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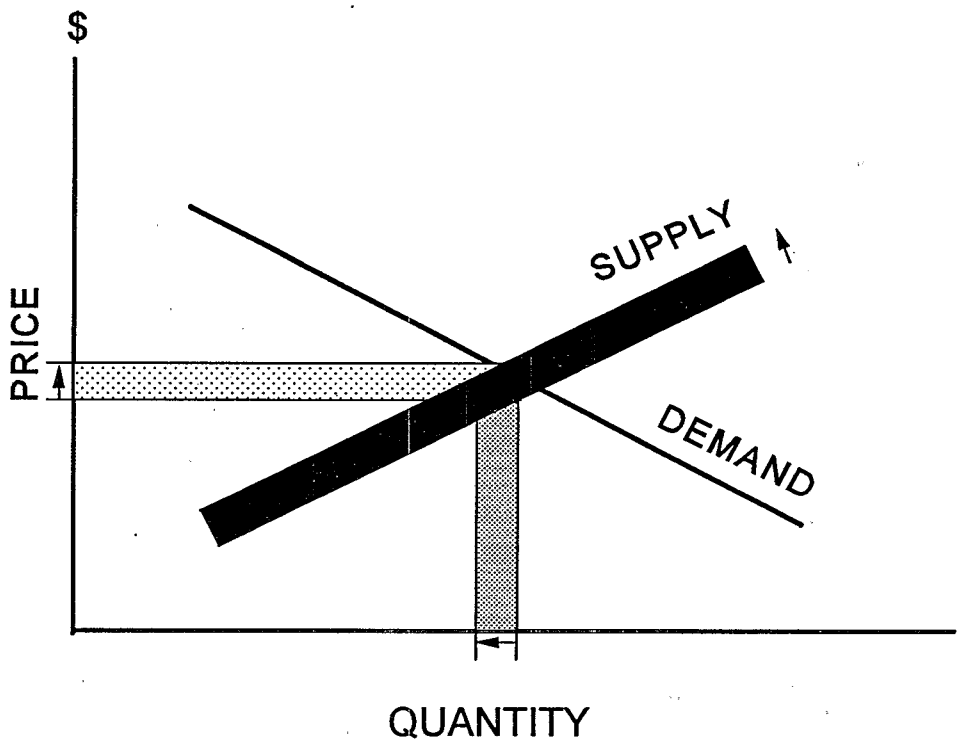
Economic Impact Analysis Of Proposed Effluent Limitations Guidelines And Standards For The Centralized Waste Treatment Industry



Economic Impact Analysis of Proposed Effluent Limitations Guidelines and Standards for the Centralized Waste Treatment Industry

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CONTENTS

CONTENTS (continued)

Chapter **Page**

CONTENTS (continued)

CONTENTS (continued)

CONTENTS (continued)

CONTENTS (continued)

FIGURES

Number **Page**

TABLES

TABLES (continued)

EXECUTIVE SUMMARY

INTRODUCTION

This report estimates the economic and financial effects of compliance with the proposed effluent limitations guidelines and standards for the Centralized Waste Treatment (CWT) industry. The Environmental Protection Agency (EPA) has measured these impacts in terms of changes in facility profitability and changes in market prices of CWT services and quantities of waste treated at CWT facilities in six geographic regions. EPA has also examined impacts on companies owning CWT facilities, including an examination of the impacts on small companies. Community impacts, international trade impacts, and effects on new CWT facilities are also discussed. In addition, EPA conducted an analysis of the cost-effectiveness of the regulatory options, which was published separately in a report entitled, "Cost-Effectiveness of Proposed Effluent Limitations Guidelines and Standards for the Centralized Waste Treatment Industry."

The effluent limitations guidelines and standards will directly impact the costs and pollutant discharges of direct and indirect CWT dischargers. Table 1 shows the total annualized cost of complying with the two alternative proposed effluent limitations guidelines and standards, including the estimated costs of modifying RCRA permits and performing required monitoring and recordkeeping. Regulatory Option 1 is estimated to have a total annualized cost of $46.4 million, and Regulatory Option 2 is estimated to have a total annualized cost of $72.5 million.

TABLE 1. TOTAL ANNUALIZED COSTS (10^6 $1989)

Option	BPT/BAT	PSES	Total
Option 1	13.415	32.951	46.367
Option 2	20.601	51.907	72.509

This analysis is conducted to assess the economic achievability of the proposed regulation. It estimates the following changes in economic and financial variables resulting from complying with the effluent limitations guidelines and standards for the CWT industry:

- Market variables: changes in prices for CWT services and quantities of waste treated in CWT processes of waste treatment services

- Facility variables: changes in revenues, costs, profits, the quantity of waste treated, and employment
- Company variables: changes in the likelihood of bankruptcy
- Community variables: changes in community employment

EPA based this projection of economic impacts on the responses to the questionnaire distributed to CWT facilities by EPA under the authority of Section 308 of the Clean Water Act (CWA). EPA sent the questionnaire, requesting both technical and economic information, to a census of 452 facilities. Responses to the census indicate that an estimated 85 facilities accepted waste from off-site for treatment in 1989. Seventy-two of those facilities discharge CWT wastewater either directly to a water body or to a publicly-owned treatment works (POTW). EPA has determined that these discharging facilities may be subject to cost increases as a result of the proposed effluent limitations guidelines and standards.

Based on the census, the 72 facilities were costed for complying with the regulation. Of these, 16 are direct dischargers and 56 discharge to a POTW. The Best Practicable Control Technology currently available (BPT)/Best Available Technology economically achievable (BAT) and Pretreatment Standards for Existing Sources (PSES) regulations are proposed for three subcategories based on technical differences exhibited between the subcategories: Subcategory A includes treatment or recovery of metal-bearing waste. Subcategory B applies to treatment and recovery of oily wastes, and Subcategory C applies to treatment or recovery of organic wastes. EPA concluded that 30 percent of all facilities treat wastes in more than one subcategory. Based on the information collected in the questionnaire, no economic considerations were significant for subcategorization.

OVERVIEW OF THE INDUSTRY

In 1990, 85 CWT facilities accepted waste from off-site sources for treatment. The wastes sent to CWT facilities may be highly concentrated and/or variable. They may include sludges, tank bottoms, products that do not meet required manufacturing specifications, process residuals, or wastes generated from remediation operations. Baseline conditions in the CWT industry are summarized in Table 2. Of 58 companies owning CWT facilities, 57 had adequate data for analysis of impacts. Of these, six companies were found to be likely to incur bankruptcy at baseline.

Of the 85 facilities managing these wastes, 55 facilities are not owned by a waste generator but accept waste on a strictly commercial basis, managing it for a fee. Fourteen are

non-commercial, exclusively captive facilities accepting waste from off-site for treatment only

TABLE 2. BASELINE CONDITIONS IN THE CWT INDUSTRY

Companies Owning CWT Facilities

	Number of Companies	Number of Facilities
Small Companies (sales < $6 million)	13	13
All Others (sales > $6 million)	44	72

Likelihood of Company Bankruptcy at Baseline[a]

	Small Companies	All Other Companies	Total
Likely	1	5	6
Indeterminate	3	13	16
Unlikely	8	18	26
	12	36	48

Baseline Market Conditions

CWT Service	Average Price ($1989/gallon)[b]	Total Quantity (10^3 gallons)
Metal Recovery	2.85	72,822
Oil Recovery	0.28	142,397
Metal Treatment	0.28	399,158
Oil Treatment	0.35	62,404
Organics Treatment	0.32	84,070

[a]Bankruptcy prediction is based on Z-score and Z"-score. Nine companies had insufficient data to compute these scores.

[b]Average price is the quantity-weighted average of prices in all relevant regional markets.

Source: Waste Treatment Industry Questionnaire

from facilities under the same ownership. The remaining 16 are mixed commercial/non-commercial facilities. They manage their own company's wastes and accept some waste from other sources for a fee. For purposes of this analysis, the 16 mixed facilities were assigned to either the commercial or non-commercial category, based on the predominant type of treatment. One of the 16 facilities was classified as non-commercial and the other 15 were classified as commercial. Thus, the analysis estimates impacts on 70 commercial and 15 non-commercial CWT facilities.

In the management of off-site wastes, CWT facilities generate wastewater containing pollutants such as cyanide, arsenic, hexavalent chromium, lead, mercury, and organic compounds including benzene and pentachlorophenol. Sixteen facilities directly discharge their wastewater to surface waters, 56 to POTWs. The remaining 13 dispose of waste residuals by other means, such as underground injection, evaporation, or off-site treatment. When wastes are directly discharged to surface waters they contribute to elevated concentrations of pollutants reducing the quality of the services provided by these water resources. When discharged to POTWs the wastewater increases the cost of treatment at the POTWs. If the POTW fails to completely treat the wastewater received from CWT facilities, it may result in the POTWs' discharging excessive amounts of pollutants to surface waters, causing degradation in the receiving waters.

The toxicity of the wastes accepted and the baseline level of treatment at CWT facilities has resulted in CWT facilities discharging high concentrations of some pollutants either into surface water or to POTWs. Four CWT facilities are included on state 304(l) Short Lists, and eight POTWs, receiving discharges from 13 CWT facilities, are on state 304(l) Short Lists. In addition, four POTWs have experienced permit violations or partial failure of treatment due to discharges from CWT facilities. Thus, development of effluent limitations guidelines and standards for the CWT industry is critical.

Baseline conditions for the companies owning CWT facilities and the markets for CWT services are shown in Table 2. The companies that own CWT facilities range from large, multi-facility manufacturing companies to small companies that own only a single facility. The 85 CWT facilities are owned by 59 separate entities: 58 companies and the Federal government. Sufficient data are available to assess company-level impacts for 57 of the companies owning CWT facilities. Of these 57 companies, 13 are small businesses (i.e., companies with less than $6 million in annual revenues). Obviously, the ability of companies to continue to support unprofitable operations will depend on company size, as well as baseline financial status.

The demand for CWT services arose because environmental regulations such as regulations promulgated under the Resource Conservation and Recovery Act (RCRA) and effluent limitations guidelines and standards promulgated under the CWA required increasingly specialized and effective treatment of wastes. Many generators, rather than developing the capability to completely treat their wastes on-site, found it economic to send their wastes to off-site waste treatment specialists such as CWT facilities. All types of manufacturing and service industries, located nationwide, are consumers of CWT services. However, because most wastes being sent to CWT facilities are bulky and heavy, markets for CWT services are generally regional in nature. Each regional market for a type of CWT service is characterized by relatively large numbers of demanders and relatively small numbers of suppliers. Each CWT facility knows its competitors and makes its business decisions taking into account its rivals' behavior. A few regional markets have only one CWT facility supplying an individual type of service within that region. Thus, the markets for CWT services are modeled as regional oligopolies or monopolies. Thus, they may have more flexibility in modifying their prices in response to changes in their costs, as compared to perfectly competitive markets.

ANALYTIC METHODOLOGY

Standard economic and financial analysis methods are used to assess the economic effects of the guidelines and standards. These methods incorporate an integrated view of CWT facilities, the companies that own these facilities, the markets the facilities serve, and the communities where they are located.

CWT facilities are divided into commercial and non-commercial categories. Different approaches are used to assess the impacts on commercial and non-commercial CWT facilities. Commercial CWT facilities are individually characterized based on the quantity of each type of waste treatment service they provide, their revenues and costs, employment, market share for each type of service provided, ownership, releases, and location (the community where they are located and the regional market they serve).

Costs of CWT facilities include variable costs (that vary with the quantity of CWT services provided) and fixed costs. Per-gallon variable costs are assumed constant to the capacity output rate. Revenues from CWT operations are estimated by multiplying the market price of the CWT service by the quantity of waste treated in the CWT service. Most CWT facilities also have revenues from other sources, which are treated as exogenous.

The demand for commercial CWT services is characterized based on the responsiveness of quantity demanded to price. CWT services are intermediate goods, demanded because they

are inputs to production of other goods and services. The sensitivity of quantity demanded to price for an intermediate good depends on the demand characteristics (elasticity) of the good or service it is used to produce, the share of manufacturing costs represented by CWT costs, and the availability of substitutes for CWT services. Overall, the change in quantity demanded for CWT services is assumed here to be approximately proportional to any price change (e.g., a one percent increase in the price of a CWT service is expected to reduce the quantity demanded for the service by about one percent).

This characterization of facilities, companies and markets is incorporated in a model that uses the engineering estimates of the costs of compliance with the effluent limitations guidelines and standards to project impacts on facilities, companies, markets and communities. Each CWT facility faced with higher costs of providing CWT services may find it profitable to reduce the quantity of waste it treats. This decision is simultaneously modeled for all facilities within a regional market, to develop consistent estimates of the facility and market impacts. Changes in the quantity of CWT services offered result in changes in the inputs used to produce these services (most importantly, labor). The economic impact analysis (EIA) thus projects changes in employment at CWT facilities. Changes in facility revenues and costs result in changes in the revenues and costs of the companies owning the facilities, and thus changes in company profits. Increased borrowing and changes in the assets owned by the companies, together with changes in profits, result in changes in overall company financial health. The EIA projects changes in the likelihood of company bankruptcy as a result of the effluent limitations guidelines and standards. These effects are separately calculated for small businesses. Changes in employment are specified by location to determine the community impacts.

Typically, facility-level impacts may include facility closures. The Agency has elected not to estimate facility closures in this analysis, because companies owning CWT facilities have historically demonstrated a willingness to allow them to operate for a period of time while they are losing money. EPA has estimated that about 25 percent of the commercial CWT facilities were unprofitable during the late 1980s. Several others were only marginally profitable (e.g., had profits less than $20,000). Most of the unprofitable facilities were still in operation three years after the census, and several of them had become profitable. Several reasons may explain why unprofitable facilities remain in operation rather than being closed by their owners. First, thirty of the 70 commercial CWT facilities receive some of the off-site waste they treat from other facilities under the same ownership. These facilities perform a service to the rest of their company, and are unlikely to close even if their commercial operations are unprofitable, although they may curtail commercial operations if they do not cover costs. Second, most of the CWT facilities are regulated under RCRA. Closure of a RCRA facility requires that the site be cleaned

up, which in some cases would entail expensive long-term remediation. Owners may find it profitable in the short run to keep unprofitable facilities in operation rather than incurring the costs of "clean-closing" the facility. Finally, the rapidly changing demand conditions in the industry may cause owners to keep facilities open because they expect that, once the facility adjusts its operations to correspond to new demand conditions, it will become profitable. For these reasons, the Agency is not conducting a traditional facility closure analysis for the CWT industry. Company-level impacts may be a better indicator of economic achievability, as they measure the resources available to achieve compliance. Facility-level changes in revenues and costs are computed as inputs to the company level analysis, and changes in facility profitability are noted, but EPA has not estimated facility closures.

For non-commercial CWT facilities a simpler approach is used. All of the compliance costs are assumed to be passed on to the parent company and company revenues do not change. This is because these non-commercial CWT facilities are generally cost centers for their companies; frequently they do not explicitly receive revenues for their services. They exist to perform a service for the rest of the company and are not expected to be "profitable" as a unit. Thus, no change in the quantity of CWT wastes treated are projected for these facilities nor are market effects analyzed for the products of the parent company, since the share of waste treatment costs in the marketed products are minimal. Instead, the Agency assumes that costs of controls on non-commercial CWT facilities are passed along to the parent company. Thus, the company-level impact analysis includes impacts on the owners of both commercial and non-commercial CWT facilities.

RESULTS OF THE EIA

Results may be reported at the facility, company, market, or community level. All facilities are either direct or indirect dischargers. Most companies own either facilities that are direct dischargers or indirect dischargers, although two companies own both direct and indirect discharging facilities. The economic and financial impacts of the proposed regulatory options are estimated assuming that both the BPT/BAT controls and the PSES controls are imposed. Market-level impacts are the combined result of both types of dischargers' simultaneously complying with the regulation. Because markets for CWT services combine facilities that are direct dischargers and facilities that are indirect dischargers, it is not possible to break the market-level impacts into impacts of BPT/BAT and impacts of PSES.

Market Impacts

Within each region, markets for overall types of treatment such as metals recovery or metals treatment may be further subdivided into smaller markets on the basis of the per-gallon cost of treatment. The price changes and quantity changes projected at the regional and service level with each option are combined into an overall national value for five broad CWT service categories. The results are shown in Table 3. In all cases the prices of these services would increase and the quantity would be expected to fall. Thus, one of the results if EPA promulgates the guidelines and standards as proposed would be a reduction in the absolute quantity of wastes commercially treated in addition, of course, to the improvement in treatment. These market-level adjustments in quantity are reflected in the reduction in the quantity of services provided by individual commercial CWT facilities.

TABLE 3. MARKET IMPACTS OF THE REGULATORY OPTIONS

	Option 1		Option 2	
Market	Percentage Change in Price	Percentage Change in Quantity	Percentage Change in Price	Percentage Change in Quantity
Metals Recovery	2.64	-3.02	2.64	-3.02
Oils Recovery	8.64	-11.00	41.76	-65.40
Metals Treatment	26.74	-20.12	26.74	-20.12
Oils Treatment	28.86	-15.14	35.31	-35.44
Organics Treatment	34.92	-16.69	34.92	-16.69

In some cases, with less waste being managed by these facilities, facility closure may even be expected. However, as noted above, unprofitable facilities tend to remain in operation in this industry, so the analysis does not predict facility closures. Nine CWT facilities are predicted to become unprofitable if Regulatory Option 1 is enacted as proposed; ten facilities are predicted to become unprofitable under Regulatory Option 2. If demanders of waste management services have fewer substitutes for CWT services than assumed here, then prices would increase more than projected here, quantities would fall less, and the facility and company level impacts would be smaller. Under Option 1, price increases would range from 3 to 35 percent, while quantities of waste treated would decrease by between 3 percent and 20 percent. Under Option 2, price

increases would range from 3 to 42 percent, while quantity decreases would range from 3 percent to 65 percent. Thus, on average, the market adjustments resulting from the regulatory options are projected to result in significant changes in the markets for CWT services.

Company Impacts

Company impacts of the proposed regulatory options are measured by changes in the likelihood of bankruptcy for affected companies owning CWT facilities. The analysis computes a company score that indicates whether the company is likely to become bankrupt, unlikely to become bankrupt, or if the company's finances are such that the company's score falls into an indeterminate range. Company scores were computed at baseline and under each proposed regulatory option. As shown in Table 4, four additional companies are identified as likely to become bankrupt under Regulatory Option 1, and three additional companies are identified as likely to become bankrupt under Regulatory Option 2. This compares with six companies that were likely to become bankrupt at baseline. Of the four additional companies identified as likely to incur bankruptcy under Regulatory Option 1, three are small companies; under Regulatory Option 2, there would be a net increase of one small company likely to become bankrupt. Thus, the Agency estimates that only three or four additional companies would experience significant impacts under the proposed regulatory options. The Agency has therefore determined, based on this analysis, that the regulatory options are economically achievable.

TABLE 4. COMPANY IMPACTS OF THE REGULATORY OPTIONS

	Option 1			Option 2		
Likelihood of Bankruptcy	**Small Companies**	**Others**	**Total**	**Small Companies**	**Others**	**Total**
Increase in the number of companies identified as likely to be bankrupt	3	1	4	1	2	3

Community Impacts

Overall, the communities in which CWT facilities are located are expected to experience fairly small, and generally positive, increases in employment as a result of the alternative Regulatory Options. In addition to the employment changes estimated for facilities becoming unprofitable under Options 1 and 2, other changes in employment may occur as facilities make

other changes in operations. These changes in employment may be positive for CWT facilities made better off by the regulation (for example, zero dischargers or facilities with the controls already in place), or they may be negative for facilities becoming less profitable but not moving from profitable to unprofitable. Nationwide, facilities becoming unprofitable would reduce their employment by 62 employees under Regulatory Option 1 and by 75 employees under Regulatory Option 2. Combined with market-related increases and decreases in employment at other facilities, the total market-related reduction in employment under Regulatory Option 1 is estimated to be 378 employees. Under Regulatory Option 2, the national market-related reduction in employees is estimated to be 501 employees.

Market-related adjustments in employment at each CWT facility are used, together with regional direct employment multipliers, to estimate total changes in employment in the communities in which the CWT facilities are located. The analysis shows that these changes in employment that result from market adjustments cause insignificant changes in employment in the communities in which the CWT facilities are located. In addition, these market-related changes in employment must be compared to the changes in employment estimated to be required for operation and maintenance of the controls to assess the likely overall effects of the regulatory options on employment and community well-being. Under Regulatory Option 1, EPA estimates that the labor requirements of the controls would result in an additional 710 employees. Regulatory Option 2 would require an additional 735 employees. Netting employment gains and losses, overall employment is projected to increase by 332 employees under Regulatory Option 1 and by 234 employees under Regulatory Option 2. Thus, we expect community-level impacts to be small and generally positive.

Foreign Trade Impacts

The EIA does not project any foreign trade impacts as a result of the effluent limitations guidelines and standards. Most of the affected CWT facilities treat waste that is considered hazardous under RCRA. Shipment of hazardous waste across the national borders for treatment in the United States is virtually nonexistent; consequently trade effects would be insignificant.

Small Company Impacts

The Agency examined the relative severity of impacts on small entities, specifically small companies, owning CWT facilities. Small companies are defined as those having sales less than $6 million, which is the Small Business Administration definition of a small business for SIC code 4953, Refuse Systems. This is the SIC code that most CWT facilities listed in their census responses. Thirteen companies are small according to this definition. To determine whether the

impacts on small companies are "significant," EPA compared the impacts of the regulatory alternatives on the likelihood of company bankruptcy for small companies and others. As shown in Tables 4 and 5, of four additional companies predicted as "likely" to incur bankruptcy under Regulatory Option 1, three are small. Of three additional companies likely to incur bankruptcy as a result of Option 2, one is small. Thus, under Regulatory Option 1, small companies would incur relatively larger impacts than large companies according to this measure, but under Regulatory Option 2, small companies would not incur relatively larger impacts.

Overall, EPA estimates that, while companies in all size categories would incur impacts, small companies may experience impacts that would be somewhat greater relative to those incurred by larger companies. The Agency has considered the following mitigating measures to reduce the impacts on small companies:

1. The regulation is in the form of an effluent limitation rather than requiring specific capital equipment or operating changes. This would allow each company the maximum flexibility in deciding how to achieve the limitations.

2. The Agency considered less stringent control options for each subcategory. However, given the concentration and toxicity of the wastes treated at CWT facilities, the Agency chose to propose more stringent control options.

CHAPTER 1
INTRODUCTION

This report analyzes the economic and financial impacts projected to result from effluent limitations guidelines and standards controlling discharges from centralized waste treatment (CWT) facilities. This report provides a brief overview of the CWT industry and summarizes the methods used to analyze the impacts of the regulations on the industry. The estimated impacts include changes in the prices and quantities of CWT services, changes in the profitability of CWT facilities, and changes in the profitability of companies owning CWT facilities.

1.1 BACKGROUND

The Federal Water Pollution Control Act Amendments of 1972 established a comprehensive program to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (Section 101[a]). To implement the Act, the Environmental Protection Agency (EPA or the Agency) promulgates effluent limitations guidelines and standards. EPA is developing a regulation to limit the discharge of pollutants into navigable waters of the United States and into publicly-owned treatment works (POTWs) by existing and new facilities that serve as centralized industrial waste treatment centers. The proposed regulation would establish effluent limitations guidelines for direct dischargers based on the following treatment technologies: "best practicable control technology currently available (BPT)," "best conventional pollutant control technology (BCT)," and "best available technology economically achievable (BAT)." New source performance standards (NSPS) are based on "best demonstrated technology." The proposed regulation would also establish pretreatment standards for new and existing indirect dischargers.

The CWT industry includes facilities that receive waste from off-site for treatment. The proposed regulation covers three subcategories of the CWT industry:

- Metals Subcategory: facilities that accept metal-bearing waste from off-site for treatment or recovery
- Oils Subcategory: facilities that accept oily waste from off-site for treatment or recovery
- Organics Subcategory: facilities that accept organic waste from off-site for treatment or recovery

The effluent limitations guidelines and standards are intended to cover discharges generated during the treatment of industrial hazardous and non-hazardous waste received from off-site facilities by tanker truck, trailer/roll-off bins, drums, barge, or other forms of shipment.

Wastes transferred by pipeline are not included in the regulation. These guidelines apply only to the waste recovery and treatment processes listed above and do not apply to thermal destruction, incineration, stabilization, fuel blending, or solvent recovery of industrial wastes received from off-site.

1.2 DESCRIPTION OF THE REGULATED INDUSTRY

Nearly all production activities and many consumption activities result in the generation of wastes, which must then be treated and disposed of in a safe and legal manner. CWT facilities accept these wastes from off-site for treatment or recovery. Industrial wastes generated by manufacturing and service industries (both hazardous wastes and non-hazardous wastes) may be treated and disposed of at the location where they are generated (on-site waste management), or they may be sent off-site to a CWT facility for treatment. The CWT industry is believed to have grown as a result of the increasingly stringent environmental regulations promulgated under the Resource Conservation and Recovery Act (RCRA) and the Clean Water Act (CWA). Generators of industrial waste that chose not to develop the specialized waste treatment capabilities required to treat highly concentrated or toxic waste on-site chose instead to send such waste to CWT facilities, thus generating the demand for CWT services. Many waste generators do some initial treatment of their waste on-site; thus, the waste sent to CWT facilities for treatment includes still bottoms, treatment residuals, products that do not meet specifications, and other highly concentrated wastes.

CWT facilities generally fall into one of three categories, based on their relationship to the facilities generating the waste they treat: commercial, non-commercial, and mixed commercial/ non-commercial. Commercial CWT facilities are specialists in waste treatment. They accept waste from generators that are not part of their company and earn the majority of their revenues from waste treatment and/or recovery services. Non-commercial CWT facilities accept off-site waste only from other facilities within their company. They are facilities within a vertically integrated company, producing a service that is an input to the production of other goods and/or services the company produces. Mixed commercial/non-commercial facilities accept waste from within their own company and also from generators that are unrelated to them. For purposes of this report, the mixed commercial/non-commercial facilities have been assigned either commercial or non-commercial status based on which type of treatment predominates. Seventy facilities are considered commercial, and 15 are considered non-commercial.

Nearly all facilities that treat waste also generate waste; for example, the treatment of wastewater generates sludge that must be treated and disposed of. Similarly, the recovery of

metals, oils, or organics may generate wastewater which then must be treated. In addition, some CWT facilities are also manufacturing facilities, and their manufacturing activities generate waste they may treat on-site. Thus, some facilities have some wastes that are subject to the CWT effluent limitations guidelines and standards and some that are not.

1.3 THE PROPOSED CWT EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS

The effluent limitations guidelines and standards if promulgated as proposed will increase the cost of aqueous liquid waste, sludge, and/or wastewater treatment for all facilities that accept waste from off-site for treatment and that discharge water from waste management processes within the scope of this regulation (in scope) either directly or indirectly to surface water. Direct dischargers must comply with by National Pollutant Discharge Elimination System (NPDES) permits; indirect dischargers discharge their wastewater to a POTW, and their effluent must comply with pretreatment characteristics set by the POTW.

The Agency is proposing two regulatory options that combine controls on the three subcategories of the CWT industry:

- Metals Subcategory
- Oils Subcategory
- Organics Subcategory

Two regulatory options are being proposed for the Oils Subcategory. The Agency is co-proposing two options because while Oils Option 2 results in poor control for the pollutants of concern it is extremely cost-effective. Oils Option 3, by contrast, would effectively control pollutant discharges but is extremely expensive. The Agency will re-examine the Oils Subcategory options based on comments received during proposal and its continuing analyses to determine which option will be promulgated.

The combined regulatory options proposed by the Agency and analyzed in this report are the following:

EPA Regulatory Option 1: This regulatory option combines the following control options:

Metals 3: selective metals precipitation, pressure filtration, secondary precipitation, solid-liquid separation, and tertiary precipitation.

Oils 2: ultrafiltration.

Organics 1: equalization, air-stripping, biological treatment, and multi-media filtration.

EPA Regulatory Option 2: This regulatory option combines the following control options:

Metals 3: selective metals precipitation, pressure filtration, secondary precipitation, solid-liquid separation, and tertiary precipitation.

Oils 3: ultrafiltration, carbon adsorption, and reverse osmosis.

Organics 1: equalization, air-stripping, biological treatment, and multi-media filtration.

The increased costs incurred by affected facilities would include capital costs of purchasing and installing additional wastewater treatment equipment, annual operating and maintenance costs, and the costs of treating and disposing of additional wastewater treatment sludge that is generated as a result of the higher standard of treatment.

1.4 SCOPE OF ANALYSIS

The CWT facilities are located throughout the country and differ from one another in size, customers, and the services they perform. EPA conducted a census of the facilities believed to be subject to the effluent limitations guidelines and standards in the 1991 Waste Treatment Industry Questionnaire. The questionnaire included two sections—Part A, a technical section, and Part B, an economic and financial section. This study used information from this questionnaire to characterize the affected facilities.

Eighty-five facilities have been identified as CWT facilities, but only 72 facilities would be subject to the regulation because they discharge directly to surface water or indirectly to POTWs. This report analyzes the impacts of the estimated costs of the effluent limitations guidelines and standards on the markets for waste treatment, the facilities performing waste treatment, and the companies owning those facilities. In addition, we discuss community impacts for the communities in which the facilities are located, potential impacts on foreign trade, and impacts on small businesses.

CHAPTER 2
DATA SOURCES

The principal source of data for the CWT industry is a questionnaire conducted by EPA during 1991. This questionnaire, the 1991 Waste Treatment Industry Questionnaire,[1] collected data under the authority of Section 308 of the CWA from 452 facilities that the Agency had identified as possible CWT facilities. Of the 452 facilities from which data were collected, the Agency determined that 363 did not treat or recover materials from industrial waste received from off-site. Of the 89 facilities that did treat or recover materials from industrial waste received from off-site, four received all of the off-site waste via pipeline. EPA has preliminarily concluded that pipeline wastes differ qualitatively from other CWT wastes and should not be regulated in the same manner. Consequently, the guidelines and standards are not proposed to apply to such facilities. The remaining 85 facilities were determined as appropriate for consideration in this regulation.

The 1991 Waste Treatment Industry Questionnaire (henceforth be referred to as "the questionnaire") collected both technical data and economic and financial data on the CWT facilities. The questionnaire data formed the basis for all of the technical and economic analyses performed in support of the development of the effluent limitations guidelines and standards and were supplemented by data collected during site visits, in telephone conversations with the facilities, and from publicly available sources.

2.1 DATA FROM THE WASTE TREATMENT INDUSTRY QUESTIONNAIRE

To gather information on which to base the effluent limitations guidelines and standards, EPA conducted a questionnaire of facilities that it preliminarily considers within the scope of the industry it was reviewing for guidelines and standards. This questionnaire collected information on the quantities and types of waste managed, the processes used to manage the waste, and the facilities' and companies' economic and financial status. The questionnaire data provided a very detailed portrait of operations at CWT facilities. This chapter examines questionnaire results and provides a baseline portrait of CWT facilities. The questionnaire sent to CWT facilities comprised two parts. Part A, including sections A through L, collected data about the facility's technical operations. Part B, including sections M through O, collected economic and financial information about the facility and its owners. Appendix A includes a copy of the economic and financial section of the questionnaire.

The technical data, collected in Part A of the questionnaire, includes the following:

- the type of waste accepted for treatment;
- the industrial waste management processes used;
- the quantity, treatment, and disposal of wastewater generated during industrial waste management;
- available analytical monitoring data on wastewater treatment;
- the degree of co-treatment (treatment of centralized waste treatment wastewater with wastewater from other industrial operations at the facility); and
- the extent of wastewater recycling and/or reuse at the facility.

Part B of the questionnaire comprised three sections. Section M of the questionnaire requested information about the company owning the CWT facility. The responses to these questions enabled the Agency to assess impacts of the regulation on the immediate owner company. These data also were used to identify the ultimate parent company of CWT facilities for which most of the company-level impacts analysis was conducted. Section N asked for data on facility operations, including revenues and costs, assets, liquidation value, closure costs, employment, and RCRA permitting status. These data were used to characterize the facility's unit costs, total costs, revenues, and profits and to assess the applicability of RCRA permit modification costs associated with the effluent limitations guidelines and standards. Section O requested information about the facility's wastewater treatment operations, including the location of customers, the commercial status of their operations, and prices charged.

Economic and financial data collected in Part B of the questionnaire includes the following:

- the costs and revenues received by the facility in each of three years for various types of waste treatment;
- other costs and revenues associated with non-waste management operations at the facility;
- prices for treatment of various types of wastewater;
- the share of wastewater received from off-site facilities owned by the same company and from those facilities owned by different companies, and the share generated on-site; and
- financial variables for the company owning the facility.

The questionnaire responses were carefully reviewed for completeness and consistency. Virtually every facility was contacted to verify and clarify questionnaire responses or to gather additional data. In the course of these quality control activities, the Agency identified several

types of discrepancies in the data provided in the questionnaire that required correction. Generally, these discrepancies were inconsistencies between the responses given in Part A of the questionnaire and those given in Part B of the questionnaire. The Agency, after examining responses and talking with CWT facility contacts, would modify the Part B responses so that they would be consistent with the Part A responses.

2.1.1 Data Modifications and Corrections

The data collected in the economic and financial section of the questionnaire formed the basis for the economic impact analysis (EIA) model used for commercial facilities and the company-level impact analysis used to assess impacts on all parent companies, including those owning non-commercial facilities. The questionnaire data provide very detailed information about the CWT facilities' and companies' economic and financial status. Nevertheless, some modifications were necessary to make the facility-level survey data correspond to facilities' technical (Part A) responses, and to organize the data so that it represented the correct baseline for the regulation. Generally, facilities provided technical data on their operations in 1989. Several types of adjustments were made to the data to yield the baseline data used for the analysis.

2.1.1.1 Matching the Economic and Financial Data with the Technical Data

The Agency's decision to make the economic data consistent with the technical survey data resulted in two main types of adjustments.

First, for several facilities the technical data did not represent 1989 operations. Three years of economic and financial data were provided, but only one year of technical data was collected. Several facilities, however, provided data on technical operations in 1990 and one provided technical data for 1991. Care was taken that the economic and financial data corresponded temporally as closely as possible to the technical data; the nearest corresponding year's economic data were used.

Second, some facilities' reported waste management revenues and costs and waste management quantities did not match. That is, they reported performing waste management operations for which there were no revenues or costs and vice versa. The reason for these discrepancies, in general, was twofold. Different people filled out the technical and economic sections of the questionnaire. Generally the plant manager filled out the technical section, while the accountant filled out the economic section. These two individuals might regard their operations differently. For example, for facilities performing recovery operations, the technical

plant manager would record those quantities as "waste recovery" quantities, but the accountant might regard them as "manufacture of a product" and report the revenues and costs as revenues and costs from the sale of products manufactured on-site. Another difficulty arose because the accountants usually had to estimate the share of waste management costs and revenues associated with each process because most facilities' accounting systems were not set up to track costs and revenues that way. Instead, most facilities' accounting systems combine all revenues and costs from CWT operations. Thus, they had to make assumptions in responding to the questionnaire about the share of revenues and costs that came from each waste treatment operation. In consultation with the facilities, EPA adjusted the economic and financial responses to reflect their technical responses. In all, 20 facilities' economic and financial data were adjusted to correspond to their technical data. Of these adjustments, the two most common were the following:

- Ten facilities had a recovery operation on-site but reported no revenues. Seven of these reported all their revenues and costs under wastewater treatment. The costs were broken out based on quantity shares, and the revenues were estimated based on the price of the service times the quantity treated. Two facilities reported their oils recovery costs and revenues under other nonaqueous treatment. These costs were simply moved to oils recovery. One facility reported metals recovery revenues and costs as deriving from the sale of a product manufactured on-site. Again, these revenues were moved to metals recovery.

- Five facilities reported revenues for wastewater treatment, but the technical data indicated that the facilities did not accept wastewater from off-site. The wastewater revenues were added to revenues for recovery processes, which the technical data indicated the facilities did do commercially.

Other discrepancies that were corrected included the following:

- Based on their technical questionnaire responses, four facilities reported no wastewater treatment revenues, but accepted wastewater from off-site. For these facilities, wastewater treatment revenues were estimated by multiplying the price for the service times the quantity treated, and the estimated amount was subtracted from other entries, either other waste treatment revenues or overall other revenues.

- A facility performing metals recovery or oils recovery combined the costs of treating the wastewater generated by the recovery process with the costs of recovery. Thus, the facility reported a quantity of waste accepted for oils recovery and reported revenues and costs associated with that operation. The oils recovery process generated wastewater that was subsequently treated, but no costs were reported for aqueous liquid waste, sludge, or wastewater treatment. In these cases, the costs were broken out for oils recovery costs and revenues using quantity shares.

- A facility reported only total waste treatment costs and revenues without assigning them to specific waste treatment operations. The costs were broken out based on quantity shares, and the revenues were estimated by multiplying the price of the service times the quantity treated.

In every case where facility economic and financial responses required adjustment to correspond to their technical responses, the basic strategy was to stay as close to the reported revenues and costs as possible. Thus, when possible, the adjustments were made within the waste treatment revenues and costs sections so that the total waste treatment revenues and costs remained unchanged. When this was not possible, the change was made so that the total facility revenues and costs remained unchanged.

2.1.1.2 Facilities That Did Not Respond to the Economic and Financial Section of the Questionnaire

Five facilities failed to respond to the economic and financial section of the questionnaire, although they had completed and returned the technical section of their questionnaire. For these facilities, revenues and costs of waste treatment operations were estimated. Because no other information was available about these facilities' finances, the total facility revenues and costs were assumed to be equal to their estimated waste treatment revenues and costs. In other words, other revenues and other costs at those facilities were assumed to be zero. Fortunately, a question in the technical questionnaire allowed us to identify which of these facilities were commercial and which were non-commercial.

For these five facilities, revenues were estimated by multiplying the price of the services they offer times the quantities treated in those operations and summing them up. Costs were estimated in two separate ways. For wastewater treatment, costs were estimated using a simple log-linear regression equation that estimated unit treatment costs as a function of volume treated:

$$\ln(\text{unit cost}) = a + b \bullet \ln(TQ_{WWT}) \qquad (2.1)$$

where;

unit cost = variable costs per gallon treated and

TQ_{WWT} = total quantity of waste treated in metals treatment, oils treatment, or organics treatment.

This equation was estimated using data for the facilities that did wastewater treatment and that responded to the economic and financial section of the questionnaire. The estimated coefficients are:

$$\ln(\text{unit cost}) = 6.377081 - 0.53634 \bullet \ln(TQ_{WWT}). \qquad (2.2)$$

Thus, total wastewater treatment costs were estimated by first estimating the unit cost of wastewater treatment, then multiplying that number times the quantity treated:

$$TC_{WWT} = \text{unit cost} \bullet TQ_{WWT} \quad (2.3)$$

where;

TC_{WWT} = total costs of wastewater treatment.

For metals recovery and oils recovery, data limitations precluded using the same approach to estimate costs for facilities without data. Instead, costs were estimated based on the median unit costs of those treatment operations for facilities responding to the economic and financial section of the questionnaire. For recovery operations, total variable costs were estimated by multiplying this median unit cost times the quantity treated at the facility:

$$TVC_{MR} = (\text{median unit cost})_{MR} \bullet Q_{MR} \text{ and} \quad (2.4)$$

$$TVC_{OR} = (\text{median unit cost})_{OR} \bullet Q_{OR},$$

where;

TVC = total variable costs,

Q = quantity treated,

MR = metals recovery, and

OR = oils recovery.

2.1.1.3 Adjusting Facility Responses to Analysis Base Year

Computations for this report were initially conducted in 1990 dollars. The data from the CWT questionnaire corresponded to several years, ranging from 1987 to 1991. For consistency, all the data were adjusted to 1990 dollars using cost indexes based on the producers price index (PPI) for all commodities. These 1990 dollar estimates were used for modeling the economic impacts of the proposed regulatory options. For this report, the results of these analyses were then adjusted to 1989 dollars, using a cost index based on the PPIs for 1989 and 1990.

The cost index for a given year is the ratio of the two PPIs:

$$\text{Cost index for 1989: } PPI_{1989}/PPI_{1990} = (112.2)/(116.3) = 0.964746 \quad (2.5)$$

The cost index is multiplied by the dollar values given in 1990 dollars to yield the same dollar values in 1989 dollars:

$$\$1989 = 0.964746 \bullet \$1990 \quad (2.6)$$

2.2 DATA SOURCES FOR DEMAND CHARACTERIZATION

Normally, demand for a good or service can be characterized using publicly-available information collected by the Department of Commerce. However, Department of Commerce data are not very useful in analyzing the demand for CWT services. The data are generally collected and reported by Standard Industrial Classification (SIC) code and CWT services fall within SIC 4953, Refuse Systems. However, the vast majority of data reported under this SIC code refer to municipal waste management services such as trash collection and municipal landfill services. The determinants and characteristics of demand for municipal waste management services are very different from those for industrial demand for CWT services. Thus, estimates of demand based on these data would be misleading.

A major source of information available about demanders of CWT services is the National Survey of Hazardous Waste Generators (GENSUR).[2] EPA's Office of Solid Waste and Emergency Response conducted the GENSUR in 1988 to collect 1986 data from a sample of hazardous waste generators. The survey provides a detailed portrait of the types of facilities generating wastes in 1986, the types of waste generated, and the locations where those wastes were managed. Waste sent off-site for management, according to the GENSUR, includes waste sent to CWT facilities. However, the GENSUR is limited to RCRA-regulated wastes and includes wastes sent off-site for disposal in non-CWT processes, such as landfills and incinerators. Obviously, because these data refer to waste management operations in 1986, the pattern may be somewhat different than the pattern of demand obtained in 1991 when the Waste Treatment Industry Questionnaire was conducted. Nevertheless, the GENSUR is a detailed source of data about the demand for off-site waste management services from which inferences can be drawn about the demand for CWT services.

Other data useful in characterizing demand for CWT services come from the Toxics Release Inventory (TRI),[3] which requires manufacturing facilities to report releases of certain chemicals under Section 313 of the Emergency Planning and Community Right-to-Know Act of 1986. TRI releases are reported annually, and the data are publicly available. One type of release reported is off-site transfer. However, because only a subset of facilities are required to

report releases, and only releases of some types of chemicals are reported, the data again do not correspond exactly to the demand for CWT services.

These sources of data are not sufficiently specific to be used for mathematically estimating the properties of CWT demand. They do, however, provide a basis for making assumptions about the characteristics of demand for CWT services.

2.3 DATA SOURCES FOR MARKET CHARACTERIZATION

Data used to characterize the markets for CWT services come mainly from the 1991 Waste Treatment Industry Questionnaire. In the questionnaire, facilities were asked the location of their customers. The majority of facilities indicated that their customers were located within their state or within a few adjacent states. Based on this information, markets for CWT services were characterized as regional rather than national.

