landfill capacity was a problem (although a few had taken steps to ensure that it would not become a problem), and only one firm said that shrinking nonhazardous landfill capacity had affected their treatment operations. A few firms did say that the bigger problem was finding a well-designed and well-operated solid waste landfill they could approve for use.

Most firms downplayed the significance of solid waste landfill capacity problems for hazardous waste treatment firms for two reasons. First, some firms believed that the competitive disadvantages of treatment services that produce a delistable residue (e.g., restrictions on influent waste characteristics) would keep many firms out of this market in the first place. They see most firms treating wastes only enough to send the residue to a hazardous waste landfill. These firms also believe that the value of delisting will decline as solid waste landfills become subject to more stringent regulation. Second, several firms expected that a firm producing a delisted treatment residue can afford to offer the highest bid for limited

solid waste landfill capacity.

Permitting delays of 3 to 6 years or more were mentioned by many respondents as the single greatest factor limiting their ability to serve growing new markets. While some were willing to acknowledge the technical complexity of the permitting process as a factor in the delays, most blamed inadequate state permit program resources, lack of state and federal agency coordination, differing state and federal interpretations of the same issue, or high staff turnover as the sources of the problem. Opinion was split on whether EPA or the states were slower in responding to permit applications, or firms saw little difference between the two. Several respondents felt the lack of activity on their permit applications was a function of the lower permitting priority of their facilities relative to incinerators and landfills, and because of a shift in priorities to monitor closing facilities.

It was also clear, however, that there have been improvements on the permitting front for several firms. Some firms have reached the draft permit stage in less than a year-and-a-half from permit application; in some cases, in less than one year. Several firms expected final permits sometime in 1983 and one facility in our survey has received its Part B permit. A few firms remarked that the permitting process seems to unfold more smoothly for a new facility as opposed to changes to an existing facility, provided a new facility can get through the initial siting process.

Respondents were also asked for their opinions on whether the new rules for permit modifications and transportable treatment units represented an improvement in their ability to respond to market changes and growth. In general, most firms expressed a wait-and-see attitude, although several were more positive about the permit modification rule or felt the process had to get better because it couldn't get any worse. The hesitation seems to stem from the concern that implementation of the rules will not live up to their promise on paper. In particular, several firms believe that EPA and/or the authorized states will not be as flexible as the rule language seems to imply, and will elect to be more stringent. Other firms believe that states will continue to label facility modifications needed to respond to market changes as major modifications and, therefore, subject to the full-blown permitting process.

All the firms were also asked for their advice on the possible roles of the federal government towards resolving the present impasse on siting new facilities. While none of the firms appeared to believe that much could be done until the situation reached the crisis stage, some firms did offer suggestions. Suggested roles for the federal government included: more aggressive public education and outreach programs; strictly enforcing the adequate capacity demonstration requirement under SARA; encouraging states to control the siting process at the state level and on the basis of technical criteria only; encouraging generators to open up dedicated TSDFs to commercial use; and withdrawing RCRA program authorization in states that enact waste import bans. Many firms expressed disappointment over what they view as the very limited success of state facility siting commissions.

2.3 MOST COMMERCIAL FIRMS BELIEVE THAT AN INCINERATION CAPACITY SHORTFALL WILL NO LONGER EXIST SOON

As compared to the predictions offered in the 1985 Survey on the question of capacity shortfalls, there has been quite a turnaround in opinions among the survey participants. Respondents had been nearly unanimous in their views of a "chronic" and "severe" shortfall in commercial incineration capacity, especially for waste solids and sludges. This year, the majority opinion seems to be that incineration capacity shortfalls are not real or, if they do exist, will be short-lived as more permits are issued between now and 1991. Several firms even go so far as to suggest a surplus in incineration capacity now exists ("we hear no generators complaining"), or will exist by 1991 or 1992 and continue through the end of the century if the permit applications already in or soon to enter the pipeline are finalized fairly quickly. Several incineration firms also report that their backlogs are down appreciably and that they are having trouble soaking up increased capacity already in place.

Much of the turnaround on the question of the reality of the incineration capacity shortfall is attributed by survey respondents to three trends. The first of these trends is the continuing decline in PCB liquids incineration freeing up kiln capacity for RCRA wastes. The second trend is the entry of cement kilns, light aggregate kilns, and industrial boilers into the thermal treatment market. These so-called "recycle kilns" and boilers filled in with a great deal of capacity that several respondents said was nowhere close to being used up so far. In addition, operators of these recycle kilns are moving to widen the window of wastes they can burn to be able to handle waste solids. Even several of the firms who believe a shortfall in kiln capacity still exists do admit that this deficit is closing rapidly and may turn into a surplus if the recycle kilns continue to be exempted from full RCRA regulation.

The third trend mentioned by respondents was the number of incineration facilities soon to receive their final permits and the large number of new units or expansions planned to be operational by 1991. Respondents reported sixteen new fixed incinerator unit projects, most to be added to existing facilities, ranging in size from 30 to 150 million Btu per hour (most in the 100 to 150 million Btu per hour range) and expected to increase kiln capacity anywhere from 25 to 150 percent depending upon the facility. Several other replacement kiln and existing kiln expansion projects were also reported. Significantly, about ten percent of the fixed incinerator unit projects were reported by firms not now in the commercial hazardous waste incineration business. While many of these projects at existing facilities must await regulatory approval, no firm seemed to believe that getting a permit would not be possible. Some firms were concerned about their "greenfield" projects and the threat of public opposition to siting a new facility.

Both sides of the issue, however, agree on the key uncertainties in their predictions: (a) the speed and successes of the permitting process over the next 3 years; (b) site remediation waste volumes for off-site treatment and

disposal and the selection of BDAT for these wastes; (c) whether EPA will continue to string out some of the variances from the land disposal restrictions; (d) how stringently cement and light aggregate kilns and industrial boilers are regulated; and (e) how aggressively generators pursue waste minimization. In particular, respondents express considerable uncertainty over what EPA will select as BDAT for the CERCLA/RCRA soils and debris and for complex cyanide wastes if these are banned from land disposal. If incineration is the only or one of several BDAT options, some firms predict a considerable shortfall in incineration capacity. Other firms feel that a move by EPA to string out the effective dates of the land bans will have a chilling effect on investment in new incineration capacity and might generate a capacity shortfall.

Several firms stressed that they have been able to detect clear evidence of gains in minimizing waste volumes by generators. This evidence has come in the form of handling even larger volumes of solid and sludge wastes and or as an overall decline in waste volumes shipped off-site for handling. They predict that this trend will continue and may negate or soften the impact of increases in the demand for incineration services when land ban extensions expire and the pace of waste site cleanups accelerates. The market effects of expiring land ban variances will, however, vary by region of the country with the West Coast and the Northeast likely to experience any capacity shortfalls sooner than the Midwest, Gulf Coast, and Southwest.

On the possibility of capacity shortfalls for other technologies, survey respondents had a variety of opinions. Firms commenting on the adequacy of secure landfill capacity believed that enough capacity exists for the next 10 to 15 years. Reservations were expressed by these firms over the pace of permitting for new cells and over the inability to site new facilities. Some respondents also mentioned that "wild cards" in their analysis were EPA's or states' decision on the status of municipal waste incinerator ash and petroleum-contaminated soils from UST cleanups as hazardous wastes, and the acceptability of land treatment for oily sludges. Other technologies/services mentioned as subject to shortfalls in available commercial capacity on either a nationwide or regional basis were: solvent recovery, aqueous wastewater treatment, and stabilization/solidification of drummed wastes.

The specific expansion and acquisition plans mentioned by respondents mirrored their individual views of growth markets (see Section 2.2) and capacity shortfalls. Factors noted by respondents as significant in their plans to expand included:

- Increasing demand for commercial waste management services in general and in particular off-site incineration services, especially for waste solids and sludges;
- The expanding site remediation and UST cleanup markets;
- Soon-to-be-issued final permits for several of their sites;

- " Decisions to enter new markets based upon perceived profitability and/or declines in their historical service markets;
- " An interest in providing more rounded, full-spectrum services; and
- " Forestalling competitors' "greenfields" projects or capitalizing on name recognition and business success in particular regions of the country.

Very few acquisition plans were noted by respondents; most of the service changes would be brought about by expanding at existing sites, although several "greenfield" projects were also mentioned. Growth through acquisitions was noted as likely to be significant, however, in cases of non-TSD permit-based service companies offering site remediation services, asbestos abatement services, waste minimization consulting, and mobile on-site treatment units.

Several survey respondents noted that their efforts would continue to expand existing landfill capacity by opening new cells meeting RCRA standards. They would also be continuing efforts to pace the rate at which they consume their available air space. A few firms reported plans to expand aqueous and chemical treatment capacity by 50 to 100 million gallons per year firm-wide. Several firms planned to add significant capacity for stabilizing drummed wastes as well as considerable drum and tank storage capacity at all or most of their existing sites. Other services slated for expansion by some firms included: solvent recovery, a variety of services for small quantity generators, fuels blending and/or burning, and deep well injection.

2.4 LAND DISPOSAL RESTRICTIONS AND OTHER MARKET EFFECTS OF LAND BANS

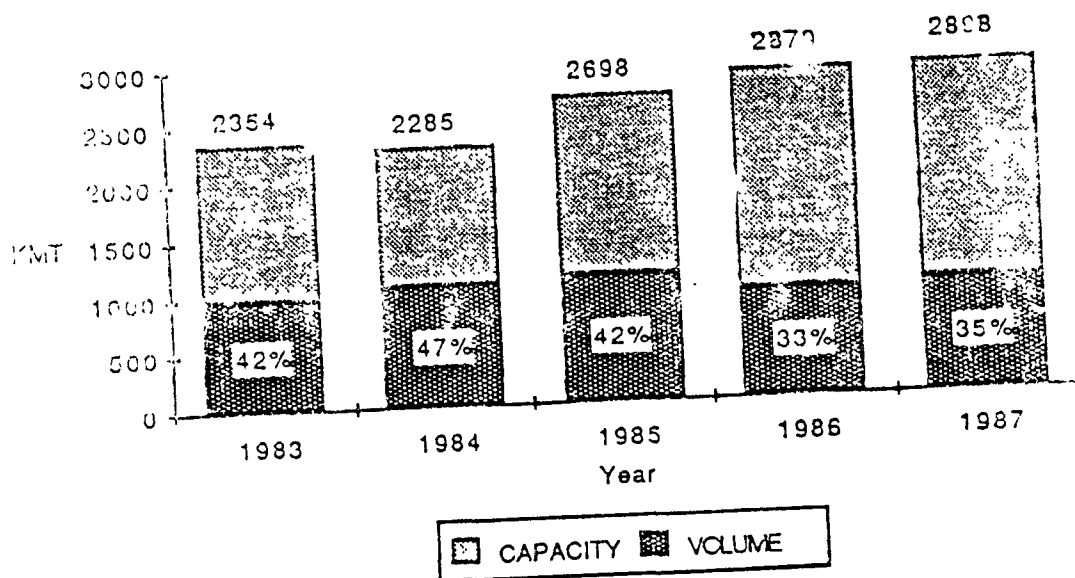
Respondents were asked several questions about the impact of land disposal restrictions on the future of various land disposal technologies. These questions included: how EPA should approach possible land disposal restrictions on RCRA and Superfund corrective action soils and debris; the future of land treatment and surface impoundments; whether the land disposal bans had altered the timing for when permits would be pursued, and whether many or few commercial land disposal facilities will be able to meet a "no migration" standard.

Reaction to whether there has been market effects tied to the land disposal bans outside of the growth of incineration services, so far, has been mixed. Three firms said they have seen no changes, and anticipate little or no effect in the future. Two of the firms believe that the effects of the bans will continue to be delayed, either through a regulatory extension or by lack of enforcement. Five firms, however, had either altered their own plans (or had seen generators accelerate their plans) to use or develop alternative treatment technologies, especially stabilization of aqueous or inorganic wastes and incineration of solids and sludges. A few firms had reacted to the

Chemical and Biological Treatment

With the expectation that waste volumes received for chemical/biological treatment will remain flat, several firms in the survey have slowed their growth in treatment capacity. Reported chemical/biological treatment capacity did increase by 7 percent between 1986 and 1985 (from an adjusted total of 2,698 thousand WMT to 2,879 thousand WMT), but increased less than one percent in 1987. This increase in capacity coupled with an eight percent decrease overall in volumes treated since 1985 resulted in capacity utilization dropping from 42 percent in 1985 (adjusted) to 35 percent in 1987.

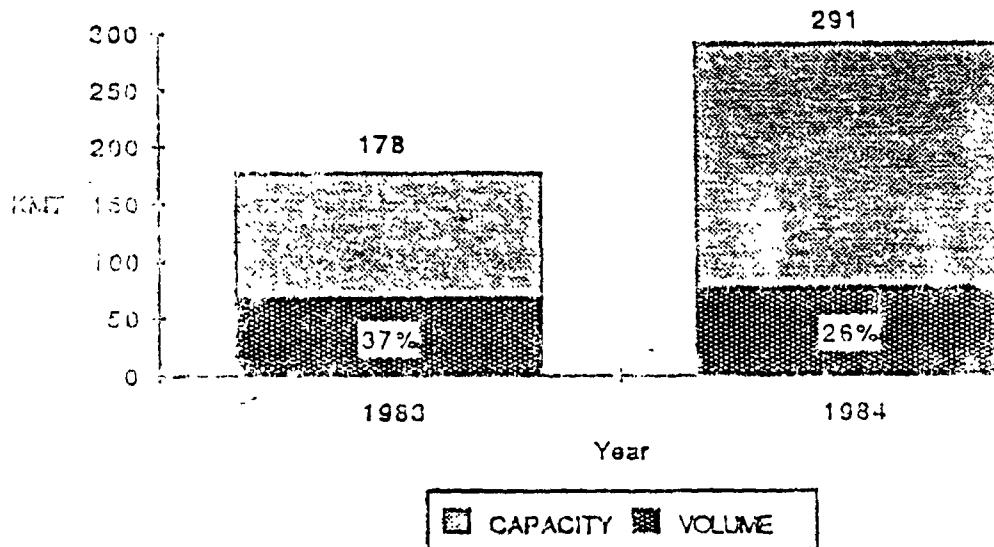
Chemical and Biological Treatment
(Capacity and Capacity Utilization)



Solidification/Stabilization

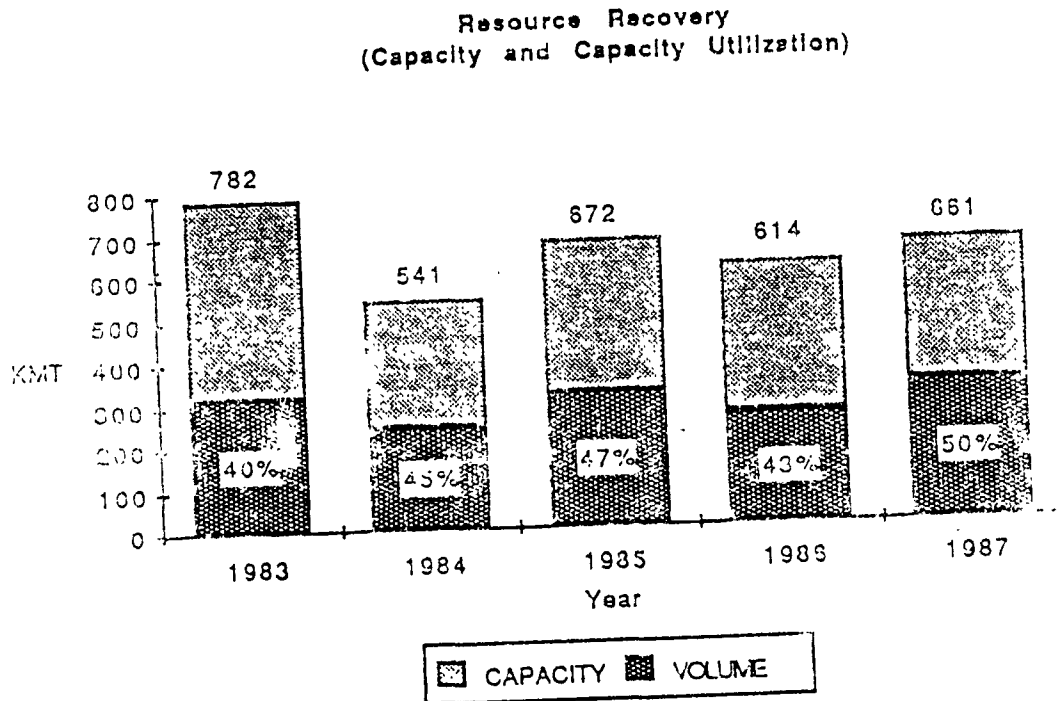
Nine firms in the 1986-1987 Survey offer waste solidification/stabilization services; however, only four firms provided capacity data. These four firms had a reported capacity of 178 thousand WMT in 1986 and 291 thousand WMT in 1987 -- a 64 percent increase. This was the next largest one-year increase in capacity behind the increase in incineration capacity. Capacity utilization over this period declined from 37 percent in 1986 to 26 percent in 1987.

Solidification/Stabilization
(Capacity and Capacity Utilization)



Resource Recovery

There has been little reported change in the resource recovery capacity operated by the firms participating in this year's survey since 1985. Capacity utilization has fluctuated slightly over this period, but has also remained fairly constant -- between 43 and 50 percent as shown in the exhibit below. Several firms expect that resource recovery volumes and capacity will rise over the next few years as generators look to minimize waste sent to land disposal, however, a few firms expect there will be a drop in the commercial solvent recovery business as more generators will recover their own solvents.

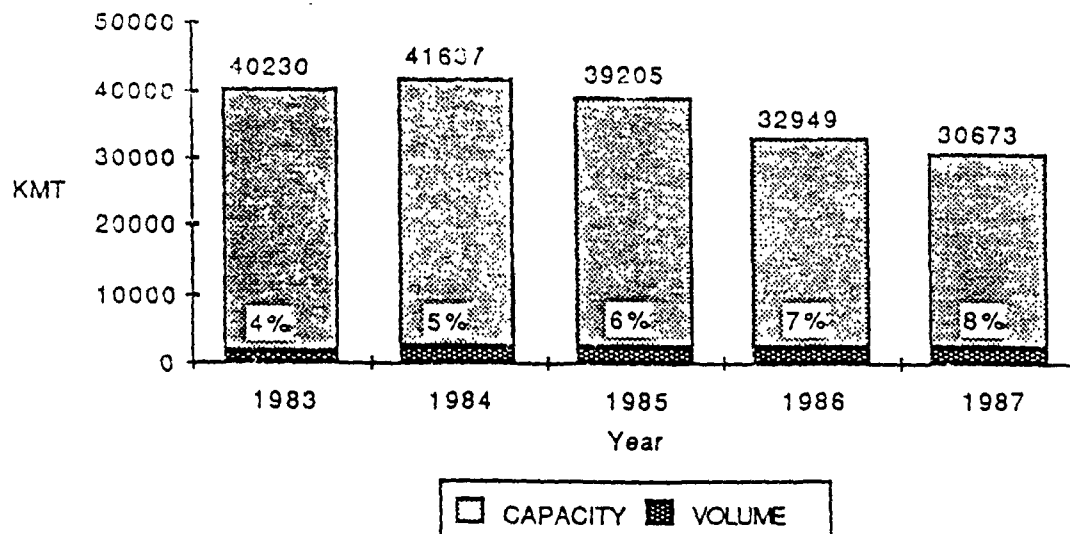


Landfill

Reported commercial landfill capacity operated by these firms has declined each year since 1985, with the biggest drop occurring between 1986 and 1985 (16 percent), even though the volume landfilled has changed little since 1985. Landfill capacity was estimated to be 30,673 thousand WMT in 1987 as compared to the adjusted total of 39,205 thousand WMT in 1985 (a drop of 22 percent). There was a reported 7 percent decline in landfill capacity between 1987 and 1986 with volumes landfilled increasing by 5 percent over the same period. Assuming a fill rate equal to the estimated 1987 waste volume landfilled (2,473 thousand WMT), current landfill capacity would be expected to last for 12 years. This is down from the previous remaining lifetime estimate of 15 to 16 years. Readers should remember that these estimates are based upon the assumption that all land area each firm plans to commit to landfill operations can be developed. At any one time, however, the available landfill capacity is much less as only a portion of a landfill site is permitted to receive wastes.