Price information was solicited from facilities for treatment of various types of waste. These data, combined with data on the per-gallon cost of treating various types of waste, were used to select prices for the markets for CWT services. These prices were verified by contacting several CWT facilities to ask if the prices were reasonable based on their experience.

2.4 DATA SOURCES USED FOR COMPANY ANALYSIS

Estimation of the economic impacts of proposed regulatory options on the ultimate parent companies of CWT facilities is a focal point of this EIA. Section M of Part B of the 1991 questionnaire of CWT facilities requested selected financial variables from the income statements and balance sheets of the immediate corporate parents of CWT facilities. The Agency believes, however, that both the financial health of CWT owners at baseline and the relative ability of these owners to incur the costs of complying with the proposed guidelines can be satisfactorily evaluated only at the highest level of ownership. Because many CWT facilities have several intermediate levels of ownership in their corporate hierarchy, the 1991 questionnaire did not provide the data required for proper analysis of the economic impacts to the ultimate parent companies of many facilities that responded to the questionnaire. A number of data sources were used to obtain—and in some cases to construct—the financial data needed to include the ultimate parent companies of these facilities in the analysis of company-level profile and impacts analysis presented in this report.

Only 43 of the 57 potentially affected parent companies are also the immediate owners of CWT facilities. For these 43 companies the necessary data were taken directly from the

questionnaire, where available, or, where specific data were omitted from the questionnaire, the data were estimated using the best information provided, appropriate Dun & Bradstreet's (D&B's) industry median benchmarks and common size financial ratios. Two other facilities included copies of parent company annual reports with their questionnaire responses, despite intermediate levels of ownership. Detailed financial statements from a published source[4] are available for an additional four companies. Dollar values were converted from current year values to $1989 values using the PPI for the appropriate years as described in Section 2.1.1.3. Table 2-1 shows the frequency for which each of these sources was used, the number of companies (and associated facilities) identified through each source, and the types of company financial data available from each source. Table 2-1 also shows the availability of company-level financial data varied for CWT parent companies in companies of different sales size categories.

For the remaining eight companies for which financial statements are not publicly available, this analysis used published estimates of the companies' annual sales revenues[5,6,7] in combination with data from D&B's *Industry Norms and Key Business Ratios*[8] to construct representative financial statements. *Industry Norms and Key Business Ratios* reports common-size financial statements and financial ratios by SIC code and aggregates financial data for all companies within an SIC code rather than reporting data for any individual company. Common-size financial statements include a representative (or average) income statement where all values are expressed as a percentage of total revenues and a representative balance sheet where all values are expressed as a percentage of total assets. Key financial ratios reported as quartile values representing above-average (upper quartile), average (median), and below-average (lower quartile) performance are also reported for each SIC code. All eight companies for which representative financial statements were constructed were assumed to be performing at an average level for companies in their respective SIC codes. Table B-1 (see Appendix B) outlines the specific calculations undertaken to estimate the baseline financial data that were constructed for these eight companies.

The financial data used to profile company financial status in this report are all presented in $1989 and in most cases reflect company activities in 1989. In a few cases, where the technical data provided by the CWT facilities were for a different year, or where the Agency learned of CWT facilities changing hands between 1989 and the time of this analysis, company financial data for the most appropriate year were used.

In addition, SIC 4953 represents companies involved in solid waste disposal, sewage treatment and disposal, and other waste treatment processes not directly affected by the CWT

TABLE 2-1. SOURCES OF COMPANY-LEVEL FINANCIAL INFORMATION

Name of Data Source	Distribution of Companies by Company Size (Annual Receipts in 10^6/year) $0 to $6	$6 to $30	$30 to $340	Over $340	Total Companies	Total Facilities	Type of Data
1991 Waste Treatment Industry Questionnaire	12	12	6	13	43	61	Partial Financial Statements
Company Annual Reports				2	2	2	Complete Financial Statements
Moody's Industrial Manual			1	3	4	10	Complete Financial Statements
Ward's Business Directory of U.S. Private and Public Companies[a]				1	1	2	Annual Sales or Total Assets
American Business Information Online[a]	1	1	1		3	3	Annual Sales Range
Dun & Bradstreet's America's Corporate Families and International Affiliates[a]		1	1	2	4	4	Annual Sales
Subtotal: Companies and Facilities Included in Company Analysis	13	14	9	21	57	82	Sufficient Data
Companies Excluded					1	1	No Company Data
Facilities Excluded Owned by Companies Included						1	Inaccurate Data
Government Facilities Excluded						1	Data Not Applicable
Subtotal: Companies and Facilities Excluded from Company Analysis					1	3	Insufficient Financial Data
Total					58	85	

[a]Company financial data were constructed using available data on company sales and benchmark ratios for the companies' SIC code from Dun & Bradstreet's *Industry Norms and Key Business Ratios*. 1992-1993. New York: Dun & Bradstreet.

Source: Dun & Bradstreet. 1990. *Who Owns Whom?* New York: Dun & Bradstreet.

guidelines. Table B-2 (see Appendix B) lists the common-size financial ratios used to construct baseline financial statements for companies for which financial data for the ultimate parent companies were not available from the questionnaire and for which complete financial statements were not available from other published sources.

As explained in Chapter 6 of this report, this analysis evaluates the debt capacity of potentially affected companies by comparing the company's debt to total assets ratio with an industry-specific benchmark ratio, reported in D&B's *Industry Norms and Key Business Ratios.* Table B-3 (see Appendix B) reports the benchmark lower quartile debt ratio of each appropriate industry (identified by SIC) for which benchmarks are available. This ratio is used as an industry-specific "prudent level of debt." It is used to assist the Agency in projecting how CWT parent companies in different industries will choose to finance their capital costs of compliance with the regulation. Where a specific industry's benchmark is not available, we used the benchmark reported for SIC 4953 Refuse Systems.

It should be noted that the companies that responded to the questionnaire are generally much larger on average than those used to compute the benchmark ratios reported in Tables B-3 and B-4 (see Appendix B). It is possible that using an industry benchmark financial ratio that reflects the financial conditions of companies that are generally smaller than those to be affected by the regulation may not be equally appropriate for companies of all sizes. If larger companies are generally able to tolerate more (or less) new debt with a given ratio of debt to total assets than are smaller companies, then the projections of company financial decisions resulting from the proposed regulation may be less accurate for larger companies. Unfortunately, industry financial ratio benchmarks are not separately available for firms of different sizes.

2.5 REFERENCES

1. U. S. EPA. 1991 Waste Treatment Industry Questionnaire. Appendix A of this report contains a copy of Part B, Economic and Financial Information.

2. U. S. EPA. 1986 National Survey of Hazardous Waste Generators.

3. U. S. EPA. Toxics Release Inventory. Data for 1989 and 1990.

4. Moody's Investor Service. *Moody's Industrial Manual.* New York, NY. 1990-1992.

5. Ward's Business Directory of U.S. Private and Public Companies. 1994. Washington, DC: Gale Research, Inc.

6. American Business Information Online.

7. Dun & Bradstreet. America's Corporate Families and International Affiliates.

8. Dun & Bradstreet. *Industry Norms and Key Business Ratios*. New York: Dun & Bradstreet. 1992-1993.

CHAPTER 3
PROFILE OF THE CWT INDUSTRY

This chapter profiles the CWT industry by describing the baseline conditions characterizing the demand for CWT services, facilities supplying CWT services, the companies that own CWT facilities, and the markets for CWT services. The baseline represents the conditions in the CWT industry in the absence of the regulation. Thus, baseline conditions form the basis for comparison with the projected conditions for these entities if the regulation is promulgated as proposed.

In 1989, 85 CWT facilities accepted waste from off-site sources for treatment or recovery. The wastes sent to CWT facilities tend to be concentrated and difficult to treat; they include process residuals, process wastewater, and process wastewater treatment residuals such as treatment sludges. The toxicity of wastes accepted and the baseline level of treatment at CWT facilities have resulted in CWT facilities discharging high concentrations of some pollutants either into surface water or to POTWs. Four CWT facilities are included on state 304(l) Short Lists, and eight POTWs, receiving discharges from 13 CWT facilities, are on state 304(l) Short Lists. In addition, four POTWs violated their permits or experienced partial failure of their treatment systems due to discharges from CWT facilities. Thus, development of effluent limitations guidelines and standards for this industry is critical.

CWT facilities are specialists in waste treatment. In developing the proposed guidelines and standards EPA looked at facilities that accept waste on a commercial basis and those that accept waste on a non-commercial basis. Fifty-five CWT facilities are not owned by a generator but accept waste on a strictly commercial basis, managing it for a fee. Fourteen are non-commercial, exclusively captive facilities accepting waste from off-site for treatment only from facilities under the same ownership. The remaining 16 are mixed commercial/non-commercial facilities. They manage wastes from their own company and also accept some waste from other companies for a fee. The commercial CWT operations and also the commercial portion of the mixed CWT facilities constitute the supply of marketed CWT services. For purposes of this report, one mixed facility has been classified as non-commercial because most of its operations are non-commercial. The other are classified as commercial. Demand for these services comes from waste generators that do not have the capability to completely treat the waste they generate on-site.

3.1 DEMAND FOR CWT SERVICES

Producing goods and services almost always involves the simultaneous production of waste materials. During the process of manufacturing goods or providing services, the material

inputs that are not embodied in the products become waste. Environmental regulations require that these wastes, once generated, be treated and disposed of in accordance with existing environmental regulatory requirements.

The demand for waste management services arises from the generation of waste as a by-product of manufacturing or other production activities. This means that the demand for CWT services is derived from and depends on the demand for the goods and services whose production generates the waste. For example, the higher the demand for plastics, the greater the quantity of plastics produced, and, in turn, the greater the quantity of by-products of plastic manufacturing that must be treated and disposed of.

Producers generating waste have three choices when they determine how to treat the waste properly. First, they may invest in capital equipment and hire labor to manage the waste on-site, that is, at the same site where it is generated. For large volumes of waste, this is often the least expensive way to manage the waste because producers can avoid the cost of transporting it. Some generators may choose to treat waste on-site, believing that it will help them control their ultimate liability under environmental laws. Alternatively, producers may choose to partially treat waste on-site initially and then to send it off-site for ultimate treatment and disposal; this choice is referred to as on-site/off-site in this report. Finally, producers may choose to send waste they generate directly to a CWT facility, a method that is called off-site waste management.

The producers of waste who choose either the on-site/off-site or the off-site method create the demand for CWT services. The proposed guidelines and standards under analysis apply to all facilities accepting waste from off-site for treatment or recovery.

3.1.1 Industries Demanding CWT Services

Data from the 1986 GENSUR can be used to characterize the generators of hazardous waste by industry and to profile the types of waste generated. This extensive survey database gives the most detailed information on the generation of waste available. The survey was designed to collect information on the generation of wastes defined as hazardous under Subtitle C of RCRA. This pattern of generation by industry may not correspond to the generation pattern for the customers of CWT facilities; some overall patterns, however, may be instructive.

Table 3-1 shows SIC codes and the quantities of waste those industries generate and ultimately send off-site for treatment and/or disposal. This is the portion of total waste generated

TABLE 3-1. WASTE GENERATION BY SIC CODE, BY TREATMENT LOCATION

Treatment Location	SIC Code	Waste Generated (tons)	Waste Sent Off-site (tons)	Number of Generators
Off-site Only	2816	4,198,360	4,198,360	1
	2821	338,895	338,895	2
	3851	317,196	317,22	1
	2813	274,265	61,390	1
	3484	194,606	194,606	5
	2869	111,740	111,362	8
	2911	34,804	34,297	16
	2833	22,124	22,124	2
	2879	17,629	17,629	2
	3644	17,316	17,316	1
	4931	15,350	15,350	9
	3317	10,786	10,785	4
	4953	9,730	9,730	22
	3714	8,295	3,198	6
	3721	6,411	6,411	6
	3471	5,356	5,351	29
	3600	5,153	4,993	14
	5983	3,562	3,562	7
	2819	3,396	3,396	5
	3661	2,483	2,483	7
	2899	2,445	2,445	14
	3441	2,431	2,431	9
	4463	2,209	2,209	1
	3312	2,078	2,078	6
	3452	1,990	1,990	15
	3679	1,417	1,417	14
	3585	1,289	1,289	2
	3728	1,207	1,201	49
	3479	1,108	1,788	5
	1311	1,085	1,085	4
	5171	1,054	1,054	21
	All Other SICs	57,649	57,174	
Off-site	*Total*	*5,673,415*	*5,454,624*	

(continued)

TABLE 3-1. WASTE GENERATION BY SIC CODE, BY TREATMENT LOCATION (CONTINUED)

Treatment Location	SIC Code	Waste Generated (tons)	Waste Sent Off-site (tons)	Number of Generators
On-site, then Off-site	2869	16,100,674	11,741,505	165
	2821	9,931,763	9,900,916	71
	3674	8,783,661	3,127,594	151
	3361	4,965,664	4,286	5
	3714	3,591,398	898,172	123
	2611	3,188,994	3,188,993	8
	2819	2,605,011	1,110,378	40
	3312	2,537,440	708,845	78
	2865	2,519,416	1,992,492	31
	2911	2,387,776	980,080	132
	3429	2,262,126	68,289	51
	3585	2,068,145	21,218	32
	2800	1,732,106	69,671	41
	3700	1,501,000	1,501,000	1
	9511	1,455,716	1,455,724	13
	3711	1,212,814	809,628	66
	3471	1,036,473	128,464	352
	4953	927,822	876,900	49
	3573	911,257	37,981	63
	3321	834,056	25,723	11
	3679	832,700	822,616	256
	3479	694,320	628,999	133
	2899	668,738	322,484	93
	3815	641,671	969	5
	3291	632,525	4,301	16
	2842	628,075	628,075	13
	3721	568,805	577,979	59
	2834	522,677	522,565	53
	3691	414,308	21,535	27
	3079	408,101	15,330	156
	3341	379,711	376,229	43
	3713	365,328	2,557	3
	2879	311,688	32,940	46

(continued)

TABLE 3-1. WASTE GENERATION BY SIC CODE, BY TREATMENT LOCATION (CONTINUED)

Treatment Location	SIC Code	Waste Generated (tons)	Waste Sent Off-site (tons)	Number of Generators
On-site,	3548	197,799	60	1
then	3678	187,311	187,296	34
Off-site	3531	187,264	1,675	8
	3639	186,263	186,263	4
	7391	174,996	11,615	125
	3316	172,206	171,159	13
	3452	165,401	148,061	40
	7535	156,994	2,060	1
	3497	152,485	152,485	2
	3592	135,143	16,645	6
	3552	134,162	434	15
	3351	132,213	4,752	22
	3825	115,536	113,172	10
	3317	108,293	57,208	36
	2542	105,750	42	2
	All Other SIC codes	2,430,930	2,221,970	
On and Off	*Total*	*83,600,788*	*45,279,340*	
	Total Waste in 1986	*650,028,569*	*50,733,964*	

Source: U.S. EPA. *National Survey of Hazardous Waste Generators, 1987*. GB Booklet, Waste Characterization. 1987.

in 1986 that was managed at CWT facilities or waste disposal facilities. Two types of treatment locations are specified: Off-site Only and On-site/Off-site. As explained earlier, wastes that, once generated, are sent directly to an off-site treatment facility are called Off-site Only. Wastes generated and treated initially on-site, then sent off-site for additional treatment or disposal, are called On-site/Off-site.

Clearly, a wide variety of manufacturing industries generate waste. The industries generating waste in 1986 are listed in Table 3-1 by their SIC codes. A list of the definitions for SIC codes is provided in Appendix C. The most frequently appearing SIC codes are those in the 2800s (chemicals manufacturing) and the 3400s (fabricated metal products). Industrial organic chemicals not elsewhere classified (2869) sends the greatest quantity of waste off-site, followed by plastics and resins (2821). The SIC code with the most generators is plating and polishing (3471). Other industries with many generators include electric services (4911), electronic components (3679), and semiconductors (3674).

Additional evidence for this pattern is shown in Table 3-2, which summarizes pollutant releases reported in the 1989 TRI including off-site transfers of waste. As with the GENSUR data, the pattern of waste releases reported in Table 3-2 may not correspond to the pattern of demand for CWT facilities, because the TRI only reports releases of certain chemicals from a subset of industries. However, Table 3-2 shows that in 1989 a broad spectrum of industries reported sending waste off-site for management.

The pattern of waste generation and off-site treatment revealed in Tables 3-1 and 3-2 may indicate the industries demanding CWT services; the quantities, however, may not be an accurate reflection of the quantities of waste managed by affected CWT facilities in 1989. The CWT proposed regulation applies only to facilities that accept waste from off-site for treatment or recovery. The quantities of waste shown in Tables 3-1 and 3-2 include wastes sent off-site for types of management not covered by this regulation, such as incineration or landfill disposal. Thus, the quantities shown may overstate a given industry's demand for affected CWT services. At the same time, because centralized waste treatment of non-hazardous wastes is also covered by the guidelines and standards, the quantities shown in Table 3-1 may understate a given industry's demand for affected CWT services. Finally, the overall quantity of waste generated surely changed from 1986 to 1989. But the general pattern, that many manufacturing and service industries in the U.S. demand the services of CWT facilities for treatment of some of the waste they generate, is certainly still true.

TABLE 3-2. THE 25 INDUSTRIES (BY FOUR-DIGIT SIC CODE) WITH THE LARGEST TRI TOTAL RELEASES AND TRANSFERS, 1989

SIC Code	Number of Facilities	Number of Releases	Total Releases and Transfers (tons)	Share of Off-site Transfers	Off-site Transfers (tons)
2869	305	2,390	163,610	0.1036	16,950
3339	23	108	99,312	0.0145	1,440
3312	143	1,103	89,826	0.3976	35,714
2816	39	192	89,616	0.0652	5,843
2819	285	1,010	78,160	0.1297	10,138
2873	64	263	65,595	0.0013	86
3331	8	77	45,606	0.0001	4
2911	170	2,315	36,844	0.0782	2,881
2821	322	1,875	35,082	0.3634	12,748
3711	59	818	32,808	0.1005	3,297
2611	31	223	31,001	0.0432	1,340
2834	131	442	29,358	0.3179	9,332
2813	142	212	28,227	0.9667	27,287
2621	139	592	27,536	0.1093	3,010
2851	598	3,452	24,675	0.5716	14,104
3321	135	559	24,408	0.3108	7,586
3861	62	343	23,845	0.3028	7,220
3714	367	1,259	23,630	0.2311	5,461
3079	344	923	23,244	0.1338	3,110
3089	321	777	21,252	0.0682	1,450
3411	190	869	20,680	0.0868	1,795
2874	27	110	20,473	0.0036	74
2511	212	976	20,214	0.0255	516
2865	76	617	19,960	0.1807	3,607
2631	61	260	19,311	0.0321	620

Source: U.S. EPA. *Toxics in the Community: The 1989 Toxics Release Inventory Report.* September 1991. Table 3-31.

The share of all waste treated or disposed of off-site is generally very small. As shown in Table 3-1, of 650 million tons of RCRA-regulated hazardous waste generated in 1986, only 51 million tons were sent off-site. Thus, the vast majority of the volume of RCRA hazardous waste generated in 1986 was treated and disposed of on-site and is outside the scope of this analysis. This is typical of waste treatment patterns. To avoid transportation costs, the largest volume wastes are treated on-site. Waste that is sent off-site for treatment tends to be relatively low in volume although it may be highly toxic. Waste that is sent off-site without initial treatment may be too concentrated for treatment in on-site treatment operations. Typically, waste that is sent off-site for treatment after initial on-site treatment is highly concentrated and difficult to treat. The wastestreams accepted by CWT facilities are the most concentrated and variable of any analyzed during development of effluent limitations guidelines and standards.

3.1.2 Trends in the Demand for CWT Services

The data described above reflect demand for total off-site hazardous waste treatment services in 1986. They demonstrate that the demanders of CWT services are diverse and include most manufacturing and many service sectors. This pattern is true for non-hazardous waste as well. The overall quantity of CWT services demanded and the pattern of off-site waste treatment, however, have probably changed since 1986. The late 1980s were a period of transition for the waste treatment industry, particularly the RCRA hazardous waste industry. Several regulatory and policy changes combined to change the framework for waste generation and treatment.

3.1.2.1 The Land Disposal Restrictions (LDR)

Regulations authorized by the Hazardous and Solid Waste Amendments to RCRA and promulgated by EPA since 1986 prohibit the land disposal of hazardous waste unless hazardous chemicals and characteristics have been removed, reduced, or stabilized to the greatest extent possible or unless EPA determines on a site-specific basis that there will be no migration of hazardous constituents from the land disposal unit. Wastes categorized as hazardous under RCRA were grouped into four groups reflecting their relative danger when land disposed. These groups are referred to as "California list wastes," "First Third wastes," "Second Third wastes," and "Third Third wastes."

California list wastes, prohibited from land disposal after July 8, 1987, included liquid hazardous wastes with a pH less than 2.0, liquid hazardous wastes containing PCBs, or aqueous mixtures containing certain concentrations of halogenated organic compounds. First third wastes include wastes that are not wastewater identified by certain RCRA codes, such as wastewater

treatment sludges, bottom sediment sludges from wood preserving, and distillation sludges and still bottoms from the production of various organic compounds. Second third wastes include wastewaters characterized by the same RCRA codes for which nonwastewaters were listed in the first third, as well as spent cyanide solutions, and many other RCRA codes. Third Third wastes include nearly all remaining liquid and sludge hazardous wastes. (Table 3-3 shows the dates LDRs were imposed for each kind of waste.)

TABLE 3-3. LDRs

Wastes Restricted	Date After Which Land Disposal Was Restricted
"California" Wastes	July 1987
First Third (most hazardous)	August 1988
Second Third	June 1990
Third Third	May 1991

Overall, the LDR (or "land ban") has changed the pattern of hazardous waste treatment, increasing the amount of treatment prior to disposal. In addition, smaller quantities of some types of waste will be land-disposed (waste that must be thermally treated, for example), while greater quantities of other wastes will be land-disposed (such as wastewater treatment sludges, which must now be mixed with stabilizing agents). The average per-unit costs of waste treatment have increased.

3.1.2.2 The Toxicity Characteristic Leachate Procedure Test

In addition to the LDR, the introduction of the toxicity characteristic leachate procedure test (TCLP) to determine if a waste is toxic under RCRA changed the classification of many wastes from non-hazardous to hazardous. Since September 1990, facilities have been required to use this test rather than the extraction procedure (EP) leaching test to determine whether wastes are hazardous. The most notable distinction between the tests is that the EP test estimates the leaching of metals only, while the TCLP also estimates the leaching of organic compounds. Many organic chemicals will ultimately be added to the characteristic list of RCRA hazardous wastes as a result of this rule change. At the same time that the TCLP was adopted, maximum concentration limits were established for 26 additional contaminants. Facilities managing these

wastes must now have a RCRA permit. Thus, the TCLP increases the demand for RCRA-permitted CWT services relative to other, non-RCRA-permitted types of waste treatment.

3.1.2.3 Pollution Prevention

Another recent policy change is a greatly increased emphasis on the part of EPA and state agencies on pollution prevention. Generators are encouraged to modify their processes, improve their housekeeping, increase their reuse and recycling of production by-products, and generally reduce the amount of waste that they release to the environment. A part of this emphasis has been the required reporting of toxic chemicals released to the environment in the annual TRI. Because this information is made publicly-available, companies have an incentive to reduce their releases. Many facilities have found cost-effective ways to modify their operations and decrease the quantity of waste they generate for a given level of production of their primary good or service. This trend has, other things equal, reduced the demand for CWT services. The EPA is presently drafting a new hazardous waste minimization strategy that may combine one or more of the following policy options:

- voluntary commitments from industry to reduce waste streams of concern,
- enforcement actions using supplemental environmental projects, and/or
- publication of a list of large quantity generators.

When finalized, this strategy may promote additional reductions in the quantity of hazardous waste being sent to CWT facilities for treatment or recovery.

3.1.2.4 Changes in the Level of Economic Activity

As discussed at the beginning of this section, the demand for CWT services depends on and is derived from the demand for the goods and services whose production generates waste. The quantities of waste generated in 1986 (shown in Table 3-1), the quantity of waste sent off-site by TRI facilities in 1989 (shown in Table 3-2), and the quantities of waste managed at CWT facilities in 1989 all reflect the levels of economic activity occurring during those years. As the level of economic activity changes over time, other things held equal, the level of waste generated and the demand for CWT services will change accordingly.

3.2 EMPIRICAL EVIDENCE OF TRENDS IN CWT DEMAND

To assess the overall trend in the demand for CWT services, EPA would need a time-series database giving several years' data about the quantity of waste sent off-site for treatment each year. Unfortunately, no database corresponds exactly to the data needed. No national data source provides time-series information about the quantity of RCRA-regulated waste sent off-site

for treatment. Because of the lack of detailed national time-series data on hazardous waste generation and treatment, quantifying the overall trend in demand for CWT services over the past five years is impossible. On the one hand, the increasingly stringent regulation of releases of pollution to the environment has increased the quantity of waste being managed by specialists (CWT facilities) for a given total quantity of waste generated. On the other hand, the emphasis on pollution prevention has decreased the total quantity of waste generated for a given level of production and may have resulted in a decreased demand for CWT services.

3.2.1 Evidence from the TRI

The TRI does provide a time series of data on releases of materials, but the materials are chemicals of concern rather than wastes. However, many of the TRI chemicals, if discarded, are RCRA-regulated hazardous wastes. Thus, the TRI database does provide information from which inferences may be drawn about the quantities of waste being generated.

A recent study done for EPA's Office of Pollution Prevention and Toxics assesses the changes in reported TRI releases and transfers between 1989 and 1990.[1] This study collected data from a sample of TRI-reporting facilities to attempt to quantify the changes in releases and transfers reported in TRI between 1989 and 1990 and to assess the contribution of "real" changes in releases as opposed to "paper" changes in releases. Real changes in releases represent actual changes in the physical quantities of a chemical sent off-site. Paper changes, on the other hand, represent changes in reported quantities of chemicals released that are not actual changes in physical releases but occur because of changes in measurement or data errors.

A sample of facilities drawn from the population of facilities in two-digit SIC codes between 20 and 39 that reported releases in the TRI in both 1989 and 1990 was contacted to clarify their responses. Based on results of these conversations, the target population reported a 15.4 percent decrease in TRI releases and transfers between 1989 and 1990. Of the 15 percent, approximately half (6.9 percentage points) is attributed to source reduction. The rest is attributed to measurement changes, changes in production, and other factors. Based on these results, it appears likely that, overall, the demand for CWT services may be declining.

3.2.2 Other Evidence of Trends in Demand for CWT Services

Anecdotal evidence abounds that indicates a declining rate of waste generation for a given level of production, especially for hazardous wastes. This decline may indicate declining demand for CWT services. Numerous case studies have been performed documenting pollution prevention activities and the resulting decreases in quantities of waste being generated. For

example, Motorola, in conjunction with two U.S. Department of Energy laboratories, developed a no-clean soldering process for circuit board production that eliminates all solvent cleaning, eliminates the use of chlorofluorocarbons (CFCs), speeds up production, decreases energy use, reduces production costs, and produces reliable hardware.[2] Additionally, in a recent assessment of pollution prevention in the chemicals industry for INFORM, Dorfman, Muir, and Miller cite dozens of examples of companies making changes to production processes, inputs, or products to reduce their waste generation. DuPont, for example, reduced solvent waste at their Deepwater, New Jersey, Chambers Works plant by approximately 40 million pounds per year. Most of their pollution prevention activities involve in-process recycling. The company estimates that these activities save DuPont $3.75 million each year. Dow Chemical's Pittsburgh, California plant modified their inputs and production processes and reduced their waste generation by approximately 12 million pounds per year.[3]

A recent article in the *Wall Street Journal* stated that, contrary to concerns in the late 1980s, hazardous waste disposal capacity seems abundant. "Existing dumps have about 50 years of capacity left ... Licensed hazardous waste incinerators ran at 74 percent of capacity in 1990 ... Hazardous waste disposal capacity went from a feared shortage to an actual glut in part because companies ... facing rising disposal costs and potential cleanup liability, overhauled production methods to reduce waste volume."[4] A recently published article in World Wastes[5] describes deteriorating market conditions in the market for hazardous waste landfill disposal. While some of the factors involved apply specifically to landfills, others such as pollution prevention would affect the market for CWT services as well.

For all of the reasons cited above, it is probable that the pattern and total volume of CWT services demanded in 1989 (the base year for the CWT analysis) are very different from those reported in the GENSUR database or TRI. No data sources reflect CWT demand in 1989 and 1990; the data used in this analysis, although out of date, are the best available.

A recent industry outlook study[6] (the Lorenz study) cited by the U.S. Department of Commerce in *U.S. Industrial Outlook 1994*[7] describes hazardous waste management as a maturing industry. The recession of the early 1990s, coupled with pollution prevention, has resulted in fierce competition between companies with considerable consolidation through acquisition. These consultants expect the following trends to continue:

- from pollution control to pollution prevention,
- from physical waste management practices to chemical ones, and
- from undifferentiated waste management techniques to waste-specific technologies targeting specific wastestreams.

The Lorenz study notes that the trend toward pollution prevention is expected to reduce the demand for CWT services, other things being equal, while the trend toward specialization and sophistication may favor CWT providers. These consultants expect the demand to be "more sensitive to public passions, regulation, and economic swings." The study projects that industrial spending for off-site services (including CWT facility) will grow by less than 2.5 percent from 1991 through 1995.

3.3 SUPPLY OF CWT SERVICES

CWT services are defined as waste treatment services performed at waste treatment facilities that accept waste from off-site for treatment. The industry has been divided into three subcategories—metals, oils, and organics—based on the types of waste treated or recovered. Thus, the Metals Subcategory includes facilities offering metals treatment or metals recovery, and the Oils Subcategory includes facilities offering oils treatment or oils recovery. The Organics Subcategory includes facilities offering organics treatment or recovery. Table 3-4 shows the numbers of facilities in each industry subcategory offering each type of waste treatment or recovery service. Many CWT facilities offer more than one of the above services and thus fall under more than one industry subcategory.

TABLE 3-4. CWT FACILITIES BY SUBCATEGORY AND CWT SERVICE[a]

Subcategory	CWT Service	Number of Facilities
Metals	Recovery	9
	Treatment	52
Total in Metals Subcategory		56
Oils	Recovery	29
	Treatment	15
Total in Oils Subcategory		32
Organics	Treatment	22

[a]Because many CWT facilities fall under more than one subcategory, the numbers in this table do not add to the total number, 85 facilities, in the CWT industry. Similarly, because most facilities performing metals or oils recovery also perform treatment, the total number of facilities in those categories does not equal the sum of facilities performing recovery and treatment.

Source: U.S. EPA. Summary Information for the Centralized Waste Treatment Industry. Computer file. December 1, 1993.

Facilities performing wastewater treatment of wastewater received from off-site will be affected by this regulation; they will probably have to install or upgrade treatment operations. In addition, metals and oils recovery processes generate wastewater that is affected by the effluent limitations guidelines and standards, as do various maintenance activities involving waste received from off-site. Figure 3-1 depicts the relationships between affected CWT processes.

CWT facilities differ widely from one another in terms of their size, the types of waste management services they offer, and their profitability. They differ in terms of their ownership type and the financial health of the companies owning them. This section profiles the suppliers of centralized waste management services.

3.4 DESCRIPTION OF SUPPLIERS

CWT facilities accept waste from off-site for treatment (i.e., they treat waste that was generated at other facilities). The generating facility may or may not be owned by the same company as the CWT facility. Suppliers are characterized by commercial status and types of services performed, SIC code, location, size, products produced, and RCRA permit status.

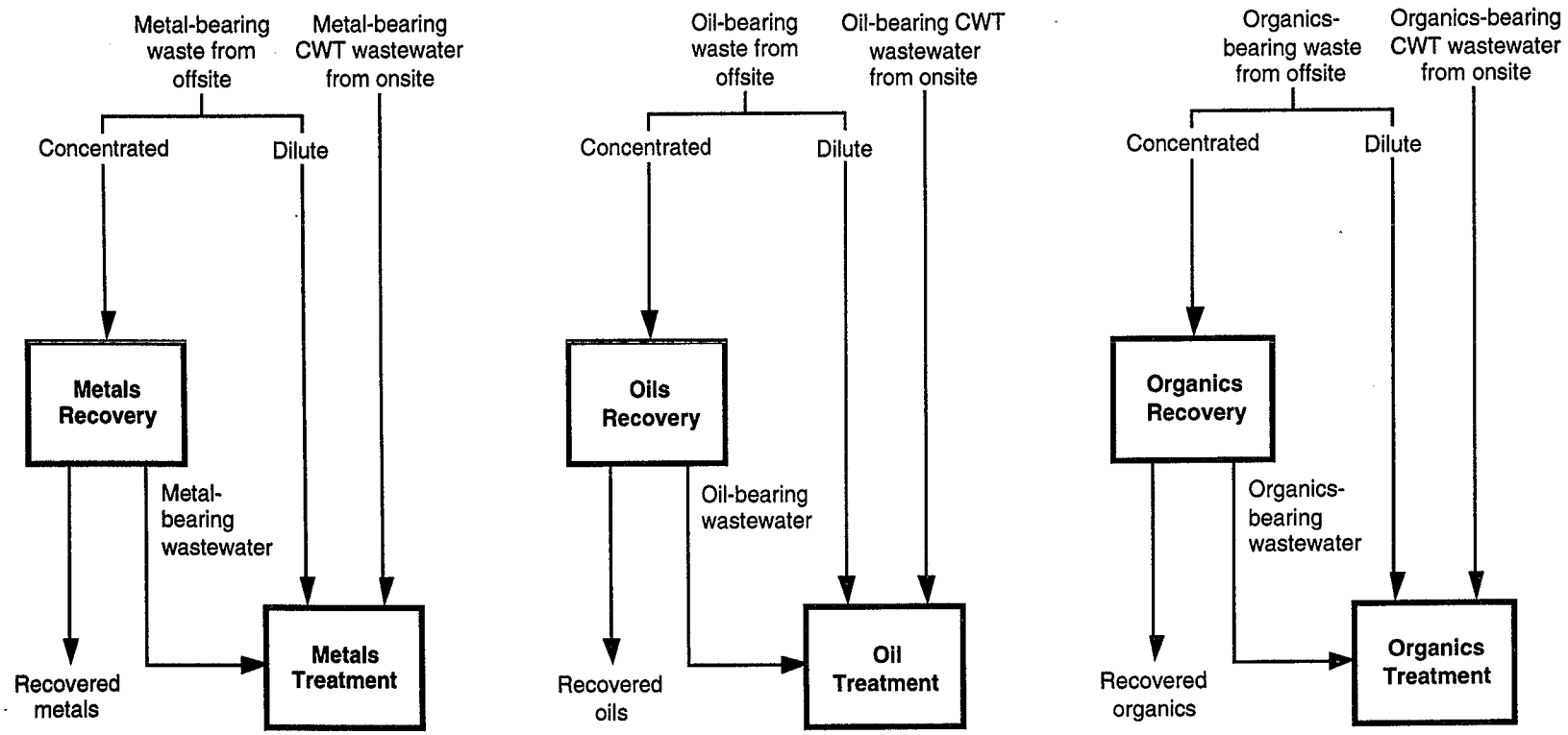
3.4.1 Commercial Status

CWT facilities have a variety of relationships with the facilities generating the waste they treat. In terms of these relationships, CWT facilities fall into three main categories:

- commercial: facilities that accept waste only from off-site generators not under the same ownership as their facility
- non-commercial: facilities that accept waste only from off-site generators under the same ownership as their facility
- mixed commercial and non-commercial: facilities that treat waste generated by other facilities under the same ownership as their facility and also accept waste from off-site generators not owned by the same company

Information about commercial status is available from several parts of the 1991 Waste Treatment Industry Questionnaire. (For a copy of the economics part of the questionnaire, including sections M, N, and O, see Appendix A.) In Question A35 in the technical section of the questionnaire, facilities were asked about their overall commercial status. In Section N in the economics section of the questionnaire, facilities were asked to list their commercial waste treatment revenues and costs separately from their non-commercial: commercial revenues in Questions N27 through N29 and non-commercial revenues in Questions N30 through N32. Purely non-commercial facilities reported their costs in Questions N30 through N32, while

Figure 3-1. CWT Processes Affected by This Regulation



commercial and mixed facilities reported their costs in Questions N27 through N29. Thus, the part of the questionnaire where the facility reports its costs and revenues indicates its commercial status. Finally, in Section O, facilities were asked in Question O4 to report the quantities of aqueous liquid waste, sludge, and wastewater they treat that is received from off-site facilities not under the same ownership, that is received from off-site facilities under the same ownership, and that is generated on-site.

Information from Sections N and O forms the primary basis for determining a facility's commercial status. When no data were available, or when the data in Sections N and O conflicted, information from Question A35 was used. Table 3-5 provides the commercial status of the 85 CWT facilities. The characterization of facilities' commercial status in this report refers only to the operations subject to the effluent limitations guidelines and standards. Facilities classified in this analysis as purely commercial may conduct some unaffected operations on a non-commercial basis. Similarly, facilities classified as purely non-commercial in this analysis may conduct some unaffected operations on a commercial basis.

TABLE 3-5. COMMERCIAL STATUS OF CWT FACILITIES

Commercial Status	Number of Facilities
Commercial	70
Non-commercial	15

Source: U.S. EPA. 1991 Waste Treatment Industry Questionnaire.

Sixteen facilities indicated in their questionnaire responses that they offer waste management services on both a commercial and a non-commercial basis. For purposes of this report, one of the mixed facilities has been categorized as non-commercial, because the vast majority of its operations are non-commercial. The other 15 facilities are included in the commercial category.

Commercial CWT facilities are specialists in waste treatment; some may have other activities. They offer one or more waste treatment services on a commercial basis and accept waste from customers that are not part of the same company. They compete with other commercial CWT facilities offering the same services. Based on data in the technical and economic section of the questionnaire, 70 CWT facilities are commercial.

Of the 85 facilities in the CWT industry, 14 of the 15 non-commercial facilities accept waste only from other facilities owned by the same company. Non-commercial waste treatment facilities are typically located at manufacturing sites and manage waste generated on-site as well as waste generated by manufacturing operations at other sites owned by the same company. Because of the potentially large liabilities associated with hazardous waste, companies sometimes choose to manage their waste internally rather than employ commercial waste management services. To take advantage of economies of scale in waste management operations, they may choose to centralize their waste management operations. For such facilities, managing waste generated by off-site facilities under the same ownership is frequently regarded as a "cost of doing business." Thus, non-commercial CWT facilities are generally cost centers for the companies owning them. They perform a service that acts as an input to the primary production activities of the owner companies. Like other centralized divisions within companies, such as the legal or accounting divisions, the CWT division performs a service to the rest of the company. The facilities may receive revenues directly for the treatment services (usually at a lower price than would be charged by a commercial treater), or they may be reimbursed for expenses.

One additional facility is included in the non-commercial category: Pearl Harbor Naval Base. The majority of the waste they manage is generated on the base; they offer some commercial treatment as a service to their community but do not operate on a for-profit basis. Therefore, they are included in the non-commercial category for a total of 15 facilities.

For purposes of the EIA, it was assumed that non-commercial CWT facilities make no changes in their CWT operations and pass all the costs of complying with the regulation through to their parent company. Impacts on purely non-commercial facilities were thus analyzed at the parent company level. This approach reflects a simplifying assumption that all non-commercial facilities follow the pattern described above. Using this assumption estimates the maximum impact of the guidelines and standards on the owners of non-commercial facilities.

Thus, 70 of the 85 CWT facilities are classified as commercial and are therefore included in the market analysis. The rest are non-commercial, and the types and quantities of CWT services that they provide to their corporate parents are assumed to be unaffected by price and quantity changes in the commercial markets for CWT services.

3.4.2 Industry Classification by SIC Code

In the questionnaire, facilities were asked to report the SIC code that best represents the facility's main operation. Table 3-6 shows the SIC codes reported by respondents. Appendix C provides a list of four-digit SIC codes included with the questionnaire forms that were sent to the facilities. The responses give one indication of the relative importance of CWT operations at the facility. No SIC code properly describes CWT services. Facilities listing 4953, Refuse Systems, as their SIC code are indicating that they are primarily waste treaters. Of the 85 CWT facilities, 60 reported 4953 as the SIC code that best described facility operations. SIC code 4953 is Refuse Systems, which is primarily for municipal waste disposal services.

Facilities listing other SIC codes are indicating that they are primarily manufacturing facilities that also do some waste management. Three facilities reported 2869, Organic Chemicals not elsewhere classified, and four additional facilities reported other SIC codes in the 2800s, indicating that they are chemicals manufacturers. Four facilities reported SICs in the 3300s, indicating that they are primary metals manufacturing facilities.

Therefore, a majority of the facilities expected to be affected by the effluent limitations guidelines and standards are primarily waste management facilities. The rest, although they have CWT services on-site, are primarily manufacturing or service facilities.

The questionnaire also asked facilities if they perform manufacturing operations at the CWT facility. The response to this question gives another indication of the relative importance of CWT services at the facility. Of the 85 CWT facilities in the industry, 25 reported having manufacturing operations on-site and 60 reported that they do not. Of the 60 facilities reporting 4953 as their SIC code, 55 of them reported that they do not have manufacturing on-site. This provides additional evidence that facilities reporting 4953 as their SIC code tend to be specialized in CWT services, while facilities reporting other SIC codes tend to have manufacturing on-site, in addition to CWT activities.

3.4.3 Location of CWT Facilities

The 85 CWT facilities are located in 29 states. The states with the highest number of waste management facilities are California, with nine, and Michigan, Ohio, Texas, and Washington with seven each. Table 3-7 shows the number of facilities located in each state. Because not all CWT facilities offer the same set of services, facilities located near one another may not be in the same markets. Likewise, a CWT facility may compete with facilities located a longer distance away if the services offered are similar.

TABLE 3-6. SIC CODES DESCRIBING CWT FACILITIES' PRIMARY OPERATIONS

SIC Code Reported	Number of Facilities
2819	1
2821	1
2834	1
2869	3
2879	1
2911	1
3312	1
3321	1
3341	1
3356	1
3483	1
3499	1
3523	1
3633	1
3679	1
3724	1
3761	1
4226	1
4953	60
5090	1
5170	1
5171	1
9661	1
9711	1
Total	85

TABLE 3-7. NUMBER OF FACILITIES PERFORMING VARIOUS CWT SERVICES

State	Number of Facilities
Alabama	1
California	9
Connecticut	6
Georgia	2
Hawaii	1
Iowa	2
Illinois	5
Indiana	2
Kentucky	1
Louisiana	1
Maryland	1
Michigan	7
Minnesota	1
North Carolina	1
Nebraska	1
Nevada	1
New Jersey	4
New York	3
Ohio	7
Oklahoma	2
Oregon	1
Pennsylvania	5
Rhode Island	1
South Carolina	1
Tennessee	3
Texas	7
Virginia	1
Washington	7
West Virginia	1
Total	85

3.4.4 Facility Size

Facility size may be defined in terms of total quantity of waste treated, total revenues and costs, or number of employees. We examined facility size using all these criteria. First, we considered the total quantity of wastewater and sludge discharged. CWT facilities may:

- discharge wastewater, treated or untreated, directly to surface water (direct dischargers);
- discharge wastewater, treated or untreated, indirectly to the sewer system, thence to a POTW (indirect dischargers); or
- not discharge their wastewater at all (zero dischargers).