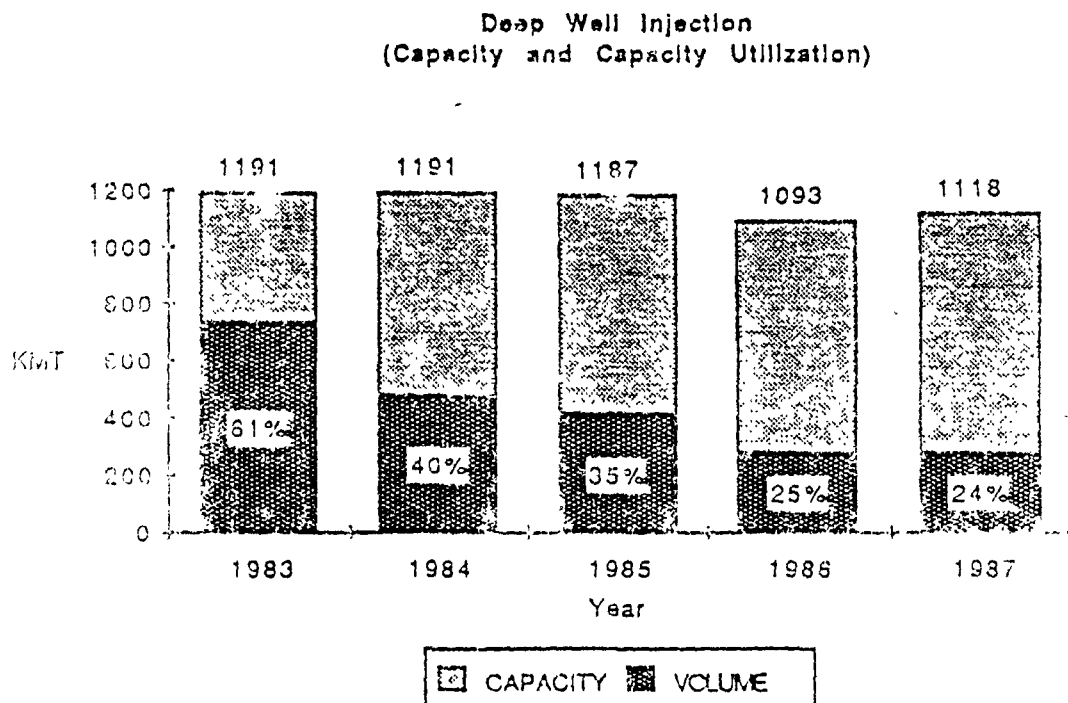
While landfills continue to fill up and with few facility expansions or new facilities permitted, the estimated loss of commercially available landfill capacity reported this year is overstated. Several firms indicated that they had withdrawn available landfill capacity from the "direct" disposal market to ensure capacity would be available to handle treatment residuals from their other operations.

Landfills
(Capacity and Capacity Utilization)



Deep Well Injection

Commercial deep well injection capacity operated by these firms declined eight percent between 1985 and 1986, but rose two percent between 1986 and 1987. Total effective capacity estimated for 1987 (1,118 thousand WMT) is now only slightly less than the estimates for 1983 through 1985 (around 1,190 thousand WMT). Over this same period, however, volumes received for deep well injection declined by 42 percent as several facilities were unable to accept wastes. Capacity utilization in 1986 and 1987, therefore, was estimated to be around 25 percent, down from 35 percent in 1985.



3.4 HAZARDOUS WASTE PRICES STABILIZED IN 1986 AND 1987

Prices for transporting, treating, or disposing of hazardous wastes can vary substantially depending on the level of regional competition, costs incurred in handling the wastes, and the risk of handling the waste. Prices for a single waste stream vary with the composition of waste. This variability would make it difficult to present detailed price data even if survey participants were willing to share that information. Survey participants will provide, however, price range data and/or information on price trends for some very general waste types across the major treatment and disposal technologies.

The price information provided in Exhibit 3-4, therefore, does not capture regional differences, quantity discounts, or waste stream variability, and should be interpreted cautiously. These are instead "typical" prices charged for hazardous waste management services by all firms surveyed in 1985, 1986, and 1987. The price ranges shown in the exhibit were calculated as the average of the low-end and high-end prices provided by individual firms. Also shown in Exhibit 3-4 are the expected price changes reported for 1988. The maximum price range reported by these firms is not shown in the exhibit, but has been reported in the sections on each technology below (i.e., the low and/or high end of any one firm's price range for a specific waste category may fall outside the "average" price range).

From 1984 through 1985, respondents had reported price increases of 30 to 100 percent for land disposal services, and from 60 to 400 percent for treatment services with incineration services garnering the highest price increases. The rate of price increase was also significant; in some cases, prices increased by 50 percent every 4 to 6 months. Among these firms, however, there was wide spread belief that the market had seen a one-shot price jump and that prices would stabilize.

The price information for 1986 and 1987 do not confirm across-the-board stabilization in prices, except for a few services. There was significant movement in service prices in 1986 as reported by these firms. Quoted prices for some services in 1986 increased as much as 174 percent (oil recovery), while prices for other services decreased by 54 percent. In 1987, prices appear to have steadied for some services. The average nominal price increase for chemical and biological treatment, deep well injection, transportation, and PCB incineration services rose less than 5 percent over their 1986 levels. The average nominal price increases for other waste management services was much greater: 10 to 48 percent for landfill; 13 to 34 percent for incineration; and 16 to 97 percent for resource recovery.

Price trends for each waste management technology are discussed further below. Prices for surface impoundments/land treatment and waste solidification/stabilization could not be included as the participating firms offering these services did not provide price data.

EXHIBIT 3-4

COMPARISON OF HAZARDOUS WASTE MANAGEMENT PRICES QUOTED BY ALL FIRMS IN 1985, 1986, AND 1987

Waste Management Technology	Form or Type of Waste	Price (\$ per gallon unless otherwise noted) ^{a/}		
		1985	1986	1987
Landfill	■ 55-gallon drum	50-137/drum	44-125/drum	64-186/drum
	■ Bulk	69-140/ton	86-154/ton	97-166/ton
Incineration	■ Clean liquids, high BTU	0.10-1.93	1.42-1.87	1.35-2.95
	■ Liquids, low BTU	1.33-4.17	1.55-2.59	1.33-3.38
	■ Sludges and solids	2.75-4.75	3.92-7.01	5.40-8.56
	■ Highly toxic liquids	2.10-8.30	2.17-3.34	2.36-5.02
	■ PCB liquids	2.50-3.50	3.33-3.61	2.36-4.34
	■ PCB solids	4.50-12.50	4.03-7.92	3.84-8.17
	■ Aqueous inorganic liquids		0.25-1.19	0.26-1.20
	■ Inorganic sludges and solids		0.44-3.51	0.44-3.51
Chemical/Biological Treatment	■ Aqueous organic liquids			
	■ Organic sludges and solids			
	■ Aqueous organics		0.40-1.00	0.40-1.00
	■ Non-aqueous organics		0.33-1.10	0.38-2.44
Resource Recovery	■ Oils	0.00-0.42	0.15-1.00	0.20-1.13
	■ Aqueous inorganics			
	■ Aqueous organics		0.08-0.50	0.09-0.50
	■ Oil wastewaters	0.08-0.50	0.08-0.50	0.09-0.50
Deep Well Injection	■ Other (toxic liquids)	0.50-1.20	0.15-0.63	0.15-0.63
Transportation		0.18-.022/ton-mile	0.22/ton-mile	0.23/ton-mile
		2.70-4.50/loaded-mile	3.28-3.37/loaded-mile	3.35-3.51/loaded mile

^{a/} Price range calculated as averages of all low-end and average of all high-end prices quoted. See text for full price ranges.

b/ The 1985 prices for chemical and biological treatment and for resource recovery (except for oils) have been omitted because the waste type categories

Landfill

From 1984 to 1985, landfill prices increased an average of 30 to 100 percent. From 1985 to 1986, however, landfill prices increased only 15 percent for bulk disposal and fell almost 10 percent for drum disposal. Typical bulk-disposal prices in 1986 ranged from an average of \$86 to \$154 per ton (full price range: \$70-\$250/ton). Prices for drum disposal ranged from an average of \$44 to \$125 per drum (full price range: \$40-\$250/drum). In 1987, average prices for drum disposal jumped 48 percent to \$64-\$186 per drum (full price range: \$40-\$330/drum). Bulk disposal prices rose an additional 10 percent to \$96-\$165 per ton (full price range: \$75-\$250/ton). Quoted prices for waste solidification or stabilization services ranged from \$70-\$270 per ton in 1986 and 1987.

Competition was mentioned as the primary reason behind the drop in drum disposal prices in 1986. As in previous years, the reasons behind the increase in landfill costs, and therefore prices, included: more waste solidified prior to disposal; increases in state waste taxes; costs for corrective actions; and higher insurance costs. One additional factor mentioned was the realization by landfill operators that permitted disposal cells are not assured to be a replaceable commodity at existing sites through the current permitting process. If they can be replaced, it will only be so at significantly higher costs at some uncertain future time. Operators will increase their prices, therefore, as a means to conserve valuable landfill capacity for the future, especially if that airspace is needed to handle residuals (e.g., ash or sludges) from the firm's own waste treatment (especially incineration) operations. Only two respondents reported their expected change in landfill prices in 1988; one said that prices would remain constant while the other predicted an increase of 10 percent.

Deep Well Injection

The average deep well injection price for toxic liquids fell 54 percent in 1986 (\$0.15 - \$0.63 per gallon) with shifts in both the low end (up) and the high end (down) of the quoted price range (full price range: \$0.08-\$1.00/gal.). The price per gallon for toxic liquids remained unchanged in 1987. The price range for oily wastewaters remained unchanged at \$0.08 - \$0.50 per gallon, and this was also the price range for the new waste type category added this year: aqueous organics. One deep well injection firm expected that their prices for toxic liquids would increase by 10 percent in 1988.

Incineration

In 1985, nominal incineration prices rose for all waste categories anywhere from 60 to 400 percent. In 1986, average incineration prices increased for one waste category -- clean, high Btu-content liquids -- by 60 percent (full price range: \$0.15-\$1.93/gal.). This was surprising given that these wastes are in demand to help support the combustion of the lower Btu-content solids and sludges. Equally surprising was the drop in prices -- by 25 percent or more -- in 1986 for low-Btu content liquids (full price range: \$0.83-\$5.84/gal.), toxic liquids (full price range: \$1.58-\$5.84/gal.), and PCB

solids (full price range: \$0.30-\$1.50/lb.), with a significant drop in the high end of the price range for each waste type. The full price range quoted for solids and sludges (non-PCB) in 1986 was \$0.40 to \$1.00 per pound, and \$2.50 to \$4.75 per gallon for PCB liquids.

In 1987, nominal incineration prices were mostly up except for PCB liquids incineration given the decline in that business area. The price to incinerate toxic liquids registered the greatest increase (34 percent), however, the average price charged was still lower than was estimated for 1985. The full 1987 price range quoted for each waste category were: \$0.12-\$2.09 per gallon of high-Btu content liquids; \$0.83-\$5.84 per gallon of low-Btu liquids; \$1.67-\$7.91 per gallon for toxic, non-PCB liquids; \$0.50-\$1.25 per pound for sludges and solids; \$2.09-\$3.75 per gallon for PCB liquids; and \$0.50-\$1.50 per pound for PCB sludges and solids. Firms providing incineration services expect that incineration prices in 1988 will remain constant or drop slightly due to competition.

Chemical and Biological Treatment

New waste type categories were used this year to characterize prices for chemical and biological treatment services. It is not possible, therefore, to compare the price quotes for 1986 or 1987 with those for 1985. As a result, the price comparison covers changes between 1986 and 1987 only.

Prices charged for chemical and biological treatment can vary considerably depending on the cost of the unit processes involved and the hazardous nature of any remaining residue that must be managed. The average price range quoted for these services in 1986 and 1987 was anywhere from \$0.25 to \$3.50 per gallon depending on the waste type treated or recovered (the more toxic and/or reactive the waste the higher the price). The full price range quoted for aqueous inorganic liquids in 1986 was \$0.14-\$3.25 per gallon and \$0.17-\$3.25 per gallon in 1987. In both 1986 and 1987, the full price range quoted for inorganic solids and sludges was \$0.30-\$6.00 per gallon. With volumes received and capacity expected to remain flat, firms offering these services predict price increases of only 10 percent in 1988.

Resource Recovery

New waste type categories were also used this year to characterize resource recovery prices. The new waste type categories were: aqueous organics, non-aqueous organics, and aqueous inorganics; only the oils category was kept from previous surveys. From 1985 to 1986, the average prices for oil recovery rose 174 percent from \$0.00 - \$0.42 per gallon to \$0.33 - \$1.00 per gallon (full price range in 1986: \$0.05-\$2.25/gal.). An additional average price increase of 16 percent was reported in 1987. The average price range for oils in 1987 was \$0.20 to \$1.13 per gallon with a full price range of \$0.20 to \$2.58 per gallon. Respondents attribute this increase to the cost of the regulations governing waste oil that came out in December 1985.

The average price quoted for recovery of aqueous organics did not change between 1986 and 1987 staying at \$0.40 to \$1.00 per gallon (full price range: \$0.35-\$1.25/gal.). The average price range for non-aqueous organics, however,

rose 97 percent in 1987 over 1986 levels to \$0.38 to \$2.44 per gallon (full 1986 price range: \$0.25-\$1.20/gallon; full 1987 price range: \$0.35-\$3.67/gallon). No price information was reported for the recovery of aqueous inorganics. No firm provided information on their 1988 price changes.

Transportation

Several of the 14 firms surveyed provide for transportation of hazardous wastes to their facilities. Transportation price data provided by these firms indicate that, in 1986, average prices on a per ton-mile basis rose 10 percent, and, in 1987, increased another 5 percent. These prices represent full-truckload shipments; prices for less-than-truckload shipments would be considerably higher. The 1986 full price range quoted for transportation services on a loaded mile basis (\$3.20-\$3.78) rose five cents on the low end and remained unchanged on the high end in 1987. Transportation prices in 1988 were not expected to rise significantly. The participating firms mention competition as the main factor behind fairly stable prices for transportation services.

APPENDIX A

CONVERSION FACTORS FOR REPORTING WASTE VOLUME
IN WET METRIC TONS

APPENDIX A

CONVERSION FACTORS FOR REPORTING WASTE VOLUME
IN WET METRIC TONS

The same assumptions and definitions used in tabulating the data for the 1980-1985 survey reports with one exception were also used for this survey.

The estimates for volume presented in this report refer to the estimated quantities of hazardous waste actually treated or disposed of by the commercial hazardous waste management industry. The estimates for effective capacity refer to the practical maximum amount of hazardous waste which could be treated at existing facilities without undertaking major capital expenditures and considering routine downtime and other factors. Since the effective capacity of a facility often depends on the types of wastes being treated or disposed, the current mix of hazardous waste is assumed in defining capacity. Several additional assumptions were made during the course of this analysis that are important to the proper interpretation of the results. These assumptions are necessary to convert data to a consistent basis, wet metric tons (WMT), when conversion factor estimates were not available:

- * Volumes reported in gallons are transformed into wet metric tons assuming that the waste has the density of water at 8.34 pounds/gallon or 0.00378 metric tons/gallon.
- * Volumes reported in cubic yards were converted into wet metric tons assuming that the waste has a density of 0.90 metric tons/cubic yard. This conversion factor was used survey assuming that no liquids are now landfilled and more wastes are stabilized before placement in landfills.
- * Capacity reported in acres is reconverted to wet metric tons by assuming each acre has 430,000 cubic feet of available capacity and 12,100 MWT can be disposed of in each acre. In general, four interrelated factors influence the capacity, as measured in wet metric tons, that can be disposed of per acre:
 - The overall size of the landfill. This defines how much can be utilized for disposal and how much must be used as buffer. The smaller the landfill, the greater the proportion of acreage that must be used as buffer.
 - The size of the trenches. A typical trench may have surface dimensions of 100 by 200 feet and have an average depth of 30 feet.

- - - The percentage utilization within a trench. The percentage of the trench utilized for hazardous waste disposal depends on the materials being disposed and the spacing practices of the operator.
- - The density of the material. There is significant variability depending on the actual wastes being disposed.

The assumption of 12,100 MWT per acre is based on the advice of several landfill operators rather than explicit assumptions about each of the parameters that affect landfill capacity.

APPENDIX B

DEFINITIONS FOR SURVEY

APPENDIX B

DEFINITIONS FOR SURVEY

<u>Hazardous wastes:</u>	Wastes regulated as hazardous under the federal and/or a state's RCRA program, plus PCB wastes.
<u>Biological treatment:</u>	The use of the metabolic processes of microorganisms to break down organic hazardous constituents into non-hazardous substances.
<u>Chemical treatment:</u>	A group of processes utilizing neutralization, precipitation, oxidation, and other chemically-based techniques to treat or immobilize hazardous constituents in a waste stream. Can occur in tanks or surface impoundments.
<u>Incineration:</u>	The thermal destruction of a hazardous waste in either a liquid injection unit, rotary kiln unit, or a cement kiln (although the latter is more commonly referred to as energy recovery).
<u>Recovery/recycling:</u>	The reclamation, via separation and purification, of usable substances from hazardous waste; and the re-use of these substances (in this report, resource recovery includes solvent and metals recovery, but not energy recovery, which has been included under incineration to avoid disclosing confidential information; future surveys may expand this market services category to separate out these very different submarkets).
<u>Landfill:</u>	The containment of hazardous waste in on-ground or below-ground repositories that are lined with layers of impermeable material.
<u>Solidification/stabilization:</u>	The conversion of liquid hazardous constituents into immobile solid forms by chemical or evaporative processes.
<u>Deep well injection:</u>	The disposal of high-concentration liquid wastes in otherwise unusable underground aquifers via pressurized wells.
<u>Land treatment:</u>	The placement of hazardous waste on or in a surface layer of soil (to render it non-hazardous through biological decay).

Solar evaporation:

The process of dewatering hazardous wastes in a surface impoundment by evaporation of the water fraction of the wastes.

Treatment:

Includes all thermal and non-thermal treatment technologies including stabilization/solidification.

Land Disposal, or Disposal:

Includes all other non-treatment technologies except storage and transportation.

Capacity, or Effective Capacity:

Measured as (or converted to) the annual mass throughput of hazardous waste through a treatment or disposal technology or system according to practical operating maximums for these systems considering routine down time for repairs and maintenance, discharge limits in various permits, electrical outages, and other factors as defined by the respondent.