Zero discharge facilities may dispose of their wastewater by pumping it down underground injection wells, evaporating it, applying it to land, selling it or recycling it, or sending it off-site to another CWT facility for treatment. Table 3-8 shows the quantities of wastewater treated by facility size category and discharge category.

TABLE 3-8. FACILITY SIZE CATEGORIES BASED ON QUANTITY OF WASTEWATER TREATED, BY DISCHARGE CATEGORY

Quantity of Wastewater Treated	Number of Facilities	Percentage
Direct Dischargers		
1 gallon to 30 million gallons	5	31.2
30 million to 100 million gallons	4	25.0
100 million to 1 billion gallons	4	25.0
Over 1 billion gallons	3	18.8
Total	16	100.0
Indirect Dischargers		
1 gallon to 5 million gallons	19	33.9
5 million to 10 million gallons	12	21.4
10 million to 100 million gallons	22	39.3
Over 100 million gallons	3	5.4
Total	56	100.0
Zero Dischargers		
1 gallon to 5 million gallons	17	73.9
5 million to 10 million gallons	0	0.0
10 million to 100 million gallons	6	26.1
Over 100 million gallons	0	0.0
Total	23	100.0

Note: Discharge categories do not sum to 85 facilities because six indirect dischargers and four direct dischargers also dispose of some of their wastewater in a zero discharge manner.

Source: U.S. EPA. Summary Information for the Centralized Waste Treatment Industry. Computer file. December 1, 1993.

Facility size may also be defined in terms of employment. The Agency is interested in facility-level employment because, if production falls at a facility as a result of a regulation, some share of the people employed there may become unemployed. This reduction in employment may be magnified throughout the community as facilities that produce goods and services previously demanded by the now unemployed residents experience decreased demand for their goods and services. Table 3-9 shows the number of CWT facilities with various numbers of employees in their CWT operations. The numbers shown in Table 3-9 represent full-time equivalent employees, computed by summing the number of full- and part-time hours worked in CWT operations and dividing by 2,000. Employment in CWT operations ranged from 1 employee to 218 employees in 1989. Fifty-two percent of facilities had fewer than 20 employees in CWT operations in 1989.

TABLE 3-9. SIZE DISTRIBUTION OF CWT FACILITIES BY NUMBER OF CWT EMPLOYEES[a]

Total Number of Employees	Number of Facilities	Percentage
1 to 9	24	32.0
10 to 19	15	20.0
20 to 29	14	18.7
30 to 49	8	10.7
50 to 100	10	13.3
More than 100	4	5.3
Total	75	100.0

[a]Number of facilities not providing data = 10.

3.4.5 Production of Waste-Based Products

In the process of treating waste, some CWT facilities produce marketable waste-based products. Table 3-10 shows the number of facilities producing recovered metals and recovered oils. Facilities in this category are simultaneously producing two products: a CWT waste treatment service and a waste-derived product. Estimated revenues received from the sale of recovered products are regarded as off-setting some of the cost of treatment. Thus, for the recovery processes, the average variable cost of the process is defined as:

$$AVC = (TVC - R_r)/Q, \quad (3.1)$$

where;

TVC = total variable cost of treatment,

R_r = estimated revenue from sale of recovered product r, and

Q = quantity treated.

TABLE 3-10. FACILITIES PRODUCING MARKETABLE WASTE-BASED PRODUCTS

Product	Number of Facilities
Recovered Metals	9
Recovered Oils	27

Source: U.S. EPA. Summary Information for the Centralized Waste Treatment Industry. Computer file. December 1, 1993.

3.4.6 Facilities Permitted under RCRA

Another difference between CWT facilities is whether they manage hazardous wastes in operations that are permitted under RCRA. Of the 85 CWT facilities, 48 do not have a RCRA Part B permit, and 37 have a RCRA Part B permit. This distinction is important in part because of what it indicates about the types of wastes the facilities manage and the types of operations they have on-site. All facilities treating hazardous waste are required to have a RCRA permit. Facilities engaged in recycling and recovery operations, such as metals recovery and oils recovery, may or may not have a RCRA permit. Recycling operations are exempt under RCRA; however, if a facility stores waste prior to treating it, it is required to have a permit.

Of direct concern for estimating the impacts of the proposed rule is the fact that facilities having RCRA permits are required to file a modification of their permits whenever their operations change (e.g., when new waste management equipment is installed). Thus, in addition to the costs of purchasing, installing, and operating additional capital equipment to comply with the effluent limitations guidelines and standards, RCRA-permitted facilities will incur the expense of modifying their RCRA permit to reflect these changes.

3.5 BASELINE FACILITY CONDITIONS

As described above, there are 85 facilities in the CWT industry and analyzed in this report. Of these, 70 are commercial and 15 are non-commercial. In this analysis, the Agency

accepts the definition of "facility" used by responding CWT facilities. In some cases, the facility is defined as only the waste management part of a plant site. In other cases, the facility is defined as encompassing the entire plant site, including non-CWT operations.

3.5.1 Baseline Quantities of Waste Treated

Table 3-11 shows baseline quantities of waste treated by commercial status and by type of treatment in 1989. These data reflect facility questionnaire responses relating to the on-site waste treatment processes:

- treatment of, or treatment and recovery of, metals from metal-bearing waste,
- treatment of, or treatment and recovery of, oils from oil-bearing waste, and
- treatment of, or treatment and recovery of, organics from organic-bearing waste.

The largest number of facilities and the largest quantities are related to metals treatment and metals recovery. Six hundred eighty-nine million gallons of waste are accepted from off-site into metals treatment, and 631 million gallons are accepted from off-site into metals recovery operations. Fifty-six of 85 CWT facilities offer metals treatment or recovery.

Within the various commercial status categories, the highest mean quantities (average quantities per facility) are accepted by commercial facilities. Commercial facilities accept the largest mean quantities of waste managed in metals treatment (21.5 million gallons), organics treatment (5.7 million gallons), and oils recovery (5.2 million gallons). Commercial facilities also accept the largest mean quantities of off-site waste per facility into oils treatment (5.9 million gallons) and metals recovery (78.7 million gallons). This last quantity is highly influenced by one facility that accepts 534 million gallons of off-site waste into metals recovery. The next highest facility quantity is 50.5 million gallons. Obviously, that one very large quantity skews the distribution.

Non-commercial facilities accept waste from off-site for a variety of reasons, including a desire to use excess capacity and to know exactly how wastes generated by their company are managed. The total quantities and mean quantities accepted from off-site are generally fairly small for non-commercial facilities.

3.5.2 Baseline Costs of CWT Operations

Table 3-12 shows a frequency distribution for the cost of treating waste in 1989 dollars. The proposed effluent limitations guidelines and standards if adopted are expected to increase the cost of treating waste at most CWT facilities; this cost increase, in turn, will increase the cost of

TABLE 3-11. QUANTITY OF WASTE TREATED BY FACILITY CATEGORY

	Baseline Quantities of Waste Accepted, by Commercial Status (10^3 gal)					
	Wastewater from Off-site (Sums Hazardous and Non-hazardous)				Waste Accepted for Recovery	
	Total Off-site Wastewater	Total Metal-Bearing Wastewater	Total Oily Wastewater	Total Organics-Bearing Wastewater	Metals Recovery	Oils Recovery
All CWT Facilities (85)						
Total waste accepted	890,732	688,997	72,529	132,206	630,518	150,225
Mean quantity	12,202	11,113	3,817	5,085	70,058	5,180
Minimum quantity	1	1	4	4	91	21
Maximum quantity	162,290	137,509	16,875	24,781	533,598	20,804
Number of facilities	73	62	19	26	9	28
Facilities Accepting Off-site Waste on a Commercial Basis (70)						
Total waste accepted	777,099	614,164	52,844	102,033	629,793	142398
Mean quantity	13,171	11,811	4,351	4,858	78,724	5274
Minimum quantity	9	7	13	4	91	21
Maximum quantity	162,290	137,509	16,875	24,781	533,598	20,804
Number of facilities	59	52	14	21	8	27
Facilities Accepting Off-site Waste on a Non-commercial Basis (15)						
Total waste accepted	113,633	74,833	11,617	30,183	725	7,827
Mean quantity	8,117	7,483	2,323	6,037	725	3,913
Minimum quantity	1	1	4	27,587	725	627
Maximum quantity	77,600	68,650	6,750	15,923	725	7,200
Number of facilities	14	10	5	5	1	2

Source: U.S. EPA. Summary Information for the Centralized Waste Treatment Industry. Computer file OVERALL.WK3. December 1, 1993.

recovery processes because those processes generate wastewater and sludge that must also be treated. These baseline waste treatment cost figures form a basis for comparing the costs of compliance, described in Chapter 5. Baseline in-scope waste treatment costs range from $3,087 to $62.2 million per facility and total $227 million across all 85 CWT facilities. They average $2.5 million per facility over all CWT facilities, $2.6 million per facility for commercial

TABLE 3-12. BASELINE WASTE TREATMENT COST (10^6)[a]

Waste Treatment Cost (10^6 $1989)	Number of Facilities	Percentage
Less than 0.1	12	14.6
0.1 to 0.5	13	15.9
0.5 to 1	17	20.7
1 to 2	20	24.4
2 to 10	16	19.5
over 10	4	4.9
Total	82	100.0

[a]Number of facilities not providing data = 3

facilities, and $5.5 million per facility for non-commercial facilities. (Waste treatment costs for non-commercial facilities generally include costs of treating CWT and non-CWT wastes.)

As shown in Table 3-12, 12 of the 82 facilities reporting baseline waste treatment costs have costs less than $100,000. Forty-two facilities have costs less than $1 million. Twenty facilities report costs between $1 million and $2 million. Only four facilities report waste treatment costs exceeding $10 million.

3.5.3 Baseline Total Costs for CWT Facilities

Total costs at CWT facilities reflect greater variability than treatment costs for the CWT process because the total costs include costs for other non-CWT operations. Overall, costs total over $8 billion and range from $32,600 to almost $2.0 billion. Thus, overall, CWT costs represent only about 3 percent of total costs at affected CWT facilities. At commercial facilities, total costs range from $32,600 to $62.4 million and sum to $587 million. At non-commercial facilities, total costs range from $309 million to nearly $2.0 billion and sum to $5.7 billion.

Table 3-13 shows a frequency distribution of total costs at CWT facilities. Only 15 facilities report total costs less than $2 million, as opposed to 62 facilities reporting in-scope waste treatment costs less than $2 million. Twenty-nine facilities report total costs exceeding $10 million, including 13 with total costs exceeding $50 million. For many facilities, waste treatment costs represent a fairly large share of total costs. For others, especially those with large manufacturing operations on-site, the cost of CWT operations is only a very small share of their total costs.

TABLE 3-13. BASELINE TOTAL COSTS AT CWT FACILITIES[a]

Total Cost (10^6 $1989)	Number of Facilities	Percentage
Less than 2	15	18.3
2 to 5	20	24.4
5 to 10	18	22.0
10 to 50	16	19.5
over 50	13	15.8
Total	82	100.0

[a]Number of facilities not providing data = 3

3.5.4 Baseline Revenues for CWT Operations

Treatment revenues for commercial CWT facilities, as described above, were estimated by multiplying market price times quantity so that the market model and facility model are consistent with one another. If estimated treatment revenues exceeded reported treatment revenues, the amount of the discrepancy was subtracted from "other revenues" so that the total facility revenues remained as reported. Similarly, if estimated treatment revenues were less than reported treatment revenues, the amount of the discrepancy was added to "other revenues." Treatment revenues at non-commercial facilities, if any, were left as reported. Because CWT operations at non-commercial facilities are generally treated as cost centers, some non-commercial CWT facilities do not report any treatment revenues.

Treatment revenues at CWT facilities range from zero at some non-commercial facilities to $187 million and sum to $473 million. For commercial facilities, treatment revenues range from $6,300 to $187 million and sum to $361 million. At non-commercial facilities, reported treatment revenues range from zero to $20.2 million and sum to $31.3 million. Table 3-14 shows a frequency distribution for treatment revenues at CWT facilities.

3.5.5 Baseline Total Revenues for CWT Facilities

Like total costs, total revenues reflect all the operations at CWT facilities, including non-CWT operations. Thus, they reflect greater variability than do CWT revenues. At baseline, total revenues at CWT facilities range from zero at some non-commercial facilities to almost $2.1 billion and sum to nearly $9.1 billion. At commercial facilities, total revenues are smaller than at non-commercial facilities, because they reflect mainly CWT revenues while non-

TABLE 3-14. BASELINE TREATMENT REVENUES AT CWT FACILITIES[a]

Treatment Revenues (10^6 $1989)	Number of Facilities	Percentage
Less than 0.1	10	12.2
0.1 to 1	23	28.0
1 to 2	16	19.5
2 to 5	14	17.1
5 to 10	11	13.4
over 10	8	9.8
Total	82	100.0

[a]Number of facilities not providing data = 3

commercial facilities frequently have substantial revenues from non-CWT operations. At commercial facilities, total revenues range from $46,000 to $187 million and sum to $755 million. At non-commercial facilities, total revenues range from zero to $2.0 billion and sum to $6.5 billion. Table 3-15 shows a frequency distribution of baseline total revenues at CWT facilities.

3.5.6 Baseline Profitability of CWT Facilities

The profit measure used in this analysis is Earnings Before Taxes, or EBT. This measure equals operating profit minus interest and depreciation; that is, it is EBIT, Earnings Before Interest and Taxes, minus interest. Profitability is not a relevant measure for non-commercial facilities, which are assumed to be treated as cost centers by their companies. Cost centers are not expected to make a profit, any more than a centralized accounting or legal department is expected to make a profit. Thus, they are not included in the facility-level profitability assessment presented here. The Agency assumes that impacts associated with compliance costs for non-commercial facilities will be incurred at the company level. Thus, a company-level financial analysis is performed for them, including an examination of the impacts on company profits.

TABLE 3-15. BASELINE TOTAL REVENUES AT CWT FACILITIES[a]

Total Revenues (10^6 $1989)	Number of Facilities	Percentage
Less than 1	11	13.4
1 to 5	23	28.0
5 to 10	15	18.3
10 to 50	19	23.2
50 to 1,000	10	12.2
over 1,000	4	4.9
Total	82	100.0

[a]Number of facilities not providing data = 3

Baseline profits at commercial CWT facilities range from -$7.6 million to $310 million and average $7.5 million. Table 3-15 shows a frequency distribution of CWT facility profits measured by EBT.

As Table 3-16 shows, 22 of 70 facilities that offer at least a part of their CWT services on a commercial basis were unprofitable in 1989. Economic theory predicts that facilities expected to remain unprofitable will be closed by their owners. The Agency contacted many of the unprofitable facilities to determine their status in 1993.[8] Of 18 facilities contacted, all but two were still in operation. Two additional facilities stated that they expected they might have to close. Of the rest, nine had become profitable and five, though still unprofitable, expected to continue in operation. Of the five unprofitable but still operating facilities, four were doing better and expected eventually to become profitable. The remaining facility indicated that it was staying open because of ongoing cleanup operations that would make closure costs extremely high.

Several factors may explain why unprofitable CWT facilities remain open. CWT facility owners may decide to allow unprofitable RCRA-permitted facilities to remain open because the costs of closing them are so high. If the owner believes that the facility can be made profitable eventually, keeping it open is the best choice. In addition, some of the smaller companies owning CWT facilities have ownership structures that encourage the owners to receive compensation in the form of salaries as opposed to profits. This makes the CWT facility's costs appear higher and profits lower than they would under other ownership structures. As noted

TABLE 3-16. BASELINE EBT AT COMMERCIAL CWT FACILITIES

Baseline EBT (10^6 $1989)	Number of Facilities	Percentage
Less than 0	22	31.4
0 to 0.5	18	25.7
0.5 to 2.0	14	20.0
2 to 10	13	18.6
over 10	3	4.3
Total	70	100.0

above, 15 facilities that accept some waste from facilities owned by the same company are classified as commercial. Five such facilities were unprofitable in 1989. One possible explanation for these commercial facilities' remaining in operation when unprofitable may be that under current accounting practices, costs of waste treatment are attributed to the CWT facility, while revenues and profits associated with manufacturing the goods whose production generates the non-commercial off-site waste at those facilities are attributed to the manufacturing facilities. This makes CWT operations appear unprofitable or as hindering the company's profitability. The fact that they remained in operation may indicate that the owner companies recognize that these facilities are not as unprofitable to the company as current accounting practices make them appear. Total cost accounting would more clearly assign costs to the processes where they originate.

Facilities indicated that the late 1980s were a period of considerable upheaval in the waste management business, as environmental laws evolved and pollution prevention became more widespread. Facility owners had refrained from closing unprofitable facilities, instead allowing them time to adjust to market changes and become profitable again. Therefore, the Agency decided not to model the baseline as if the unprofitable facilities would close. Rather, EPA retained all 85 of the CWT facilities identified in 1989. Even the facilities that have in fact closed since the questionnaire were included in the analysis, under the assumption that capacity at other similar facilities had increased to treat the waste that those facilities had treated.

3.6 BASELINE CONDITIONS FOR NON-COMMERCIAL FACILITIES

Fourteen facilities indicated that their CWT operations accepted off-site waste only from facilities owned by the same company as their CWT facility. One additional facility that accepts

some waste from off-site commercially is being considered non-commercial for this report, because it is owned by the Federal government.

The companies owning non-commercial CWT facilities represent a variety of industrial sectors, including aircraft, defense technologies, agricultural chemicals, pharmaceuticals, recreation, oil refining, construction, and fabricated metals. The non-commercial CWT facilities include one doing metals recovery, nine doing metals treatment, four each doing oil treatment and organics treatment, and two doing oils recovery. They treat 72 million gallons of metal-bearing waste, 9 million gallons of oily waste, and 30 million gallons of organic waste. They accept 725,000 gallons of waste into metals recovery and nearly 8 million gallons of waste into oils recovery. Overall, their facilities range widely in the quantity of waste accepted from off-site: some facilities accept less than 10,000 gallons per year, and one very large facility accounts for 69 of the 72 million gallons of metal-bearing waste accepted from off-site. Many of the facilities also treat waste generated on-site.

Non-commercial CWT operations typically are treated as a cost center for the company and may or may not receive explicit revenues or cross-charges in return for their services. Most frequently, the facilities reported that the facility performed its CWT services "at cost" so that revenues from treatment exactly equaled cost. Other facilities reported receiving no revenue for their services. Total cost accounting, which attributes to a production process all the costs associated with that process, would trace the waste treatment costs back to the production processes where the waste was generated. This approach would encourage pollution prevention by providing accurate cost signals to managers. Most companies, however, have made very little progress in adapting their accounting systems to this approach.

Because non-commercial CWT facilities are generally regarded by their owner companies as providing a service to the rest of the company, the analysis does not assess impacts at the facility level for them. Rather, the analysis assumes that added costs associated with complying with the effluent limitations guidelines and standards will be borne by the company as a whole. The impacts on non-commercial facilities are therefore assessed at the company level.

3.7 BASELINE MARKET CONDITIONS

Questionnaire data and information gathered in follow-up conversations with facilities and during site visits at several facilities were used to characterize the markets for CWT services.

3.7.1 Defining Regional Markets

For modeling the impacts of the regulation on markets for CWT services, this study divided the contiguous United States into six regional CWT markets. In their questionnaire

responses, the facilities indicated that, in general, their customers are located within their own state or in a few adjacent states. Of 70 commercial facilities, 58 indicate that their customers are within their state and a few adjacent states. Even for the 12 facilities stating that their customers are located nationwide, some of their customers may in fact be local. This pattern is consistent with predictions of economic geography or "location theory," which state that heavy, bulky, or fragile materials or materials otherwise difficult to transport will be traded in localized markets.[9] Wastewater and concentrated oily or metal-bearing wastes are extremely heavy and bulky. Generators therefore want to transport waste as short a distance as possible for treatment and are likely to choose a local CWT facility rather than one located a long distance away.

As discussed previously, CWT facilities are widely distributed across the country; for modeling purposes, the contiguous 48 states were divided into six regions:

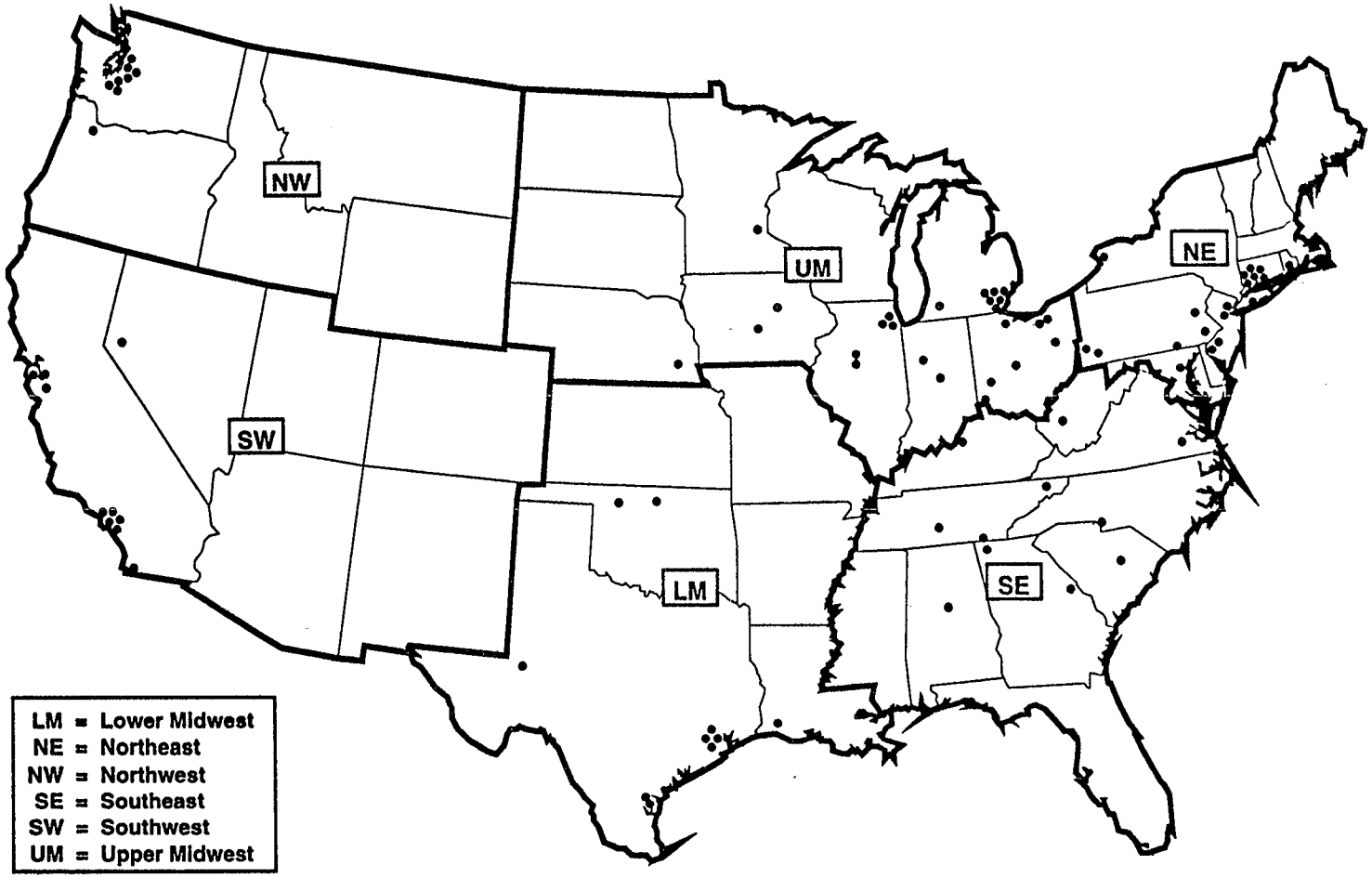
- Northeast: CT, DE, MA, MD, ME, NH, NJ, NY, PA, RI, VT
- Southeast: AL, FL, GA, KY, MS, NC, SC, TN, VA, WV
- Upper Midwest: IA, IL, IN, MN, MI, NB, ND, OH, SD, WI
- Lower Midwest: AR, KS, LA, MS, OK, TX
- Northwest: WA, OR, ID, MT, WY
- Southwest: AZ, CA, CO, NM, NV, UT

The map in Figure 3-2, which outlines the regions, shows varying numbers of affected CWT facilities within each region. Each of these facilities performs one or more CWT services.

This definition of regional markets is a simplification of actual markets. Obviously, facilities located along the borders of the "regions" designated in this study may compete with facilities in adjoining regions in addition to competing with facilities in their own regions. We modeled the regions as if they were independent; however, we recognize that the presence of other facilities offering the same CWT services in nearby regions does affect the structure of the region's markets for CWT services.

In reality, there are exceptions to the regional pattern: highly specialized types of waste treatment services such as precious metals recovery are offered by only a few facilities nationwide. Markets for these services may be national. In general, however, markets for CWT services are regional.

Figure 3-2. Regional Markets Defined for this Analysis



3.7.2 Defining Markets for Specific CWT Services

In the market model, facilities are identified as offering one or more of five broad categories of CWT services:

- metals recovery,
- oils recovery,
- treatment of metal-bearing waste,
- treatment of oily waste, and
- treatment of organic waste.

The first two types of CWT services may result in the production of a salable product; they also result in the generation of wastewater. Under the general category of wastewater treatment, facilities may treat any or all of the following: metal-bearing wastewater, oily wastewater, or organics-bearing wastewater. These three types of wastewater treatment require different treatment processes and have different prices. Thus, these services are traded in separate markets.

As noted above, within the broad types of treatment, there exists considerable variation depending on the specific characteristics of the wastes being treated. Wastes with differing characteristics may require more treatment chemicals, for example, or more steps in the treatment process, although the basic overall type of treatment is the same. To reflect the complexity of these markets, each overall type of treatment or recovery may be broken into as many as three submarkets, based on the per-gallon cost of treatment. This is based on the assumption that different per-gallon costs of treatment reflect the different treatments required by differing waste characteristics. Thus, facilities with similar per-gallon treatment costs are assumed to be treating similar wastes. The modeling approach assumes that each facility treats waste of a single type within each broad treatment category with a uniform per-gallon cost of treatment. This modeling approach is a simplification; in fact, different batches of wastes treated at a single facility vary in type and therefore in cost of treatment. As modeled, each facility offers at most only a single cost-level of each broad treatment category. Data did not permit further detail in the delineation of the types of CWT services offered and their associated costs at each facility.

As the markets are defined, the number of facilities competing in each market varies considerably. Table 3-17 presents the number of facilities offering each type of CWT service by region.

TABLE 3-17. NUMBER OF FACILITIES OFFERING CWT SERVICE BY REGION

Market/Process	Number of Facilities
Northeast	19
High-Cost Metals Recovery	1
Low-Cost Metals Recovery	1
High-Cost Oils Recovery	3
Low-Cost Oils Recovery	2
High-Cost Metals Treatment	2
Low-Cost Metals Treatment	12
Oils Treatment	2
Organics Treatment	7
Northwest	6
High-Cost Oils Recovery	1
Low-Cost Oils Recovery	3
Low-Cost Metals Treatment	5
Oils Treatment	2
Organics Treatment	2
Southeast	8
Metals Recovery	1
High-Cost Oils Recovery	1
Med-Cost Oils Recovery	3
Low-Cost Oils Recovery	1
Metals Treatment	3
Oils Treatment	3
Organics Treatment	3
Southwest	10
High-Cost Metals Recovery	1
Low-Cost Metals Recovery	2
Oils Recovery	1
High-Cost Metals Treatment	5

(continued)

TABLE 3-17. NUMBER OF FACILITIES OFFERING CWT SERVICE BY REGION (CONTINUED)

Market/Process	Number of Facilities
Southwest (continued)	10
Low-Cost Metals Treatment	4
Oils Treatment	3
Organics Treatment	1
Lower Midwest	9
High-Cost Metals Recovery	1
High-Cost Oils Recovery	1
High Cost Metals Treatment	2
Low Cost Metals Treatment	6
Oils Treatment	1
High-Cost Organics Treatment	1
Low-Cost Organics Treatment	5
Upper Midwest	21
High-Cost Metals Recovery	2
Low-Cost Oils Recovery	5
Higher-Cost Oils Recovery	5
Highest-Cost Oils Recovery	2
High-Cost Metals Treatment	1
Med-Cost Metals Treatment	2
Low-Cost Metals Treatment	12
Oils Treatment	5
Organics Treatment	4

3.7.3 Market Structure

Based on the data presented in Table 3-17, the markets for CWT services are not perfectly competitive. Competitive markets are characterized by large numbers of suppliers, none of which are able to exert substantial market power. CWT markets as this study defines them have few participants. The participants in those markets will probably be able to exert

considerable influence on the outcomes of market negotiations. That is, they have some degree of monopoly power in those markets. Again, contacts with facilities during site visits and follow-up phone calls to verify questionnaire information indicated that facilities are generally aware of their competitors and make their business decisions after considering their competitors' behavior and likely responses. This type of market behavior is consistent with oligopoly, a market comprising a fairly small number of competitors in which the competitors are aware of and consider their rivals' behavior in forming their decisions related to price and quantity. For these reasons we modeled the regional markets for CWT services as oligopolistic. Chapter 5 and Appendix E provide more detailed descriptions of the modeling methodology. In some markets in some regions, only one facility offers the service, so these were treated as regional monopolies.

3.7.4 Substitutes for CWT Services

The existence of substitutes for CWT services influences the responsiveness of the demand for CWT services to changes in their price. Non-CWT facilities also produce goods and services that may be substitutes for the goods and services produced by CWT facilities. For example, waste-generating facilities may decide to construct treatment units on-site; thus on-site waste treatment would be substituted for centralized waste treatment. Underground injection wells, and other types of waste management that are not regulated under these effluent limitations guidelines and standards, may be substituted for regulated types of centralized waste treatment. In most of these cases, the non-CWT goods and services are not perfect substitutes for the goods and services produced by CWT facilities. Nevertheless, when the cost of CWT-produced commodities increases, some consumers of these goods and services may choose to substitute the other goods and services, which are now relatively cheaper.

The increased cost of waste treatment may also induce some demanders of CWT services to choose another type of substitution. They may modify their processes, essentially substituting additional capital equipment, materials, and labor for waste treatment. In other words, some generators may employ pollution prevention to reduce their demand for CWT services. This type of substitution would result in smaller quantities of waste being generated per unit of the primary product produced.

3.7.5 Baseline Market Prices and Quantities of CWT Services

Table 3-18 shows the baseline market prices and quantities of CWT services as defined by our model. As described above, facilities offering CWT services within a region were

TABLE 3-18. BASELINE MARKET PRICES AND QUANTITIES OF CWT SERVICES

Market/Process	Market Price ($1989/gallon)	Market Quantity (10^3 gallons)
Northeast		
High-Cost Metals Recovery	$89.93	14
Low-Cost Metals Recovery	$3.03	61,698
High-Cost Oils Recovery	$0.65	9,771
Low-Cost Oils Recovery	$0.16	14,615
High-Cost Metals Treatment	$1.30	1,477
Low-Cost Metals Treatment	$0.30	226,573
Oils Treatment	$0.27	18,254
Organics Treatment	$0.37	53,625
Northwest		
High-Cost Oils Recovery	$17.53	500
Low-Cost Oils Recovery	$0.24	13,451
Metals Treatment	$0.89	17,443
Oils Treatment	$0.15	190
Organics Treatment	$0.15	627
Southeast		
Metals Recovery	$6.11	2,442
High-Cost Oils Recovery	$0.14	7,058
Low-Cost Oils Recovery	$0.05	330
Metals Treatment	$0.23	79,106
Oils Treatment	$0.23	11,580
Organics Treatment	$0.21	15,059
Southwest		
High-Cost Metals Recovery	$2.70	605
Low-Cost Metals Recovery	$0.25	7,279

(continued)

TABLE 3-18. BASELINE MARKET PRICES AND QUANTITIES OF CWT SERVICES (CONTINUED)

Market/Process	Market Price ($1989/gallon)	Market Quantity (10^3 gallons)
Southwest (continued)		
Oils Recovery	$0.46	5,705
High-Cost Metals Treatment	$1.23	2,887
Low-Cost Metals Treatment	$0.08	43,026
Oils Treatment	$0.57	22,467
Organics Treatment	$1.70	837
Lower Midwest		
Metals Recovery	$0.87	773
Oils Recovery	$0.07	8,074
High Cost Metals Treatment	$1.09	1,605
Low Cost Metals Treatment	$0.09	118,248
Oils Treatment	$0.14	2,275
High-Cost Organics Treatment	$1.87	124
Low-Cost Organics Treatment	$0.16	13,124
Upper Midwest		
Metals Recovery	$12.32	94
High-Cost Oils Recovery	$0.83	674
Medium-Cost Oils Recovery	$0.28	35,006
Low-Cost Oils Recovery	$0.11	47,213
High-Cost Metals Treatment	$4.70	2,749
Medium-Cost Metals Treatment	$0.68	2,509
Low-Cost Metals Treatment	$0.21	131,585
Oils Treatment	$0.15	7,638
Organics Treatment	$0.21	674

grouped into markets according to the type of service offered and the cost of treatment. For each market, a baseline price must be determined. In practice, some facilities price each batch treated based on laboratory tests on the waste in the batch, but the model abstracts from this practice and assumes that all batches treated by a facility are similar and would have a single price. Prices for CWT services vary between being just equal to the highest per-gallon cost experienced by facilities in a market and being equal to approximately three times the highest per-gallon cost in the market. Where the price falls in that range depends on the demand elasticity assumed for the market and on information from the questionnaire. The selected prices were verified by contacting several facilities to see if they were reasonable.[10] The baseline market quantities are the summed facility quantities as reported in the technical part of the questionnaire.

3.8 COMPANY FINANCIAL PROFILE

New effluent limitations guidelines and standards for CWT facilities will potentially affect the companies that own the regulated facilities. The CWT facilities described in Section 3.4 are the location for physical changes in treatment processes. They are the sites with plant buildings and equipment where inputs (materials, energy, and labor) are combined to produce outputs (waste treatment services, recovered metals, organics or oils, residuals). Companies that own the CWT facilities are legal business entities that have the capacity to conduct business transactions and make business decisions that affect the facility.

The population of potentially affected companies is described using three characteristics:

- company size expressed in annual receipts,
- legal form of ownership (sole proprietorship, partnership, corporation), and
- degree of vertical and/or horizontal integration.

Each characteristic influences the effect of any regulatory action on companies and the method for conducting the company-level analysis.

Potentially affected companies include entities owning facilities that accept waste from off-site for treatment in CWT processes and that generate wastewater in their waste treatment process. These facilities are classified as indirect, direct, or zero dischargers. In the 1991 Waste Treatment Industry Questionnaire, EPA requested three years of financial data regarding the immediate corporate parents of each of the 85 facilities discussed in Section 3.4. Frequently, however, the immediate owners of CWT facilities are in turn subsidiaries of larger companies that generate much of the waste that they receive from off-site. The Agency has determined that

the appropriate context for assessing the potential impact of the regulation is at the highest level of corporate ownership.

Only 58 companies are at the ultimate level of corporate ownership; they own the 84 private-sector CWT facilities. The eighty-fifth facility discussed in Section 3.2 is a government-owned facility administered by the U.S. Navy. The baseline financial profile presented in this section is based on data collected for 57 of the 58 companies identified as owners of 82 of the 84 private-sector CWT facilities. Accurate facility-level economic data are not available for one facility that has changed hands since the time of the questionnaire. The facility was purchased by a company owning three other CWT facilities. The baseline profile of CWT activities undertaken by this company includes operations performed at its other three CWT facilities but excludes activities undertaken by the facility for which data are not available. Another potentially affected company was excluded entirely from this analysis because the only CWT facility that it owns did not respond to the financial section of the CWT questionnaire, and no data on the company are publicly available. Discussion of the government-owned facility is also omitted from this section.

3.8.1 Size Distribution

The first characteristic by which companies are described is company size expressed in company sales revenues or company annual receipts. Company size is likely to be a factor in the distribution of the regulatory action's financial impacts, and grouping the companies by size facilitates the analysis of small business impacts. Furthermore, reporting the distribution of impacts by size category helps ensure that sensitive, proprietary data are not revealed for an individual company.

Potentially affected companies range in size from approximately $772,000 to over $47 billion in annual receipts. Table 3-19 shows the size distribution of potentially affected companies by annual receipts.

Companies in the largest receipts category account for over 99 percent of total receipts for potentially affected companies. Figure 3-3 shows the size distribution of potentially affected companies in percentage terms. The 48 smallest companies account for less than 10 percent of total annual receipts. Conversely, the nine largest potentially affected companies account for more than 90 percent of total annual receipts.

Table 3-20 shows the average size of CWT facilities (measured as total annual receipts) owned by companies in each size category, the average number of CWT facilities owned by

TABLE 3-19. SIZE DISTRIBUTION OF POTENTIALLY AFFECTED COMPANIES

1989 Annual Receipts Category (10^6 1989)	Number of Companies	Total Annual Receipts (10^6 1989)	Average Receipts per Company (10^6 1989)[a]
≤ 6	13	37.0	2.9
6 – 30	14	198.6	14.2
30 - 340	9	1,209.3	134.4
Over 340	21	177,076.7	8,432.3
Total	57	178,521.6	3,132.0

[a]Computed by dividing total annual receipts by the number of companies.

Sources: U.S. EPA. 1991 Waste Treatment Industry Questionnaire.
Moody's Investor Service, Inc. *Moody's Industrial Manual.* 1992. New York, Moody's Investor Service, Inc.
Company Annual Reports.
Business America Online. Omaha, NE, American Business Information. 1993-1994.

Figure 3-3. 1989 Size Distribution of Potentially Affected Companies

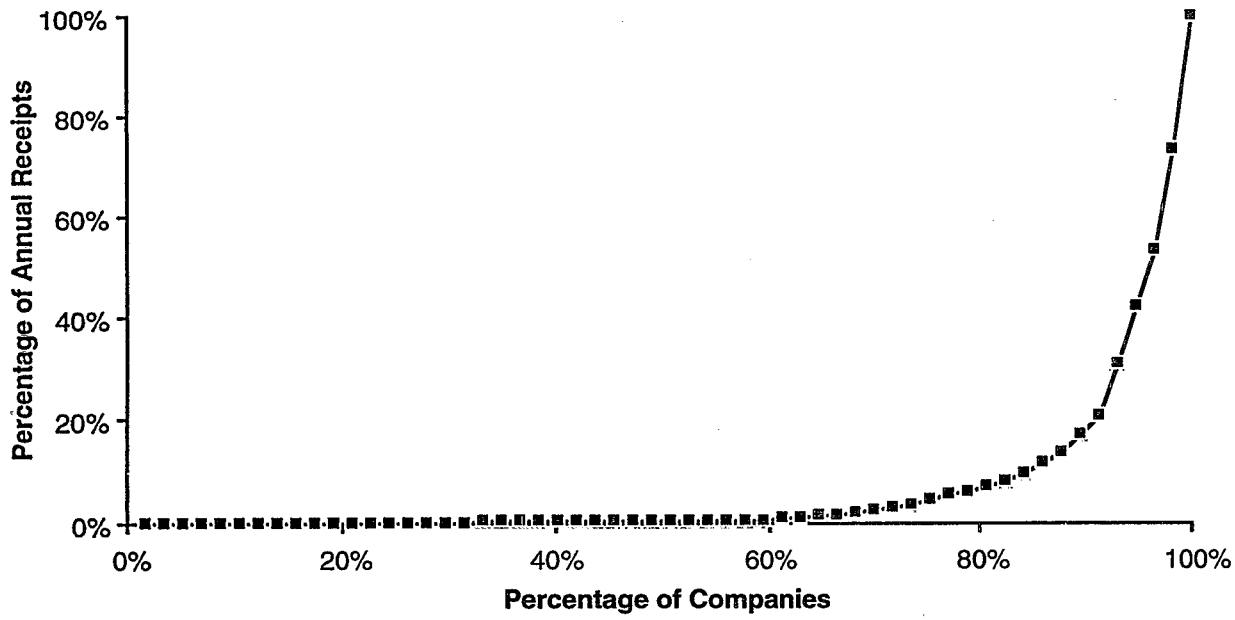


TABLE 3-20. AVERAGE SIZE OF CWT FACILITIES BY COMPANY SIZE CATEGORY

Company Size in 1989 Annual Receipts (10^6 1989)	Average Size of CWT Facilities in 1989 (10^6 1989)	Average Number of CWT Facilities Owned in 1989	Average CWT Facility Receipts as Percentage of Average Company Receipts in 1989 (%)
≤6	2.6	1.00	91.58%
6 – 30	10.5	1.21	74.32%
30 – 340	22.7	2.00	16.90%
Over 340	255.6	1.62	3.03%

Sources: U.S. EPA. 1991 Waste Treatment Industry Questionnaire.
Moody's Investor Service, Inc. *Moody's Industrial Manual.* 1992. New York, Moody's Investor Service, Inc.
Company Annual Reports.
Business America Online. Omaha, NE, American Business Information. 1993-1994.

companies within each size category, and the ratio of average CWT facility sales to average company sales for each size category. Larger companies generally own more and larger CWT facilities than smaller companies, although companies in the third size category, with annual receipts between $30 million and $340 million, own two CWT facilities on average, as opposed to 1.62, the average number of CWT facilities owned by companies grossing more than $340 million annually. CWT facility receipts as a share of total company receipts decrease geometrically from an average of over 91 percent for the smallest companies to just under 3 percent collectively for companies grossing more than $340 million annually.

3.8.2 Legal Form of Ownership

The legal form of ownership affects the cost of capital, availability of capital, and effective tax rate faced by the company and is one of three basic types: sole proprietorship, partnership, and corporation. Corporations may be further subdivided between those that have publicly-traded stock and those that do not. The latter may include Subchapter S corporations, closely-held corporations, and wholly-owned subsidiaries. (Corporations that meet certain size restrictions contained in the Internal Revenue Code may be set up as Subchapter S corporations. S corporations are taxed as proprietorships or partnerships but receive many of the benefits of the corporate form of organization [e.g., limited liability]). Many of the CWT facilities potentially affected by the proposed effluent guidelines and standards are owned by companies that are

wholly-owned subsidiaries of other larger companies. To best assess the relative impact of the proposed regulation on companies that own CWT facilities, the Agency decided to ignore intermediate levels of ownership within potentially affected corporate families and to focus instead on the economic impacts on the ultimate corporate parent. For this reason, if a company that owns a CWT facility is a wholly-owned subsidiary of a publicly-traded company, its legal form of ownership is considered in this analysis to be that of a publicly-traded company, even though common stock for its immediate corporate parent is not available to the public. Figure 3-4 shows the distribution of ultimate parent companies by legal form of ownership, and Table 3-21 shows how this distribution varies by company size category.