Capacity Utilization:

The ratio of commercial volumes processed by a technology in that year to effective capacity, both expressed in mass units, and represented as a percentage.

Superfund Wastes:

The wastes originating from cleanup activities at hazardous waste sites where these activities are funded by Superfund monies.

land bans by imposing their own restrictions on the waste types they would accept for landfilling, some as a measure to conserve space for disposal of their own waste treatment residues.

Most respondents predicted that the future of surface impoundments or land treatment is "bleak" and that these technologies will be stringently regulated or phased out. At the same time, however, these firms had widely different opinions about the need for using surface impoundments and land treatment to manage hazardous wastes. A few firms felt that there will be a continuing need for and use of these technologies, but could not agree on which technology would be the more likely to survive. Five firms believed that land treatment was a viable or necessary technology that will survive, although operators would face increased restrictions to manage fewer wastes. One firm expects that new surface impoundments will be constructed, but many more respondents said that surface impoundments will be replaced by treatment in tanks.

At present, fairly large volumes of RCRA and CERCLA corrective action soils and debris are disposed of in secure landfills with little or no pretreatment. Survey participants expect, however, that future land disposal restrictions and the move to more "permanent" remedies will soon require that most or all corrective action soils and debris be treated before land disposal. If true, most respondents believe that there is currently inadequate capacity to meet the potential need to treat RCRA and CERCLA corrective action soils and debris. Most companies are not confident about correcting any near-term shortfall in treatment capacity for soils and debris quickly. One firm stated that many firms have and are building transportable treatment units to meet the CERCLA program need, and several noted that on-site treatment units will be the long-term solution to land disposal restrictions. The firms differed on whether exemptions or extensions should be allowed because of the potential capacity shortfall. A few firms feel that there should be extensions granted for "approved" landfills and that additional land disposal capacity should be permitted to handle the potential volumes. Other firms feel that extensions should not be granted. One firm stated that there should not be extensions granted merely because of the origin of wastes. Another firm stated that capacity has been coming on line and will continue to do so, but that adequate capacity will not be placed into operation unless and until the bans are enforced and firms actually see the demand.

Even with required treatment of RCRA and CERCLA corrective action soils and debris, a few firms still expect that the impact on land disposal volumes will be minor, however. Several firms expect that more landfill capacity will be permitted, especially to accommodate disposal of high volume wastes for which there are no alternative technologies, or, because the treatment residues will still require disposal, expect that the volume of waste going to landfills will actually rise.

Only five firms responded to the question of whether they operate a land disposal unit capable of meeting the "no migration" standard that will allow them to continue disposing untreated hazardous wastes. One firm stated only that they meet the RCRA minimum technology requirements and would not answer

whether it meets the no migration standard. Three firms believe that it will be virtually impossible to file a petition that will be approved. Only one firm intends to submit the application by the hammer deadlines. Even so, the firm believes the petition requirements are inappropriate, inasmuch as they place too high a reliance on a manipulable computer model, rather than any development of hard data.

2.5 CLEANUP BUSINESS SEEN TO BE GROWING FOR MANY FIRMS, BUT CLEANUP POLICIES WILL DECIDE FUTURE

Many of the survey participants also have divisions or groups that specialize in site remediation and field services. Although this aspect of their business mix was not a subject for this survey, several questions were asked that touched upon their participation in and views of the site cleanup market. For example, respondents were asked in they handled any Superfund cleanup, non-Superfund cleanup, or RCRA corrective action cleanup wastes in 1986 or 1987. About half of the firms surveyed did not handle Superfund cleanup wastes in either 1986 or 1987. A handful of firms had handled Superfund cleanup wastes during 1986 and 1987, and about an equal number had also handled wastes in both years from non-Superfund cleanups. Only one firm reported handling wastes from a RCRA corrective action site. The majority of firms reported that handling site cleanup wastes had not caused delays in handling wastes from their "live stream" customers, but two firms did report minor delays, especially for "third party" wastes received from brokers.

Although only a few firms had handled wastes from cleanup sites in 1986 or 1987, more firms said they were planning to get into this business in the near future. Most firms said they expected the site cleanup business to experience significant growth rates over the near-term, a trend borne out by the recent experiences of several firms that had handled cleanup wastes previously. One firm noted that it had handled four times the volume of site cleanup wastes in 1987 versus 1986. Another firm noted that waste volume had increased 10 to 20 percent over that same period, and still another firm reported steady volume increases each year since 1982. The experience of other firms was not as positive: their cleanup waste volumes had increased, but at a rate less than had been predicted and at lower profit margins.

When asked about the market effects of the SARA amendments, the survey participants either had no comment or stated that they had yet to detect any effects. One respondent insisted that the principal effect had been to slow down site cleanup work. Many respondents stated that they had anticipated undertaking more on-site treatment projects by now, but had not seen much movement in this direction and were concerned about whether EPA would elect to pursue on-site treatment remedies. Several firms noted that the promise of the Superfund cleanup program for them hinged upon how aggressively EPA would pursue permanent cleanups through the use of on-site treatment technologies like transportable incinerators.

More respondents were upbeat about the future growth of the non-Superfund site cleanup market. They reported considerable activity by responsible parties to clean up sites before that site might be considered for inclusion

on the federal or a state's priority list. Many firms also expected that the RCRA corrective action market would be very big, but were not sure of its profitability. Several firms expected that this cleanup market would be highly competitive and subject to lower profit margins.

Survey participants were also asked about the market effects of EPA's Off-Site Policy. Only a few firms chose to comment and their opinions were very negative. Although no numbers were cited, these few respondents said that this policy had resulted directly in delaying cleanups, in a considerable loss of revenue, and generally in "mass confusion".

2.6 SPECIAL SURVEY TOPICS

Each year EPA includes a group of special interest topics in the commercial industry survey. In years past, survey participants were asked for their views on topics such as the waste oil regulations debate, and for several years have been asked about the availability of liability insurance and servicing small quantity generators.

The list of special interest survey topics this year included the following: (a) commercial waste management firms' capacity to perform the Toxicity Characteristic Leaching Procedure (TCLP), (b) the availability of liability insurance, (c) servicing the small quantity generator market, and (d) the emergence of the "quasi-commercial" waste management services industry.

a. Capacity to Perform the Toxicity Characteristic Leaching Procedure (TCLP)

The majority of firms surveyed believe that most commercial waste management firms do not yet have adequate capacity and may not be able to develop adequate capacity in time. Although the larger firms generally see themselves as capable of either performing the test now or developing the capacity to perform the test fairly quickly, several firms expressed the belief that "smaller" commercial firms may not be able to perform the test. If the capacity of commercial laboratories to perform the test is considered, however, these firms believe any potential shortfall in testing capacity is likely to be small. Several firms anticipate that imposing the TCLP will extend the testing time and increase costs to generators.

b. Availability of Liability Insurance

Respondents to this question noted that, in general, the availability of liability insurance "is no longer a problem if you have the money to pay for it." Six firms stated they now see more offerors of insurance to commercial waste management firms. Another firm believes that there has been a "relaxation in insurance for waste haulers", which have been able to qualify for higher coverage limits, apparently at affordable rates. Two firms stated that they have not been able to obtain as much insurance as they need or want. One has obtained only one-tenth the insurance it wants, and the other must

self-insure because it is unable to obtain the minimum insurance required by the state and federal governments.

c. Servicing Small Quantity Generators

Generators of between 100 to 1000 kilograms of hazardous waste per month -- small quantity generators (SQGs)⁴ -- require much in the way of waste management services and still only a few commercial firms in the survey said they actively seek SQG business directly. Even so, it appeared that more firms this year talked of their interest in looking at this market than was the case in the 1985 Survey.

Firms participating in the SQG services market say it requires extensive less-than-truckload transportation capabilities, a strong quality control program, a willingness to supply the additional recordkeeping services required, effective logistical planning, and an awareness of the liabilities that can be incurred, especially when an off-spec waste is received. Firms that can meet these demands and do so fairly inexpensively consider the SQG market to be a major growth market and potentially quite lucrative. Several firms commented that they have been surprised by the unexpectedly high growth rate of services to SQGs.

Other firms either handle no or only a "trickle" of SQG waste directly, or do so only through waste brokers as they cannot supply the necessary services for a price SQGs can afford or they are scared of the potential liabilities. Many firms, even those who do service SQGs, are also critical of the lack of enforcement effort invested to date in SQG compliance. The potential demand will never be realized and commercial firms will remain unwilling to invest in services to SQGs, they say, until cheaper disposal options are foreclosed to SQGs. Several firms also spoke of the need for more local storage and transfer facilities to help handle SQG business since just the waste transportation price is enough of a problem for many smaller generators.

d. Emergence of the "Quasi-Commercial" Waste Management Industry

Press articles discussing waste management service firms that will come in and build, permit, and operate a fixed treatment/disposal facility⁵ for the generator prompted EPA to inquire about the emergence of this "quasi-commercial" waste management industry. In particular, EPA was interested in unconfirmed reports that some of these service arrangements were being made

⁴ The term small quantity generator is now officially reserved by the USEPA for generators of less than 100 kilograms of waste per month, but has been used here to represent the 100-1000 kilogram per month generator as this is the more typical reference used by the commercial firms.

⁵ Not included in this definition would be transportable or mobile units for on-site treatment, or fixed, transportable, or mobile units built and operated as part of a waste site cleanup.

with an eye towards opening the treatment/disposal facility for at least partial commercial operation at some later date. A related development also of interest to EPA were reports that generators planning to build and operate their own treatment/disposal facilities were willing to allow commercial access to these facilities.

Six out of the eleven firms responding to this question had never heard of the idea of commercial firms operating fixed, initially dedicated, treatment or disposal facilities at a generator's site. Five firms, however, had heard about the idea and two firms reported they had held discussions with three generators though all were unsuccessful. Still another firm reported a different twist on this idea: generators had inquired if the commercial operator would build and operate a dedicated, off-site waste management facility that would not go commercial.