Approximately 21 percent of the potentially affected companies in this analysis are privately-owned companies. This ownership category includes both sole proprietorships and partnerships. A sole proprietorship consists of one individual who contributes all of the equity capital, takes all of the risks, makes the decisions, and takes the profits or absorbs the losses. Legally the individual and the proprietorship are the same entity. A partnership is an association of two or more persons to operate a business.

Partnerships and proprietorships are similar in several ways. First, all tax liabilities are passed through to the individual who owns the company and are reflected on individual tax returns. Second, the individual owner is fully liable for all debts and obligations of the company.[11] When a lender lends money to a proprietorship or partnership, the owner's signature obligates him or her personally and all of his/her assets. A lender's assessment of the likelihood of repayment based on the company and personal financial status of the borrower is considered legal and sound lending practice because they are legally one-and-the-same. The inseparability of the company and the individual complicates the assessment of credit availability and terms. Credit might be available to a financially distressed "company" if the financial status of the individual is strong enough to compensate. Alternatively, credit might be unavailable to a financially healthy "company" if the financial status of the individual is sufficiently weak.

Corporations comprise approximately 79 percent of the potentially affected companies in this analysis, and slightly more than half of the corporations have publicly-traded stock. Unlike a partnership or proprietorship, a corporation is a legal entity separate and apart from its owners or founders. Owners receive financial gains from profits and bear financial losses in proportion to their investment in the corporation. Analysis of credit availability to a corporation must recognize at least two features of corporations. First, they have the legal ability to raise needed

Figure 3-4. Share of Companies by Form of Ownership

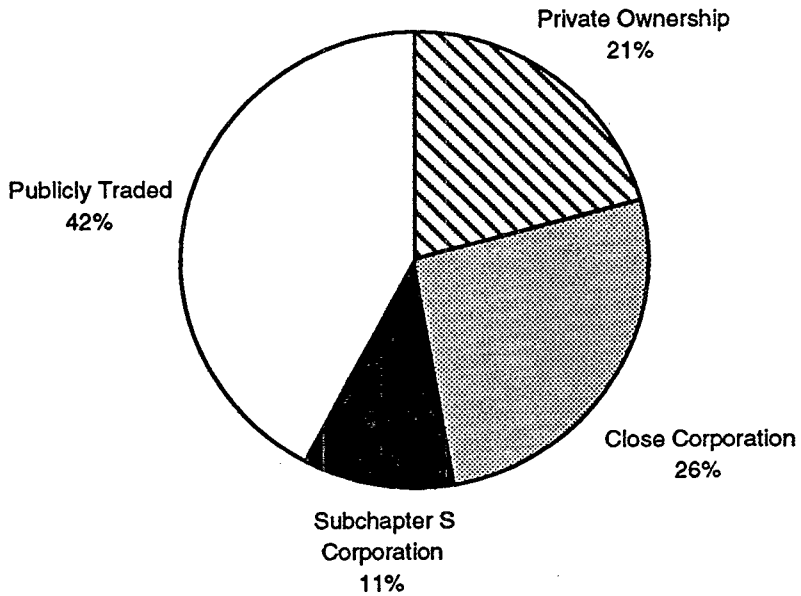


TABLE 3-21. DISTRIBUTION OF OWNERSHIP TYPE BY COMPANY SIZE CATEGORY

Ownership Type	Company Size in 1989 Annual Receipts (10^6)				Total
	≤6	6 – 30	30 – 340	Over 340	
Publicly-Traded	0	2	3	19	24
Proprietorship and Partnership	7	4	1	0	12
Closely-Held Corporation	3	6	5	1	15
Subchapter S Corporation	3	2	0	1	6

Sources: U.S. EPA. 1991 Waste Treatment Industry Questionnaire.
Dun and Bradstreet. *Who Owns Whom?* New York, Dun and Bradstreet. 1990.
Dun & Bradstreet. "America's Corporate Families and International Affiliates." 1993.

funds by issuing new stock. Second, institutional lenders (e.g., banks) to corporations generally assess credit worthiness solely on the basis of the financial health of the corporation—not its owners.

Another difference between corporations and partnerships or proprietorships is the effective tax rate faced by each. Corporations (except Subchapter S corporations) are subject to a

tax rate schedule that is different from the schedule faced by individuals. Furthermore, corporate profits distributed to owners in the form of dividends are paid out of after-tax profits. Owners must then pay personal income taxes on the dividends. Consequently, corporate profits distributed as dividends are taxed twice. For this reason, owners of closely held corporations that are involved in the daily operations of the company may choose to receive higher salaries in lieu of receiving dividends. The incentive to distribute profits as salaries rather than dividends may result in lower reported net income for the company.

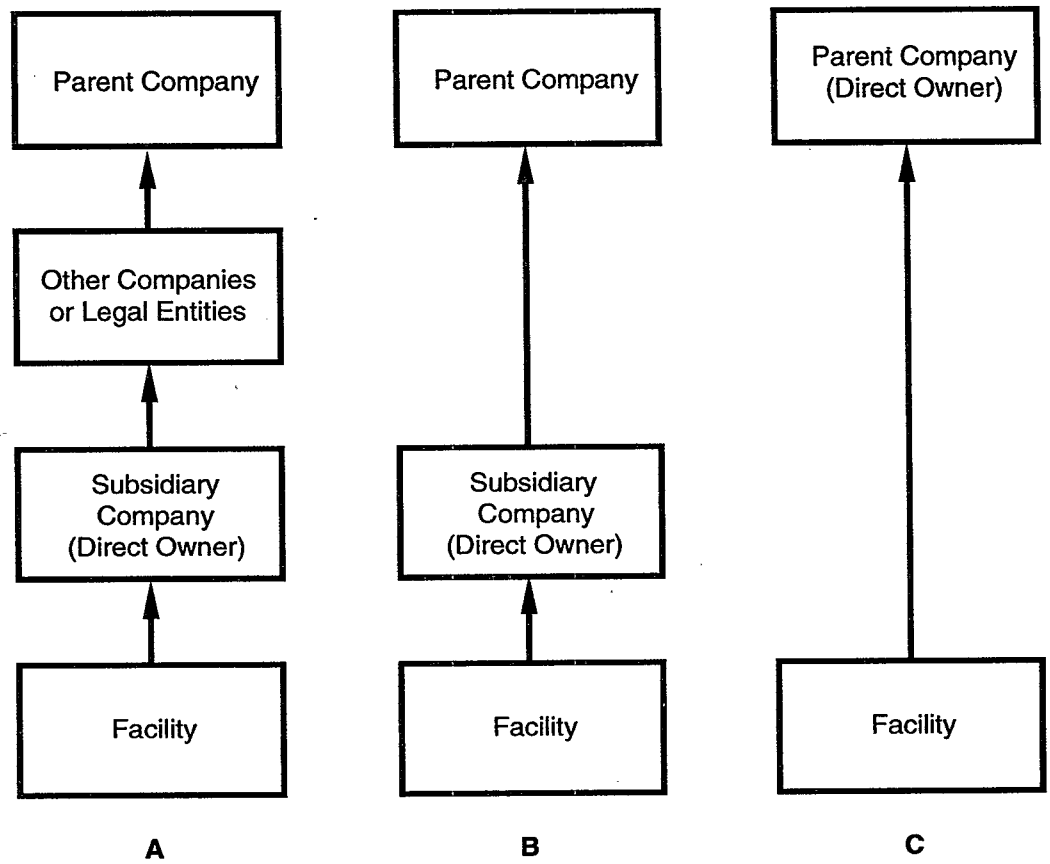
Companies evaluated for this analysis include those owned directly by the shareholders/owners and those owned by a "parent" company. As seen in Figure 3-5, the chain of ownership may be as simple as one facility owned by one company or as complex as multiple facilities owned by subsidiary companies. Where data are available, this analysis focuses on the financial well-being of the ultimate corporate parents of potentially affected CWT facilities. It is the view of the Agency that both the financial health of CWT facility owners at baseline and the relative ability of individual companies to incur the costs of complying with the proposed guidelines are best assessed and compared at the highest level of ownership.

3.8.3 Vertical and/or Horizontal Integration

Vertical integration is a potentially important dimension in company-level impact analysis because the regulation could affect a vertically integrated company on several levels. For example, the regulation may affect companies for whom waste treatment is not the company's primary focus but rather is an input into the company's other production processes such as chemical manufacturing. A regulation that increases the cost of waste treatment for vertically integrated companies will also affect the cost of producing the primary products. Table 3-22 shows the range of industries, by SIC code, represented by companies that own CWT facilities. There is no "typical" corporate family structure of CWT facility owners. Fifteen of the 57 potentially affected companies are single-facility companies with no other business than the waste management activities offered at the regulated CWT facility. An additional 30 potentially affected companies only own a single CWT facility but have at least one other line of business. Another 12 affected companies own two to four CWT facilities and in some cases have other lines of business than waste management.

These larger companies with multiple CWT facilities may well be the wave of the future, at least for companies involved in commercial CWT operations. Growth has been very slow in demand for waste treatment services since 1989, which has caused increased competition among companies involved in waste treatment. Many of the smaller companies offering commercial

Figure 3-5. Chain of Ownership



waste management services may be swept up in the general down-sizing and corporate consolidation that beset the waste management industry during the 1980s. Well-managed companies with better than average liquidity and strong balance sheets have been eager to purchase companies with valuable control equipment or desirable market positions.[12] The Agency expects this trend to continue, because many of the market conditions that gave rise to it are projected to continue.

Horizontal integration is also a potentially important dimension in company-level impact analysis for either or both of two reasons:

- First, a diversified company could be indirectly as well as directly affected by the regulation. For example, if a company is diversified in manufacturing pollution control equipment, the regulation could indirectly and favorably affect it.
- Second, a diversified company may own facilities in unaffected industries. This type of diversification would help to mitigate the financial impacts of the regulation.

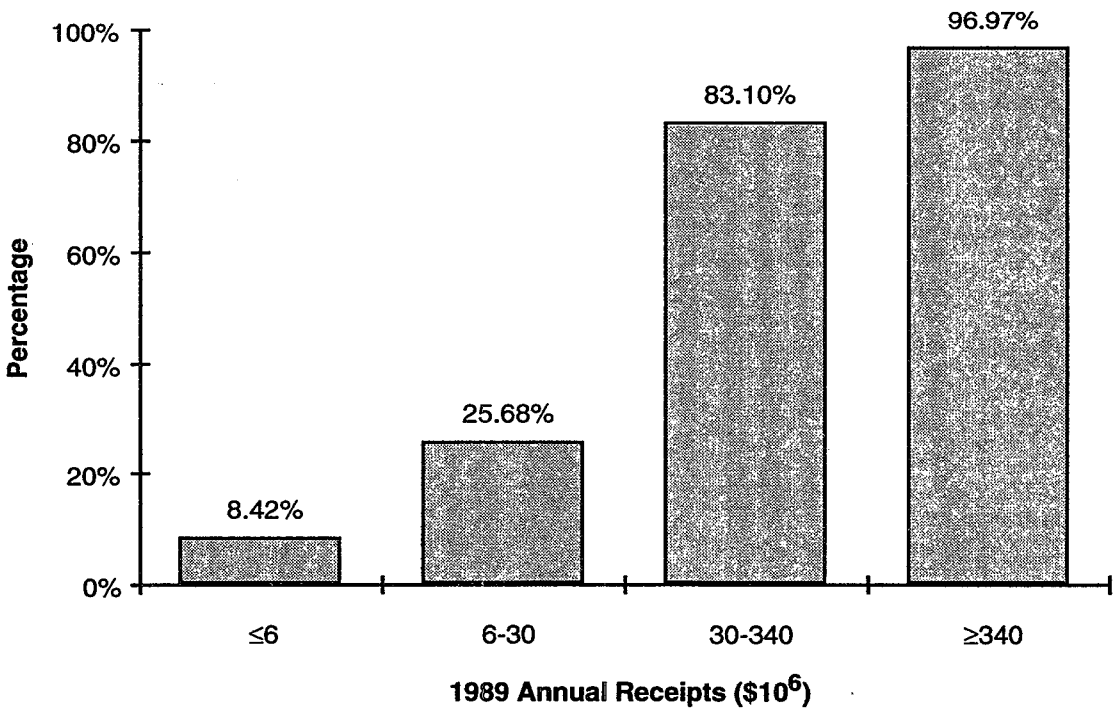
TABLE 3-22. PRIMARY SIC CODES FOR COMPANIES THAT OWN CWT FACILITIES

SIC Code	Description of the Industry
2819	Industrial Inorganic Chemicals, NEC
2834	Pharmaceutical Preparations
2869	Industrial Organic Chemicals, NEC
2879	Pesticides and Agricultural Chemicals, NEC
2911	Petroleum Refining
2992	Lubricating Oils and Greases
3312	Steel Works, Blast Furnaces (Including Coke Ovens), and Rolling Mills
3339	Primary Nonferrous Metals
3351	Copper Rolling and Drawing
3523	Farm Machinery and Equipment
3679	Electronic Components, NEC
3724	Aircraft Engines and Engine Parts
4011	Railroads, Line-Haul Operating
4226	Special Warehousing and Storage, NEC
4911	Electric Services
4953	Refuse Systems
5093	Scrap and Waste Materials
5169	Chemicals and Allied Products, NEC
5171	Petroleum Bulk Stations and Terminals
8999	Services, NEC

Sources: U.S. EPA. 1991 Waste Treatment Industry Questionnaire.
Standard Industrial Classification Manual, 1987.

Figure 3-6 shows the share of total receipts from business activities other than waste treatment for companies in each receipt size category. Companies in the two largest size categories receive a vast majority of their revenues from activities other than waste treatment. Conversely, companies in the two smallest size categories receive the majority of their revenues from waste treatment. Of the 57 potentially affected companies included in the company-level analysis, only 13 offer their services on a non-commercial basis. All but two of these companies are in the largest size category. There is also one company owning a non-commercial CWT facility in both the second and the third largest size categories. Of the 13 companies owning a non-commercial CWT facility, 11 own only one CWT facility. The CWT facility owned by each of these companies serves the purpose of treating wastes generated at other facilities owned by the same corporate parent in the process of manufacturing the goods and services that are their primary lines of business. The other two companies owning non-commercially operating facilities each own one commercial CWT facility and one non-commercial CWT facility. These companies use one of their CWT facilities to treat the wastes generated at other facilities that they own, but they also own a CWT facility that operates as a profit center for the company by accepting wastes for treatment on a commercial basis from off-site waste generators that have no affiliation with the parent company.

Figure 3-6. Share of Total Receipts Represented by Nonwaste Treatment



Note: Computed based on direct owner company data.

Source: EPA 1991 Waste Treatment Industry Questionnaire Data.

3.9 REFERENCES

1. Riley, G.J., J.L. Warren, and R.D. Baker. *Assessment of Changes in Reported TRI Releases and Transfers Between 1989 and 1990.* Research Triangle Park, NC, Research Triangle Institute. May 1993. 38 pp.

2. Motorola. No-Clean Solder Process. Distributed at the U.S. Department of Energy Conference on Industrial Waste Reduction Program Review Conference, Santa Fe, NM, May 17-20, 1993.

3. Dorfman, M.H., R. Muir, and C. G. Miller. *Environmental Dividends: Cutting More Chemical Wastes.* New York, INFORM, Inc. 1992. 263 pp.

4. Bailey, J. (1993, April 30). "Environment: Managing Waste." *The Wall Street Journal.*

5. Hanke, Jon. "Hazwaste Landfill Operators Face Difficult Times." World Wastes. September 1994, pp.10-11.

6. Lorenz, William T. and Co., 1993 Update—Hazardous Waste Control Industry Outlook. 1993.

7. U.S. Department of Commerce. *U.S. Industrial Outlook 1994.* January, 1994.

8. RTI. Confidential memorandum from Sandra Curtis-Powell to U.S. Environmental Protection Agency summarizing telephone communications. February 3, 1993.

9. Hoover, Edgar M. 1975. *An Introduction to Regional Economics*, 2d. Ed. New York, Alfred A Knopf, Inc. pp. 49-51.

10. Confidential written communications with selected CWT facilities. October 1993.

11. Behrens, Robert H. 1985. *Commercial Loan Officer's Handbook.* Boston, Banker's Publishing company.

12. Lorenz, William T. and Co., 1993 Update—Hazardous Waste Control Industry Outlook. 1993.

CHAPTER 4
DESCRIPTIONS AND COSTS OF THE CWT CONTROL OPTIONS

EPA is proposing effluent limitations guidelines and standards to limit the discharge of pollutants into navigable waters of the United States and into POTWs by new and existing facilities that receive industrial waste from off-site for treatment or recovery. This chapter describes the control options examined by the Agency for each subcategory of the CWT industry (metals treatment or recovery, oils treatment or recovery, and organics treatment or recovery) and describes the two combined regulatory options the Agency is proposing. In estimating the costs of complying with the proposed control options, the Agency made the conservative assumption that each facility treating wastes in a subcategory would require the full suite of the technology on which the proposed limits are based, unless they already had these in place. In fact, the facilities may select other means of compliance that prove to be less costly for them.

The Agency is proposing effluent limitations guidelines and standards for direct dischargers based on the following technologies: BPT, BCT, and BAT. NSPS are based on "best demonstrated technology." The Agency is also establishing pretreatment standards for new (PSNS) and existing (PSES) indirect dischargers.

4.1 CONTROL OPTIONS CONSIDERED FOR EACH SUBCATEGORY OF THE CWT INDUSTRY

The Agency developed several control options for each subcategory of the CWT industry. These control options were evaluated, and recommended controls for BPT limitations were selected. The proposed BAT controls are based on the technologies proposed for BPT. The Agency is proposing to set NSPS equivalent to the proposed BPT effluent limitations. The Agency is proposing to set PSES equivalent to the proposed BAT effluent limitations. The proposed PSNS are set equivalent to proposed NSPS effluent limitations. See the technical development document[1] for more information. This section describes the control options examined for each subcategory.

4.1.1 Subcategory A: Metals Subcategory

The Agency examined the following three control options to reduce the discharge of pollutants from the Metals Subcategory of the CWT industry:

- *Option 1: Chemical Precipitation, Solid-Liquid Separation, and Sludge Dewatering.* Under Option 1, BPT limitations would be based upon chemical precipitation with a lime/caustic solution followed by some form of separation and sludge dewatering to control the discharge of pollutants in wastewater. The data reviewed for this option showed that settling/clarification followed by pressure filtration of sludge yields

lime/caustic solution followed by some form of separation and sludge dewatering to control the discharge of pollutants in wastewater. The data reviewed for this option showed that settling/clarification followed by pressure filtration of sludge yields removals equivalent to pressure filtration. In some cases, BPT limitations would require the current treatment technologies in-place to be improved by use of increased quantities of treatment chemicals and additional monitoring of batch processes. For metals streams which contain concentrated cyanide complexes, BPT limitations under Option 1 are based on alkaline chlorination at specific operating conditions prior to metals treatment. Without treatment of cyanide streams prior to metals treatment, metals removals are significantly reduced.

- *Option 2: Selective Metals Precipitation, Pressure Filtration, Secondary Precipitation, and Solid-Liquid Separation.* The second option evaluated for BPT for CWT facilities would be based on the use of numerous treatment tanks and personnel to handle incoming waste streams, and use of greater quantities of caustic in the treatment chemical mixture. (Caustic sludge is easier to recycle.) Option 2 is based on additional tanks and personnel to segregate incoming waste streams and to monitor the batch treatment processes to maximize the precipitation of specific metals in order to generate a metal-rich filter cake. The metal-rich filter cake could possibly be sold to metal smelters to incorporate into metal products. Like Option 1, for metals streams which contain concentrated cyanide complexes, under Option 2, BPT limitations are also based on alkaline chlorination at specific operating conditions prior to metals treatment.

- *Option 3: Selective Metals Precipitation, Pressure Filtration, Secondary Precipitation, Solid-Liquid Separation, and Tertiary Precipitation.* The technology basis for Option 3 is the same as Option 2 except an additional precipitation step at the end of treatment is added. For metals streams which contain concentrated cyanide complexes, like Options 1 and 2, for Option 3, alkaline chlorination at specific operating conditions would also be the basis for BPT limitations.

The Agency is proposing to adopt BPT effluent limitations based on Option 3 for the Metals Subcategory. These limitations were developed based on an engineering evaluation of the average of the best demonstrated methods to control the discharges of the regulated pollutants in this Subcategory. EPA's decision to base BPT limitations on Option 3 treatment reflects primarily an evaluation of three factors: the degree of effluent reduction attainable, the total cost of the proposed treatment technologies in relation to the effluent reductions achieved, and potential non-water quality benefits.

4.1.2 Subcategory B: Oils Subcategory

The Agency examined four control options for reducing the discharge of pollutants by CWT facilities in this subcategory:

- *Option 1: Emulsion-Breaking*. Under Option 1, BPT limitations would be based on present performance of emulsion-breaking processes using acid and heat to separate oil-water emulsions. At present, most facilities have this technology in place unless less stable oil-water mixtures are accepted for treatment. Stable oil-water emulsions require some emulsion-breaking treatment because gravity or flotation alone is inadequate to break down the oil/water stream.

- *Option 2: Ultrafiltration.* Under Option 2, BPT limitations would be based on the use of ultrafiltration for treatment of less concentrated, stable oily waste receipts or for the additional treatment of wastewater from the emulsion-breaking process.

- *Option 3: Ultrafiltration, Carbon Adsorption, and Reverse Osmosis.* The Option 3 BPT effluent limitations are based on the use of carbon adsorption and reverse osmosis in addition to the Option 2 technology. The reverse osmosis unit removes metals compounds found at significant levels for this subcategory. Inclusion of a carbon adsorption unit is necessary in order to protect the reverse osmosis unit by filtering out large particles which may damage the reverse osmosis unit or decrease membrane performance.

- *Option 4: Ultrafiltration, Carbon Adsorption, Reverse Osmosis, and Carbon Adsorption.* Option 4 is similar to Option 3 except for the additional carbon adsorption unit for final effluent polishing.

The Agency is proposing BPT effluent limitations for the Oily Waste Subcategory based on Option 3 as well as Option 2 treatment systems. EPA has preliminarily concluded that both options represent BPT. The technologies are currently in use in the industry and the data collected by the Agency show that the limitations are being achieved.

Among the options considered by the Agency, both Options 2 and 3 would provide for significant reductions in regulated pollutants discharged into the environment over current practice in the industry represented by Option 1. EPA is concerned about the cost of Option 3 because it is substantially more expensive than Option 2. The Agency is proposing Option 2 because it is a currently available and cost-effective treatment option. However, the BPT pollutant removal performance required for a number of specific pollutants (particularly oil and grease and metals) is less stringent than current BPT effluent limitations guidelines promulgated for other industries. EPA has preliminarily concluded that, even though the cost of Option 3 is significantly greater than Option 2 (based on installation, operation, and maintenance of reverse osmosis equipment), the costs are not unreasonable given other factors.

Thus, this analysis examines the economic impacts of two combined regulatory options, one which includes Option 2 and one which includes Option 3. EPA is asking for comment on whether the benefits of Option 3 outweigh the high cost of the additional removal obtained through reverse osmosis. The Agency is particularly interested in comments on the ancillary effects of the less stringent Option 2 limitations. The Agency will conduct additional analyses of both the costs and removals of the Oils Subcategory control options based on comments received and information collected during a sampling episode in August of 1994, received too late for incorporation into this analysis.

4.1.3 Subcategory C: Organics Subcategory

The Agency evaluated the following two technology options to reduce the discharge of pollutants from the Organics Subcategory of CWT facilities:

- *Option 1: Equalization, Air-Stripping, Biological Treatment, and Multi-media Filtration.* BPT Option 1 effluent limitations are based on the following treatment system: equalization, two air-strippers in series equipped with a carbon adsorption unit for control of air emissions, biological treatment in the form of a sequential batch reactor (which is operated on a batch basis), and finally multi-media filtration units for control of solids.
- *Option 2: Equalization, Air-Stripping, Biological Treatment, Multi-media Filtration, and Carbon Adsorption.* Option 2 is the same as Option 1 except for the addition of carbon adsorption units.

The Agency is proposing to adopt BPT effluent limitations based on the Option 1 technology for the Organics Subcategory. The demonstrated effluent reductions attainable through Option 1 control technology represent the best practicable performance attainable through the application of currently available treatment measures.

4.2 COSTS OF CONTROLS

Based on the information received by EPA from the technical questionnaire, a detailed monitoring questionnaire, and site visits, the Agency has estimated the costs of complying with each control option described above. Costs of compliance fall into five broad categories:

- costs of capital equipment required, including installation costs;
- annual O&M costs, including costs of additional labor, energy, and materials;
- costs of additional land required, if any;
- costs of modifying the facility's RCRA permit, if any; and
- costs of monitoring controls and recordkeeping.

The O&M compliance costs will vary with the level of throughput at the facility and will therefore increase the facility's variable costs of operating each process. These costs, on a per-gallon treated basis, will increase the marginal costs and average variable costs of each CWT process. They therefore represent the upward shift in the facility average variable cost curve, which results in a decrease in market supply for each CWT service. The monitoring and recordkeeping costs, although annual rather than lump-sum, are incurred on a facility-wide basis. They increase the facilities' fixed costs, and affect the facility's overall profitability.

The capital, land, and RCRA-modification costs are one-time expenses. The lump-sum expenditures are too large for most CWT facilities to finance out of current revenues; they will

probably be paid for by equity or debt financing. These costs are annualized over the expected life of the capital equipment (to represent the annual cost of financing the lump sum cost), and these annualized costs, together with the monitoring and recordkeeping costs, will increase the facility's fixed costs. These costs will affect the facility's overall profitability but will not affect the average and marginal costs of producing each CWT service.

4.2.1 Annualization of the Land, Capital, and RCRA-Modification Compliance Costs

In annualizing the land, capital equipment, and RCRA costs associated with the regulation, the Agency used the following formula:

$$\text{Ann. K Costs} = K / (1 - ((1 + R)^{-20})/R) \quad (4.1)$$

where;

Ann. K costs = annualized cost of land, capital, and RCRA-modification,

K = lump-sum cost of land, capital, and RCRA-modification, and

R = company-specific real weighted average cost of capital.

The term "real weighted average cost of capital" (R in equation 4.1) reflects the fact that in making investments, companies typically use two sources of funds: equity and debt. Each source differs in its riskiness, its taxation, and its cost. Equity financing involves obtaining additional funds from owners, either through the use of retained earnings (internal equity) or through the issuance of additional stock (external equity). Debt involves obtaining additional funds from lenders who are not owners; they include buyers of bonds, banks, or other lending institutions. To estimate the true cost of capital to the company, one must include both the cost of debt and the cost of equity.

The Agency requested facilities' discount rate (weighted average cost of capital) in the questionnaire. Twenty-eight of the 58 companies provided responses; for the rest, the weighted average cost of equity and (after tax) debt was estimated using the following formula:

$$WACC = W_d(1 - 5) \bullet K_d + W_e \bullet K_e, \quad (4.2)$$

where;

WACC = weighted average cost of capital,

W_d = weighting factor on debt,

t = marginal effective state and federal corporate tax rate averaged for U.S. companies,

K_d = the cost of debt or interest rate,

W_e = weighting factor on equity, and

K_e = cost (required rate of return) on equity.

This formula implicitly assumes that investments in pollution control equipment are similar in risk to other projects that the company is considering. In addition, the formula assumes that the method of financing for control equipment is similar to other investments by the company.

To estimate the WACC, values for K_d and K_e were estimated. Marginal costs of capital, not historical average costs are appropriate hurdle rates for new investments.[2] However, data are available only for historical values. The analysis estimates the cost of debt for companies owning CWT facilities based on the average bond yields reported by Standard and Poors (S&P).[3] Bond ratings indicate potential default risk. Assuming that companies owning CWT facilities are in average financial condition at baseline, the Agency used yields for corporate industrial bonds rated BBB. These yields ranged from 8.82 to 9.5 percent in 1992. For this analysis, EPA uses the midpoint of the range, or 9.16 percent. Because debt interest is deductible for state and federal corporate income tax purposes, the cost of debt has to be adjusted downward to account for the tax savings. The Tax Foundation estimates that the effective marginal state and federal tax rate averaged 30.3 percent in 1992.[4] Applying this rate to the real costs of debt computed above gives the after-tax debt costs for companies in the CWT industry: 6.38 percent.

Financial analysts use several methods to estimate the cost of equity capital. The Agency selected the Capital Asset Pricing Model (CAPM) to estimate the cost of equity capital. The CAPM is expressed in the following equation:

$$K_e = R_f + ß(R_m - R_f) \qquad (4.3)$$

where;

K_e = the cost of equity capital,

R_f = the risk-free rate of return (long-term treasury bonds),

$ß$ = beta, a measure of the relative risk of the equity asset, and

$(R_m - R_f)$ = the market risk premium.

For the risk-free rate of return, this analysis used the average rate of return on long-term treasure bonds, reported in the *Survey of Current Business* as averaging 7.52 percent.[5] Ibbotson and Associates estimate that the market risk premium (Rm – Rf) has averaged approximately 6 percent over the last 66 years.[6] Beta values, however, are a measure of the relative riskiness of the company and generally vary from company to company. Data are insufficient to estimate company-specific beta values, however, so the average beta value for companies with bonds rated BBB to B was used: 1.41.[7]

Next, the weighting factors were estimated and used to estimate the WACC equation. The theoretically correct weights are the target rates rather than the historical weights. Financial theory holds that each company has an optimal capital structure that maximizes the value of the company by minimizing its cost of capital. However, estimating the target capital structure for each potentially affected company is beyond the scope of this analysis. It was assumed that the actual capital structure employed by companies approximates their target or optimal capital structure and that companies are minimizing their cost of capital in the baseline. Furthermore, it was assumed that book-value weights approximate market-value weights where market-value weights are not available.[8]

4.2.2 Compliance Costs for the Control Options

The tables in this section show the total costs for each category of compliance costs. Lump-sum land and capital costs are summed shown in the first column of each table. The annualized land and capital costs, annualized based on company-specific weighted average cost of capital values, are shown in the second column. These annualized land and capital costs are intended to represent the annual costs associated with financing the land and capital expenditures over 20 years. The third column shows the annual O&M costs associated with the regulation. The fourth column sums the annualized land and capital costs with the annual O&M costs to give total annualized cost.

4.2.2.1 Metals Subcategory Control Option Costs

Table 4-1 shows the total costs associated with the three Metals Subcategory control options. Overall, 56 facilities incur costs resulting from the control options. Twelve of these are direct dischargers and 44 are indirect dischargers. For facilities incurring costs under the Metals control options, the lump-sum capital and land costs range from $11,400 to $940,000 under Option 1; they range from $14,300 to $3.30 million under Option 2 and from $14,300 to $3.47 million under Option 3. Annual O&M costs range from $1,920 to $1.12 million under Option 1, from $36,600 to $1.94 million under Option 2, and from $36,600 to $1.97 million under

TABLE 4-1. METALS SUBCATEGORY COMPLIANCE COSTS (10^3 $1989)[a]

	Total Capital and Land Costs	Annualized Capital and Land Costs	Annual O&M Costs	Total Annualized Costs
BPT/BAT Costs (12 facilities affected)				
Option 1	1,645	181	2,788	2,969
Option 2	13,311	1,496	9,634	11,129
Option 3	14,570	1,628	9,891	11,519
PSES Costs (44 facilities affected)				
Option 1	2,070	212	2,929	3,141
Option 2	23,536	2,334	20,846	23,179
Option 3	26,863	2,661	21,674	24,334
Total Costs (56 facilities affected)				
Option 1	3,715	393	5,717	6,110
Option 2	36,847	3,830	30,479	34,309
Option 3	41,433	4,288	31,565	35,853

[a]Numbers may not add due to rounding.

Option 3. The average per-facility capital costs and O&M costs are higher for direct dischargers than for indirect under all three options.

4.2.2.2 Oils Subcategory Control Option Costs

Thirty-four facilities incur compliance costs under the Oils Subcategory for Options 2, 3, and 4. Option 1 represents present practice, so no costs are associated with it. The total compliance costs are shown in Table 4-2. Lump-sum capital compliance costs range from $36,700 to $559,000 under Option 2, from $66,300 to $2.36 million under Option 3, and from $67,900 to $3.12 million under Option 4. Annual O&M compliance costs range from $9,270 to $499,000 under Option 2, from $23,700 to $5.69 million under Option 3, and from $39,100 to $6.67 million under Option 4. Again, the average facility compliance costs, both capital and land and O&M, are higher for the direct dischargers than for the indirect dischargers.

4.2.2.3 Organics Subcategory Control Option Costs

Table 4-3 shows the total costs of complying with each of the two control options for the Organics Subcategory. Nineteen facilities incur compliance costs under this subcategory's

TABLE 4-2. OILS SUBCATEGORY COMPLIANCE COSTS (10^3 $1989)[a]

	Total Capital and Land Costs	Annualized Capital and Land Costs	Annual O&M Costs	Total Annualized Costs
BPT/BAT Costs (4 facilities affected)				
Option 2	967	85	734	819
Option 3	3,628	314	7,690	8,005
Option 4	4,598	396	9,066	9,462
PSES Costs (30 facilities affected)				
Option 2	3,976	401	2,233	2,634
Option 3	12,271	1,252	20,337	21,590
Option 4	14,547	1,485	24,397	25,883
Total Costs (34 facilities affected)				
Option 2	4,942	485	2,967	3,452
Option 3	15,899	1,567	28,028	29,594
Option 4	19,145	1,882	33,463	35,345

[a]Numbers may not add due to rounding.

TABLE 4-3. ORGANICS SUBCATEGORY COMPLIANCE COSTS (10^3 $1989)[a]

	Total Capital and Land Costs	Annualized Capital and Land Costs	Annual O&M Costs	Total Annualized Costs
BPT/BAT Costs (6 facilities affected)				
Option 1	791	75	307	382
Option 2	1,242	116	2,855	2,971
PSES Costs (13 facilities affected)				
Option 1	10,450	1,066	1,328	2,395
Option 2	10,865	1,111	3,739	4,850
Total Costs (19 facilities affected)				
Option 1	11,241	1,141	1,635	2,777
Option 2	12,107	1,226	6,594	7,820

[a]Numbers may not add due to rounding.

controls. Capital and land compliance costs range from $79,500 to $1.47 million under Option 1 and from $83,500 to $1.58 million under Option 2. O&M compliance costs range from $36,500 to $171,000 under Option 1 and from $63,100 to $1.05 million under Option 2. For most categories of organics costs, the indirect dischargers incur higher costs on average than do the direct dischargers.

4.2.3 Compliance Costs Associated with RCRA Permit Modification and Monitoring and Recordkeeping

Table 4-4 summarizes the compliance costs associated with the two remaining categories of costs: for facilities permitted under RCRA, monitoring and recordkeeping and modifying the RCRA permit to reflect their additional treatment technologies associated with the subcategory controls.

TABLE 4-4. RCRA MODIFICATION AND MONITORING COSTS (10^3 $1989)[a]

	Total RCRA Modification Costs	Annualized RCRA Costs	Annual Monitoring Costs	Total Annualized Costs
BPT/BAT Costs (14 facilities affected by RCRA costs, 16 by monitoring costs)	420	45	651	696
PSES Costs (47 facilities affected by RCRA costs, 56 by monitoring costs)	1,410	150	3,438	3,589
Total Costs (61 facilities affected by RCRA costs, 72 by monitoring costs)	1,830	195	4,089	4,284

[a]Numbers may not add due to rounding.

All 72 facilities incurring compliance costs are assumed to incur monitoring and record-keeping costs. These costs range from $40,680 per year to $570,000 per year. Only 61 CWT facilities have RCRA permits, according to questionnaire results and other information. The costs of modifying their RCRA permits are estimated to be $30,000 per facility.

4.2.4 Compliance Costs of Combined Regulatory Options

The Agency is co-proposing two combinations of the control options described above:

- Regulatory Option 1: Metals 3, Oils 2, and Organics 1
- Regulatory Option 2: Metals 3, Oils 3, and Organics 1

Table 4-5 summarizes the combined costs of these regulatory options. Of the 72 facilities, 70 facilities incur compliance costs under Regulatory Options 1 and 2. The other CWT facilities have no costs under any subcategory, either because they are zero dischargers or because they already met the requirements of the proposed standards and guidelines at baseline. The remaining two facilities have no subcategory costs, but do incur monitoring.

TABLE 4-5. COMPLIANCE COSTS FOR THE PROPOSED REGULATORY OPTIONS (10^3 $1989)[a]

	Total Capital and Land Costs	Annualized Capital and Land Costs	Annual O&M Costs	Total Annualized Costs
BPT/BAT Costs (16 facilities affected)				
Option 1	16,748	1,832	11,583	13,415
Option 2	19,409	2,062	18,540	20,601
PSES Costs (54 facilities affected)				
Option 1	42,698	4,278	28,673	32,951
Option 2	50,994	5,130	46,777	51,907
Total Costs (70 facilities affected)				
Option 1	59,446	6,110	40,256	46,367
Option 2	70,402	7,192	65,317	72,509

[a]Numbers may not add due to rounding.

Under Regulatory Option 1, capital and land compliance costs range from $30,000 to $4.39 million. O&M compliance costs range from $40,680 to $2.16 million. Under Regulatory Option 2, capital and land compliance costs range from $30,000 to $4.91 million, and O&M compliance costs range from $40,680 to $6.59 million. Average per-facility compliance costs are higher for direct dischargers than for indirect dischargers.

Total annualized costs for the BPT/BAT controls are $13.4 million under Regulatory Option 1 and $19.4 million under Regulatory Option 2. For the PSES controls, total annualized costs are $33.0 million under Regulatory Option 1 and $51.9 million under Regulatory Option 2. Nationwide, total annualized costs are $46.4 million under Regulatory Option 1 and $72.5 million under Regulatory Option 2.

Commercial CWT facilities incurring these costs will respond by changing their production behavior. This will change market quantities and prices, which in turn will change the revenues and production behavior of CWT facilities not incurring costs (because they are zero-dischargers or already have the controls in effect). The following chapters describe the methodologies used to assess the impacts of these costs on commercial CWT facilities and on companies owning CWT facilities, including both commercial or non-commercial CWT facilities.

4.3 REFERENCES

1. U.S. EPA. *Development Document for Proposed Effluent Limitations Guidelines and Standards for the Centralized Waste Treatment Industry.* 1994.

2. Bowlin, O.D., J. D. Martin, and D. F. Scott. *Guide to Financial Analysis.* 2nd Ed. New York, McGraw-Hill. 1990.

3. Standard & Poor's. *Security Owner's Stock Guide.* Vol. 47, No. 1. January 1993.

4. The Tax Foundation. Special Report. No. 18. March 1993.

5. U.S. Department of Commerce. *Survey of Current Business.* Volume 71, No. 9. 1991.

6. Ibbotson and Associates. SBBI 1993 Yearbook, Chapter 6.

7. Value Line Investment Survey. June 11, 1993.

8. Bowlin, O. D., J. D. Martin, and D. F. Scott. *Guide to Financial Analysis.* 2nd Ed. New York, McGraw-Hill. 1990.

CHAPTER 5
MARKET ANALYSIS METHODOLOGY

As mentioned in Chapter 3, some facilities accept waste on a commercial basis; that is, they accept waste from off-site facilities not under the same ownership as their facility and treat it for a fee. Other facilities accept waste only from off-site facilities that are owned by the same company as their facility; these are termed non-commercial facilities. Different approaches were used to analyze the impacts on commercial and non-commercial facilities.

For the commercial facilities, a market model was used to estimate changes in market prices, and market quantities of waste treated, facility revenues, costs, and profits. For the non-commercial facilities, the CWT operations were treated as cost centers, and impacts were assessed at the company level. This chapter describes the analytical approach used to assess the impacts on commercial CWT activities. Chapter 6 describes the analytical approach used to assess impacts on companies owning CWT facilities, including those owning non-commercial facilities.

5.1 INTRODUCTION

The effluent limitations guidelines and standards will directly increase the costs and reduce the pollutant discharges of CWT facilities that are direct or indirect dischargers. Faced with increased costs resulting from the regulation, companies owning CWT facilities have two basic choices:

- Comply with the regulation and incur the costs. This would entail the CWT facility's adjusting its operations to maximize profits under the new market conditions that result as all CWT facilities adjust to the regulation.
- Cease CWT operations. This could entail closing the facility or ceasing its CWT operations so that the facility is no longer subject to the guidelines or standards.

Conventional economic reasoning argues that owner companies will make their decision based on an assessment of the benefits and costs of the facility to the company. For commercial CWT facilities, the benefits to the company are the total revenues received; costs to the company include the payments made to the factors of production (labor, materials, etc.) plus the opportunity costs of self-owned resources (e.g., the land and capital equipment). For non-commercial facilities there is no observable measure of benefits to the company of having the capacity to manage the wastes in a facility owned by the company. Clearly, however, companies do weigh the benefits and costs of operating a CWT facility, and the benefits in this case may

include lower expected future liability costs, more control over the costs and scheduling of treatment, and certainty that treatment capacity exists for their wastes.

Overall, as long as generators have alternatives to commercial treatment (e.g., on-site treatment, pollution prevention) the total quantity of CWT services traded may be expected to fall as a result of the effluent limitations guidelines and standards. Changes in the costs of treatment at commercial CWT facilities may be expected to result in an increase in the price of CWT services and a decrease in the total quantity of CWT services sold. The changes in prices and quantities will affect the revenue side of these facilities, and the changes in quantities and costs will affect the cost side of CWT facilities. Facility profitability will change, and changes in facility costs, revenues, and profits will cause changes in the costs, revenues, and profits of companies owning CWT facilities. The market model estimates these changes and generates the inputs for the company impacts, regulatory flexibility, and community impacts analyses.

5.2 OVERVIEW OF THE ANALYTIC METHODOLOGY

CWT facilities are divided into commercial and non-commercial. The commercial facilities, which offer at least some of their CWT services commercially for a fee, are characterized individually based on the quantity of each type of waste treatment service they provide, their revenues and costs, employment, market share for each type of service provided, ownership, releases, and location in terms of the community where they are located and the regional market they serve. CWT services offered by non-commercial facilities do not affect the market for CWT services; for the reasons outlined above, they are analyzed at the company level. Analyses of company-level impacts are discussed in Chapter 6. This section describes the market model used to analyze impacts on commercial CWT operations.

Costs of CWT facilities include those that vary with the quantity of CWT services provided (variable costs) and those whose value is fixed. Per-gallon variable costs are assumed constant to the capacity output rate. Revenues from CWT operations are estimated by multiplying the market price of the CWT service by the quantity of waste treated in the CWT service. Most CWT facilities also have revenues from other sources, which are treated as exogenous.