Those firms that reported receiving inquiries from generators about building and operating dedicated on-site fixed facilities said that generators had different objectives in pursuing the idea, including potential cost savings, liability protection, and access to guaranteed capacity. Most of these negotiations had failed, they said, because generators were unwilling to pay enough to allow the commercial operator to make a good return on his investment. One firm commented that they saw some potential in this idea for the very large waste generator that lacked the internal capabilities to operate the facility, but doubted there were many generators who fit this description.

More firms, of course, had heard of generators willing to open up their own incinerators or chemical treatment facilities to other generators since several state facility siting facilities have entertained this idea as a solution for capacity shortfalls and siting woes. These firms believed, however, that few generators would do so or that the permitting hurdles would prove fatal to the idea. They stressed that generators are more likely to run their own show and that it made no sense for a generator to assume the liability that made them discontinue using commercial facilities in the first place. Another firm noted that most mid-sized waste generators will find that the economics favor using commercial service firms. Even so, other firms did note that the profitability of commercial waste management services could still be a sufficient lure for generators to enter the market.

* * * * *

The next chapter discusses the quantitative results of the survey concerning waste volumes received, capacity operated, and prices charged by all firms in 1986 and 1987. These results are also compared to results from the 1985 Survey (as adjusted).

CHAPTER 3

WASTE VOLUMES, CAPACITY, AND PRICES

This chapter discusses results of the 1986-1987 survey concerning: the number of facilities operated by the 14 firms and the services offered; recent acquisitions; waste volumes received; effective capacity and capacity utilization; and service prices. Unlike previous survey reports, only occasionally will distinctions be made in the results between firms that have participated since the first survey and firms included more recently. The fourteen firms participating in the survey this year were:

- " Browning-Ferris Industries/CECOS International;
- " Chem-Clear;
- " Chemical Waste Management;
- " Envirosafe, Inc.;
- " ENSCO, Inc.;
- " Envirite;
- " Environmental Waste Resources;
- " GSX Corporation;
- " Rollins Environmental Services;
- " Ross Incineration;
- " Safety-Kleen/McKesson EnviroSystems;
- " Systech;
- " U.S. Pollution Control, Inc.; and
- " W.J. Lamberton/Chemical Resources, Inc.

3.1 THESE 14 FIRMS OPERATED A TOTAL OF 83 FACILITIES IN 1986 AND 1987

Excluding transfer facilities, the 14 firms surveyed operated 83 treatment or disposal facilities in 1986. The distribution of waste management services offered at these facilities is shown in Exhibit 3-1. Significantly, these 14 firms report that more of their facilities now or soon will offer thermal treatment services for hazardous wastes than they reported in 1985. There was also a drop in the number of landfill facilities, but this reflected a correction of past errors. Four firms opened or acquired a total of eight new facilities in 1987. Only two companies reported closing facilities in 1986 or 1987, although a few facilities were closed temporarily for some portion of this period.

Acquisition activity by these firms picked up in 1986 and 1987 as expected. In 1986, much of the acquisition activity involved GSX Corporation. GSX Corporation, and its parent corporation Genstar, were first acquired by Imasco Ltd. Imasco quickly elected to sell GSX Corporation, both the solid and hazardous waste operations, to Laidlaw Transportation Ltd. Later, GSX Corporation acquired a liquid injection incinerator and a waste transfer operation in the Southeast. For a while, Laidlaw contemplated selling the hazardous waste operations of GSX, but, according to recent reports, will

EXHIBIT 3-1

NUMBER OF HAZARDOUS WASTE MANAGEMENT FACILITIES
OPERATED IN 1986-1987 BY 14 FIRMS

Firm	Number of Facilities 1986-1987	Facilities by Technology a/, c/						
		Landfill	Surface Impoundments/ or Land Treatment	Incineration b/	Injection Wells	Resource Recovery	Chem/bio Treatment	Solidification/ Stabilization
Chemical Waste Management	26	7	2	2	3	8	10	15
Browning Ferris Industries/ CECOS International	7	3	1	--	2	1	2	2
GSX Corporation	7	1	--	1	--	--	--	1
Envirite	4	--	--	--	--	--	4	4
Rollins Environmental Services	4	2	--	3	1	--	3	2
ENSCO	3	--	--	1	--	--	--	--
Enviro-safe, Inc.	2	2	--	--	--	--	--	--
Chem-Clear	4	--	--	--	--	3	4	2
Safety-Kleen d/	13	--	--	2	--	12	--	--
Ross Incineration	1	--	--	1	--	--	--	--
Environmental Waste Resources	2	--	--	--	--	2	1	1
Systech	6	--	--	6	--	--	--	--
U.S. Pollution Control, Inc.	3	2	2	--	--	1	2	2
W.J. Lamberton/Chem. Resources	1	--	--	--	1	--	--	--
TOTAL	83	17	5	16	7	27	26	19

a/ As designated by respondents to survey.

b/ Includes rotary kilns, cement kilns, liquid injection, and other incinerator units, but excludes incinerator ships.

c/ Total number of facilities does not equal number of facilities by technology due to multiple services offered at individual facilities, and because other facilities offer services not in the technology list above.

d/ Includes facilities acquired from McKesson EnviroSystems.

Source: ICF Incorporated

apparently keep this portion of the business.

Exhibit 3-2 provides a list of selected acquisitions since 1983 by firms in the commercial hazardous waste management industry. Safety-Kleen's acquisition of McKesson EnviroSystems in 1987, as noted in Chapter 1, shortened the list of survey candidates from eighteen to seventeen firms. Additional acquisition activity not covered in this list involved business areas such as asbestos abatement services, consulting and engineering services, and UST cleanup and other remediation/field services. Most observers predict service diversification and consolidation trends to continue for the near future in the commercial hazardous waste management industry.

3.2 FIRMS SURVEYED RECEIVED 4.2 TO 4.6 MILLION WET METRIC TONS OF HAZARDOUS WASTE IN 1986 AND 1987

A total of at least 4.2 million wet metric tons (WMT) of hazardous wastes was received for treatment and/or disposal in 1986 by the 14 firms surveyed. This volume was down 8 percent from the adjusted 1985 Survey total of 4.6 million WMT (1985 total volume was adjusted to exclude volumes for firms not participating this year and to reflect corrected 1985 results provided to ICF). In 1987, these same firms received a total waste volume of at least 4.6 million WMT, an increase of 6.5 percent over 1986. While the total waste volume handled by these commercial firms appears to be holding fairly steady, several firms experienced significant increases or declines in volume received over the 1986-1987 period.

Total volumes received by technology and the percentage changes from 1985 through 1987 are shown in Exhibit 3-3.⁶ As the table shows, only the waste volume incinerated did not experience a decline in volume in 1986 as compared to 1985. Respondents reported that their volumes incinerated increased by 30.5 percent in 1986 over 1985 (adjusted). Waste volumes sent to deep well injection in 1986 experienced the largest decline (-34 percent).

Over half of the firms reported that waste volumes received in 1986 went down as compared to 1985. The percent change in volumes received by individual firms in 1986 versus 1985 covered a very broad range -- from an increase of as much as 73 percent to a decrease of 91 percent. The average change in volume was about -4 percent. Reasons for the decline in volume included permanent or temporary facility closures (due to regulatory or enforcement action), regulatory limits on volumes received at certain facilities, self-imposed restrictions on volumes received in order to conserve land disposal capacity, and slowdowns in certain service markets (e.g., wastewater treatment). Firms reporting an increase in volume cited such

⁶ Excluded from these results are the waste volumes sent to land treatment or surface impoundments as there were numerous problems with the results provided this year. These results were not provided as any observations based upon these data would have been unreliable and misleading. Reported separately for the first time this year are the waste volumes stabilized or solidified.

EXHIBIT 3-2

SELECTED ACQUISITION ATTEMPTS WITHIN THE COMMERCIAL
HAZARDOUS WASTE MANAGEMENT INDUSTRY

Acquiring Firm	Target	Year	Result
Browning-Ferris Industries	CECOS/NECO	1983	Successful
SCA Chemical Services	Triangle Resources Industries	1983	Successful
EnviroSAFE, Inc.	Pondessey Landfill/ACS Remedial Group	1983	Successful
ENSCO	Ziapro	1984	Unsuccessful
IT Corporation	b'Appolonia Waste Management Services	1984	Successful
McKesson Environmental	ENSCO	1984	Unsuccessful
CECOS International	Connecticut Treatment Corporation	1984	Successful
Waste Management/Genestar	SCA Chemical Services	1984	Successful
b'Addario Enterprises	ENR	1984	Successful
Michigan Tech Ventures Inc.	Ziapro	1985	Successful
U.S. Pollution Control Inc.	PMI, Inc.	1985	Successful
Safety-Kleen	Custom Organics	1985	Successful
GSX Corporation	Gulf Coast Environmental	1986	Successful
GSX Corporation	Abco Industries	1986	Successful
Imasec Ltd.	Genstar (including GSX Corp.)	1986	Successful
Laidlaw Transportation Ltd.	GSX Corporation	1986	Successful
Envirite Corp.	American Resources Corp.	1986	Successful
IT Corporation	McGill, Inc.	1986	Successful
SCA Services, Inc.	Wastequid, Inc.	1986	Successful
Chemical Waste Management	Oil & Solvent Process Co.	1986	Successful
Envirite Corp.	American Resources Corp.	1986	Successful
Safety-Kleen	McKesson Environmental Systems	1987	Successful
ENSCO	Great Lakes Environmental Services	1987	Successful
ENSCO	Water Management Inc.	1987	Successful
Union Pacific Corp.	USPCI	1987	Unsuccessful

Sources: ICF Incorporated.