The demand for CWT services is characterized based on the responsiveness of quantity demanded to price. CWT services are intermediate goods, demanded because they are inputs to production of other goods and services. The sensitivity of quantity demanded to price for an intermediate good depends on the demand characteristics (elasticity) of the good or service it is used to produce, the share of manufacturing costs represented by CWT costs, and the availability

of substitutes for CWT services. The elasticity of demand for manufactured products varies widely. CWT services costs as a share of manufacturing costs are generally quite small. Substitutes for CWT services include other types of off-site waste management such as underground injection or incineration, on-site treatment, or pollution prevention. Overall, the change in quantity demanded for CWT services is assumed here to be approximately proportional to any price change (e.g., a one percent increase in the price of a CWT service is expected to reduce the quantity demanded for the service by about one percent). Appendix D provides a more detailed discussion of the elasticity of demand for CWT services.

The markets for CWT services are regional. This market characterization is based on responses to the 1991 Waste Treatment Industry Questionnaire and is consistent with the theory of economic geography.[1] Each market has a relatively small number of suppliers and a relatively large number of demanders. Thus the market structure is treated as being imperfectly competitive, which implies that the competition each facility faces is limited to facilities in its region so that all suppliers have a degree of market power.

This characterization of companies and markets is incorporated in a model that uses the engineering estimates of the costs of compliance with the effluent limitations guidelines and standards to project impacts on facilities, companies, markets, and communities. In general, each CWT facility faced with higher costs of providing CWT services may find it economical to reduce the quantity of waste it treats. Depending on the costs incurred and the decisions made by other producers in a given CWT market, some CWT facilities may choose to increase the quantity of waste they treat in some markets. These decisions are simultaneously modeled for all facilities within a regional market to develop consistent estimates of the facility and market impacts. Changes in the quantity of CWT services available would result in changes in the inputs used to produce these services (most importantly labor). The Agency thus projects changes in employment at CWT facilities. Changes in facility revenues and costs result in changes in the revenues and costs of the companies owning the facilities and thus changes in company profits. Estimation of company impacts is discussed in Chapter 6. Section 5.3 describes in more detail the methodology used to estimate market and facility impacts of the effluent limitations guidelines and standards.

5.3 MODELING MARKET AND FACILITY IMPACTS

Market and facility impacts of the effluent limitations guidelines and standards were estimated using an economic model that simulates market and facility responses to the costs of

complying with the regulation. The model integrates market and facility responses, so that the estimated changes in facility quantity, market quantity, and market price are consistent.

The Agency used a model that simulates facility interaction and attempts to estimate the comparative static impact of complying with the controls. Comparative static models start with the "before" or baseline state of the facilities and markets and, by simulating the responses of facilities to their increased costs and the interactions of the facilities in the markets, estimates the "after" or with-regulation state of the facilities and markets. No attempt is made to realistically simulate the adjustment path from the baseline to the with-regulation state. Similarly, no attempt is made to project other changes in CWT facilities' situations that could occur between now and when the regulation is promulgated. Thus, the analysis strictly compares the conditions of CWT facilities, companies, and markets without the regulation and with the regulation; rather than presenting a true "before" and "after." The mathematical workings of the model are described in detail in Appendix E. This chapter provides an intuitive description of the model.

5.3.1 Defining the Markets for CWT Services

As discussed in Chapter 3, facilities supplying CWT services are divided into six regional markets. Within each regional market, facilities may supply one or more of five general types of CWT service:

- metals recovery,
- oils recovery,
- metals treatment,
- oils treatment, and/or
- organics treatment.

Within each region, the broad types of treatment or recovery are further subdivided into markets based on the per-gallon cost of treatment. Each facility offers its services in only one cost category per treatment type.

This arrangement reflects a simplifying assumption. Information obtained during site visits and telephone conversations indicates that many facilities operate their CWT processes on a batch basis. The characteristics of the waste being treated vary somewhat from batch to batch, so the per-gallon cost of treatment and the price per gallon may also vary. Economic data received from the questionnaire are not sufficiently detailed to enable the Agency to model each transaction individually; therefore, as in virtually all modeling efforts a simplifying assumption must be made. For the economic analysis, the Agency computed the per-gallon cost of treatment

for each treatment type at each commercial facility by dividing total variable costs of that treatment type (e.g., metals recovery) by the quantity of waste received commercially into metals recovery. The model assumes that all waste treated in metals recovery at the facility has the same per-gallon cost (and similarly for the other four broad treatment types). The division of broad waste treatment types into several markets based on the per-unit cost of treatment reflects the fact that wastes with similar characteristics will have similar costs of treatment. The analysis assumes that the converse is also true. Thus, facilities with similar costs of treatment are assumed to be treating similar wastes and using similar processes; their CWT services are substitutes for the CWT services of other facilities in the same region with similar per-gallon costs of providing that type of treatment.

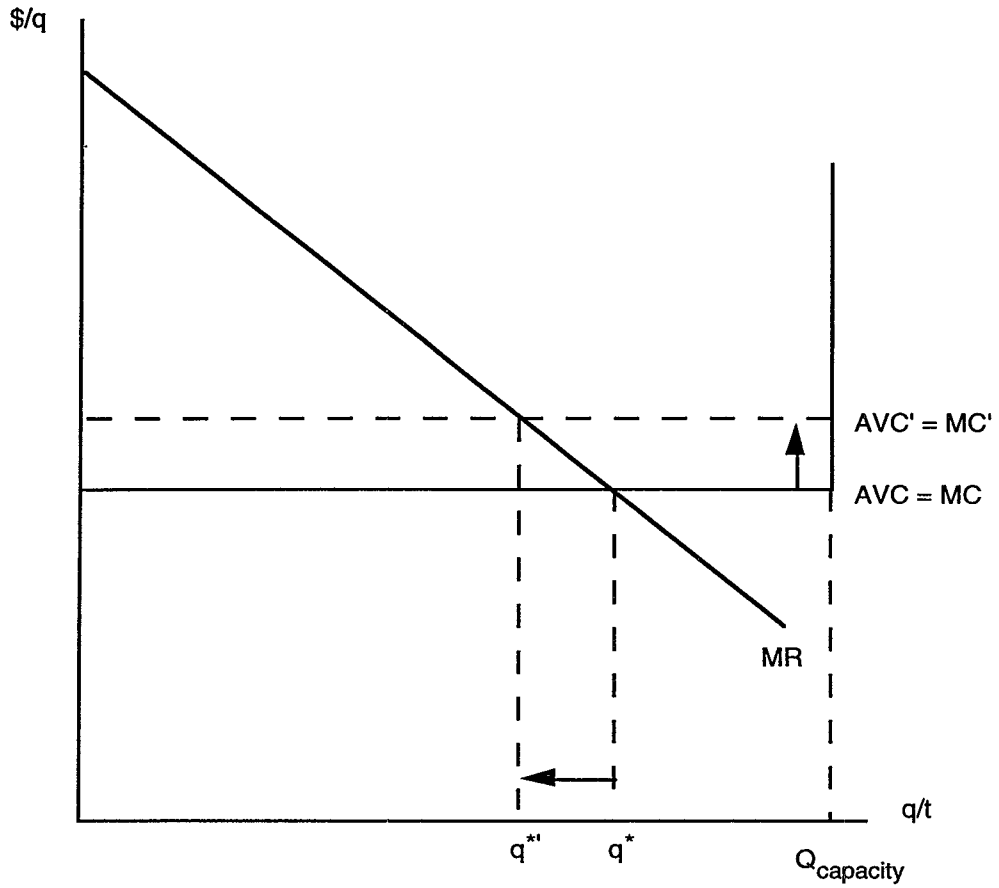
In each regional market, only a small number of facilities offer each type of CWT service. The number of facilities in a specific market (e.g., high-cost metals recovery) ranges from one to ten. Markets in which only one facility is active are modeled as regional monopolies. Markets in which a small number of facilities operate are modeled as regional oligopolies. Oligopolistic markets are characterized by a small number of suppliers, each of which is aware of his competitors' actions and is able to have some influence on the market price.

5.3.2 Baseline Facility Equilibrium Conditions

Complying with the controls will impose capital and O&M costs on facilities with affected CWT processes, as well as costs associated with modifying their RCRA permit if they have one and costs of monitoring their operations to ensure compliance. These costs were described in more detail in the previous chapter.

Of these categories of costs, only the O&M costs increase the operating costs of the CWT processes. The CWT processes at each facility were assumed to be characterized by constant average variable costs. That is, facility average variable cost curves were assumed to be horizontal up to process capacity, at which point they become vertical. Process capacity was based on data obtained from the questionnaire, detailed monitoring questionnaire, and site visits. The curve labeled AVC = MC in Figure 5-1 depicts a facility average variable cost curve and marginal cost curve at baseline for a CWT process. The average variable cost (AVC) curve for this process at this CWT facility is shaped like a backwards "L." AVC is defined as the variable cost per unit output (in this case, the variable cost per gallon treated). Marginal cost (MC) is the additional cost incurred for treating an additional gallon of waste. Because the average variable cost curve is constant, it is equal to the marginal cost curve. Facilities' profit-maximizing level

Figure 5-1. Effects of Compliance on Oligopolistic Company



AVC = baseline average variable cost = (total variable cost) / quantity = average per-gallon cost of treatment.

MC = baseline marginal cost = (change in variable cost) / (change in quantity) = additional cost to treat one additional gallon.

AVC' = with-regulation AVC.

MC' = with-regulation MC.

q^* = equilibrium baseline quantity treated.

$q^{*'}$ = equilibrium with-regulation quantity treated.

of output (q*) is the quantity at which their MC (MC=AVC) equals their marginal revenue (MR). MR is defined as the additional revenue received for treating an additional gallon of waste. The facility's MR curve reflects both market demand and the production accounted for by other producers in the market. It is derived from the facility's *residual* demand curve, which reflects the demand for the treatment services of this CWT facility, after accounting for the production decisions of the other CWT facilities in the market.

5.3.3 Adjustments in Response to the Variable Costs of Complying with the Effluent Limitations Guidelines and Standards

The O&M compliance costs increase the facility's average variable cost by the per-gallon amount of the O&M compliance costs. This vertical shift is shown in the curve labeled AVC' = MC' in Figure 5-1. In response, facilities modify their production decisions (moving to a quantity treated such as q*') to maximize the profitability of each CWT service given the new costs they incur. In each CWT market, these adjustments result in a reduction in supply (see Figure 5-2).

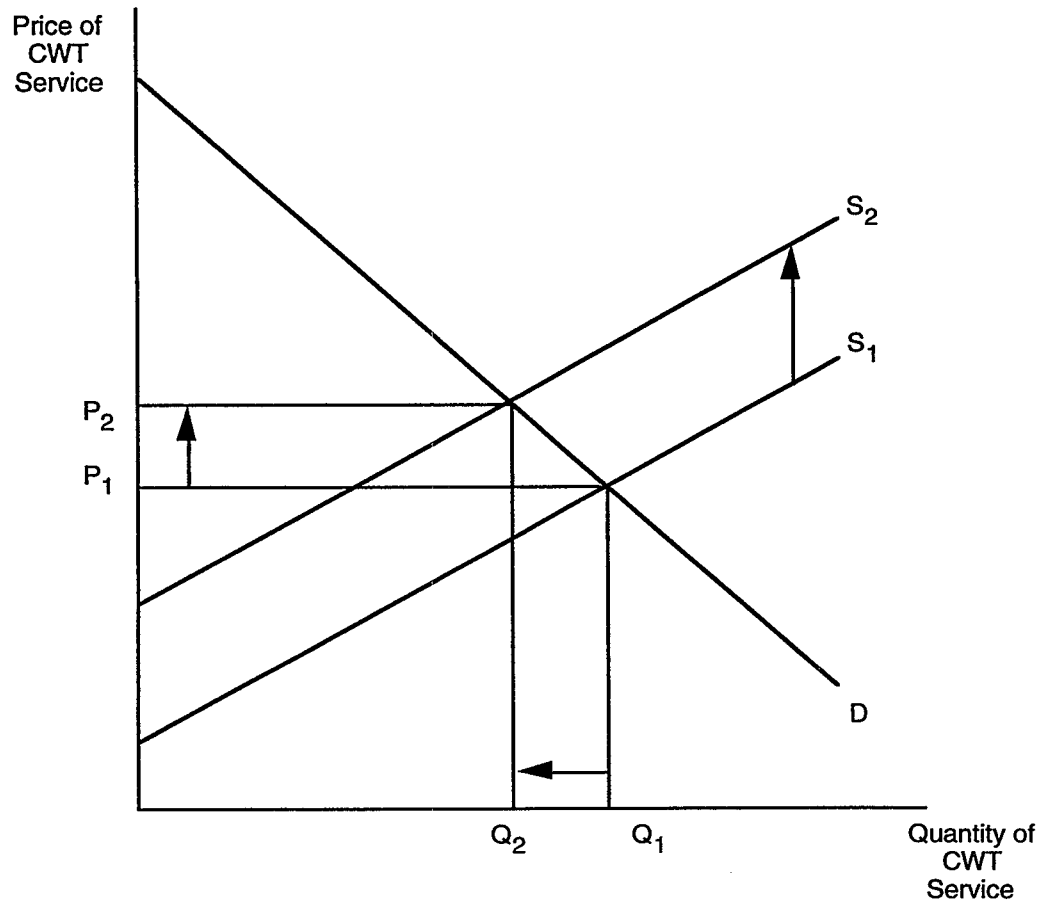
The interaction of the with-regulation supply curve, S_2, and the market demand curve, D, results in a higher with-regulation price, P_2, and a lower with-regulation quantity, Q_2, of CWT services in that market. The specific decisions made by facilities in response to the change in their variable costs of production depend in part on the structure of the markets in which they interact. In this analysis, the markets were assumed to be regional, imperfectly competitive (either oligopoly or monopoly) markets.

5.3.2.1 Oligopoly Markets

Oligopoly markets are characterized by relatively small numbers of facilities, each of which is aware of its competitors and makes its production and market decisions based on its expectation of what its competitors will do. A variety of rationales for forming these expectations about competitors' responses are possible; in the economics literature, they are referred to as "conjectural variations." The model employed by the Agency assumes a Cournot-Nash rationale for forming expectations about competitors' behavior. According to that rationale, each facility in a market determines its profit-maximizing quantity of output, assuming that its competitors will not respond in a strategic manner; rather, they will also determine their profit-maximizing level of output. An advantage of this modeling approach is that facility expectations are self-fulfilling: all the facilities, deciding to maximize their profits, assume that the other facilities will maximize their profits rather than behave strategically, thus producing the market-equilibrium quantity of output. Thus, in a Cournot-Nash equilibrium, no supplier finds it profitable to change its production once it discovers the choices actually made by the other suppliers.

Operationally, the O&M compliance costs increase the average variable cost of performing each affected CWT service for facilities that incur costs. Facilities, in response to increased costs, adjust the quantity of the CWT service they provide so that the with-regulation MC equals the with-regulation MR. The analytical model represents each market as a series of

Figure 5-2. With-Regulation Equilibrium Price and Quantity of a CWT Service



S_1 = baseline market supply of CWT services.

S_2 = with-regulation market supply of CWT services.

D = demand for CWT services.

Q_1 = baseline equilibrium quantity of waste treated by all CWT facilities in the market.

Q_2 = with-regulation equilibrium quantity of waste treated.

P_1 = baseline price of treatment.

P_2 = with-regulation price of treatment.

linear equations, and individual equations represent each facility's supply of the CWT service, market demand, and market supply. At baseline, the markets and facilities are all in equilibrium; the O&M compliance costs throw the market out of equilibrium, and the model solves simultaneously for the market price, facility quantities, and market quantity that characterize the

new equilibrium. In finding the new equilibrium, the model constrains the solution so that facilities cannot reduce their level of production of a CWT service by more than their baseline quantity (CWT service quantities produced must be non-negative) and cannot increase their CWT service production beyond their capacity output.

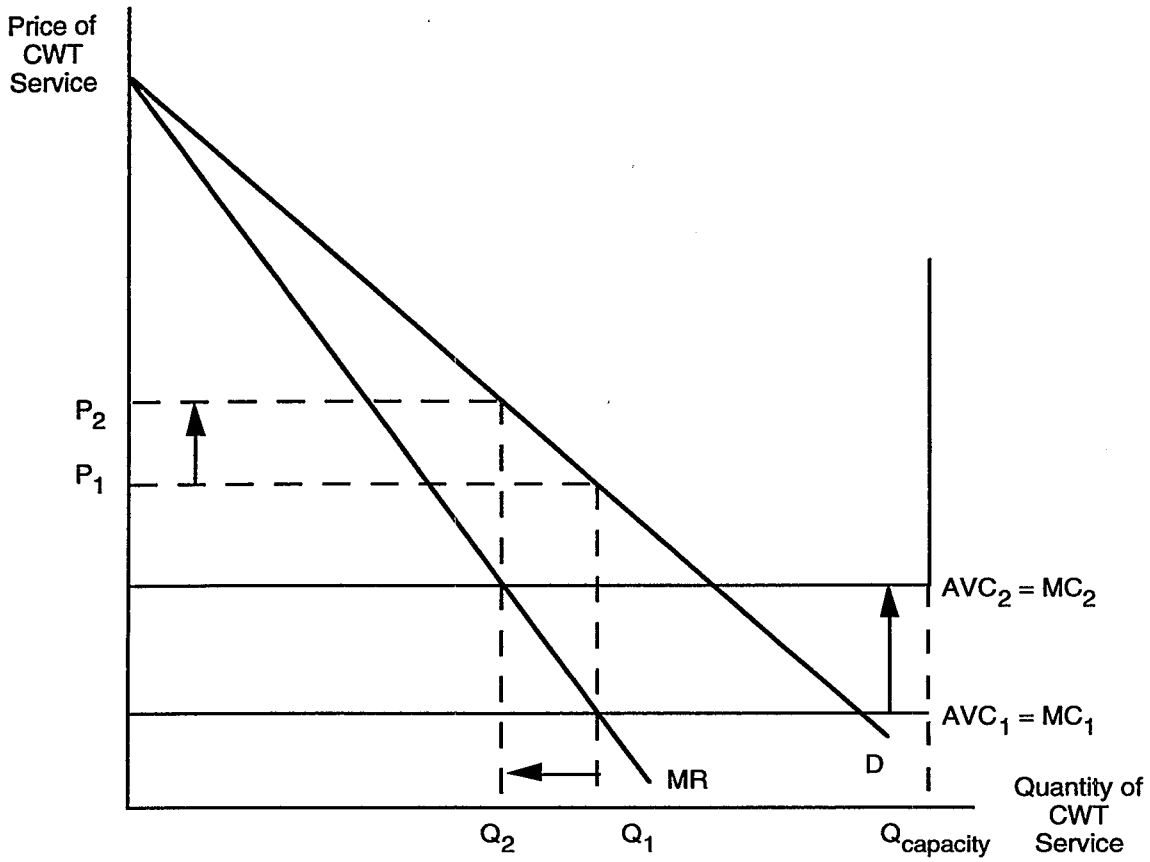
Facilities that supply a CWT service in a market but do not incur compliance costs will choose to increase the quantity of waste they treat. Even facilities incurring costs may choose to increase their quantity treated. Because the MR curve depends not only on market demand but also on the quantity of market demand taken up by other suppliers in the market, changes in the quantities produced by those other suppliers may shift the facility's residual demand and thus its MR curve. Thus, some facilities may decide to increase the quantity of waste they treat, even if they incur compliance costs. The market model described in Appendix E solves for the equilibrium quantities of waste treated by each facility in each market, taking into account these adjustments.

5.3.2.2 Monopoly Markets

As noted above, several of the CWT regional markets for particular CWT services were characterized as regional monopolies. Facilities supplying CWT services in these markets do not need to consider their competitors' responses to their actions. Rather, they simply determine the quantity of CWT service production and the market price that maximize their profits. This adjustment is shown in Figure 5-3. In Figure 5-3, the curve labeled D is the market (and facility) demand curve. It shows the price paid for each gallon of waste treated. The MR curve shows the additional revenue received for treating an additional gallon. The curve labeled AVC=MC is the baseline average variable cost curve. As described above, AVC is defined as the per-gallon cost of treatment, and MC is defined as the additional cost incurred to treat an additional gallon of waste. Because AVC is constant, AVC and MC are equal. The curve labeled AVC_2=MC_2 shows the with-regulation AVC and MC. To maximize profits, monopolists choose to treat the quantity at which the marginal revenue just equals the marginal cost. When his costs increase due to the regulation, the monopolist chooses to reduce his output from Q_1 to Q_2, at which MR_2=MC_2. This new quantity of waste treatment can be sold at a price of P_2.

In choosing the new equilibrium price and quantity, the model constrains monopolists so that facilities cannot reduce their level of production of a CWT service by more than their baseline quantity (CWT service quantities produced must be non-negative) and cannot increase their CWT service production beyond their capacity output. The only other constraint monopolists face in making their decisions is the demand curve. If they want to sell more CWT

Figure 5-3. With-Regulation Price and Quantity in a CWT Market that is a Regional Monopoly



AVC_1 = baseline AVC = baseline average per-gallon cost of treatment.

MC_1 = baseline MC = baseline additional cost to treat one additional gallon.

AVC_2 = with-regulation AVC.

MC_2 = with-regulation MC.

D = market and facility demand; relates price to quantity treated.

MR = additional revenue received for an additional gallon treated.

Q_1 = baseline equilibrium quantity of waste treated.

Q_2 = with-regulation equilibrium quantity of waste treated.

P_1 = baseline equilibrium price of treatment.

P_2 = with-regulation equilibrium price of treatment.

services, they have to offer them at a lower price. In our analysis, the elasticities of the demand curves faced by both oligopolistic and monopolistic producers of CWT services reflect the presence of suppliers of similar CWT services in other regions. Thus, the elasticity of demand assumed in these regional markets is somewhat higher than would be the case for national or international oligopolies or monopolies.

5.4 OUTPUTS OF THE MARKET MODEL

The model solution estimates changes in market prices and quantities in each affected market. In addition, for each commercial facility, the model estimates changes in the quantity of each type of CWT waste they treat, changes in facility revenues and costs, and changes in facility profits. Changes in waste treatment employment are estimated proportional to the changes in quantity treated.

5.4.1 Changes in Market Prices and Quantities

In each of the individual markets for a CWT service, the market model estimates the change in price and total quantity treated under each of the regulatory options. The model solves simultaneously for changes in facility quantity and changes in market quantity so that the sum of the estimated facility quantity changes equals the estimated market change in quantity.

5.4.2 Changes in Facility Profitability

Frequently, the assumption is made in economic modeling that facilities making negative profits (whose revenues are less than their costs) will be closed. In the CWT industry, however, this has not been the case recently. It appears that the criterion for closure is not current profitability but expected future profitability. In 1989, according to data collected from the questionnaire, 22 of the 85 facilities in the CWT industry were unprofitable.

To determine how to treat these facilities in the EIA, the Agency contacted 18 of them. All but two were still in operation, and two others thought they might have to close. Of the rest, nine had become profitable and four others, although still unprofitable, were doing better and expected to continue in operation. The remaining facility, still unprofitable, expected to stay open because of an ongoing clean-up operation that would render closure extremely costly. Thus, one year's negative profits were not enough to cause facility owners to close them. In fact, several years' negative profits did not necessarily result in facility closures.

The Agency believes, based on conversations with the facilities in the industry, that facility profits in 1989 reflected a period of great change in the markets for CWT services,

resulting from changes in regulations affecting them and their customers, pollution prevention efforts that affected the demand for their services, and regional economic recessions in some areas of the country. Owners of CWT services appear willing to allow their facilities time to adjust their operations to conform to the changing conditions in the market. Thus, it is not realistic to model the industry as closing facilities immediately when they become unprofitable. Thus, the Agency measures and reports changes in facility profitability with the regulation in place but does not project facility closures as such.

5.4.3 Inputs into the Company-Level Analysis

The economic achievability of the regulation is assessed based on the impacts incurred by companies owing CWT facilities. To conduct this analysis, estimated facility-specific changes in revenues and costs resulting from compliance were aggregated to the parent-company level. These changes, predicted by the market model, serve as inputs into the analysis of company-level impacts. Changes in facility revenues and costs result in changes in parent company revenues and costs and thus in parent company profits. In addition, the acquisition of new capital equipment and the financing arrangements estimated to be made for purchasing the capital equipment result in changes in parent company assets and liabilities. These data were used to estimate the impacts of compliance with the regulation on the parent companies owning CWT facilities. The analytic methodology used to assess company-level impacts is discussed in Chapter 6. In addition to the impacts incurred by parent companies owning commercial facilities, the company-level analysis assesses impacts on parent companies owning non-commercial facilities, which are assumed to pass all the costs of compliance through to their parent company.

5.4.4 Inputs into the Community Impacts Analysis

Communities in which commercial CWT facilities are located may be affected because of changes in employment that may occur at these facilities. Facilities may decide to increase or decrease the quantity of waste they treat in response to the regulatory options. If they increase the quantity of waste they treat, the labor needed to run their CWT operations is assumed to increase proportionally. If they decrease the quantity of waste they treat, the labor needed to run their CWT operations is assumed to decrease proportionally. Thus, the market model estimates market-related changes in employment at each commercial CWT facility. Overall, while some facilities are predicted to increase their employment, CWT facility employment is predicted to fall because overall, the quantity of CWT treatment nationwide is predicted to fall.

In addition to market-related changes in employment, the Agency has estimated changes in CWT employment that will be needed to operate the controls associated with the effluent limitations guidelines and standards. These changes in employment are larger than the overall decrease in employment predicted by the market analysis. The two types of employment change are combined to estimate changes in community employment associated with the regulation.

5.5 REFERENCES

1. Hoover, Edgar M. *An Introduction to Regional Economics*. 2nd ed. New York, Alfred A. Knopf. 1975, pp. 49-51.

CHAPTER 6
COMPANY ANALYSIS METHODOLOGY

The legal and financial responsibility for compliance with a regulatory action rests with the owners of the CWT facility who must bear the financial consequences of their decisions. Thus, an analysis of the company-level impacts in the context of EPA regulations involves identifying and characterizing affected entities, assessing their response options and modeling or characterizing the decision-making process, and analyzing the impacts of those decisions.

Chapter 3 of this report characterizes the affected entities according to relevant characteristics including size and degree of horizontal and vertical integration. This chapter presents the Agency's methods of assessing the impact to the CWT facility owners of the proposed regulatory options. First, it identifies the owners' response options and characterizes their decision-making process. It then describes the impact measures chosen by the Agency to assess the company-level economic impacts and to illustrate the distribution of these impacts across companies of different sizes. The chosen impact measures include potential changes in the capital structure and cost of capital of affected companies and changes in the likelihood of financial failure.

6.1 OWNERS' RESPONSES

In reality, CWT facility owners' response options to the impending regulation potentially include the following:

- installing and operating pollution control equipment,
- discontinuing one or more regulated processes within CWT facilities that they own,
- closing or selling the facility,
- complying with the regulation via process and/or input substitution (versus control equipment installation), and
- discontinuing the practice of accepting off-site waste for treatment in CWT processes.

This analysis assumes that the owners of an affected facility will pursue a course of action that maximizes the value of the company, subject to uncertainties about actual costs of compliance and the behavior of other companies.

The market model presented in Chapter 5 models facility and market impacts for commercial facilities under the owners' first two options listed above. For the reasons described in Section 5.4.2, EPA is assuming that owners will not decide to close or sell facilities as a result of the regulation. Evaluating facility and market impacts under the remaining two options listed

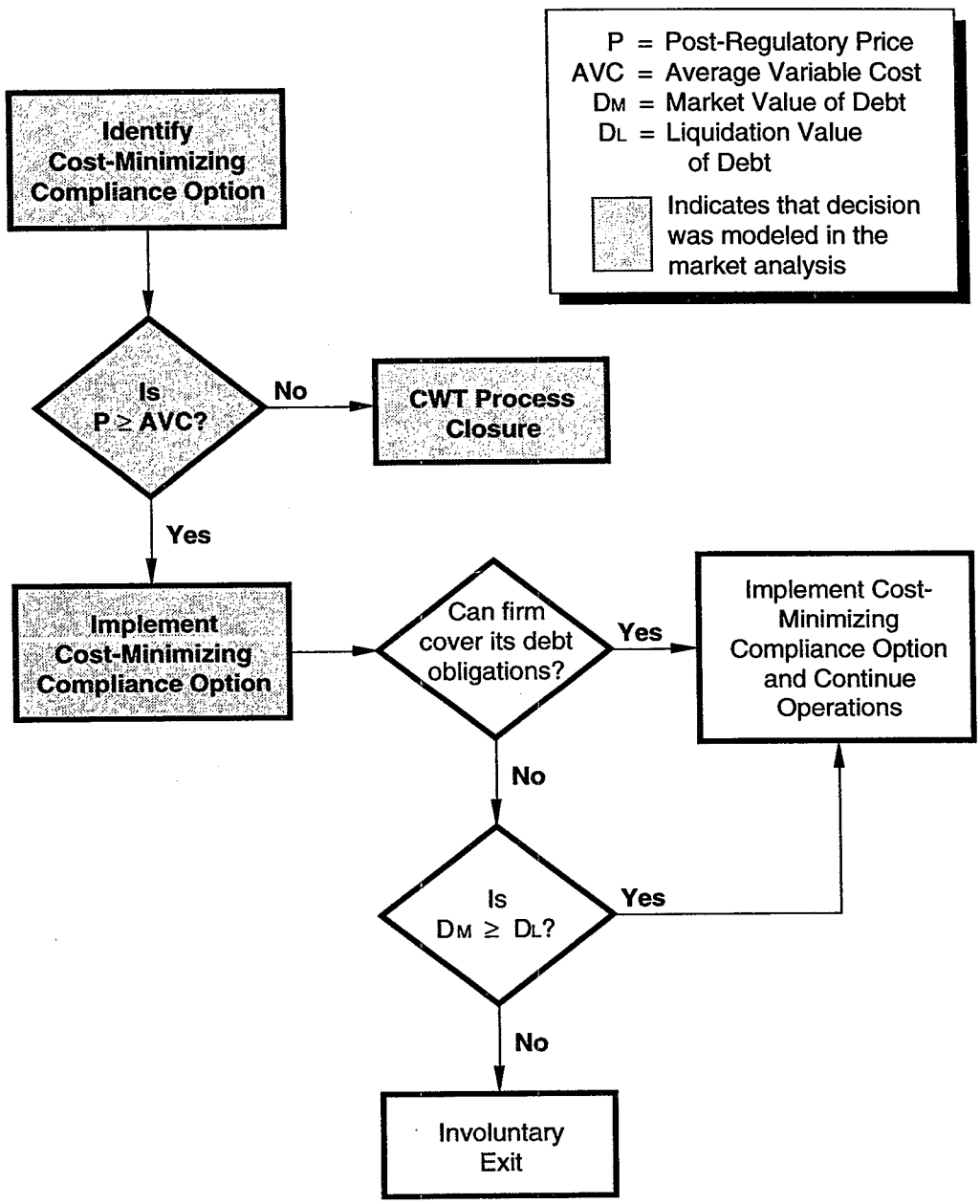
above requires detailed data on production costs and input prices; costs and revenues associated with alternative services/products; and other owner motivations, such as legal and financial liability concerns, and is beyond the scope of this analysis. Consequently, the company-level analysis is based on the assumption that owners of commercial CWT facilities respond to the regulation by installing and operating pollution control equipment or discontinuing selected regulated processes within facilities that they own. The commercial facility-level responses, presented in Chapter 7, must be aggregated across sibling facilities and used to assess the economic impacts to the ultimate corporate owners of commercially operating CWT facilities. The results of the company analysis are presented in Chapter 8.

For non-commercial CWT facilities a simpler approach is used. All of the compliance costs are assumed to be passed on to the parent company and company revenues do not change. This is because these non-commercial CWT facilities are generally cost centers for their companies; frequently they do not explicitly receive revenues for their services. They exist to perform a service for the rest of the company and are not expected to be "profitable" as a unit. Thus, no change in the quantity of CWT wastes treated is projected for these facilities nor are market effects analyzed for the products of the parent company, since the share of waste treatment costs in the marketed products is generally too small to have much impact on overall production costs of the marketed products. However, the company-level impacts analysis includes these companies, so changes in their financial viability were evaluated.

As a result of the proposed regulations governing CWT services, companies will potentially experience changes in the costs of providing waste treatment services as well as changes in the revenues generated by providing these services. Both cost and revenue impacts may be either positive or negative. The cost and revenue changes projected to result from passage of each of the regulatory options considered in this report are anticipated to occur at the facility level as a result of market adjustments explained in Chapter 5. Net changes in company profitability are derived by summing facility cost and revenue changes across all commercial and non-commercial facilities owned by each affected company. The net impact on a company's profitability may be negative (cost increases exceed revenue increases) or positive (revenue increases exceed cost increases).

Figure 6-1 characterizes owners' potential responses to regulatory actions. The shaded areas represent decisions made at the facility-level that are used as inputs to the company-level analysis. For this analysis companies are projected to implement the cost-minimizing compliance option and continue to operate their facilities. As long as the company continues to meet its debt obligations, operations will continue. Realistically, if the company cannot meet its

Figure 6-1. Characterization of Owner Responses to Regulatory Actions



interest payments or is in violation of its debt covenants, the company's creditors may take control of the exit decision and forced exit may occur. If the market value of debt (DM) under continued operations is greater than the liquidation value of debt (DL), creditors would probably allow the facility to continue to operate. Under these conditions, creditors may renegotiate the terms of debt. If, however, the DM under continued operations is less than DL, involuntary exit will result and the facility will discontinue operations. Exit will likely take the form of liquidation of assets or distressed sale of the facility. For this analysis the decision process is simplified. All owners are assumed to implement the cost-minimizing compliance option and continue to operate the facility. The increased likelihood of financial failure potentially caused by these assumptions is presented in Chapter 8, but the financial impacts of creditor imposed exit decisions are not modeled.

In the decision-making process modeled in this analysis, current owners of CWT facilities are assumed to either implement the cost-minimizing compliance option and continue to operate all services provided by the facility, discontinue unprofitable services yet continue to operate the facility. These decisions are modeled in terms of their financial impact to parent companies. The decision to continue to operate may be accompanied by a change in the cost of capital, capital structure and financial viability of the company.

6.2 FINANCIAL IMPACTS OF THE REGULATION

The Agency evaluated changes in the financial status of companies owning CWT facilities by first projecting the changes in the cost of capital and changes in capital structure for potentially affected companies. Next, post-compliance balance sheets and income statements that assume these changes in capital costs and structure were constructed for each company to simulate with-regulation changes in company finances after the CWT market adjustments described in Chapter 5 have been incurred. Then, the Agency calculates baseline and with-regulation values of one of two composite indexes of financial health to indicate any change in the likelihood of financial failure due to the regulation. For publicly-traded companies the appropriate index is the Z-score, a multidiscriminant function that simultaneously considers liquidity, asset management, debt management, profitability, and market value to assess the company's potential for bankruptcy. For companies that are not publicly-traded, the Agency uses a similar function called the Z"-score as a predictor of company-level financial distress. The Z"-score function differs from the Z-score function in that no market-value parameter is considered and the coefficients for the other four financial parameters are different.

6.2.1 Changes in the Capital Structure and Cost of Capital

Investments in pollution control equipment required to comply with the regulation will potentially reduce the debt capacity of the company, change its capital structure, and increase its cost of capital. This section describes the framework used for projecting the impacts of the regulation on the company's capital structure and its cost of capital. While the Agency does not directly link changes in a company's capital structure or a given change in a company's cost of capital to its ability to withstand the demands of the regulation, the Agency does project such changes on a company-specific basis and recognizes that these changes are integral to analyses determining the regulation's expected impact on companies' financial viability. This section briefly describes how cost of capital changes were estimated for potentially affected companies.

Realistically, companies may use many strategies to raise required additional capital to comply with a regulation of this kind. To objectively model the financing decisions of such a wide variety of companies the following simplifying assumptions were made:

- Companies have access to capital from only three sources: debt, new internal equity (current portion of retained earnings), and new external equity (the sale of new stock).
- The company's baseline capital structure is optimal, and new capital will be raised if necessary to maintain this optimal capital structure.
- Companies are constrained in their debt financing to an industry-specific benchmark. The lower quartile debt ratio for a company's SIC code represents the upper bound of prudent debt financing. The portion of total with-regulation company value that is financed with debt shall not exceed this threshold unless the company's baseline debt-to-company value ratio already exceeds it.
- Companies with a baseline debt-to-company value ratio greater than the industry benchmark use equity financing exclusively.
- The cost of debt (the interest rate at which individual companies may borrow) is not projected to change due to the regulation.
- The cost of equity obtained through issuance of new stock is greater than the cost of equity obtained through retained earnings.
- Companies retain 100 percent of their earnings unless data on dividends paid out are available.
- For each one percent increase in the quantity of shares outstanding, the price of each share decreases by 0.5 percent. This decrease in price is reflected in a corresponding increase in the required return, or cost, of external equity.
- Companies use all of their available internal equity capital to finance the compliance capital costs before issuing new external equity.

These assumptions will be reintroduced individually as the model is explained in greater detail.

6.2.1.1 Changes in Company Value

In financial theory, the value of an investment is measured as the present value of its future cash flows. The cash flows associated with an investment in pollution control equipment are generally negative. Thus, pollution control investments tend to reduce the company's value. ("Reduce" here means reduce from what the firm's value would be if there were no legal requirement to invest in pollution control equipment. However, the promulgation of a regulation should trigger a reassessment of the value of an affected firm's facilities. Thus, if a regulation is implemented, if the alternative to control equipment is facility shutdown, and if shutdown would be very costly, then investment in pollution control equipment probably would increase the firm's value.) Furthermore, pollution control investments generally reduce the debt capacity of potentially affected companies by reducing the company's profitability and, thus, the overall ability of the company to support debt service.[1] The change in company value can be estimated using the following equation:

$$\Delta V = K + \sum (R - O)/(1 + r) \qquad (6.1)$$

where;

ΔV = the change in company value,
K = the installed capital costs of the regulation,
R = the change in the company's annual revenue stream,
O = the change in the company's annual operating cost cash flows, and
r = the company's weighted average cost of capital (WACC).

Companies may issue new debt or equity depending on the magnitude of the compliance capital requirements relative to the value of the company's earnings. If an affected company has no unused debt capacity and is making no other investments besides the investment in pollution control equipment, it would be forced to retire existing debt in response to the regulation to maintain its target capital structure. In practice, however, companies will likely be carrying out other investment and financing programs along with the pollution control requirements. Rather than retiring existing debt, the company would change its financing mix to issue more equity and less debt than otherwise. If an affected company has unused debt capacity, it will potentially use this capacity to finance the required investment in pollution control equipment. However, using this debt capacity potentially displaces investment in other assets that increase the company's value rather than decrease it.

6.2.1.2 Capital Structure and the Marginal Cost of Capital

For this analysis, it was assumed that a company has access to capital from three sources: debt, new internal equity (current portion of retained earnings), and new external equity. To project the financing mix used for pollution control investments, EPA must make assumptions regarding the company's capital structure policy, dividend policy, and the relative cost of capital raised from each of the three sources.

Responses to the regulatory requirements hinge on the cost of new, or marginal, capital. Thus, the relevant costs of capital are not historical; rather, they are the marginal costs of new funds that must be raised to finance the control equipment. Capital structure theory holds that a specific breakpoint exists in the company's marginal cost of capital (MCC) schedule as shown in Figure 6-2. The point labeled "B" in the figure illustrates the increase in the company's WACC when the company raises new external equity to meet its capital requirements while maintaining an optimal capital structure.[2] This breakpoint is referred to as the retained earnings breakpoint in financial literature and is identified using the following equation:

$$REB = RE/S \qquad (6.2)$$

where;

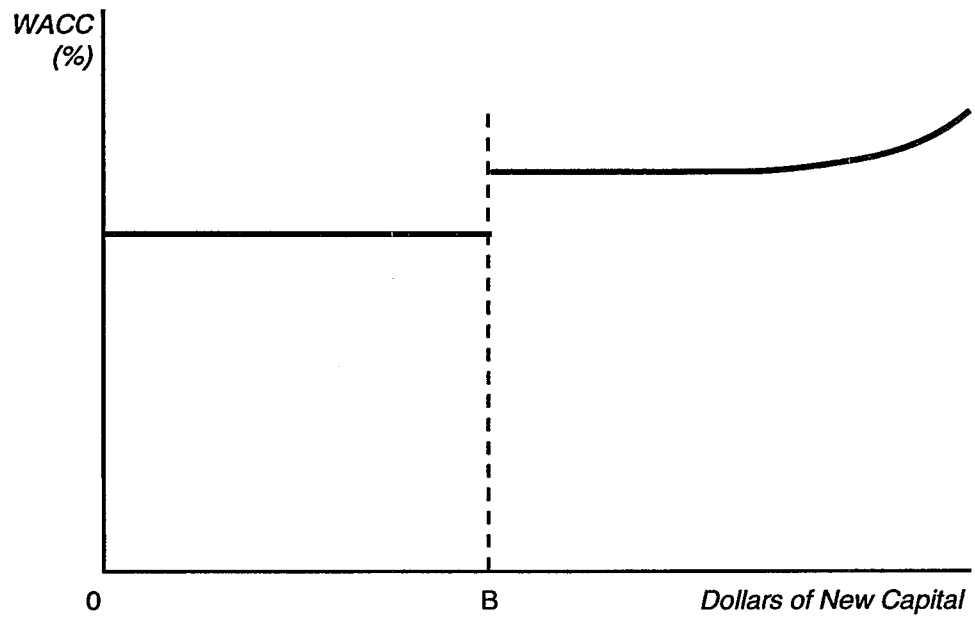
REB = the retained earnings breakpoint,
RE = the current year's retained earnings, and
S = the share of total company value represented by equity.

The breakpoint is based on several assumptions:

- The company's current capital structure is optimal, and new capital will be raised in such a way as to maintain this optimal capital structure.
- New equity could come from one of two sources: the part of this year's profits that management decides to retain (internal) or the sale of new stock (external).
- If the cost of equity obtained through retained earnings = k_e, the cost of equity obtained through the issuance of new stock is k_e + flotation (transaction) costs.

The MCC schedule jumps at the point where the company must raise new external equity capital to meet its investment requirements.

Figure 6-2. Marginal Cost of Capital Schedule



6.2.1.3 Companies' Capacity for New Debt

Empirical evidence shows that capital structure can vary widely from the theoretical optimum and yet have little impact on the value of the company.[3] Thus, companies typically focus on a "prudent" level of debt rather than on setting a precise optimal level. Brigham and Gapenski define a prudent level of debt as one that captures most of the (tax) benefits of debt financing yet keeps financial risk at a manageable level, ensures financing flexibility, and maintains a favorable credit rating. For this analysis, it was assumed that the industry benchmark reflecting the 75th percentile for the debt ratio (corresponding to the lower quartile debt ratio in Table B-3) represents the upper bound of prudent debt financing. For example, the 75th percentile debt ratio for SIC 4953 is 68 percent. Thus, it was assumed that companies in this SIC code will seek to maintain a level of debt that is equal to or below 68 percent of the company's with-regulation value. This assumption has several implications for modeling decisions regarding the financing mix chosen to cover the compliance capital costs. First, it was assumed that companies with a baseline debt-to-company value ratio greater than the industry benchmark use equity financing exclusively. Second, this analysis assumed that a company's debt capacity, the maximum amount of compliance capital costs that may be financed through debt is computed based on the following formula:

$$D_M = [(D/V)_{LQ} \bullet (V_B + \Delta V)] - D_B \quad (6.3)$$

where;

D_M = the maximum amount of new debt to finance compliance capital costs,
$(D/V)_{LQ}$ = the industry-specific lower quartile debt ratio,
V_B = the baseline value of the company,
ΔV = the change in the value of the company because of regulation, and
D_B = the baseline book value of long-term debt.

The baseline value of the company (V_B) is computed as the sum of the market value of equity (measured as average share price times average number of shares outstanding) and the book value of long-term debt. Where data on share prices and number of shares outstanding are inappropriate or unavailable, the value of equity is measured as total assets minus total liabilities.

Equation (6.3) defines the estimated maximum amount of new debt issued to cover the compliance capital costs. However, a company may employ a level of new debt that is less than DM in response to the regulation. In particular, where the company's baseline D/V ratio is less than its industry's $(D/V)_{LQ}$ ratio, it was assumed that the company issues new debt up to a level equivalent to its baseline D/V ratio times the installed capital cost. Thus the share of the compliance capital costs financed through debt does not exceed the company's baseline D/V ratio and may be less than the D/V ratio where the product of D/V and the compliance capital costs exceed D_M.

6.2.1.4 Internal vs. External Equity

Compliance capital costs that are not financed using debt are financed using internal or external equity funds. Internal equity includes the current portion of the company's retained earnings that are not distributed in the form of dividends to the owners (shareholders) of the company. External equity refers to newly issued equity shares. This analysis assumed that the company retains 100 percent of its earnings unless data on dividends paid out are available. Because data on dividends are generally available only for large, publicly-traded companies, the analysis implicitly assumed that private companies and small companies retain a larger share of their earnings. This assumption is not unreasonable because companies that are not publicly-traded and small companies, in particular, do not typically have a consistent dividend payout policy. Thus, these companies are more likely to retain a larger share of their earnings when faced with regulatory costs than are publicly-traded companies, because publicly-traded companies are potentially concerned about the signal that a change in dividend policy sends to

investors. This situation is particularly true, because the cost of new external equity is higher than the cost of current retained earnings due to flotation costs (see Figure 6-2).

Flotation costs associated with new equity increase the effective cost of these funds. It was assumed that flotation costs for new equity average approximately one percent.[4] Because new equity is more costly than retained earnings, this analysis assumed that companies use all of their available internal equity capital to finance the compliance capital costs before issuing new external equity. The projected share of capital costs financed through debt, retained earnings, and new external equity for each regulatory option are presented in Chapter 8.

As companies raise larger and larger sums of capital during a given time period, the costs of both debt and equity components may begin to rise, and as this occurs, the WACC also rises. This increase in the cost of capital is shown as the upward-sloping portion (beyond the retained earnings breakpoint) of the hypothetical marginal cost of capital schedule illustrated in Figure 6-2. This upward-sloping cost curve reflects the assumption that investors' demand for securities is downward sloping. An estimated elasticity of demand is required to project the change in the cost of equity resulting from an increase in the number of shares issued. However, estimating company-specific elasticities is beyond the scope of this analysis. This analysis assumed that the price elasticity of demand for an individual company's securities is 0.5. In other words, for each one percent increase in the quantity of shares outstanding, the price of each share decreases by 0.5 percent. This decrease in price is reflected in a corresponding increase in the required return, or cost, of equity.

Under the assumptions regarding capital structure policy, the share of debt in the company's capital structure does not change appreciably. Consequently, EPA does not project a change in the cost of debt due to the regulation. Using the baseline debt and equity weights (which are assumed to be the company's target weights), the baseline cost of debt, and the with-regulation cost of equity, EPA computed a with-regulation WACC for each regulatory option. Because the economic impact of proposed regulatory options on individual companies' financial viability depends less on companies' absolute costs of compliance than on their annualized costs of compliance (relative to their respective baseline levels of financial health), projected changes in companies' costs of capital are pivotal in projections of economic impacts of the regulatory options.

6.2.2 Changes in Financial Viability

Financial ratio analysis provides a method of identifying changes in the financial viability of affected companies that may be caused by the regulation. One of two possible functions was

used to compute a composite index of financial well-being for each of the 57 companies included in the company-level impact analysis. The choice of an appropriate function depended on whether or not the company in question had publicly-traded stock. As explained earlier, for publicly-traded companies the appropriate composite index is called the Z-score. The Z-score is a multidiscriminant function used to assess bankruptcy potential developed specifically for manufacturing companies. It simultaneously addresses liquidity, asset management, debt management, profitability, and market value.

The function is given in the following equation:

$$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 0.999X_5 \quad (6.4)$$

where;

Z = overall index,
X_1 = working capital/total assets,
X_2 = retained earnings/total assets;
X_3 = earnings before interest and taxes/total assets,
X_4 = market value of equity/book value of total debt, and
X_5 = sales/total assets.

The market value component (X_4) uses stock price data. Consequently, the Z-score is only applicable to companies with publicly-traded stock.

For companies that are not publicly-traded a modified function called the Z"-score was used. The Z"-score function does not include a parameter for market value, and the coefficients for each of its other parameters are different. The Z"-score function is given in the following equation:

$$Z'' = 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4 \quad (6.5)$$

where Z" is the overall index, X_1 through X_3 are as defined for Z above, and X_4 is net worth to total liabilities.

Taken individually, each of the ratios given above is higher for companies in good financial condition and lower for companies in poor financial condition. Consequently, the greater a company's bankruptcy potential, the lower its overall index score. For each of these composite indexes of financial well-being the ranges of values that indicate promising, uncertain, and discouraging financial well-being are different. For the Z-score index a score below 1.81

indicates that bankruptcy is likely, and a score above 2.99 indicates that bankruptcy is unlikely. Z-scores between 1.81 and 2.99 are indeterminate. For the Z"-score index, a score below 1.10 indicates that bankruptcy is likely, and a score above 2.60 indicates that bankruptcy is unlikely. Z"-scores between 1.10 and 2.60 are indeterminate. The Agency has determined that any company whose Z-score or Z"-score at baseline does not suggest the likelihood of bankruptcy, but whose with-regulation projected Z-score or Z"-score does indicate the likelihood of bankruptcy, is considered to suffer significant economic impact from the regulation.

6.3 REFERENCES

1. Pogue, Dr. Gerald A. *Estimation of the Cost of Capital for Major United States Industries with Application to Pollution-Control Investments*. November. 1975.

2. Brigham, Eugene F., and Louis C. Gapenski. *Financial Management: Theory and Practice*. 6th Ed. Orlando, FL, The Dryden Press. 1991.

3. Brigham, Eugene F., and Louis C. Gapenski. *Financial Management: Theory and Practice*. 6th Ed. Orlando, FL, The Dryden Press. 1991.

4. Brigham, Eugene F., and Louis C. Gapenski. *Financial Management: Theory and Practice*. 6th Ed. Orlando, FL, The Dryden Press. 1991.

CHAPTER 7
MARKET IMPACTS OF THE CWT EFFLUENT LIMITATIONS GUIDELINES AND STANDARDS

This chapter describes the results of the analysis of market impacts resulting from the Agency's proposed regulatory options:

- **Regulatory Option 1**: Metals Option 3, Oils Option 2, and Organics Option 1
- **Regulatory Option 2**: Metals Option 3, Oils Option 3, and Organics Option 1

The Agency is recommending control options for each subcategory. Therefore, for facilities in more than one subcategory, compliance with the effluent limitations guidelines and standards will involve complying with the controls for each relevant subcategory. Thus, if a facility accepts both oils and metals from off-site, the facility will incur the costs associated with complying with both the proposed Metals Subcategory pollutant controls and the proposed Oils Subcategory pollutant controls.

As described above, complying with the proposed CWT effluent limitations guidelines and standards would generally increase the costs of performing various CWT services. The costs incurred by a CWT facility would depend on

- the types of affected CWT processes the facility has on-site,
- the types of waste managed in those CWT processes, and
- the baseline levels of control the facility had achieved for each CWT process.

For each control option, compliance costs were estimated for each CWT process at each facility, based on facility-specific information about the types of waste managed and the baseline levels of control. These costs are described in detail in Chapter 4. The EPA expects that facilities affected by the standard would undertake capital investments and annual O&M expenses to comply with the standard. In addition, facilities permitted under RCRA would be required to modify their permits to include the changes in their processes and equipment. Monitoring to ensure compliance would also impose costs on the facilities.

7.1 COMPANY RESPONSES TO THE COSTS OF COMPLIANCE

The Agency assumes that facilities and the companies that own them will determine the actions to take to maximize their profits with the regulation in effect. In this analysis, the responses of companies owning commercial CWT facilities and companies owing non-commercial CWT facilities are assessed under different assumptions. The Agency assumes that

facilities performing CWT services on a commercial basis will modify their market behavior to maximize their with-regulation profits at the facility level. The methodology used to model commercial facility and market responses to the costs of complying with the regulation is described in Chapter 5.

In each regional CWT market, facilities were assumed to determine their with-regulation profit-maximizing quantity of waste treatment, believing that the other facilities in that market will not react to this change in quantity by modifying the quantities they treat. The model simultaneously determines the equilibrium market price and quantity in each CWT market and the profit-maximizing quantity of waste treated in each CWT service by each facility. Overall, the quantity of waste treated in CWT processes declines and the price of CWT services increases. Individual CWT facilities may increase or decrease the quantity of waste they treat and may experience increased or decreased costs, revenues, and profits. These facility-level changes are summed across commercial CWT facilities owned by each company to provide inputs into the company-level impacts analysis reported in Chapter 8.

Non-commercial CWT facilities are assumed not to modify their CWT operations in response to the costs of compliance but rather to pass the costs of compliance along to their parent company. This assumption reflects information received from non-commercial facilities indicating that their CWT operations were treated as a cost center rather than a profit center. The CWT operations were assumed to be treated like other "overhead" operations such as centralized accounting or legal departments. Although the CWT operations provide a service to the company as a whole and are compensated for that service, they are not generally expected to make a profit. The impacts of the regulation on non-commercial CWT facilities are thus assumed to be incurred by the parent company owning those facilities and are reported in Chapter 8. The first part of this chapter addresses impacts on facilities with commercial CWT operations.

7.2 MEASURES OF IMPACTS

As described above, commercial CWT facilities' adjustments in response to the compliance costs of the regulation result in changes in market prices and quantities in the markets for CWT services. As described in Chapter 3, as many as three individual markets for each of the broad types of CWT service exist in each of six regions. The actual changes in prices and quantities estimated in each of those markets are presented in Appendix F. The measure of market impact presented here is the median change in price and quantity for all the markets in

each broad CWT treatment type: metals recovery, oils recovery, metals treatment, oils treatment, and organics treatment.

For each commercial CWT facility, the with-regulation equilibrium may be characterized by changes in the quantity of waste treated, changes in revenues, changes in costs, changes in profits, and changes in employment. These changes were estimated by the market model, along with the changes in market price and quantity discussed above. Each of the impacts is reported in detail in Appendix F. The impacts on commercial CWT facilities are summarized by changes in facility profitability.

Frequently, the assumption is made in economic modeling that facilities making negative profits (whose revenues are less than their costs) will be closed. In the CWT industry, however, this has not been the case recently. It appears that the criterion for closure is not current profitability but expected future profitability. Data provided in the questionnaire indicated that in 1989, 22 of the 85 CWT facilities were unprofitable. Of 18 unprofitable facilities contacted for clarification, all but two were still in operation two years after the questionnaire.

Several reasons may explain why unprofitable facilities remain in operation rather than being closed by their owners. First, 30 of the 70 commercial CWT facilities receive some of the off-site waste they treat from other facilities under the same ownership. These facilities perform a service to the rest of their company and are unlikely to close even if their commercial operations are unprofitable, although they may curtail commercial operations if they do not cover costs. Second, most of the CWT facilities are regulated under RCRA. Closure of a RCRA facility requires that the site be cleaned up, which in some cases would entail expensive long-term remediation. Owners may find it maximizes their profits in the short run to keep in operation facilities that are losing money on their CWT operations, rather than incurring the costs of "clean-closing" the facility. Finally, the rapidly changing demand conditions in the industry may cause owners to keep facilities open because they expect that, once the facility adjusts its operations to correspond to new demand conditions, it will become profitable. For these reasons, the Agency is not conducting a traditional facility closure analysis for the CWT industry. Facility-level changes in revenues and costs were computed as inputs to the company level analysis, and changes in facility profitability are reported, but they were not used to project closures.

7.3 RESULTS OF THE MARKET ANALYSIS

The integrated market/facility model described in Chapter 5 was used to estimate the equilibrium with-regulation changes in market prices and quantities and facility revenues, costs, profits, and quantities resulting from complying with EPA's proposed regulatory options.

7.3.1 Market Impacts

As described above, the market impacts of the proposed effluent limitations guidelines and standards, if promulgated, would include changes in market prices and quantities in affected CWT markets. As discussed above, the facilities, in deciding how to respond to the O&M compliance costs, modify the amount of CWT services they offer, resulting in a decrease in market supply in most CWT markets. The market model solves simultaneously for the with-regulation equilibrium market price and quantity and the with-regulation facility quantities in each market.

Most of the analytical inputs and results shown in this report are reported separately for BPT/BAT controls and for PSES controls. For the market impacts, however, this is not appropriate. Market-level impacts cannot be broken into impacts of BPT/BAT controls and impacts of PSES controls. Because many regional markets include both facilities that are direct dischargers and facilities that are indirect dischargers, and because the Agency is expecting to promulgate both types of controls simultaneously, market impacts must be analyzed and reported based on the *combined* effects of the BPT/BAT and PSES controls analyzed together. Table 7-1 shows the median percentage changes in prices and quantities for each of the five broad types of CWT service.

TABLE 7-1. MARKET IMPACTS OF BPT/BAT AND PSES CONTROLS

	Option 1		Option 2	
Market	Percentage Change in Price	Percentage Change in Quantity	Percentage Change in Price	Percentage Change in Quantity
Metals Recovery	2.64	-3.02	2.64	-3.02
Oils Recovery	8.64	-11.00	41.76	-65.40
Metals Treatment	26.74	-20.12	26.74	-20.12
Oils Treatment	28.86	-15.14	35.31	-35.44
Organics Treatment	34.92	-16.69	34.92	-16.69

The median percentage changes in price and quantity in affected CWT markets indicate that overall the impact of the effluent guidelines limitations and standards is moderate, although in some markets especially under Option 2, impacts are significant. Under each broad market category, there are some regional submarkets that are virtually unaffected by the regulation and others that incur significant changes in price and quantity. In all cases, the market prices of broad types of CWT services are projected to increase and the quantity of waste treated in CWT processes is projected to fall. Thus, one of the expected features of the guidelines is a reduction in the absolute quantity of wastes commercially treated, in addition to an improvement in the level of treatment. These market adjustments in quantity are reflected in decreases in the quantity of waste treated at some individual CWT facilities. In some cases, with less waste being treated, CWT processes at some facilities may close down. Other facilities may experience increases in the quantity treated in some CWT processes, because their costs are unaffected by the controls, or they incur very small increases in costs relative to other facilities supplying CWT services in their market. These facility-specific variations are summarized below and are aggregated in the market-level responses.

Demanders of CWT services may either have decreased the quantity of CWT services demanded by generating less waste (pollution prevention) or by substituting other waste management options not affected by this regulation for CWT services. These other waste management options include on-site waste treatment and off-site waste disposal by such means as underground injection or incineration. As discussed in Appendix D, the Agency has assumed that demand is moderately responsive to changes in price; that is, that a one percent change in price results in a one to 1.5 percent change in quantity demanded. If demand in some CWT markets is less responsive to changes in price than was assumed for this analysis, price increases would be greater than estimated and quantity decreases would be smaller than estimated. The converse would be true if demand is more responsive to price than assumed.

Under Regulatory Option 1, median price increases range from 3 to 35 percent, while median decreases in the quantities of waste treated range between 3 and 20 percent. Under Option 2, median price increases range from 3 to 42 percent, while median quantity treated decreases range from 3 to 65 percent. Thus, the median changes in price and quantity indicate that for some markets, impacts of the effluent limitations guidelines and standards may be significant.

Market impacts are especially significant for the oils recovery and oils treatment markets under Regulatory Option 2. One reason for the high costs of compliance with this regulatory option and for the resulting significant impacts is that many facilities in the Oils Subcategory

have relatively low levels of treatment at baseline. (For example, only one oils recovery facility treats the wastewater generated from the oils recovery process.) Thus, the investment they must make to comply is significant.

As discussed in Appendix D, the cost of CWT services in overall production cost of the production processes that generate waste is generally very small (less than 1 percent). Thus, the Agency does not predict changes in the prices or quantities of goods whose production generates the demand for CWT services.

7.3.2 Facility Impacts

In addition to the changes in prices and quantities experienced by affected markets for CWT services, complying with the costs of the control options results in impacts on CWT facilities. Facilities adjust the quantities of waste treated in each treatment process to maximize their profits with the regulation in effect. At the same time, the cost per gallon treated and the price received per gallon treated also change. Thus, CWT facilities experience changes in revenues and costs as a result of the effluent limitations guidelines and standards. Changes in facility revenues and costs resulting from the market and facility responses to the effluent limitations guidelines and standards combine to result in changes in facility profitability (Profit = Total Revenue – Total Cost). For this analysis, profit is defined as Earnings Before Taxes, or EBT.

Table 7-2 summarizes the changes in facility profitability resulting from the controls. In Table 7-2, "profits improved" shows the number of facilities for which either of the following was true: (1) facility profits were positive both with and without the regulation and were higher with the regulation, or (2) facility profits were negative both with and without the regulation but were less negative with the regulation. "Profits worse" shows the number of facilities for which either of the following was true: (1) facility profits were positive both with and without the regulation but were lower with the regulation, or (2) facility profits were negative both with and without the regulation and were more negative with the regulation. "Became unprofitable" shows the number of facilities that were profitable without the regulation but became unprofitable with the regulation in effect.

The most severely affected facilities become unprofitable with the regulation in effect. As noted in Chapter 3, several of these facilities were just breaking even at baseline but were pushed into unprofitable territory by the market responses to the regulation. Companies owning these facilities were previously made more profitable by their ownership of these facilities; now they are made less profitable. Because these facilities are the most severely affected, their changes in employment will be highlighted in the following section.

TABLE 7-2. PROFITABILITY IMPACTS BY DISCHARGE STATUS

	Regulatory Option 1	Regulatory Option 2
Direct Dischargers		
Profits improved	2	2
Profits worse	5	5
Became unprofitable	0	0
Indirect Dischargers		
Profits improved	12	12
Profits worse	30	29
Became unprofitable	9	10
Zero Dischargers		
Profits improved	13	13
Profits worse	0	0
Became unprofitable	0	0

7.3.3 Employment Impacts

Changes in employment evaluated in this analysis result from two sources:

- Changes in the quantity of CWT services produced require changes in the quantity of labor used.
- Labor is required to operate the controls on which the control options and combined regulatory options are based.

Table 7-3 shows the estimated changes in employment, both positive and negative, resulting from changes in the quantity of CWT services provided. To estimate changes in employment, the Agency used data provided in the questionnaire about hours of full-time and part-time employment associated with CWT operations. These data were used to compute the number of full-time equivalent employees associated with each gallon treated at each CWT facility. Then, the estimated change in the quantity of waste treated at each CWT facility is multiplied by this employment factor to estimate the change in facility employment. In addition to these market-related changes in employment, it shows the estimated labor requirements to operate the controls under each option. Finally, it sums the two categories to give an overall estimate of the change in employment projected to result from each control option and combined regulatory option.

TABLE 7-3. EMPLOYMENT IMPACTS

	Option 1	Option 2
Changes in Employment Resulting from Market Adjustments		
Job losses at facilities becoming unprofitable	-62	-75
Job losses at other facilities	-557	-655
Job Losses		
National Total	-619	-730
Job Gains		
National Total	242	229
Net Change In Employment From Market Adjustments		
National Total	-378	-501
Changes in Employment due to Labor Requirements of Controls		
National Total	710	735
Total Change in Employment		
National Total	332	234

The Agency's combined regulatory options are both projected to result in a net increase in employment, because of the relatively large number of employees estimated to be needed to operate the pollutant controls. Option 1 is projected to result in 619 market-related job losses and 242 market-related job gains, for a net change in employment resulting from market and facility adjustments to the regulation of 378 job losses. An estimated 710 additional employees will be needed to operate the pollutant controls so that the overall employment impact of Option 1 is an increase of 332 employees. Option 2 is projected to cause 730 market-related job losses and 229 market-related job gains so that the net impact of facility and market adjustments to the regulation is a loss of 501 jobs. Because 735 additional employees are projected to be needed to operate the controls, the overall impact of the regulation is a net gain of 234 jobs.

Several points should be made about these employment impacts. The market-related job increases, while partially offsetting the market-related job decreases on a national basis, occur at different plants from the job losses. There is no guarantee that the workers displaced at one CWT plant would be hired at another CWT plant or would be willing to move to seek those jobs.

Similarly, it is not certain (although it is likely) that the skills required to operate the pollution control equipment are the same as those required to operate the capital equipment the CWT facility had in place at baseline. Thus, the employment gains associated with the controls may only partially offset the job losses from production decreases at a given plant. Thus, from the individual employee's standpoint, the fact that complying with the regulation results in a net increase in CWT employment nationwide may not mean that they do not experience displacement due to the regulation. From the point of view of communities in which CWT facilities are located, however, the net increase in employment is likely to be good news. Community impacts of the effluent limitations guidelines and standards are discussed in Chapter 10.

7.3.4 Inputs to the Company-Level Analysis

As discussed above, changes in facility revenues and costs, assets, and liabilities resulting from the regulation were aggregated to the company level by summing the changes across all facilities owned by each company. Summary statistics for the facility-level changes in revenues, costs, and profits are shown in Appendix F. These company-level changes were then used to estimate changes in companies' likelihood of bankruptcy resulting from the regulation. Assessment of company-level impacts is important because the resources the parent company has available determine whether the CWT facilities will be able to comply with the proposed regulation. In this sense, whether the regulation is economically achievable or not depends on how CWT facilities' parent companies are affected by the regulation. These impacts are assessed in the following chapter.

CHAPTER 8
COMPANY IMPACT ANALYSIS

The company impact analysis evaluates the impact of regulatory compliance on companies owning facilities that would be subject to the CWT effluent limitations guidelines and standards. Analysis of the economic impact of regulatory options at the company level is perhaps the most important component of the EIA. Because CWT services are intermediate goods that are integral to production processes of final goods marketed in many dissimilar industries, it is difficult to identify a "typical" CWT facility, and it is equally challenging to identify a "typical" corporate parent of a CWT facility. Some facilities operate as non-commercial cost centers for parent companies whose primary focus has nothing to do with waste management. Others are operated by large waste management companies that rely entirely on commercial sales of waste treatment and disposal services. Some CWT facilities are identical in size and scope of operations to the companies that are legally and financially responsible for their activities. Others are several intermediate levels of ownership removed from their corporate parents. These peculiarities were discussed in detail in Chapter 3.

The Agency cannot confidently predict facility closures as a response to the financial burdens of the regulation. Historical observation has shown that companies are extremely slow to close unprofitable CWT facilities. The Agency has determined that the best method for evaluating total impacts of the regulation is to project the impacts on company finances at the highest level of corporate ownership of affected CWT facilities. The impacts resulting from both BPT/BAT and PSES compliance under each of the regulatory options are presented. Two companies that own both a direct and an indirect discharging facility are included in the summary of impacts for both standards.

The company impact analysis is organized into three sections. The first section reviews the concepts used to drive the financial analysis. The second section describes the methodology used to implement these concepts. The third section presents the results of the company analysis.

8.1 ANALYTIC APPROACH

The company-level analysis is the final step in a multi-staged effort to model the impacts of the proposed regulatory options. Inputs to this analysis include

- engineering cost estimates for each CWT facility,
- projected adjustments in the with-regulation market prices and the quantities of CWT services offered at each affected CWT facility, and
- information regarding the baseline financial status of CWT facilities' parent companies.

A company's ability to comply with the regulatory requirements is assessed in two stages:

- The *baseline analysis* identifies companies whose financial condition, independent of demands of the proposed effluent limitations guidelines and standards, is already so distressed that compliance with the regulation may not be advisable. Such companies would be at risk of financial failure even without regulatory costs. For this reason, companies that fail both the baseline and the with-regulation analyses are not considered to suffer severe impacts as a result of the regulation.
- The *post-compliance analysis* identifies those companies, otherwise financially sound, whose financial viability may be impaired by regulatory compliance. Such companies would be weakened by the financing burden and additional operating expenses of the proposed regulatory options.

The company-level analysis is based on the assumption that owners respond to the regulation by installing and operating pollution control equipment or discontinuing regulated processes within the facility. The impacts of these facility-level responses, presented in Chapter 7, must be aggregated across all facilities owned by a company to assess the regulation's economic impacts on the parent company's financial performance. This analysis is conducted from a perspective that evaluates companies' financial strength both before and, on a projected basis, after their CWT facilities have incurred the cost and revenue impacts presented in Chapter 7. For a company to meet the demands of the regulation without severe economic distress it must be financially viable both at baseline and post-compliance. The following section summarizes the methodology used to derive company-level economic impacts. A more detailed description of the company impacts model is presented in Chapter 6.

Some companies that own more than one CWT facility own facilities that are in different discharge categories. Because of differences in the guidelines and standards to which direct and indirect dischargers are held, the Agency has tried, where possible, to present the economic impacts of the regulatory options for direct and indirect dischargers separately. For the company impact analysis this means that impacts to companies owning CWT facilities in more than one discharge status category are included in summaries of each of the discharge categories that describes facilities that they own. Table 8-1 shows the distribution of companies by the range of discharge categories that apply to the facilities that they own.

8.2 ANALYTIC PROCEDURE

As described in Chapter 6, the Agency projects changes in the financial status of companies owning CWT facilities by first projecting the changes in the cost of capital and

TABLE 8-1. COMPANY COUNT BY TYPES OF DISCHARGERS OWNED

Discharge Status Category	Number of Companies
Direct Only	12
Indirect Only	34
Zero Only	6
Direct and Indirect	1
Indirect and Zero	3
Direct, Indirect, and Zero	1
Total	57

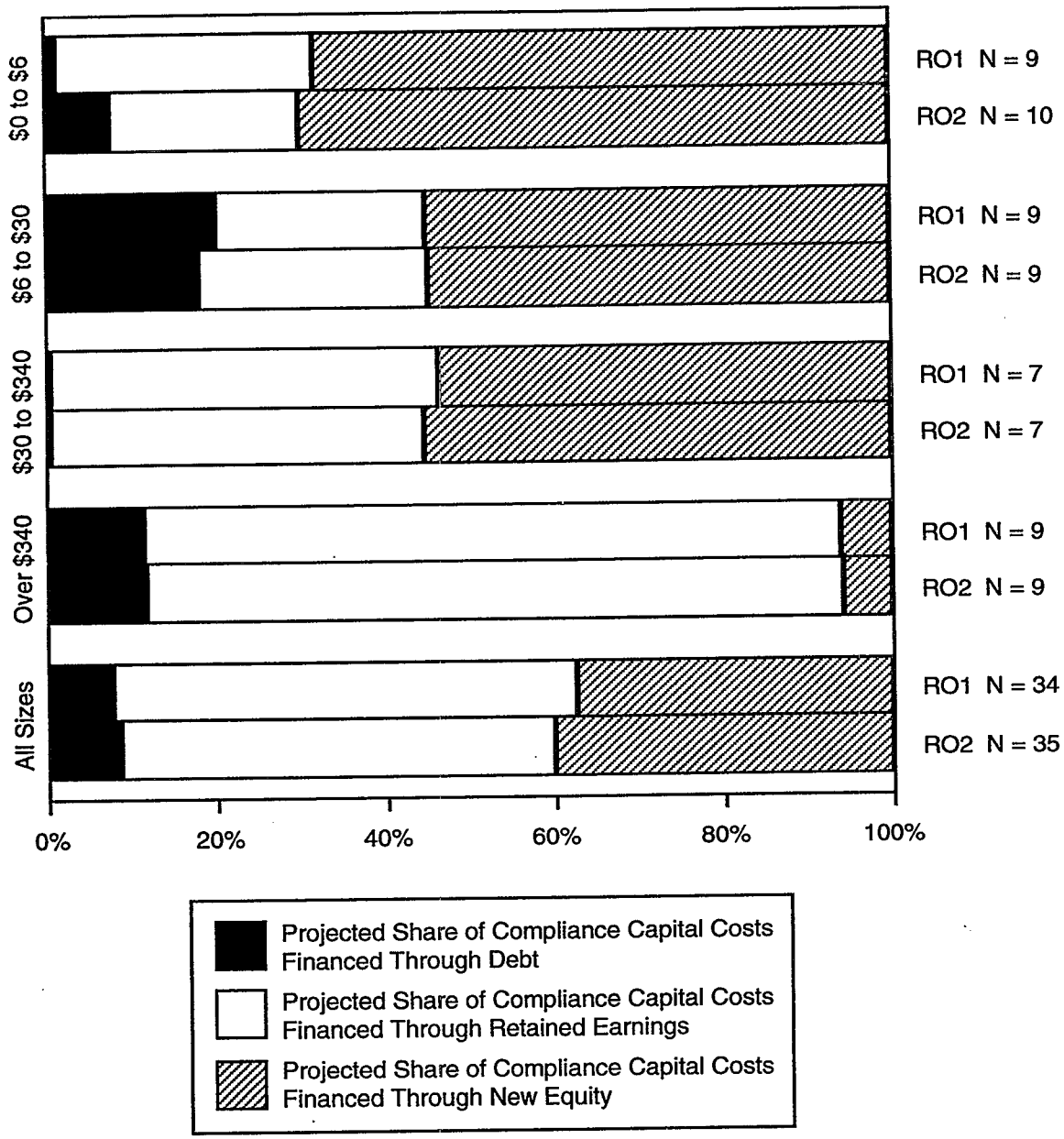
changes in the capital structure for potentially affected companies, then by using this information and the estimated changes in revenues and costs, to assess changes in the likelihood of bankruptcy.

8.2.1 Changes in the Cost of Capital

Companies will need to raise additional capital to comply with each of the proposed regulatory options. To do so they can tap three different sources of capital. They can borrow the money from creditors, they can use retained earnings if they have them, or they can issue new stock. The assumptions used to project how companies will elect to raise the required capital were explained in detail in Chapter 6. In each case companies will experience some change in their debt structure. Depending on the financing option projected for a given company, these changes may also change the company's cost of capital. The greater a company's reliance on financing with new external equity (new stock) the greater the likelihood of increases in the company's cost of capital.

Figures 8-1 and 8-2 permit comparison across companies of different sizes and across companies owning direct and indirect discharging CWT facilities of the projected shares of capital compliance costs to be financed with resources drawn from new debt, retained earnings, and new external equity. Generally, the larger the company the smaller the projected share of compliance capital costs that are financed with new external equity and the greater the share

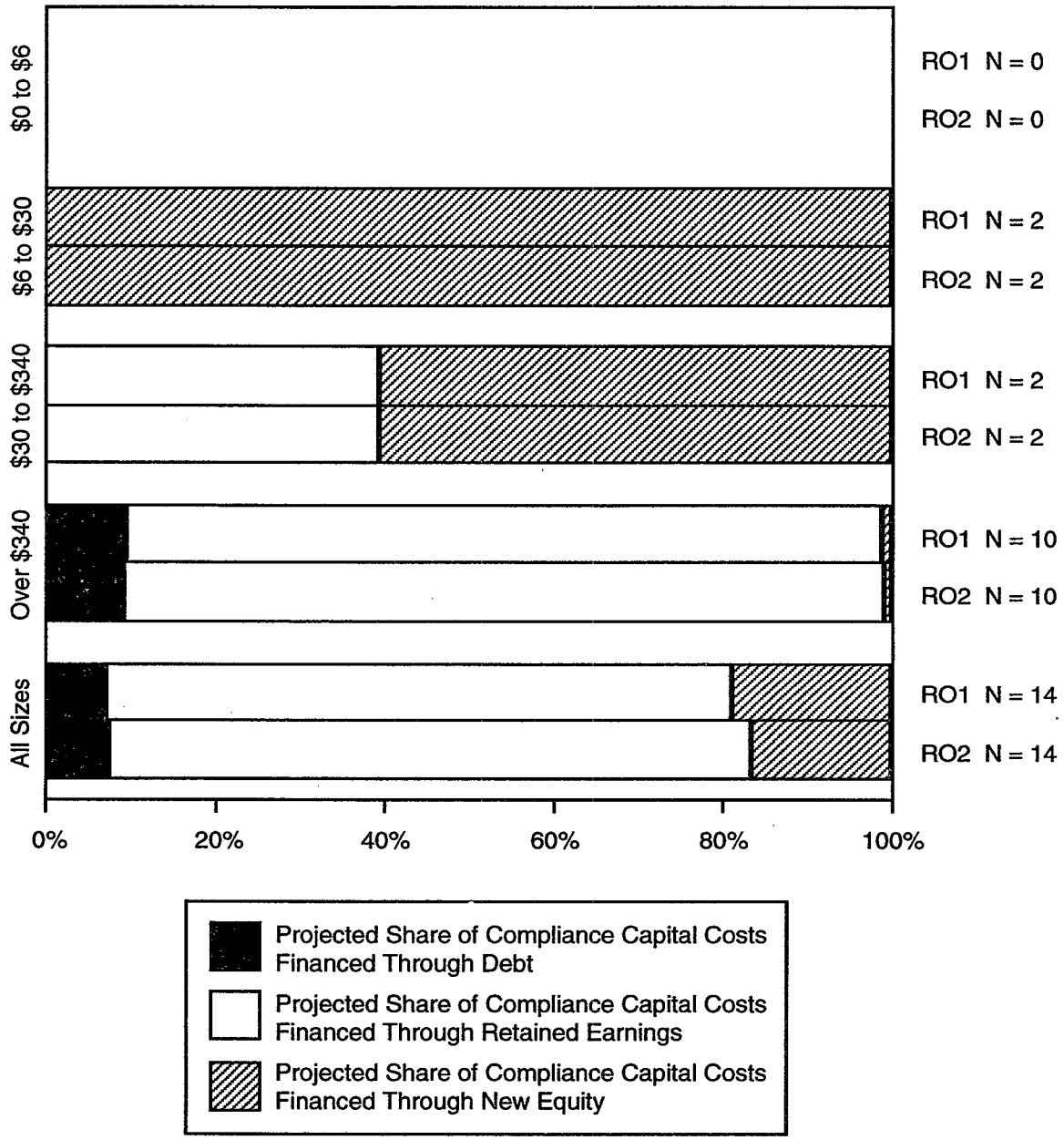
Figure 8-1. Projected Share of Compliance Capital Costs by Type of Financing for Companies Owning at least One Indirect Discharging CWT Facility



Note: The projected financing decisions of two companies that own both a direct discharging CWT facility and an indirect discharging CWT facility are included in both figures.

RO1 = Regulatory Option 1.
RO2 = Regulatory Option 2.

Figure 8-2. Projected Share of Compliance Capital Costs by Type of Financing for Companies Owning at least One Direct Discharging CWT Facility



Note: The projected financing decisions of two companies that own both a direct discharging CWT facility and an indirect discharging CWT facility are included in both figures.

RO1 = Regulatory Option 1.
RO2 = Regulatory Option 2.

financed with retained earnings. Smaller companies owning direct discharging CWT facilities are projected to rely exclusively on new external equity to finance their capital compliance costs. As a group, however, indirect discharger owners of all sizes are projected to use new external equity to finance a far greater share of their compliance capital costs than are owners of direct dischargers.

In keeping with their greater reliance on new external equity, smaller companies are projected to incur greater increases in their costs of capital than larger companies. The baseline cost of capital is generally higher for companies owning direct discharging CWT facilities than for owners of indirect dischargers, and it is typically higher for indirect dischargers than it is for zero dischargers. There is only a marginal difference in the relative increases in capital costs projected for companies owning CWT facilities of different discharge statuses, when the companies are not segregated according to their relative sizes. The WACC increases by about two percentage points from baseline to post-compliance with Regulatory Option 1, and it increases slightly more from baseline to post-compliance with Regulatory Option 2. Descriptive statistics on the change in the cost of capital for affected companies of different sizes are presented in Table G-1 (see Appendix G). Differences in the projected changes in the cost of capital for companies owning CWT facilities in different discharge categories can be found in Table G-2 (see Appendix G).

After projecting companies' financing decisions, the Agency incorporated projected changes in companies' capital structure and capital costs along with the changes in costs and revenues projected to occur at their CWT facilities and constructed new company balance sheets and income statements to simulate with-regulation changes in company finances. Table 8-2 shows the adjustments made to the baseline financial statements to develop the with-regulation financial statements used for this analysis.

8.2.2 Bankruptcy Analysis

Using projected post-compliance financial statements, the Agency recalculates the financial ratios used to estimate the respective composite indexes used to identify regulation-induced changes in the likelihood of bankruptcy for publicly-traded and private companies. For publicly-traded companies the appropriate index is the Z-score, a multidiscriminant function that simultaneously considers liquidity, asset management, debt management, profitability, and market value to assess the company's potential for bankruptcy. For companies that are not publicly-traded, the Agency uses a similar function called the Z"-score as a predictor of company-level financial distress. The Z"-score function differs from the Z-score function in that

TABLE 8-2. CALCULATIONS USED TO CONSTRUCT WITH-REGULATION FINANCIAL STATEMENTS

Financial Statement Category	Calculations
Income Statement	
Annual Revenues	Baseline annual revenues + the estimated change in annual revenues.
Cost of Sales	No change from baseline.
Gross Profit	Annual revenues – cost of sales.
Expenses due to Regulation	Interest: Projected share of capital costs financed through debt • debt interest rate. Depreciation: 10% • compliance capital costs. Operating: operating compliance costs.
Other Expenses and Taxes	(Gross profit – estimated expense due to regulation) • baseline ratio of other expenses and taxes to gross profit.
Net Income	Gross profit – estimated expense due to regulation – other expenses and taxes.
Balance Sheet	
Cash	No change from baseline.
Accounts Receivable	No change from baseline.
Cash + Accounts Receivable	No change from baseline.
Other Current Assets	No change from baseline.
Total Current Assets	No change from baseline.
Fixed Assets	Baseline fixed assets + compliance capital cost.
Other Noncurrent Assets	No change from baseline.
Total Assets	Total current assets + fixed assets + other noncurrent assets.
Accounts Payable	No change from baseline.
Other Current Liabilities	Baseline other current liabilities + amortized compliance cost financed through debt – estimated interest expense.
Total Current Liabilities	Accounts payable + other current liabilities.
Noncurrent Liabilities	Baseline noncurrent liabilities + (capital compliance cost financed through debt – current portion of debt).
Total Liabilities	Total current liabilities + noncurrent liabilities.
Net Worth	Total assets – total liabilities.
Total Liabilities and Owner's Equity	Total assets.

Note: Depreciation expense is based on the first year's allowable deduction for industrial equipment under the modified accelerated cost recovery system.

there is no market-value parameter considered, and the coefficients for the other four financial parameters are different. Details about the individual financial ratios included in each of these composite indexes are provided in Section 6.2.2. Companies whose baseline and with-regulation Z-score values (or Z"-score for companies that are not publicly-traded) indicate that they are financially viable at baseline, but are likely to experience financial failure post-compliance, are considered to suffer severe economic impacts from the regulation.

8.3 RESULTS

With-regulation Z-scores were computed to assess the probability that the regulation will result in financial failure or bankruptcy for potentially affected companies. In the baseline analysis, EPA estimates that 6 of the 48 companies for which enough data are available to estimate Z or Z" scores are likely to experience some form of financial failure. Tables G-3 through G-5 (see Appendix G) compare the likelihood of bankruptcy at baseline with an assessment of that likelihood for companies after incurring expected CWT market adjustments to each regulatory option. Four additional financial failures over baseline are projected for Regulatory Option 1, three of which are small privately-held single-facility companies, and one is a privately-held company in the third largest size category.

As discussed in Section 6.1, affected companies can experience changes in the revenues generated by CWT services as well as in the costs of providing these services. The net impact on a company's profitability is negative if cost increases exceed revenue increases, but it is positive if revenue increases exceed cost increases. The projected market adjustments (of higher prices and lower quantities of services provided) in the markets for oils treatment and oils recovery are much greater in response to Regulatory Option 2 than in response to Regulatory Option 1. Despite the fact that the compliance costs are generally higher for Regulatory Option 2 than they are for Regulatory Option 1, the net impact of cost and revenue changes is less painful for a number of companies owning CWT facilities. Under Regulatory Option 2, the prices of oil treatment and oil recovery services are projected to increase substantially in many regional markets. For some companies, this results in significant increases in revenues and profitability. In total numbers only three additional failures over baseline are projected as a result of Regulatory Option 2. These financial failures are also more evenly distributed across size categories. Two new failures are projected to occur among the 13 companies in the smallest size category, but one small company projected to fail at baseline is projected to benefit from the regulation to the extent that financial failure is unlikely post-compliance with Regulatory Option 2. Thus there is one net additional failure for the smallest size category. There is also one new

failure projected for companies in the second smallest size category and one new failure projected for the second largest size category.

No new publicly-traded companies are projected to fail in response to either regulatory option. In each case where companies are projected to suffer severe impacts of either regulatory option the affected companies are private companies whose facilities offer their waste treatment services on a commercial basis only. It is perhaps not surprising that these are the companies most severely hit by such a regulation, because they rely more heavily on revenues from CWT services than do other companies with greater vertical integration and other sources of revenue.

As discussed at the conclusion of Chapter 6, 15 companies are indistinguishable in terms of their size and scope of operations from the CWT facilities for which they are legally and financially responsible. Two of these 15 companies are projected to fail at baseline, four are projected to fail post-compliance with Regulatory Option 1, and three are projected to fail post-compliance with Regulatory Option 2. The results of Regulatory Option 2 are particularly interesting in the context of these single-facility companies whose only business is off-site waste treatment. One of these companies, a small business projected to fail at baseline, is projected not to fail after complying with Regulatory Option 2. Two of the other companies in this group, one a small business and one in the second smallest size category, are projected to fail with Regulatory Option 2.

8.4 CONCLUSIONS

Overall, company impacts are not predicted to be severe. Only four additional companies are estimated as likely to be bankrupt as a result of Regulatory Option 1, and a net increase of three companies are predicted as likely to be bankrupt as a result of Regulatory Option 2. This reflects four companies becoming likely to be bankrupt and one company that was likely to be bankrupt at baseline becoming unlikely to be bankrupt as a result of the market adjustments to Regulatory Option 2. Overall, therefore, the Agency concludes that the proposed effluent limitations guidelines and standards are economically achievable.