EXHIBIT 3-3

VOLUMES RECEIVED IN 1985, 1986, AND 1987 BY ALL FIRMS
(THOUSANDS OF METRIC TONS)

Waste Management Technology	Received in 1985	Received in 1986	Received in 1987	Growth Rate (%)	
				1985-86	1986-87
Chemical and Biological Treatment	1,131	938	1,011	-15	6
Incineration	269	331	476	31	36
Landfill ^{a/}	2,424	2,366	2,473	-2	5
Resource Recovery	316	264	330	-17	25
Deep Well Injection	412	271	273	-34	1
TOTAL	4,552	4,210	4,563	-8	8

^{a/} Firms reportedly solidified/stabilized 66 thousand ^{a/}MT in 1986 and 75 thousand ^{a/}MT in 1987. Part of all of these volumes are included in the landfill volume estimates.

factors as growth in their site cleanup and lagoon closure business; growth in their waste pretreatment and treatment services due to the land disposal restrictions; the ban on disposing of bulk liquids in landfills; the tightening of Clean Water Act pretreatment standards; growth in the waste fuels market; and an increase in tank closure and cleaning services.

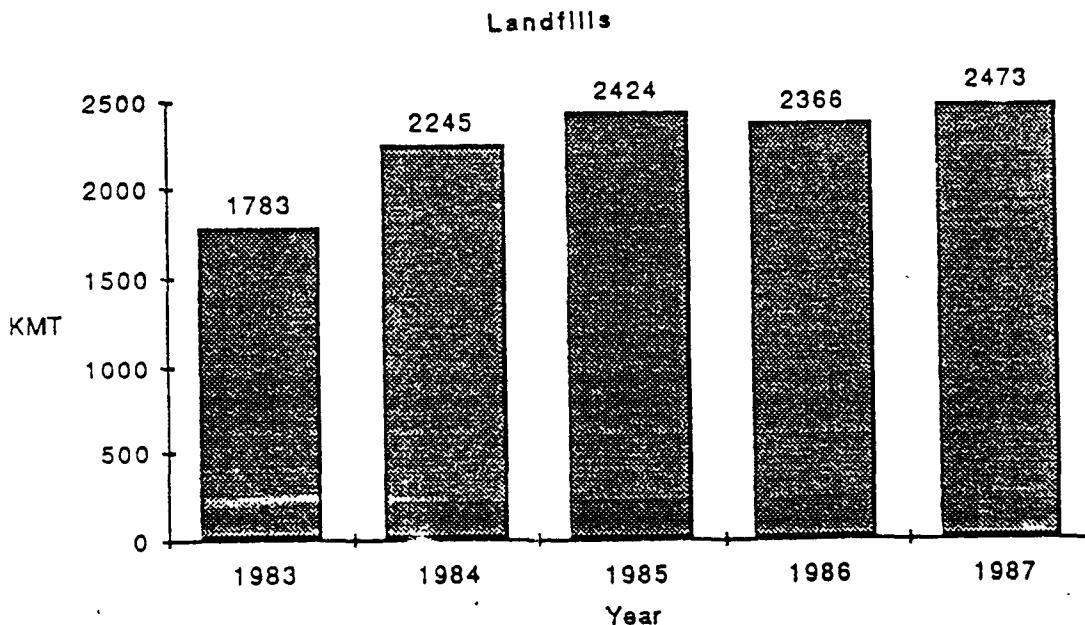
The decline in waste volumes handled by technology were all reversed in 1987. Again, the volume of waste incinerated experienced the largest growth in volume (36 percent) over the reported total for the previous year. Volumes sent to resource recovery increased by 25 percent over the reported 1986 total. In contrast to 1986, over half of the firms surveyed reported an increase in the total volume of waste handled in 1987 as compared to the previous year. Again, the percent change in volume received in 1987 versus 1986 by each firm varied markedly -- from up 233 percent to a decline of 85 percent -- with an average of a 20 percent increase.

Respondents were not asked this year to provide waste volume totals by waste type. Each firm was asked instead to list those waste types they do not accept either by choice or because of their permit conditions. The majority of firms surveyed do not accept dioxins, explosives, radioactive wastes, infectious wastes, herbicides, pesticides, and gas cylinders. Several firms do accept PCB wastes for treatment and/or disposal while others do not.

Each of the following sections discuss the waste volume trends for each technology in more detail.

Landfills

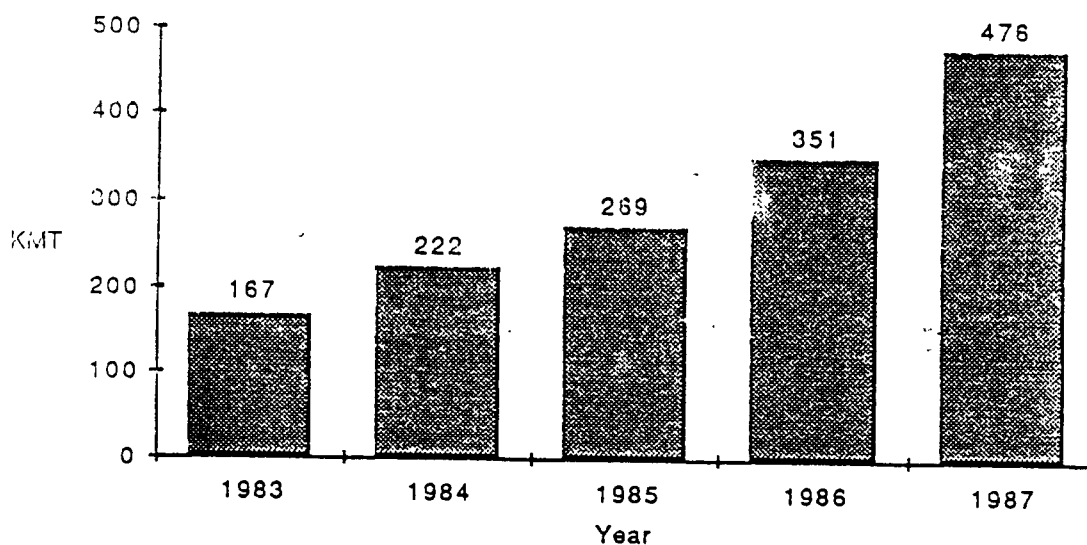
Waste volumes reported as landfilled by the commercial hazardous waste firms surveyed fell from 2,424 thousand WMT in 1985 (adjusted) to 2,366 thousand WMT in 1986 -- a decrease of about 2 percent. This decline in volume was followed by an increase of 4.5 percent in 1987 over 1986 to a reported total of 2,473 thousand WMT. Survey participants reporting an increase in the volume of waste landfilled had seen greater volumes of site cleanup wastes, a rise in waste stabilization and solidification, and/or more business due to the closure of several competitors' facilities. Waste volumes were down for some firms reportedly due to declines in their remedial cleanup business and/or self-imposed limits on the amount of commercial waste accepted for disposal in order to save landfill capacity for their own treatment residuals.



Incineration

As shown in the exhibit below, the volume of waste incinerated by firms in the survey has grown rapidly. From 1983 to 1987, the volume of hazardous waste incinerated by these firms has increased from 167 thousand WMT to 476 WMT. This is an increase of some 185 percent. From 1986 to 1987 alone, the volume of waste reported incinerated increased by 36 percent. Volumes of waste incinerated were reported as up in 1986 and 1987 for all the firms in the survey offering thermal treatment services. The principal factors cited by respondents as driving up incineration demand were the various land disposal restrictions and generators' growing preference for total destruction. Additional observations about incineration demand are discussed in Sections 2.1 and 2.2.

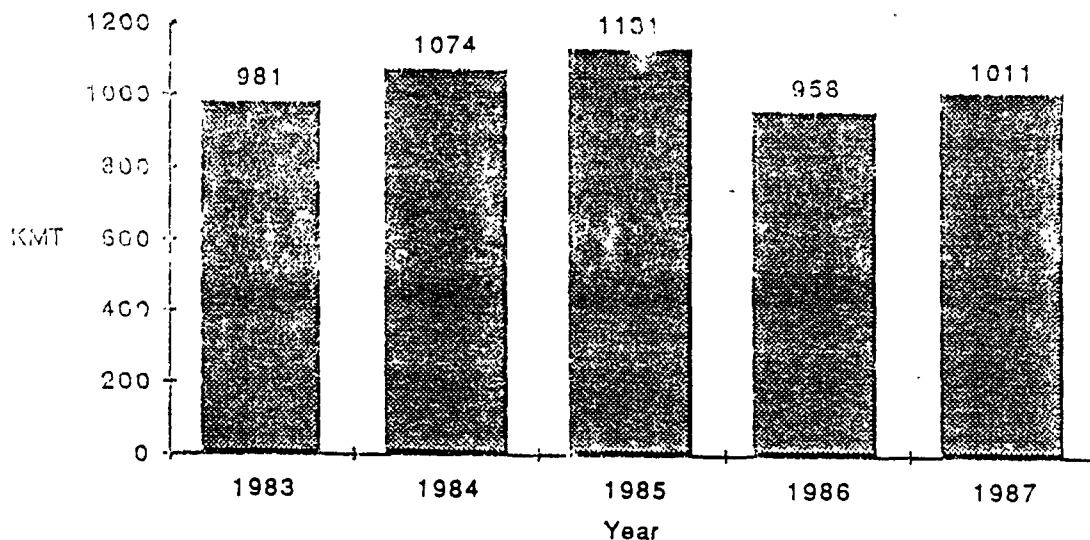
Incineration



Chemical and Biological Treatment

In 1986, the firms surveyed reported treating 958 thousand WMT of hazardous wastes, excluding wastes stabilized or solidified prior to land disposal (see below). This volume was down 15 percent from 1,131 thousand WMT treated in 1985 (adjusted). Waste volumes treated in 1987, however, increased by 6 percent (to 1,011 thousand WMT) over the previous year, but this was still below the adjusted 1985 volume. The performance of individual firms in this service sector was highly variable. Four firms reported an increase in volumes treated while several others reported significant decreases due to self-imposed business restrictions and loss of market share or overall declines in their regional markets. These results mirrored respondents' expectations, discussed in Section 2.2, that the wastewater treatment market will likely remain flat at best or decline unless there is a significant investment in enforcing the Clean Water Act pretreatment requirements.