CHAPTER 9
SMALL BUSINESS IMPACTS

This chapter considers the expected effects of the proposed effluent limitations guidelines and standards for the CWT industry on small businesses. The Regulatory Flexibility Act (RFA) requires that federal agencies consider whether regulations they develop will affect small entities (which may include nonprofit organizations, small governmental jurisdictions, and small businesses). If the proposed rule is likely to have a significant adverse economic impact on a substantial number of small entities, a regulatory flexibility analysis is required. The Act allows some flexibility in defining small entities and determining what are a substantial number and significant impact.

9.1 METHODOLOGY

This analysis considers whether the proposed effluent limitations guidelines and standards for the CWT industry are likely to have a significant impact on a substantial number of small entities. At the outset the term "small entity" was defined. Small businesses are identified by Small Business Administration (SBA) general size standard definitions. For SIC code 4953, Refuse Systems, small business concerns are those receiving less than $6 million/year, averaged over the most recent three fiscal years.[1] Small government entities are defined in the RFA as those with populations less than 50,000. Only 1 of the 85 in-scope CWT facilities identified for this analysis is owned by a government entity, and it is owned by the federal government and administered by the U.S. Navy. No affected facilities are owned by a small government entity. Consequently, this analysis focuses on impacts incurred by potentially affected companies. Directly affected companies range from some of the largest companies in the U.S. to very small, single-facility waste treatment companies. Of the 84 private-sector facilities, 13 are owned by single-facility companies grossing less than $6 million annually.

EPA provides guidelines for determining when a "substantial number" of these small entities have been "significantly affected."[2] This EPA guidance states that a "substantial number" is "more than 20 percent of these (small entities) affected for each industry the proposed rule would cover." The Agency's chosen measure of severe impacts is a change in financial viability, as indicated by the companies' baseline and with-regulation Z-score (or Z"-score for companies that are not publicly-traded) values, from a level that indicates that bankruptcy is unlikely or indeterminate to a level that suggests that bankruptcy is likely. Thus, if the Agency determines that the 20 percent of small entities threshold is appropriate and over 20

percent of the small entities affected by a regulatory option were projected to risk bankruptcy as a result of the option, then a regulatory flexibility analysis of that option would be needed.

9.2 RESULTS

Because the regional markets for CWT services modeled for this analysis include both direct and indirect discharging CWT facilities, the economic impacts of each regulatory option presented in this report are the projected impacts of both the BPT/BAT guidelines and PSES standards under each regulatory option. The impacts of each regulatory option are presented separately for entities affected by the BPT/BAT and PSES rules. These impacts can be compared in Tables G-3 through G-5 (see Appendix G).

9.2.1 Impact of BPT/BAT Regulations on Direct Dischargers

Under the proposed effluent limitations guidelines and standards, no companies are projected to incur severe economic impacts. Furthermore, none of the companies owning direct discharging CWT facilities are small entities, as defined by the SBA size standard. Therefore, conducting a regulatory flexibility analysis of either of the regulatory options for direct discharging CWT facilities presented in this report is not necessary.

9.2.2 Impact of PSES Regulations on Indirect Dischargers

Under the effluent limitations guidelines and standards proposed as Regulatory Option 1, three of the four entities projected to incur severe impacts are small businesses. If the EPA Administrator certifies that three companies constitutes a substantial number, then the 20 percent of affected entities threshold (3/13=23%) would indicate a need for a regulatory flexibility analysis for this option.

Only two of four entities projected to incur significant impacts under Regulatory Option 2 are small businesses. Furthermore, one small entity projected to fail without the regulation is projected not to fail in the post-compliance analysis. On balance, there is a projected net increase of just one small business failure over baseline as a result of Regulatory Option 2, therefore conducting a regulatory flexibility analysis of Regulatory Option 2 is not necessary.

9.3 MITIGATING MEASURES

The impacts reported in the previous section indicate that all but the largest companies will experience impacts because of the regulation. While the disparity is much more pronounced under Regulatory Option 1 than under Regulatory Option 2, a greater share of the smallest

businesses are projected to incur severe impacts as a result of the regulation than is the case for financially larger entities. This may accelerate the consolidation of the CWT industry that began in the 1980s, with large waste treatment companies and other multi-disciplinary companies buying up smaller waste treatment companies. EPA is particularly concerned about these impacts on small entities. To address these concerns, measures designed to mitigate the impacts on small entities are being considered. First, the proposed regulatory options are in the form of effluent limitations guidelines and standards rather than design, equipment, work practice, or operational standards. This reduces impacts by giving the CWT facility owner/operator the freedom to use the least costly mix of process changes and control equipment installations that will meet the limitations. This measure potentially reduces impacts at all potentially affected CWT facilities regardless of the size of the facility. The Agency also considered proposing less stringent control options for each of the treatment subcategories.

9.4 REFERENCES

1. Code of Federal Regulation, 1991.

2. Memorandum from the Administrator, U.S. Environmental Protection Agency, entitled "EPA Implementation of the Regulatory Flexibility Act." February 9, 1982.

CHAPTER 10
COMMUNITY IMPACTS ANALYSIS

In response to the effluent limitations guidelines and standards, commercial CWT facilities are predicted to modify the quantities of waste they treat. This change in production levels will be associated with changes in employment. The changes in employment predicted to occur as a result of the regulation include direct changes, which combine these market-related changes in employment with changes in employment resulting from the labor requirements of the regulation, and indirect changes, which result from the changed spending of those people experiencing the direct employment effects. No changes in employment are predicted to result from controls on non-commercial facilities, because the Agency assumes that the companies owning these facilities will continue to operate them without changing the quantity of waste treated in response to the regulation. Overall, employment is predicted to increase as a result of the effluent limitations guidelines and standards.

Changes in output and employment at a CWT facility affect not only the welfare of the individual employees either hired or laid off but also the communities in which the CWT facilities are located, because unemployed individuals have less income and spend less in the community, in addition to perhaps placing additional burdens on community services within the community. Conversely, newly employed individuals spend some of their income in the community, which increases the incomes and spending of other community residents. Direct changes in employment thus result in a multiplied community-wide impact. The U.S. Department of Commerce, Bureau of Economic Analysis (BEA), publishes estimates of direct-effect employment multipliers[1] for each state for broad industry categories. These multipliers estimate the direct total change in employment resulting from one job gained or lost in each industry category. These data can be used to estimate total community impacts resulting from changes in the operations of CWT facilities.

10.1 DIRECT EMPLOYMENT CHANGES

Direct employment changes resulting from compliance with the proposed effluent limitations guidelines and standards would include facility-specific changes in employment at commercial CWT facilities that result from their changes in CWT operations as a result of market adjustments to the proposed regulation. In addition, direct employment effects of the proposed regulation include the estimated labor requirements of the controls. These labor requirements are estimated on a national basis and are therefore not included in the community-level analysis.

10.1.1 Facility-Specific Changes in Employment Resulting from Market Adjustments

As described in Chapter 7, the Agency estimated changes in employment at each commercial CWT facility resulting from market adjustments to the costs of complying with the proposed effluent limitations guidelines and standards. The Agency does not project facility closures for any CWT facility as a result of the proposed regulation, because the owners of unprofitable facilities appear to allow them to continue to operate for several years. Thus, there are no employment changes estimated as a result of facility closures. Instead, changes in quantity treated at each facility are multiplied by facility-specific employment factors, computed based on information from the questionnaire. These employment factors show the number of full-time equivalent employees (FTEs) for each gallon treated (a fractional quantity).

$$\text{Change in employment (FTEs)} = \text{Change in quantity treated (gallons)} \bullet \text{Employment factor (FTEs/gallon)}$$

For some CWT facilities, the quantity treated is estimated to increase as a result of the regulation, and employment is therefore estimated to increase also. For other facilities, the quantity treated is estimated to decrease as a result of market adjustments to the proposed regulation, and employment is also estimated to decrease. Table 10-1 shows a frequency distribution of the direct employment effects of the BPT/BAT and PSES controls under each regulatory option. Because the Agency expects to impose regulations on direct and indirect dischargers simultaneously, the model was run imposing compliance costs on both types of facilities. This method is appropriate, because many markets include both direct and indirect dischargers, and the best estimate of the economic impacts is the combined effect of both BPT/BAT and PSES controls imposed simultaneously. Thus, the results described below represent the impacts of all controls on facilities affected by the BPT/BAT controls or the PSES controls, rather than the effects of the BPT/BAT controls and the PSES controls imposed independently.

Table 10-1 shows that, in general, changes in employment at CWT facilities are fairly small. While two facilities (one direct discharger and one indirect discharger) are estimated to experience more than 100 job losses as a result of market adjustments, one indirect discharger is also estimated to increase employment by more than 100 jobs. The median change in employment for direct dischargers is -4 under Regulatory Option 1 and -5 under Regulatory Option 2. For indirect dischargers, the median change in employment is -2 under Regulatory Option 1 and -5 under Regulatory Option 2. CWT facilities that are zero dischargers are

TABLE 10-1. CHANGES IN CWT EMPLOYMENT RESULTING FROM MARKET ADJUSTMENTS AT CWT FACILITIES

	Number of Facilities	
Change in Employment	Regulatory Option 1	Regulatory Option 2
BPT/BAT		
Increase	2	2
Decrease by fewer than 10 jobs	4	4
Decrease by more than 10 jobs	1	1
PSES		
Increase	12	11
Decrease by fewer than 10 jobs	25	21
Decrease by more than 10 jobs	13	18

estimated to experience no change in employment or employment gains ranging from 1 to 12 employees.

10.1.2 Labor Requirements of the Controls

The other type of direct employment effect is the estimated labor requirements of the control options. These data are presented at the national level, rather than the facility level, and are used to qualify and place in context the market-related community-wide employment effects. This comparison is described in Section 10.4 at the end of this chapter.

10.2 COMMUNITY EMPLOYMENT EFFECTS

The direct market-related changes in employment at commercial CWT facilities can be used to estimate changes in total employment in the communities in which the CWT facilities are located. As noted above, the changed incomes of individuals either hired or laid off at CWT facilities will result in changes in their spending within the community. This change, in turn, will result in changes in employment at establishments throughout the community where the CWT employees transact business. The BEA direct-effect regional employment multipliers, published for broad industry categories in each state, measure the change in state-wide employment expected to result from a one-job change in employment (including the initial one job change). Table 10-2 shows the direct-effect regional employment multipliers used to

TABLE 10-2. DIRECT-EFFECT REGIONAL MULTIPLIERS FOR STATES IN WHICH CWT FACILITIES ARE LOCATED

State	Direct-Effect Employment Multiplier
California	5.1316
Connecticut	3.2796
Georgia	4.0769
Illinois	5.3610
Indiana	5.3335
Kentucky	5.4906
Louisiana	4.9349
Maryland	3.9997
Michigan	3.6638
Minnesota	3.6915
North Carolina	3.6247
New Jersey	3.8339
Nevada	3.0610
New York	2.9124
Ohio	5.1695
Oklahoma	5.0973
Pennsylvania	5.6759
Rhode Island	3.2728
South Carolina	3.9489
Tennessee	4.4237
Texas	6.5537
Virginia	4.7204
Washington	3.8849

estimate the total change in employment resulting from the market adjustments to CWT controls. These multipliers range from 2.91 in New York to 6.55 in Texas, and average 4.05 across all states. Thus, overall, each one-job change in employment occurring at a CWT facility results in a statewide change in employment of between three and six jobs.

Table 10-3 is a frequency distribution of the total change in community employment resulting from the changes in CWT employment reported in Table 10-1. For direct dischargers, estimated community-wide changes in employment range from a gain of 71 employees to a loss

TABLE 10-3. CHANGES IN COMMUNITY EMPLOYMENT RESULTING FROM MARKET ADJUSTMENTS AT CWT FACILITIES

	Number of Communities	
Change in Employment	Regulatory Option 1	Regulatory Option 2
BPT/BAT		
Increase by 0 to 100 jobs	2	2
Decrease by fewer than 50 jobs	4	4
Decrease by more than 300 jobs	1	1
PSES		
Increase by more than 400 jobs	1	1
Increase by 1 to 100 jobs	11	10
Decrease by fewer than 50 jobs	26	22
Decrease by 50 to 160 jobs	11	16
Decrease by more than 600 jobs	1	1

of 337 under both regulatory options. The median change in community employment for communities in which direct dischargers are located is 23 employees. For indirect dischargers, the change in community employment is predicted to range from a gain of 426 jobs to a loss of 634 jobs under Regulatory Option 1 and to range from a gain of 426 jobs to a loss of 658 jobs under Regulatory Option 2. The median change in employment for communities in which indirect-discharger CWT facilities are located is estimated to be 11.5 employees under Regulatory Option 1 and 18 employees under Regulatory Option 2. Thus, overall, the market-adjustment changes in community employment are generally small.

10.3 MEASURING THE SIGNIFICANCE OF COMMUNITY EMPLOYMENT IMPACTS

To assess the severity of these impacts on the affected communities, the Agency employed the most conservative definition of "affected community" available. Thus, the affected community is defined as the city or town in which the CWT facility is located, if the city or town has a population exceeding 10,000. For CWT facilities located in cities or towns with populations less than 10,000, the Agency assumed that the labor force from which the CWT facility draws employees is the county in which the CWT facility is located.[2] The Agency compared the estimated change in community employment with baseline 1990 community

employment. A severe employment impact would occur if the change in community employment exceeded 1 percent of the baseline 1990 community employment. Table 10-4 shows a frequency distribution of the impact measure, change in employment as a percentage of baseline 1990 employment. In no community did the change in employment exceed 1 percent of baseline community employment; therefore, no significant employment impacts are predicted to result from the proposed effluent limitations guidelines and standards.

TABLE 10-4. PERCENTAGE CHANGE IN COMMUNITY EMPLOYMENT

	Number of Communities	
Percentage Change in Employment	Regulatory Option 1	Regulatory Option 2
BPT/BAT		
Increase by less than 0.1 percent	2	2
Decrease by less than 0.2 percent	3	2
Decrease by 0.2 to 0.4 percent	2	3
PSES		
Increase by 0.1 to 0.99 percent	2	3
Increase by less than 0.1 percent	10	8
Decrease by less than 0.1 percent	27	28
Decrease by 0.1 to 0.5 percent	9	8
Decrease by 0.5 to 0.9 percent	2	3

Percentage changes in community employment resulting from the proposed effluent limitations guidelines and standards are estimated to range from a decrease of 0.88 percent to an increase of 0.99 percent. The median percentage change in employment is -0.05 percent for direct dischargers under both regulatory options and is -0.01 percent for indirect dischargers under both regulatory options. Thus, the market-adjustment related changes in community employment will not result in significant community impacts.

10.4 INCLUDING THE LABOR REQUIREMENTS OF THE CONTROLS

As noted above, the Agency estimates that CWT facilities will have to hire additional workers to operate the controls required under the proposed effluent limitations guidelines and standards. Table 10-5 compares the market-adjustment changes in employment with the labor requirements of the controls.

TABLE 10-5. COMPARING MARKET CHANGES IN EMPLOYMENT WITH LABOR REQUIREMENTS OF CONTROLS

	Change in Employment	
	Regulatory Option 1	Regulatory Option 2
BPT/BAT		
Market-related change in CWT employment	-112	-114
Labor requirements of controls	126	129
PSES		
Market-related change in CWT employment	-272	-390
Labor requirements of controls	584	606

Nationwide, increases in CWT employment resulting from the labor requirements of the controls exceed decreases in CWT employment from CWT production changes in response to market adjustments to the regulation. Of course, employment may fall as a result of the controls at some facilities. Overall, however, the employment impact is expected to be positive rather than negative: the proposed effluent limitations guidelines and standards are estimated to result in increases in employment at CWT facilities.

10.5 CONCLUSIONS

Market-related changes in employment at CWT facilities are projected to result in insignificantly small changes in community employment if the proposed effluent limitations guidelines and standards are promulgated. National estimates of the labor requirements of the controls exceed the estimated changes in CWT employment resulting from market adjustments to the regulation. Thus, the overall impact of the proposed effluent limitations guidelines and standards is estimated to be a small increase in employment in most communities in which CWT facilities are located.

10.6 REFERENCES

1. U.S. Department of Commerce, Economics and Statistics Administration, Bureau of Economic Analysis. *Regional Multipliers: A User Handbook for the Regional Input-Output Modeling System (RIMS II)*. May 1992.

2. U.S. Department of Commerce, Economics and Statistics Administration, Bureau of the Census. County and City Data Book. 1994. Used 1990 employment for the city or county in which the CWT is located. For cities over 25,000 and for counties, employment is listed. For cities between 10,000 and 25,000, employment is estimated by using the average employment/population ratio for all CWT locations with employment data: 0.4485. This ratio was multiplied by the 1990 population for communities between 10,000 and 25,000 population to estimate their 1990 employment.

CHAPTER 11
INTERNATIONAL TRADE EFFECTS

Generally, changes in the costs incurred by a domestic industry result in changes in the imports and exports of the products produced by that industry. In the case of the CWT industry, however, there is virtually no international trade in CWT services. The Agency therefore does not expect any international trade effects to result from the proposed effluent limitations guidelines and standards.

11.1 RESTRICTIONS ON INTERNATIONAL SHIPMENTS OF HAZARDOUS WASTE

Much of the waste accepted by CWT facilities is considered hazardous and is regulated under RCRA. RCRA establishes stringent regulations for exporting and importing hazardous waste.

11.1.1 Exports of Hazardous Waste

Under Subpart E of RCRA, §262.50 through §262.58, exports of hazardous waste are prohibited unless the following are true:

- EPA is notified of an intended export 60 days before the initial shipment.
- The receiving country has consented to receive the hazardous waste.
- A copy of the EPA Acknowledgment of Consent to the shipment accompanies the hazardous waste shipment.
- The hazardous waste shipment conforms to the terms of the receiving country's written consent as reflected in the EPA Acknowledgment of Consent.

In addition to the above requirements, special manifest requirements, annual reporting requirements, and recordkeeping requirements are associated with the export of hazardous waste.

11.1.2 Imports of Hazardous Waste

Importers of hazardous waste are required under Subpart F, §262.60, to comply with special manifesting requirements associated with the shipment of hazardous waste. Once imported, hazardous waste must be managed under the same regulations that apply to domestically generated hazardous waste.

11.2 TRENDS IN INTERNATIONAL SHIPMENT OF HAZARDOUS WASTE

Overall, the U.S. exports approximately 150,000 tons of hazardous waste annually, 80 to 90 percent of it to Canada. This is less than one percent of hazardous waste generated annually, but it is increasing. Exports of hazardous waste have increased over the period 1986 to 1990; in 1990, EPA received 550 notices of export, which was approximately twice the number received in 1986.

Under the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, which the U.S. signed in 1990, imports and exports of hazardous waste and some types of non-hazardous waste may be more restricted. The Congress has ratified the Convention but must enact enabling legislation before the Convention will apply to U.S. international trade in waste. "Proposed federal legislation to implement the Basel Convention would prohibit the export and import of hazardous and municipal wastes and residues from the incineration of municipal wastes, except in cases where the U.S. has a bilateral agreement with another country ensuring that wastes will be handled in an environmentally sound manner."[1]

11.3 CONCLUSIONS

Because international trade in hazardous wastes is such a small share of the quantity of waste generated, and because the restrictions on transboundary shipments of hazardous waste are expected to become increasingly stringent, the Agency does not expect the proposed effluent limitations guidelines and standards to affect international trade in waste treatment services. As noted above, the share of waste management costs in total production costs for the goods whose production generates waste is very small. Therefore, the Agency does not predict significant impacts on the markets for those goods as a result of the proposed regulation, including international trade in those goods. Overall, the Agency does not predict significant changes in foreign trade to result from the proposed effluent limitations guidelines and standards.

11.4 REFERENCES

1. Lorenz, William T. & Co. 1993 Update—Hazardous Waste Control Industry Outlook. 1993.

CHAPTER 12
IMPACTS ON NEW SOURCES

In this chapter, the effects of the proposed New Source Performance Standards (NSPS) and Pretreatment Standards for New Sources (PSNS) on new discharge sources are considered. New facilities have the opportunity to incorporate the best available demonstrated technologies, including process changes, in-plant controls, and end-of-pipe treatment technologies and to use facility site selection to ensure adequate treatment system installation. The impacts of the proposed regulations on new sources are expected to be less burdensome than the impacts of the BPT/BAT and PSES regulations on existing sources. Designing a new technology prior to facility construction is typically far less expensive than retrofitting a facility for a new technology. The proposed NSPS and PSNS regulations and the reasonableness of the associated costs are discussed below.

12.1 NEW SOURCES

Many of the facilities in the CWT industry accept hazardous waste from off-site for treatment and are therefore regulated under RCRA. Siting a new RCRA-regulated facility involves obtaining a RCRA permit for the facility. This process, in turn, involves a lengthy application process including public hearings on the siting and frequently becomes extremely political and costly. In addition, changes in the pattern of demand for CWT services has resulted in reduced demand and excess capacity for some types of treatment in some regions of the country. For both of these reasons, very few new RCRA-regulated facilities have been sited in the past ten years, and the Agency expects this trend to continue.

In addition to completely new RCRA-regulated CWT facilities, new sources may include new operations at existing RCRA-regulated CWT facilities. In addition to the cost of designing, purchasing, and installing new capital equipment for the process, such new CWT operations require modifications to the facility's RCRA permit, if the facility has one. This process is costly (estimated by the Agency for this analysis to cost $30,000) but is less onerous than the process of obtaining a new RCRA permit. Thus, existing RCRA-regulated facilities may have some new sources.

Finally, not all existing CWT facilities are RCRA-regulated. Thus, new sources may not be RCRA-regulated. These new sources would not incur the costs associated with obtaining or modifying a RCRA permit. However, the demand trends discussed above apply to these facilities as well. Overall, the demand for off-site waste management services in general is not

projected to grow over the next few years, so the Agency does not expect many new sources to be constructed.

12.2 NSPS

EPA is proposing to set NSPS equivalent to the proposed BPT/BAT effluent limitations for all subcategories of the CWT industry. This represents the best available and best demonstrated technology for the CWT industry as a whole. The EIA shows that this regulatory approach, as shown in Regulatory Options 1 and 2, would be economically achievable for existing sources. EPA believes that new sources will be able to comply at costs that are similar to or less than the costs for existing sources, because new sources can apply control technologies more efficiently than sources that need to retrofit for those technologies. EPA's analysis concludes that NSPS equivalent to Options 1 and 2 would be economically achievable for new sources and would not be a barrier to entry.

12.3 PSNS

EPA is proposing to set PSNS equivalent to NSPS effluent limitations for all subcategories of the CWT industry. The Agency is proposing to establish PSNS for the same pollutants and the same points of application as are being proposed for NSPS. EPA considered the cost of the proposed PSNS technology for new facilities and concluded that those costs are not so great as to present a barrier to entry, as demonstrated by the fact that currently operating facilities are using these technologies. The Agency considered energy requirements and other non-water quality environmental impacts and found no basis for any different standard than the selected PSNS. As with the NSPS, the Agency has analyzed the economic impacts for Regulatory Options 1 and 2 for existing indirect dischargers and has concluded that they are economically achievable. Because new indirect dischargers can implement these controls at costs that are equal to or lower than the costs for existing sources, the Agency concludes that the proposed PSNS regulations would be economically achievable and would not be a barrier to entry.

APPENDIX A

Copy of Part B of the Waste Treatment Industry Questionnaire

U.S. ENVIRONMENTAL PROTECTION AGENCY
WASTE TREATMENT INDUSTRY QUESTIONNAIRE
PART 2. ECONOMIC AND FINANCIAL INFORMATION

INTRODUCTION

The U.S. Environmental Protection Agency (EPA) is conducting a survey of the Waste Treatment Industry as part of its effort to establish national wastewater regulations for this industry. For purposes of this questionnaire, hazardous and non-hazardous wastes will be covered. The data collected by the Technical section of the questionnaire will be used to determine the number of facilities in this industry, the number of dischargers to surface waters and publicly-owned treatment works, the characteristics of these discharges, and the treatment technologies currently used by this industry. The data collected by the Economic and Financial section of the questionnaire will be used to characterize the industry and to estimate the possible economic impacts of the regulations.

AUTHORITY

This survey is conducted under the authority of Section 308 of the Clean Water Act (the Federal Water Pollution Control Act, 33 U.S.C. Section 1318). All facilities which receive this questionnaire must respond. Only if you were instructed in Section A of Part 1 of the questionnaire to stop filling out the questionnaire are you not required to complete Part 2. Follow the questionnaire instructions and answer the questions as accurately as possible. PLEASE RETURN THE QUESTIONNAIRE TO EPA WITHIN 60 DAYS. Late filing or failure otherwise to comply with these instructions may result in criminal fines, civil penalties, and other sanctions as provided by law.

WHO SHOULD COMPLETE THE ECONOMIC/FINANCIAL SECTION OF THE QUESTIONNAIRE?

Each section of this questionnaire should be completed by the person who is most knowledgeable about the information it requests. Nevertheless, verifying each section of the questionnaire and signing the certification statement located in Part 3 should be a single individual's responsibility. Accurate responses will enable EPA to consider the information in future policy decisions.

EPA has prepared this part of the questionnaire so that it is applicable to a wide variety of waste management facilities. Therefore, not all the questions may apply to your facility. Unless instructed otherwise, you are expected to make an effort to complete every item using available data. However, you are not required to perform non-routine tests or measurements solely for the purpose of responding to this questionnaire. If exact measurements are not available but can be estimated, please provide estimates and note, on the NOTES page at the end of each section, the method used in making the estimation. Please indicate on the NOTES page *all* questions for which your responses are estimates.

Note: If you responded "No" to Question A.17 in Part 1, you are not required to complete Part 2.

QUESTIONNAIRE HELPLINE

If you have any questions about the economic/financial part of the questionnaire or would like to provide additional information, please contact the Waste Treatment Industry Questionnaire Helpline at 1-800-626-5767.

PROVISIONS REGARDING DATA CONFIDENTIALITY

Regulations governing the confidentiality of business information are contained in 40 CFR Part 2 Subpart B. You may assert a business confidentiality claim covering part or all of the information you submit in the manner described in 40 CFR 2.203(b):

> "(b) Method and time of asserting business confidentiality claim. A business which is submitting information to EPA may assert a business confidentiality claim covering the information by placing on (or attaching to) the information, at the time it is submitted to EPA, a cover sheet, stamped or typed legend, or other suitable form of notice employing language such as 'trade secret,' 'proprietary,' or 'company confidential.' Allegedly confidential portions of otherwise non-confidential documents should be clearly identified by the business, and may be submitted separately to facilitate identification and handling by EPA. If the business desires confidential treatment only until a certain date or until the occurrence of a certain event, the notice should so state."

If no business confidentiality claim accompanies the information when it is received by EPA, EPA may make the information available to the public without further notice to you.

Please be specific in indicating whether a claim of confidentiality covers all or only part of the information on a questionnaire or attachment.

Information covered by a claim of confidentiality will be disclosed by EPA only to the extent, and by means of the procedures, set forth in 40 CFR Part 2 Subpart B. In general, submitted information protected by a business confidentiality claim may be disclosed to other employees, officers, or authorized representatives of the United States concerned with carrying out the Clean Water Act, or when relevant to any proceeding under the Act.

Effluent data are not eligible for confidential treatment, pursuant to Section 308(b) of the Clean Water Act.

The information submitted will be made available to EPA contractors in order that the contractors may carry out the work required by their contract with EPA. All EPA contracts provide that contractor employees shall use the information only for the purpose of carrying out the work required by their contract and shall refrain from disclosing any confidential business information to anyone other than EPA without the prior written approval of each affected business or of the EPA legal office. Any comments you may wish to make on this issue must be submitted in writing at the time of submitting your response. Please direct any questions regarding confidential business information to the Waste Treatment Industry Questionnaire Helpline at 1-800-626-5767.

CHECKLIST

Be sure that the following additional information is included with the completed questionnaire, unless instructed otherwise:

- ☐ **Question M.22:** 1987, 1988, and 1989 annual reports for the facility (if independently owned) or for the business entity that owns and/or controls the facility; include income statements and balance sheets. (Please see definitions of facility and business entity, p. M-1.)
- ☐ **Question O.2:** If the facility uses a standard contract in arranging with clients to accept aqueous liquid waste, sludge, and/or wastewater generated offsite for treatment onsite, please attach a copy of the standard contract. (See p. O-1.)

GENERAL INSTRUCTIONS

1. **Read all definitions.** Please read all definitions on page M-1 carefully before completing Part 2 of the questionnaire. The individual who responds to each section must be familiar with the pertinent economic and financial aspects of waste treatment, disposal, and recycling/recovery operations at this facility.

2. **Mark responses for each question.** Please circle the appropriate response or responses in each question. More than one response may be circled for some questions, where appropriate. Please complete all questions that require written responses by printing or typing in the spaces provided. If the space allotted for the answer to any question is not adequate for your complete response, please continue the response in the NOTES area at the end of each section of the questionnaire. Reference the comments to the appropriate question. If additional attachments are used to clarify a response, please make certain that the code number for this questionnaire, which appears at the top right hand corner of each page, is also placed at the top right hand corner of each page of the attachments.

3. **Please enter all asset, liability, revenue, and cost information in *dollars*, and price information in *dollars per ton*. Please enter quantity information in short tons (2000 pounds=1 ton).**

4. **Indicate information which should be treated as confidential.** Please follow the instructions given in the PROVISIONS REGARDING DATA CONFIDENTIALITY section on page ii to indicate which information in your responses is confidential so that it may be protected under confidentiality procedures.

5. **Answer all items unless instructed otherwise.** Please answer all items unless instructed to do otherwise. The purpose of this questionnaire is to gather all available economic and financial information pertinent to hazardous and non-hazardous waste treatment, disposal, and recycling/recovery operations that produce wastewaters. If a question is not applicable, indicate by writing "N/A." If, after conscientious attempts to obtain requested information, an item remains unknown and cannot be estimated, write "UNK" and explain in the NOTES area at the end of the appropriate section why such information is not available. If an item seems ambiguous, complete it as fully as possible and state your assumption in doing so in the NOTES area at the end of the appropriate section. Reference all explanations and assumptions to the appropriate questions. If actual data are not available to answer a question, please estimate and indicate that you have done so in the NOTES.

6. **Retain a copy of completed questionnaire.** EPA will review the information submitted and may request your cooperation in answering follow-up clarification questions, if necessary, to complete the data base. Please retain a copy of the completed questionnaire, including attachments, in case EPA must contact you to verify your responses. Also, please maintain a record of sources used to complete the financial section.

7. **If you detached the economic and financial section of the questionnaire, please reattach it and return the entire questionnaire to:**

   Debra S. DiCianna
   U.S. EPA (WH-552)
   Office of Water
   Office of Water Regulations and Standards
   Industrial Technology Division
   401 M Street, SW
   Washington, DC 20460

8. **Call in questions.** If you have any questions about the economic/financial section, please telephone the Waste Treatment Industry Questionnaire Helpline at 1-800-626-5767.

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left blank.

FILE NAME: P2S

PLEASE RETURN THIS PAGE WITH YOUR COMPLETED ECONOMIC AND FINANCIAL QUESTIONNAIRE.

1. **Provide the name, title, and telephone number of the individual who may be contacted to answer questions concerning information submitted in Part 2. Economic and Financial Information.**

P041CBI
P041COM

P041A Name of Contact: _____

P041B Title of Contact: _____

P041C Telephone Number: ( ) _____

P041D What is the most convenient time to call? _____

ATTACH LABEL HERE

Review the information on the preprinted label above. If any of the information is incorrect, enter the correct information in the appropriate spaces on this page.

2. **If the mailing address shown on the preprinted label is not correct, enter the corrections to the label in the spaces provided below.**

P042CBI
P042COM

P042 ☐ N/A

P042A Name of Facility: _____

P042B Street Address or P.O. Box: _____

P042C City: _____ State: P042D Zip: P042E

3. **If the street address of the facility is different from the mailing address, provide the street address in the spaces provided below.**

P043CBI
P043COM

P043 ☐ N/A

P043A Name of Facility: _____

P043B Street Address: _____

P043C City: _____ State: P043D Zip: P043E

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SECTION M: BUSINESS ENTITY FINANCIAL INFORMATION

The purpose of Section M is to collect financial information about the business entity directly owning and/or controlling your facility. These data will be used to assess impacts of the regulation on business entities.

For independently-owned and operated facilities and multi-facility establishments whose primary business is waste treatment, recycling/recovery, and/or disposal, the business entity is the facility or establishment. The information requested in Section M is to be based on corporate annual reports.

For multi-facility establishments whose primary business is not waste treatment, recycling/recovery, and/or disposal activity, the business entity is the level of ownership closest to the facility for which there exist income statements, balance sheets, market or book value of stock. This may be, for example, the waste management division of a larger company.

Answer the questions in sequence and do not leave any entry blank unless instructed otherwise. Definitions and specific instructions are provided throughout. Use the NOTES page at the end of the section if you wish to explain your response to any question. Reference each comment with the appropriate question number. **Reminder:** Please provide estimates, if possible, of data for which exact measurements are unavailable. Indicate on the NOTES page at the end of the section which responses are estimates, and explain the method of estimation.

DEFINITIONS

Financial Statements: balance sheet and income statement that were derived from accounting records according to generally accepted accounting principles (GAAP).

Business Entity: a proprietorship, partnership, or corporation, or a division or subsidiary of a proprietorship, partnership, or corporation, **for which financial statements exist.**

Facility: the physical location or site where waste is managed.

DUNS Number: a unique nine-digit number assigned by Dun & Bradstreet Corporation to each business establishment (i.e., to each branch location, headquarters location, and single location establishment). These identification numbers, based on the Data Universal Numbers System, are referred to as D-U-N-S Numbers (printed here as DUNS).

Commercial Facility: a facility that treats, disposes, or recycles/recovers the wastes of other facilities not under the same ownership as this facility. Commercial operations are usually made available for a fee or other remuneration. Commercial waste treatment, disposal, or recycling/recovery does not have to be the primary activity at a facility for an operation or unit to be considered "Commercial".

Non-commercial Facility: a facility that provides treatment, disposal, or recycling services to other facilities under the same ownership as this facility, for which no fee is charged. Included in this definition are intracompany waste treatment facilities, which treat, dispose, or recycle/recover the wastes generated off-site from facilities under the same corporate ownership. Intra-company waste treatment facilities may receive remuneration in the form of intra-company funds, services, etc.

Value of Product Manufactured (for non-commercial facilities only): quantity of product manufactured, valued at market price.

FILE NAME: MS

PART 2. SECTION M. BUSINESS ENTITY FINANCIAL INFORMATION

M.1. **Is this facility independently owned and operated? (I.e., the facility is the business entity.)**
M401CBI
M401COM
(Circle one number.)

M401
01 Yes *(GO TO QUESTION M.10 ON PAGE M-3)*
02 No *(CONTINUE TO NEXT QUESTION)*

M.2. **What is the name and mailing address of the business entity that directly owns and/or controls this facility and for which financial statements exist?**
M402CBI
M402COM

M402A Name of Business Entity: _____

M402B Street Address or P.O. Box: _____

M402C City: _____ State: M402D Zip: M402E

M.3. **What is the name and mailing address of the corporate parent that owns and/or controls this business entity?**
M403CBI
M403COM

M403 ☐ Same as in Question M.2

M403A Name of Corporate Parent: _____

M403B Street Address or P.O. Box: _____

M403C City: _____ State: M403D Zip: M403E

M.4. **What is the business entity's DUNS number?**
M404CBI
M404COM
(If the business entity does not have a DUNS number, circle the response code for "not applicable.")

M404 DUNS number: |__|__|__|__|__|__|__|__|__|
Not applicable: 00

M.5. **Please give the month and year when the business entity purchased or took control of the facility.**
M405CBI
M405COM

Month: |__|__| Year: 19|__|__|
M405A M405B

M.6. **Does the business entity currently own and/or control any other facilities engaged in aqueous liquid waste, sludge, and/or wastewater treatment, recycling/recovery, and/or disposal operations?**
M406CBI
M406COM
(Circle one number.)

M406
01 Yes *(CONTINUE TO NEXT QUESTION)*
02 No *(GO TO QUESTION M.8 ON THE NEXT PAGE)*

M.7. **Including your facility, how many aqueous liquid waste, sludge, and/or wastewater treatment facilities that accept waste from offsite does the business entity own and/or control?**

M0707CBI
M0707COM

M0707 Number of facilities (including your facility): |__|__|__|

M.8. **Does the business entity currently own and/or control any facilities <u>not</u> engaged in treatment, recycling/recovery, and/or disposal of aqueous liquid waste, sludge, and/or wastewater from offsite?**
(Circle one number.)

M0708CBI
M0708COM

M0708
01 Yes *(CONTINUE TO NEXT QUESTION)*
02 No *(GO TO QUESTION M.10)*

M.9. **Give the number of facilities owned and/or controlled by the business entity which are not engaged in treatment of aqueous liquid waste, sludge, and/or wastewater from offsite?**

M0709CBI
M0709COM

M0709 Number of facilities: |__|__|__|

M.10. **Please report all information for *calendar* year requested.** For questions M.12–M.16 and N.24–N.32, please report information for *calendar* years 1987, 1988, and 1989. For all other questions, please report information for *calendar* year 1989. If it is impossible for you to report information on a calendar year basis, you may report information on a fiscal year basis.

M0710CBI
M0710COM

Information reported on basis of:
(Circle one number)

M0710
01 Calendar year *(GO TO QUESTION M.12 ON THE NEXT PAGE)*
02 Fiscal year *(CONTINUE TO NEXT QUESTION)*

M.11. **If information is reported on fiscal year basis, what are the start and end months of your fiscal year (e.g., January = 01, February = 02)?**

M0711CBI
M0711COM

M0711A Start month: |__|__|

M0711B End month: |__|__|

		1987	1988	1989
	Note: All questions refer to common stock.	*If the business entity owned and controlled this facility in 1987, complete all of the questions in this column. If not, go to the next column.*	*If the business entity owned and controlled this facility in 1988, complete all of the questions in this column. If not, go to the next column.*	*If the business entity owned and controlled this facility in 1989, complete all of the questions in this column. If not, go to the next page.*
m412cBI m412com	**M.12.** For the business entity, how was stock distributed at the end of each calendar year? *(Circle one number for each year.)*	m412_87 01 Publicly traded 02 Private ownership 03 Other *(specify)*: m412_87O	m412_88 01 Publicly traded 02 Private ownership 03 Other *(specify)*: m412_88O	m412_89 01 ~~P~~ly traded 02 Private ownership 03 Other *(specify)*: m412_89O
m413cBI m413com	**M.13.** ~~For the business entity, what was the stock~~ price, in dollars, at the end of each calendar year? *(Report market value if stock is publicly traded; report b~~ ~~.e if not.)*	m413_87 $|__|,|___|.|__|	m413_88 $|__|,|___|.|__|	m413_89 $|__|,|___|.|__|
m414cBI m414com	**M.14.** Is the stock price listed in Question M.13 the market value or book value of the stock? *(Circle one number for each year.)*	m414_87 01 Market value 02 Book value 03 NA	m414_88 01 Market value 02 Book value 03 NA	m414_89 01 Market value 02 Book value 03 NA
m415cBI m415com	**M.15.** For the business entity, what was the number of shares outstanding at the end of each calendar year?	m415_87 |___|,|___|,|___|	m415_88 |___|,|___|,|___|	m415_89 |___|,|___|,|___|
m416cBI m416com	**M.16.** For the business entity, what were the annual dividends per share, in dollars, at the end of each calendar year?	m416_87 $|___|.|__|	m416_88 $|___|.|__|	m416_89 $$|___|.|__|
		GO TO THE TOP OF THE "1988" COLUMN	GO TO THE TOP OF THE "1989" COLUMN	GO TO THE NEXT PAGE

M.17. For the business entity, report the following amounts for each calendar year.

m#17CBI
m#17com

a. Sales
m#17A87 1987: $ |_|_|_|,|_|_|_|,|_|_|_|
m#17A88 1988: $ |_|_|_|,|_|_|_|,|_|_|_|
m#17A89 1989: $ |_|_|_|,|_|_|_|,|_|_|_|

b. Working capital
m#17B87 1987: $ |_|_|_|,|_|_|_|,|_|_|_|
m#17B88 1988: $ |_|_|_|,|_|_|_|,|_|_|_|
m#17B89 1989: $ |_|_|_|,|_|_|_|,|_|_|_|

c. Retained earnings
m#17C87 1987: $ |_|_|_|,|_|_|_|,|_|_|_|
m#17C88 1988: $ |_|_|_|,|_|_|_|,|_|_|_|
m#17C89 1989: $ |_|_|_|,|_|_|_|,|_|_|_|

d. Earnings before interest and taxes
m#17D87 1987: $ |_|_|_|,|_|_|_|,|_|_|_|
m#17D88 1988: $ |_|_|_|,|_|_|_|,|_|_|_|
m#17D89 1989: $ |_|_|_|,|_|_|_|,|_|_|_|

e. Total assets
m#17E87 1987: $ |_|_|_|,|_|_|_|,|_|_|_|
m#17E88 1988: $ |_|_|_|,|_|_|_|,|_|_|_|
m#17E89 1989: $ |_|_|_|,|_|_|_|,|_|_|_|

f. Book value of total liabilities
m#17F87 1987: $ |_|_|_|,|_|_|_|,|_|_|_|
m#17F88 1988: $ |_|_|_|,|_|_|_|,|_|_|_|
m#17F89 1989: $ |_|_|_|,|_|_|_|,|_|_|_|

M.18. **What is the discount rate currently used by the business entity when calculating net present values for waste treatment, recycling/recovery, and/or disposal capital investment decisions?**

m#18CBI
m#18com

m#18 Discount rate: |_|_|.|_|_| %

M.19. **What is the corporate income tax rate that applies to the business entity?**

m#19CBI
m#19com

m#19 Corporate income tax rate: |_|_|.|_|_| %

M.20. **What is the average pre-tax rate of interest the business entity paid on debt in 1989?**

m#20CBI
m#20com

m#20 Pre-tax interest rate: |_|_|.|_|_| %

M.21. What is the business entity's after-tax rate of return on equity?

mφ21CBI
mφ21com
mφ21

After-tax return on equity rate: |__|__| • |__|__| %

M.22. Include copies of the 1987, 1988, and 1989 annual reports and 10K reports for your facility (if independently owned) or for the business entity that owns and/or controls your facility, including income statement and balance sheet, with your return of the completed questionnaire. Business entities owning and/or controlling multiple facilities need send only one copy of each annual report.

mφ22CBI
mφ22com

mφ22data ☐ CHECK IF COPIES INCLUDED.

FILE NAME: MC

MCPGE ___ MCGF ___

NOTES

MCA	MCB	MCC
MCCBI Question Number(s)	Line Number	Notes, comments, etc.
	1	
	2	
	3	
	:	

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SECTION N: FACILITY FINANCIAL INFORMATION

The purpose of Section N is to collect financial information at the facility level. This information will be used to assess impacts of the regulation on facilities.