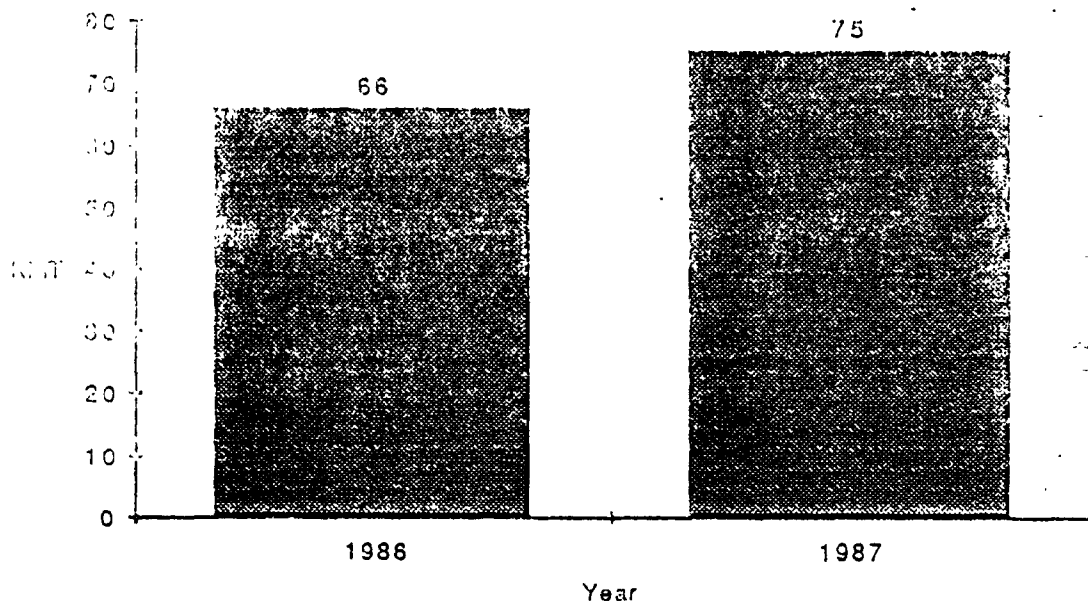
Chemical and Biological Treatment



Solidification/Stabilization

Several firms reported waste volumes stabilized or solidified separately from their chemical treatment or landfilled volumes for the first time this year. Nine respondents in the survey are known to offer these services, but only four provided volume data for 1986 and 1987. In 1986, these four firms reported solidifying and/or stabilizing a total of 66 thousand WMT of wastes. Their reported 1987 volume for this technology rose 13 percent as compared to 1986 -- to 75 thousand WMT. These volumes are not shown separately in Exhibit 3-3 as these firms preferred to count these volumes only once under their volume landfilled. ICF assumes that the other firms offering these services, but who did not report these volumes separately, also included any waste volume solidified or stabilized in their landfill volume total.

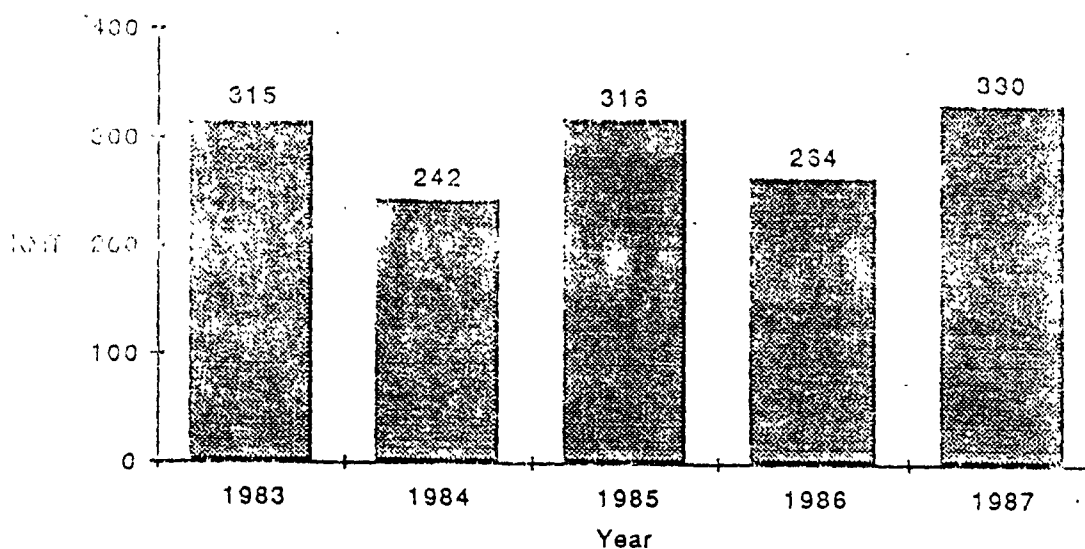
Solidification/Stabilization



Resource Recovery

For this survey, this service sector encompasses the recovery of spent solvents, oils, and metals from hazardous wastes, as well as the blending (but not burning) of hazardous wastes as fuel (energy recovery). In 1986, respondents reported that waste volumes handled by resource recovery operations dropped 17 percent, from 316 to 264 thousand WMT. However, in 1987, resource recovery saw a resurgence in waste volumes handled, increasing over 1986 levels by 25 percent to 330 thousand WMT. Most of this increase was attributed to growth in fuel blending activity to support the demand for hazardous wastes as fuels by cement kilns and industrial furnaces. Smaller volumes of halogenated solvents were handled by recyclers in both 1986 and 1987.

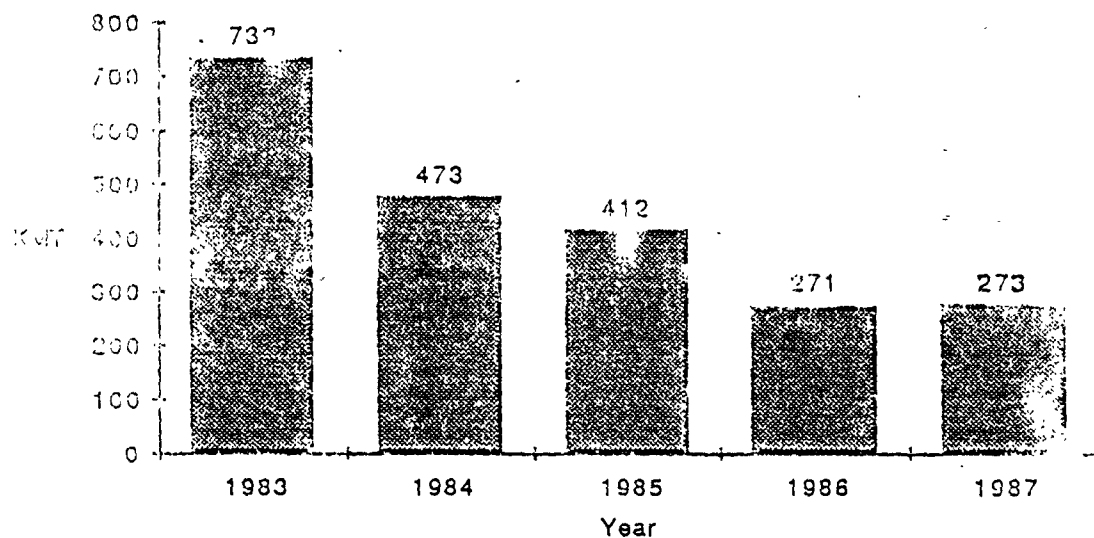
Resource Recovery



Deep Well Injection

The volume of waste reported handled at commercial deep well injection facilities in the survey decreased by 34 percent -- to 271 thousand WMT -- over the period of 1985 through 1987. The exhibit below also shows that deep well injection volumes have declined steadily since 1983 for the firms participating in this annual survey. Some of the decline can be attributed to the temporary closures of a few of the deep well injection facilities during at least a portion of this two-year period. Most respondents expected further declines in volumes sent to commercial deep well injection facilities, although several firms expected to recover some of their lost market share.

Deep Well Injection



3.3 REPORTED INCINERATION CAPACITY HAS INCREASED BY 98 PERCENT SINCE 1985

Commercial incineration capacity operated by several of the firms surveyed increased by 98 percent from 1985 to 1987. As shown below, total capacity in 1985 was reported to be 318 thousand WMT and in 1987 has risen to an estimated 631 thousand WMT. Over two-thirds of the increase in capacity occurred in 1987 with four firms increasing their capacity in 1986 and three in 1987. Between 1985 and 1986, respondents reported increasing incineration capacity by 24 percent, and between 1987 and 1986 by nearly 60 percent. Some of the increase in capacity has been brought about by de-bottlenecking existing capacity, but several firms expanded, opened, or acquired incinerator units in 1986 and/or in 1987. Even greater capacity increases -- anywhere from 200 to 300 percent -- are expected between 1988 and 1991 (see Section 2.3).

Incineration capacity grew at a faster pace than the increase in waste volumes received for incineration over this period. Estimated incineration capacity utilization was 85 percent in 1985, rose slightly to 89 percent in 1986, and stands at 75 percent in 1987. A few firms reported that backlogs were down appreciably at their facilities and that they were having trouble soaking up their increased capacity. Incineration capacity utilization for individual firms in 1987 ranged from 62 to 100 percent (average: 85 percent) as compared to a range of 71 to 94 percent in 1986 (average: 86 percent).