Answer the questions in sequence and do not leave any entry blank unless instructed otherwise. Definitions and specific instructions are provided throughout. Use the NOTES page at the end of the section if you wish to explain your response to any question. Reference each comment with the appropriate question number. **Reminder:** Please provide estimates, if possible, of data for which exact measurements are unavailable. Indicate on the NOTES page at the end of the section which responses are estimates, and explain the method of estimation.

N.1. **What is your facility's DUNS number?**

N00100CBI
N00100COM

(If your facility does not have a DUNS number, circle the response code for "not applicable.")

N00100 DUNS number: |__|__|-|__|__|__|__|-|__|__|__|__|

Not applicable: 00

N.2. **What SIC Code best represents your facility's main operation?**

N00200CBI
N00200COM

(See the list of possible SIC Codes, Table R-2 in Instructions and Reference Tables.)

N00200 SIC Code: |__|__|__|__|

N.3. **Do you conduct manufacturing operations at this facility?**

N00300CBI
N00300COM

(Circle one number.)

N00300 01 Yes *(CONTINUE TO NEXT QUESTION)*
02 No *(GO TO QUESTION N.10 ON PAGE N-3)*

N.4. **Do your manufacturing operations generate aqueous liquid waste, sludge, and/or wastewater?**

N00400CBI
N00400COM

(Circle one number.)

N00400 01 Yes *(CONTINUE TO NEXT QUESTION)*
02 No *(GO TO QUESTION N.6 ON THE NEXT PAGE)*

N.5. N045CDI N045com

What quantity of wastewater was generated by this facility's manufacturing operations during 1987, 1988, and 1989, and what percentage of this wastewater was treated onsite?

Year	Quantity Generated	Percent Treated Onsite
1987 N045A87	|___,___,___| tons	N045B87 |___| %
1988 N045A88	|___,___,___| tons	N045B88 |___| %
1989 N045A89	|___,___,___| tons	N045B89 |___| %

N.6. N046CDI N046com N046

What was the calendar year during which manufacturing operations began at this facility?

Year: \|____\|

N.7. N047CDI N047com

Does your facility ship any product manufactured onsite to other facilities under the same ownership as your facility?

(Circle one number.)

N047

01 Yes *(CONTINUE TO NEXT QUESTION)*

02 No *(GO TO QUESTION N.10 ON THE NEXT PAGE)*

N.8. N048CDI N048com

What was the total value of shipments or value of product manufactured and shipped to other facilities under the same ownership in calendar years 1987, 1988, and 1989?

(Please include these revenues or cross charges in your responses to Questions N27b, N28b, and N29b, or N30b, N31b, and N32b.)

N048_87 1987: $ \|___,___,___\|

N048_88 1988: $ \|___,___,___\|

N048_89 1989: $ \|___,___,___\|

N.9. N049CDI N049com

How was the transfer price determined for shipments to other facilities under the same ownership?

(Circle one number.)

01 Market price

N049 02 Manufacturing cost

03 Other *(specify)*: N049O

N.10. **What was the calendar year during which aqueous liquid waste, sludge, and/or wastewater treatment, recycling/recovery, and/or disposal began at this facility?**

N∅1∅CBI
N∅1∅COM

N∅1∅ Year: |_|_|_|_|

N.11. **What was the calendar year during which the most recent major expansion or renovation of aqueous liquid waste, sludge, and/or wastewater treatment, recycling/recovery, and/or disposal capacity was substantially completed at this facility?**

N∅11CBI
N∅11COM

(A major expansion or renovation is one which resulted in a production increase of at least 10% and/or a capital expenditure equal to at least 10% of the accumulated gross investment in plant and equipment at the time of the investment decision.)

N∅11 Year: 19|_|_|

N.12. **Does your facility have a RCRA Part B permit?**

N∅12CBI
N∅12COM

(Circle one number.)

N∅12 01 Yes *(CONTINUE TO NEXT QUESTION)*
02 No *(GO TO QUESTION N.20 ON PAGE N-7)*

N.13. **Estimate the cost of obtaining this facility's RCRA Part B permit.**

N∅13CBI
N∅13COM

N∅13A a. Legal fees: $|_|_|_|,|_|_|_|,|_|_|_|

N∅13B b. Administrative costs: $|_|_|_|,|_|_|_|,|_|_|_|

N∅13C c. Public relations: $|_|_|_|,|_|_|_|,|_|_|_|

N∅13D1 d. Other *(specify)*: N∅13D10 $|_|_|_|,|_|_|_|,|_|_|_|

N∅13D2 N∅13D20 $|_|_|_|,|_|_|_|,|_|_|_|

N∅13E e. Total: $|_|_|_|,|_|_|_|,|_|_|_|

N.14. **Has this facility's RCRA Part B permit ever been modified?**

N∅14CBI
N∅14COM

(Circle one number.)

N∅14 01 Yes *(CONTINUE TO NEXT QUESTION)*
02 No *(GO TO QUESTION N.20 ON PAGE N-7)*

N.15. How many modifications have been made to the facility's RCRA Part B permit?

N415CBI
N415COM
N415

Number of modifications: |__|__|

For each modification, complete Questions N.16 through N.19 on the next page. If, for example, three modifications were made to your RCRA Part B permit, photocopy Page N-5 (Questions N.16 through N.19) two times.. Use the original page to report information on the first modification, and the remaining copies to report on the second and third modifications. Number each copy in the space provided in the top right corner of the page.

MODIFICATION #[ ] OF[ ]
NMMODNUM NMMODOF

N.16. What was the date of the modification to the facility's RCRA Part B permit?

N∅16CBI
N∅16COM
N∅16 Year: 19[ ][ ]

N.17. Estimate the cost of obtaining this modification.

N∅17CBI
N∅17COM

N∅17A a. Legal fees: $[ ][ ][ ],[ ][ ][ ],[ ][ ][ ]

N∅17B b. Administrative costs: $[ ][ ][ ],[ ][ ][ ],[ ][ ][ ]

N∅17C c. Public relations: $[ ][ ][ ],[ ][ ][ ],[ ][ ][ ]

N∅17D1 d. Other *(specify)*: N∅17D1O $[ ][ ][ ],[ ][ ][ ],[ ][ ][ ]

N∅17D2 N∅17D2O $[ ][ ][ ],[ ][ ][ ],[ ][ ][ ]

N∅17E e. Total: $[ ][ ][ ],[ ][ ][ ],[ ][ ][ ]

N.18. For what purpose was the permit modified?

N∅18CBI
N∅18COM
(Circle one number.)

N∅18

01 Addition of new tanks for wastewater treatment

02 Addition of new units for other treatment technologies

03 Addition of new treatment technologies

04 Request for increase of storage capacity

05 Request for increase of treatment capacity

06 Request for increase of Subtitle C landfill capacity

07 Closure of a treatment unit/facility section

08 Other *(specify)*: N∅18O

N.19. How much time was required for this modification to be approved?

N∅19CBI
N∅19COM
N∅19 Months: [ ][ ]

This page is intentionally left blank.

N.20. **Are your wastewater, sludge, or aqueous liquid waste treatment operations conducted, at least in part, in units permitted under RCRA?**
(Circle one number.)

I♦2♦CBI
♦2♦ COM

N♦2♦

01 Yes
02 No

N.21. **Does this aqueous liquid waste, sludge, and/or wastewater treatment facility provide transportation services?**
(Do not include transportation services provided by another division or facility. Include only transportation services for which the costs and revenues are attributed to this aqueous liquid waste, sludge, and/or wastewater treatment facility.)

N♦21 CBI
N♦21 COM

N♦21

01 Yes *(CONTINUE TO NEXT QUESTION)*
02 No *(GO TO QUESTION N.24 ON PAGE N-8)*

N.22. **What is the average distance over which you transport aqueous liquid waste, sludge, and/or wastewater?**

N♦22 CBI
N♦22 COM

N♦22 Miles: |__|,|__|__|__|

N.23. **What is the average cost or price of transportation services?**

N♦23 CBI
N♦23 COM
N♦23A a. Per loaded mile: $ |__|,|__|__|__|.|__|__|

N♦23B b. Per ton: $ |__|,|__|__|__|.|__|__|

N♦23C c. Other *(specify)*: N♦23 C O $ |__|,|__|__|__|.|__|__|

	1987	1988	1989
	If the facility treated, recycled, or disposed received from offsite in 1987, complete all of the questions in this column. If not, go to the next column.	*If the facility treated, recycled, or disposed waste received from offsite in 1988, complete all of the questions in this column. If not, go to the next column.*	*If the facility treated, recycled, or disposed waste received from offsite in 1989, complete all of the questions in this column. If not, go to the next page.*

N.24. **What were the current assets of the facility for calendar years 1987, 1988, and 1989?**

N24CDT
N24COM

(Report the requested information at the facility level. If no actual information is available for the facility level, please estimate based on this facility's share of business entity information.)

CURRENT ASSETS
(Includes cash and other assets that could reasonably be converted to cash, sold, or consumed.)

a. **What was the value of all current assets, excluding inventories?**
(Include cash, accounts receivable, and prepaid expenses such as rent, operating supplies, and insurance.)
N24A87 / N24A88 / N24A89
$ | | | , | | | , | | |

b. **What was the value of inventories owned by this facility at cost or market value, whichever is lower?**
(Include finished products, products in the process of being manufactured, raw materials, supplies, fuels, etc., regardless of where the inventories are held.)
N24B87 / N24B88 / N24B89
$ | | | , | | | , | | |

c. **What was the sum of (a) current assets and (b) inventories?**
N24C87 / N24C88 / N24C89
$ | | | , | | | , | | |

d. **Please list any current assets not included in a or b, above, and estimate their value**

N24D10 _____
N24D20 _____
N24D30 _____

N24D187 / N24D188 / N24D189
$ | | | , | | | , | | |
N24D287 / N24D288 / N24D289
$ | | | , | | | , | | |
N24D387 / N24D388 / N24D389
$ | | | , | | | , | | |

e. **What percentage of these total current assets is associated with aqueous liquid waste, sludge, and/or wastewater treatment operations?**
N24E87 / N24E88 / N24E89
| | | % (each)

GO TO THE TOP OF THE "1988" COLUMN	GO TO THE TOP OF THE "1989" COLUMN	GO TO THE NEXT PAGE

	1987	1988	1989
	If the facility treated, recycled, or disposed waste received from offsite in 1987, complete all of the questions in this column. If not, go to the next column.	*If the facility treated, recycled, or disposed waste received from offsite in 1988, complete all of the questions in this column. If not, go to the next column.*	*If the facility treated, recycled, or disposed waste received from offsite in 1989, complete all of the questions in this column. If not, go to the next page.*

N.25. **What were the non-current assets of this facility for calendar years 1987, 1988, and 1989?**

N025CDI
N025COM

(Report the requested information at the facility level. If no actual information is available for the facility level, please estimate based on this facility's share of business entity information.)

NON-CURRENT ASSETS
(Includes physical items such as property, plant, equipment, long-term investments, and intangibles.)

	1987	1988	1989
a. Land (facility)	N025A87 $	N025A88 $	N025A89 $
b. Buildings, including expansions and renovations (original cost)	N025B87 $	N025B88 $	N025B89 $
c. All equipment and machinery (original cost)	N025C87 $	N025C88 $	N025C89 $
d. Intangibles including franchises, patents, trademarks, and copyrights, net of accumulated amortization	N025D87 $	N025D88 $	N025D89 $
e. Assets like investments in capital stocks and bonds	N025E87 $	N025E88 $	N025E89 $
f. Cumulative depreciation	N025F87 $	N025F88 $	N025F89 $
g. Depletion	N025G87 $	N025G88 $	N025G89 $
h. What was the value of all non-current assets? *(Sum a through e minus f and g.)*	N025H87 $	N025H88 $	N025H89 $
i. Please list any non-current assets not included in a-h, above, and estimate their value			
N025I10	N025I187 $	N025I188 $	N025I189 $
N025I20	N025I287 $	N025I288 $	N025I289 $
N025I30	N025I387 $	N025I388 $	N025I389 $
j. What percentage of these total non-current assets is associated with aqueous liquid waste, sludge, and/or wastewater treatment operations?	N025J87 %	N025J88 %	N025J89 %

GO TO THE TOP OF THE '1988' COLUMN | GO TO THE TOP OF THE '1989' COLUMN | GO TO THE NEXT PAGE

	1987	1988	1989
	If the facility treated, recycled, or disposed waste received from offsite in 1987, complete all of the questions in this column. If not, go to the next column.	*If the facility treated, recycled, or disposed waste received from offsite in 1988, complete all of the questions in this column. If not, go to the next column.*	*If the facility treated, recycled, or disposed waste received from offsite in 1989, complete all of the questions in this column. If not, go to the next page.*

N.26. **What were the current and non-current liabilities of this facility for calendar years 1987, 1988, and 1989?**

N426CBI
N426COM

(Report the requested information at the facility level. If no actual information is available for the facility level, please estimate based on this facility's share of business entity information.)

CURRENT LIABILITIES *(Includes all liabilities that fall due for payment within the calendar year.)*

a. **What were the current liabilities for the year?** *(Include all liabilities that fall due for payment within the calendar year, e.g., accounts payable, accrued expenses and taxes, and the current portion of long-term debt.)*

N426A87 $ | | | , | | | , | | |

N426A88 $ | | | , | | | , | | |

N426A89 $ | | | , | | | , | | |

b. **Please list any current liabilities not included in a, above, and estimate their value**

N426D10 _____

N426D20 _____

N426D30 _____

N426D187 $ | | | , | | | , | | |
N426D287 $ | | | , | | | , | | |
N426D387 $ | | | , | | | , | | |

N426D188 $ | | | , | | | , | | |
N426D288 $ | | | , | | | , | | |
N426D388 $ | | | , | | | , | | |

N426D189 $ | | | , | | | , | | |
N426D289 $ | | | , | | | , | | |
N426D389 $ | | | , | | | , | | |

NON-CURRENT LIABILITIES *(Includes all liabilities that fall due beyond one year.)*

c. **What was the liability on all long-term debt such as bonds, debentures, and bank debt, and all other non-current liabilities such as deferred income taxes?**

N426C87 $ | | | , | | | , | | |

N426C88 $ | | | , | | | , | | |

N426C89 $ | | | , | | | , | | |

d. **Please list any non-current liabilities not included in c, above, and estimate their value**

N426D10 _____

N426D20 _____

N426D30 _____

N426D187 $ | | | , | | | , | | |
N426D287 $ | | | , | | | , | | |
N426D387 $ | | | , | | | , | | |

N426D188 $ | | | , | | | , | | |
N426D288 $ | | | , | | | , | | |
N426D388 $ | | | , | | | , | | |

N426D189 $ | | | , | | | , | | |
N426D289 $ | | | , | | | , | | |
N426D389 $ | | | , | | | , | | |

e. **What percentage of these total liabilities is associated with aqueous liquid waste, sludge, and/or wastewater treatment operations?**

N426E87 | | | %

N426E88 | | | %

N426E89 | | | %

GO TO THE TOP OF THE '1988' COLUMN

GO TO THE TOP OF THE '1989' COLUMN

GO TO THE NEXT PAGE

(1)

IF THIS FACILITY IS COMMERCIAL (I.E. ACCEPTS WASTE FROM OFFSITE FACILITIES NOT UNDER THE SAME OWNERSHIP), CONTINUE TO QUESTION N.27 ON THE NEXT PAGE. OTHERWISE, GO TO DIRECTIONS ON PAGE N-15.

(2)

IF YOUR FACILITY IS COMMERCIAL, AND ALSO ACCEPTS WASTE FROM OFFSITE FACILITIES UNDER THE SAME OWNERSHIP, PLEASE COMPLETE ALL PARTS OF QUESTIONS N.27 THROUGH N.29.

REPORT ALL COSTS OF WASTE TREATMENT OPERATIONS IN PART F OF QUESTIONS N.27 THROUGH N.29. THIS MAY INCLUDE THE COSTS OF TREATING ANY OR ALL OF THE FOLLOWING:
WASTE FROM OFFSITE FACILITIES NOT UNDER THE SAME OWNERSHIP,
WASTE FROM OFFSITE FACILITIES UNDER THE SAME OWNERSHIP,
AND/OR WASTE GENERATED ONSITE.

GIVE REVENUES ASSOCIATED WITH COMMERCIAL WASTE MANAGEMENT SERVICES IN PART A OF QUESTIONS N.27 THROUGH N.29.

INCLUDE THE TOTAL REVENUES ASSOCIATED WITH NONCOMMERCIAL WASTE MANAGEMENT SERVICES UNDER PART C (NET SALES OF OTHER GOODS AND SERVICES AND OTHER OPERATING REVENUE) OF QUESTIONS N.27 THROUGH N.29.

REPORT FACILITY LEVEL DATA FOR ALL OTHER PARTS OF QUESTIONS N.27 THROUGH N.29. (PART B AND PARTS D THROUGH O).

THEN, REPORT IN DETAIL THE REVENUES FROM INDIVIDUAL NONCOMMERCIAL WASTE TREATMENT OPERATIONS IN PART A OF QUESTIONS N.30 THROUGH N.32.

N427COL
N427com

N.27. What were the revenues and expenses of this commercial facility in calendar year 1987? *(If information is not available, please estimate. If not applicable, please indicate with "N/A")*

REVENUES

a. Revenues from on-site waste treatment, recycling/recovery, and/or disposal services *(If your facility accepts waste from both offsite facilities under the same ownership and offsite facilities not under the same ownership, please include both revenues from commercial services and credits or cross charges for non-commercial services.)*

i.	thermal processes	N427A1	$
ii.	Subtitle C landfill disposal	N427A2	$
iii.	Subtitle D landfill disposal	N427A3	$
iv.	solidification/stabilization	N427A4	$
v.	waste oil recovery	N427A5	$
vi.	solvent recovery	N427A6	$
vii.	metals recovery	N427A7	$
viii.	fuels blending	N427A8	$
ix.	other non-aqueous waste treatment	N427A9	$
x.	aqueous liquid waste, sludge, and/or wastewater treatment	N427A10	$
xi.	transportation revenues associated with waste treatment	N427A11	$
xii.	total *(Sum of a.i through a.xi)*	N427A12	$

b. Net sales of product manufactured onsite N427B $

c. Net sales of other goods and services and other operating revenue N427C $

d. Other income (such as equity earnings and interest)

(specify): N427DO N427D $

e. Total revenues *(Sum of a through d)* N427E $

COSTS AND EXPENSES

f. Operating costs of on-site waste treatment, recycling/recovery, and/or disposal operations

i.	thermal processes	N427F1	$
ii.	Subtitle C landfill disposal	N427F2	$
iii.	Subtitle D landfill disposal	N427F3	$
iv.	solidification/stabilization	N427F4	$
v.	waste oil recovery	N427F5	$
vi.	solvent recovery	N427F6	$
vii.	metals recovery	N427F7	$
viii.	fuels blending	N427F8	$
ix.	other non-aqueous waste treatment	N427F9	$
x.	aqueous liquid waste, sludge, and/or wastewater treatment	N427F10	$
xi.	transportation cost associated with waste treatment	N427F11	$
xii.	total *(Sum of f.i through f.xi)*	N427F12	$

g. Cost of goods sold for product manufactured onsite N427G $

h. Cost of other goods and services sold (such as purchases and operating expenses)

(specify): N427HO N427H $

i. Selling, general, and administrative expenses N427I $

j. Depreciation and amortization N427J $

k. Total costs and expenses *(Sum of f through j)* N427K $

l. EARNINGS BEFORE INTEREST AND TAXES *(Subtract k from e)* N427L $

m. INTEREST EXPENSE N427M $

n. TAXES N427N $

o. NET INCOME *(Subtract m and n from l)* N427O $

N28CBI
N28COM

N.28. What were the revenues and expenses of this commercial facility in calendar year 1988? *(If information is not available, please estimate. If not applicable, please indicate with "N/A")*

REVENUES

a. Revenues from on-site waste treatment, recycling/recovery, and/or disposal services *(If your facility accepts waste from both offsite facilities under the same ownership and offsite facilities not under the same ownership, please include both revenues from commercial services and credits or cross charges for non-commercial services.)*

i.	thermal processes	N28A1	$
ii.	Subtitle C landfill disposal	N28A2	$
iii.	Subtitle D landfill disposal	N28A3	$
iv.	solidification/stabilization	N28A4	$
v.	waste oil recovery	N28A5	$
vi.	solvent recovery	N28A6	$
vii.	metals recovery	N28A7	$
viii.	fuels blending	N28A8	$
ix.	other non-aqueous waste treatment	N28A9	$
x.	aqueous liquid waste, sludge, and/or wastewater treatment	N28A10	$
xi.	transportation revenues associated with waste treatment	N28A11	$
xii.	total *(Sum of a.i through a.xi)*	N28A12	$

b. Net sales of product manufactured onsite N28B $

c. Net sales of other goods and services and other operating revenue N28C $

d. Other income (such as equity earnings and interest)

(specify): N28DO N28D $

e. Total revenues *(Sum of a through d)* N28E $

COSTS AND EXPENSES

f. Operating costs of on-site waste treatment, recycling/recovery, and/or disposal operations

i.	thermal processes	N28F1	$
ii.	Subtitle C landfill disposal	N28F2	$
iii.	Subtitle D landfill disposal	N28F3	$
iv.	solidification/stabilization	N28F4	$
v.	waste oil recovery	N28F5	$
vi.	solvent recovery	N28F6	$
vii.	metals recovery	N28F7	$
viii.	fuels blending	N28F8	$
ix.	other non-aqueous waste treatment	N28F9	$
x.	aqueous liquid waste, sludge, and/or wastewater treatment	N28F10	$
xi.	transportation cost associated with waste treatment	N28F11	$
xii.	total *(Sum of f.i through f.xi)*	N28F12	$

g. Cost of goods sold for product manufactured onsite N28G $

h. Cost of other goods and services sold (such as purchases and operating expenses)

(specify): N28HO N28H $

i. Selling, general, and administrative expenses N28I $

j. Depreciation and amortization N28J $

k. Total costs and expenses *(Sum of f through j)* N28K $

l. EARNINGS BEFORE INTEREST AND TAXES *(Subtract k from e)* N28L $

m. INTEREST EXPENSE N28M $

n. TAXES N28N $

o. NET INCOME *(Subtract m and n from l)* N28O $

N29C81
N29COM

N29. What were the revenues and expenses of this commercial facility in calendar year 1997? *(If information is not available, please estimate. If not applicable, please indicate with "NA")*

REVENUES

a. Revenues from on-site waste treatment, recycling/recovery, and/or disposal services *(If your facility accepts waste from both offsite facilities under the same ownership and offsite facilities not under the same ownership, please include both revenues from commercial services and credits or cross charges for non-commercial services.)*

i.	thermal processes	N29A1	$
ii.	Subtitle C landfill disposal	N29A2	$
iii.	Subtitle D landfill disposal	N29A3	$
iv.	solidification/stabilization	N29A4	$
v.	waste oil recovery	N29A5	$
vi.	solvent recovery	N29A6	$
vii.	metals recovery	N29A7	$
viii.	fuels blending	N29A8	$
ix.	other non-aqueous waste treatment	N29A9	$
x.	aqueous liquid waste, sludge, and/or wastewater treatment	N29A10	$
xi.	transportation revenues associated with waste treatment	N29A11	$
xii.	total *(Sum of a.i through a.xi)*	N29A12	$

b. Net sales of product manufactured onsite N29B $

c. Net sales of other goods and services and other operating revenue N29C $

d. Other income (such as equity earnings and interest)

(specify): N29DO N29D $

e. Total revenues *(Sum of a through d)* N29E $

COSTS AND EXPENSES

f. Operating costs of on-site waste treatment, recycling/recovery, and/or disposal operations

i.	thermal processes	N29F1	$
ii.	Subtitle C landfill disposal	N29F2	$
iii.	Subtitle D landfill disposal	N29F3	$
iv.	solidification/stabilization	N29F4	$
v.	waste oil recovery	N29F5	$
vi.	solvent recovery	N29F6	$
vii.	metals recovery	N29F7	$
viii.	fuels blending	N29F8	$
ix.	other non-aqueous waste treatment	N29F9	$
x.	aqueous liquid waste, sludge, and/or wastewater treatment	N29F10	$
xi.	transportation cost associated with waste treatment	N29F11	$
xii.	total *(Sum of f.i through f.xi)*	N29F12	$

g. Cost of goods sold for product manufactured onsite N29G $

h. Cost of other goods and services sold (such as purchases and operating expenses)

(specify): N29HO N29H $

i. Selling, general, and administrative expenses N29I $

j. Depreciation and amortization N29J $

k. Total costs and expenses *(Sum of f through j)* N29K $

l. EARNINGS BEFORE INTEREST AND TAXES *(Subtract k from e)* N29L $

m. INTEREST EXPENSE N29M $

n. TAXES N29N $

o. NET INCOME *(Subtract m and n from l)* N29O $

(1)

IF YOU DID NOT COMPLETE QUESTIONS N.27 THROUGH N.29, PLEASE RESPOND TO ALL PARTS OF QUESTIONS N.30 THROUGH N.32. THESE QUESTIONS REQUEST COSTS AND REVENUES, CREDITS, OR CROSS CHARGES FOR NON-COMMERCIAL FACILITIES.

(2)

IF YOU DID COMPLETE QUESTIONS N.27 THROUGH N.29, AND YOUR FACILITY ALSO ACCEPTS WASTE FROM OFFSITE FACILITIES UNDER THE SAME OWNERSHIP AS YOUR FACILITY, PLEASE COMPLETE PART A OF QUESTIONS N.30 THROUGH N.32, SHOWING THE REVENUES, CREDITS, OR CROSS CHARGES YOUR FACILITY RECEIVED FOR TREATMENT OF WASTE GENERATED BY FACILITIES UNDER THE SAME OWNERSHIP AS YOUR FACILITY.

(3)

IF YOU DID COMPLETE QUESTIONS N.27 THROUGH N.29, AND YOUR FACILITY DOES NOT ACCEPT WASTE FROM OFFSITE FACILITIES UNDER THE SAME OWNERSHIP AS YOUR FACILITY, PLEASE GO TO QUESTION N.33 ON PAGE N-19

N30CDI
N30COM

N.30. What were the revenues and expenses of this non-commercial facility in calendar year 1987? *(If information is not available, please estimate. If not applicable, please indicate with "NA")*

REVENUES, CREDITS OR CROSS CHARGES RECEIVED

a. Revenues or credits earned from on-site waste treatment, recycling/recovery, and/or disposal of waste generated onsite. Off-site waste generated offsite by facilities under the same ownership. If no revenues are earned, include cross charges designed to recover costs.

i.	thermal processes	N0301	$
ii.	Subtitle C landfill disposal	N0302	$
iii.	Subtitle D landfill disposal	N0303	$
iv.	solidification/stabilization	N0304	$
v.	waste oil recovery	N0305	$
vi.	solvent recovery	N0306	$
vii.	metals recovery	N0307	$
viii.	fuels blending	N0308	$
ix.	other non-aqueous waste treatment	N0309	$
x.	aqueous liquid waste, sludge, and/or wastewater treatment	N0310	$
xi.	transportation revenues, credits, or cross-charges	N0311	$
xii.	total *(Sum of a.i through a.xi)*	N0312	$

b. Value of product manufactured N0313 $

c. Other operating revenues, credits, or cross charges

(specify): N0314CO N0314C $

d. Total revenues, credits, or cross charges *(Sum of a through c)* N0315D $

COSTS AND EXPENSES

e. Operating costs of on-site waste treatment, recycling/recovery, and/or disposal operations

i.	thermal processes	N0316E1	$
ii.	Subtitle C landfill disposal	N0316E2	$
iii.	Subtitle D landfill disposal	N0316E3	$
iv.	solidification/stabilization	N0316E4	$
v.	waste oil recovery	N0316E5	$
vi.	solvent recovery	N0316E6	$
vii.	metals recovery	N0316E7	$
viii.	fuels blending	N0316E8	$
ix.	other non-aqueous waste treatment	N0316E9	$
x.	aqueous liquid waste, sludge, and/or wastewater treatment	N0316E10	$
xi.	transportation cost	N0316E11	$
xii.	total *(Sum of e.i through e.xi)*	N0316E12	$

f. Cost of goods sold for product manufactured onsite N0317F $

g. Cost of other goods and services sold (such as purchases and operating expenses)

(specify): N0318GO N0318G $

h. Selling, general, and administrative expenses N0319H $

i. Depreciation and amortization N0320I $

j. Total costs and expenses *(Sum of e through i)* N0321J $

k. EARNINGS BEFORE INTEREST AND TAXES *(Subtract j from d)* N0322K $

l. INTEREST EXPENSE N0323L $

m. TAXES N0324M $

n. NET INCOME *(Subtract l and m from k)* N0325N $

N31CBE
N31COM

N.31. What were the revenues and expenses of this non-commercial facility in calendar year 1987? *(If information is not available, please estimate. If not applicable, please indicate with "N/A")*

REVENUES, CREDITS OR CROSS CHARGES RECEIVED

a. Revenues or credits earned from on-site waste treatment, recycling/recovery, and/or disposal of waste generated onsite or of waste generated offsite by facilities under the same ownership. If no revenues are earned, include cross charges designed to recover costs.

i.	thermal processes	N31A1	$
ii.	Subtitle C landfill disposal	N31A2	$
iii.	Subtitle D landfill disposal	N31A3	$
iv.	solidification/stabilization	N31A4	$
v.	waste oil recovery	N31A5	$
vi.	solvent recovery	N31A6	$
vii.	metals recovery	N31A7	$
viii.	fuels blending	N31A8	$
ix.	other non-aqueous waste treatment	N31A9	$
x.	aqueous liquid waste, sludge, ~~and/or wastewater treatment~~	N31A10	$
xi.	transportation revenues, credits, or cross-charges	N31A11	$
xii.	total *(Sum of a.i through a.xi)*	N31A12	$

b. Value of product manufactured N31B $

c. Other operating revenues, credits, or cross charges
(specify): N31CO N31C $

d. Total revenues, credits, or cross charges *(Sum of a through c)* N31D $

COSTS AND EXPENSES

e. Operating costs of on-site waste treatment, recycling/recovery, and/or disposal operations

i.	thermal processes	N31E1	$
ii.	Subtitle C landfill disposal	N31E2	$
iii.	Subtitle D landfill disposal	N31E3	$
iv.	solidification/stabilization	N31E4	$
v.	waste oil recovery	N31E5	$
vi.	solvent recovery	N31E6	$
vii.	metals recovery	N31E7	$
viii.	fuels blending	N31E8	$
ix.	other non-aqueous waste treatment	N31E9	$
x.	aqueous liquid waste, sludge, and/or wastewater treatment	N31E10	$
xi.	transportation cost	N31E11	$
xii.	total *(Sum of e.i through e.xi)*	N31E12	$

f. Cost of goods sold for product manufactured onsite N31F $

g. Cost of other goods and services sold (such as purchases and operating expenses)
(specify): N31GO N31G $

h. Selling, general, and administrative expenses N31H $

i. Depreciation and amortization N31I $

j. Total costs and expenses *(Sum of e through i)* N31J $

k. EARNINGS BEFORE INTEREST AND TAXES *(Subtract j from d)* N31K $

l. INTEREST EXPENSE N31L $

m. TAXES N31M $

n. NET INCOME *(Subtract l and m from k)* N31N $

N32CDI
N32COM

N.32. What were the revenues and expenses of this non-commercial facility in calendar year 1997? *(If information is not available, please estimate. If not applicable, please indicate with "N/A")*

REVENUES, CREDITS OR CROSS CHARGES RECEIVED

a. Revenues or credits earned from on-site waste treatment, recycling/recovery, and/or disposal of waste generated onsite or of waste generated offsite by facilities under the same ownership. If no revenues are earned, include cross charges designed to recover costs.

i.	thermal processes	N32A1	$
ii.	Subtitle C landfill disposal	N32A2	$
iii.	Subtitle D landfill disposal	N32A3	$
iv.	solidification/stabilization	N32A4	$
v.	waste oil recovery	N32A5	$
vi.	solvent recovery	N32A6	$
vii.	metals recovery	N32A7	$
viii.	fuels blending	N32A8	$
ix.	other non-aqueous waste treatment	N32A9	$
x.	aqueous liquid waste, sludge, and/or wastewater treatment	N32A10	$
xi.	transportation revenues, credits, or cross-charges	N32A11	$
xii.	total *(Sum of a.i through a.xi)*	N32A12	$

b. Value of product manufactured N32B $

c. Other operating revenues, credits, or cross charges

(specify): N32CO N32C $

d. Total revenues, credits, or cross charges *(Sum of a through c)* N32D $

COSTS AND EXPENSES

e. Operating costs of on-site waste treatment, recycling/recovery, and/or disposal operations

i.	thermal processes	N32E1	$
ii.	Subtitle C landfill disposal	N32E2	$
iii.	Subtitle D landfill disposal	N32E3	$
iv.	solidification/stabilization	N32E4	$
v.	waste oil recovery	N32E5	$
vi.	solvent recovery	N32E6	$
vii.	metals recovery	N32E7	$
viii.	fuels blending	N32E8	$
ix.	other non-aqueous waste treatment	N32E9	$
x.	aqueous liquid waste, sludge, and/or wastewater treatment	N32E10	$
xi.	transportation cost	N32E11	$
xii.	total *(Sum of e.i through e.xi)*	N32E12	$

f. Cost of goods sold for product manufactured onsite N32F $

g. Cost of other goods and services sold (such as purchases and operating expenses)

(specify): N32GO N32G $

h. Selling, general, and administrative expenses N32H $

i. Depreciation and amortization N32I $

j. Total costs and expenses *(Sum of e through i)* N32J $

k. EARNINGS BEFORE INTEREST AND TAXES *(Subtract j from d)* N32K $

l. INTEREST EXPENSE N32L $

m. TAXES N32M $

n. NET INCOME *(Subtract l and m from k)* N32N $

N.33. **What were the average total number of employees and the total employee hours worked at the facility in calendar year 1989 in the categories listed?**

N433CBI
N433Com

		Average Total Employees	Total Employee Hours
a.	Aqueous liquid waste, sludge, and/or wastewater treatment operations *(including maintenance)*		
	i. full-time employees N433A1_1	___,___	___,___,___ N433A
	ii. part-time employees N433A2_1	___,___	___,___,___ N433A2
b.	Other waste treatment, recycling/ recovery, and/or disposal operations *(including maintenance)*		
	i. full-time employees N433B1_1	___,___	___,___,___ N433B1
	ii. part-time employees N433B2_1	___,___	___,___,___ N433B2
c.	Production: other N433C_1	___,___	___,___,___ N433C
d.	Non-production: *(e.g., sales, clerical, and administrative)*	N433D_1 ___,___	___,___,___ N433D_
e.	Of the *total* number of employees and labor hours worked at this facility in the categories a-c above, how many were employees of contractors?	N433E_1 ___,___	___,___,___ N433E_

N34CBI
N34Com

N.34. What was the 1989 value of buildings, land, and equipment at this facility?
(Note: We would prefer the appraised or assessed value of land, buildings, and equipment. If that is not available, please give book value.)

a. What was the value of land for this facility in 1989?
   i. appraised or assessed value — N34A1 — $ |_|_|_|,|_|_|_|,|_|_|_|
   ii. book value — N34A2 — $ |_|_|_|,|_|_|_|,|_|_|_|

b. What was the value of buildings at this facility in 1989?
   i. appraised or assessed value — N34B1 — $ |_|_|_|,|_|_|_|,|_|_|_|
   ii. book value — N34B2 — $ |_|_|_|,|_|_|_|,|_|_|_|

c. What was the value of equipment and machinery at this facility in 1989?
   i. appraised or assessed value — N34C1 — $ |_|_|_|,|_|_|_|,|_|_|_|
   ii. book value — N34C2 — $ |_|_|_|,|_|_|_|,|_|_|_|

d. What was the total 1989 value of land, buildings, equipment, and machinery at this facility? *(Sum items a through c.)*
   i. appraised or assessed value — N34D1 — $ |_|_|_|,|_|_|_|,|_|_|_|
   ii. book value — N34D2 — $ |_|_|_|,|_|_|_|,|_|_|_|

N35CBI
N35Com

N.35. On what percentage of market value is your tax assessment based?
(If you did not report the assessed value of the facility's buildings, land, and equipment, circle the response code for "not applicable.")

N35A — Percentage of market value: |_|_|_| %

N35B — Not applicable: 00

N36CBI
N36Com
N36

N.36. What is the estimated liquidation value of your facility?

Estimated liquidation value: $ |_|_|_|,|_|_|_|,|_|_|_|

N37CBI
N37Com

N.37. Estimate the closure and post-closure costs which would be incurred if your facility were closed.

N37A — a. Closure costs: $ |_|_|_|,|_|_|_|,|_|_|_|

N37B — b. Post-closure costs: $ |_|_|_|,|_|_|_|,|_|_|_|

NOTES

NCCBE	NCA Question Number(s)	NCB Line Number	NCC Notes, comments, etc.
☐		1	
↓		2	
		3	

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FILE NAME : OS

SECTION O: COSTS AND REVENUES FROM AQUEOUS LIQUID WASTE, SLUDGE, AND/OR WASTEWATER TREATMENT

The purpose of Section O is to obtain costs for aqueous liquid waste, sludge, and/or wastewater treatment technologies which could form the basis of effluent limitations guidelines. This information will be used to assess impacts on waste treatment processes.

Answer the questions in sequence and do not leave any entry blank unless instructed otherwise. Definitions and specific instructions are provided throughout. Use the NOTES page at the end of the section if you wish to explain your response to any question. Reference each comment with the appropriate question number. **Reminder:** Please provide estimates, if possible, of data for which exact measurements are unavailable. Indicate on the NOTES page at the end of the section which responses are estimates, and explain the method of estimation.

O.1. **Where are the facilities located which generate the aqueous liquid waste, sludge, and/or wastewater you accept from offsite?**
(Circle the number for the largest area that applies.)

Oφφ1CBI
Oφφ1COM

Oφφ1

01 Within 50 miles of your facility

02 Within your state

03 Within a few adjacent states

04 Nationwide

O.2. **Which of the following describes the contractual arrangements under which you accept aqueous liquid waste, sludge, and/or wastewater from offsite for treatment?**
*(Circle all that apply. **Include a copy of a standard contract with your completed questionnaire if one is available.**)*

Oφφ2CBI
Oφφ2COM

Oφφ2-φ1 01 Contracts are written and signed on the basis of the individual shipment of aqueous liquid waste, sludge, and/or wastewater.

Oφφ2-φ2 02 Contracts are signed with customers under which your facility agrees to accept all aqueous liquid waste, sludge, and/or wastewater generated by the customer and meeting certain criteria for a pre-set fee per shipment.

Oφφ2-φ3 03 Other *(specify)*: Oφφ2-φ3O _____

_____

_____

O.3. **What was the total amount of revenue earned by your facility for transportation of aqueous liquid waste, sludge, and/or wastewater for on-site treatment during 1987, 1988, and 1989?**

O♦♦3CBI
O♦♦3COM

a. Aqueous liquid waste, sludge, and/or wastewater received from offsite facilities not under the same ownership:

O♦♦3A87 1987 $ |_|_|_|,|_|_|_|,|_|_|_|

O♦♦3A88 1988 $ |_|_|_|,|_|_|_|,|_|_|_|

O♦♦3A89 1989 $ |_|_|_|,|_|_|_|,|_|_|_|

b. Aqueous liquid waste, sludge, and/or wastewater received from offsite facilities under the same ownership:

O♦♦3B87 1987 $ |_|_|_|,|_|_|_|,|_|_|_|

O♦♦3B88 1988 $ |_|_|_|,|_|_|_|,|_|_|_|

O♦♦3B89 1989 $ |_|_|_|,|_|_|_|,|_|_|_|

O.4. **What was the total quantity of aqueous liquid waste, sludge, and/or wastewater treated onsite during 1987, 1988, and 1989?**

O♦♦4CBI
O♦♦4COM

a. Aqueous liquid waste, sludge, and/or wastewater received from offsite facilities not under the same ownership:

O♦♦4A87 1987 |_|_|_|,|_|_|_|,|_|_|_| tons

O♦♦4A88 1988 |_|_|_|,|_|_|_|,|_|_|_| tons

O♦♦4A89 1989 |_|_|_|,|_|_|_|,|_|_|_| tons

b. Aqueous liquid waste, sludge, and/or wastewater received from offsite facilities under the same ownership:

O♦♦4B87 1987 |_|_|_|,|_|_|_|,|_|_|_| tons

O♦♦4B88 1988 |_|_|_|,|_|_|_|,|_|_|_| tons

O♦♦4B89 1989 |_|_|_|,|_|_|_|,|_|_|_| tons

c. Aqueous liquid waste, sludge, and/or wastewater generated onsite *(estimated value of services):*

O♦♦4C87 1987 |_|_|_|,|_|_|_|,|_|_|_| tons

O♦♦4C88 1988 |_|_|_|,|_|_|_|,|_|_|_| tons

O♦♦4C89 1989 |_|_|_|,|_|_|_|,|_|_|_| tons

O.5. **Are any approved or authorized investment projects planned for water pollution control?** *(Circle one number.)*

O045CBI
O045COM

O045

01 Yes *(CONTINUE TO NEXT QUESTION)*
02 No *(GO TO QUESTION O.8)*

O.6. **Describe and give the estimated capital cost of each approved or authorized water pollution control project.**

O046CBI
O046COM

(If additional space is necessary, complete the description in the NOTES space. Reference the information by the above question number.)

O046A a. Project 1: $ |_|_|_|,|_|_|_|,|_|_|_|

Describe: O046AO

O046B b. Project 2: $ |_|_|_|,|_|_|_|,|_|_|_|

Describe: O046BO

O046C c. Project 3: $ |_|_|_|,|_|_|_|,|_|_|_|

Describe: O046CO

O.7. **What is the projected completion date of each approved or authorized water pollution control project?**

O047CBI
O047COM

(Report the month, date, and year as two-digit numbers; e.g., June 1, 1989 = 06-01-89.)

a. Project 1: O047A1 |_|_| - O047A2 |_|_| - O047A3 |_|_|

b. Project 2: O047B1 |_|_| - O047B2 |_|_| - O047B3 |_|_|

c. Project 3: O047C1 |_|_| - O047C2 |_|_| - O047C3 |_|_|

O.8. **Did this facility perform aqueous liquid waste, sludge, and/or wastewater treatment on a commercial basis in 1989 (i.e., did the facility accept for treatment onsite aqueous liquid waste, sludge, and/or wastewater that was generated at an offsite facility *not under the same ownership*)?**

O048CBI
O048COM

(Circle one number.)

O048

01 Yes *(CONTINUE TO NEXT QUESTION)*
02 No *(GO TO QUESTION O.10 ON PAGE O-5)*

O.9. **Enter 1989 price information in the following table for each type of aqueous liquid waste, sludge, and/or wastewater that is currently treated in wastewater treatment processes onsite.**

O449 CBI
O449 Com

(Answer for ALL this facility's commercial wastewater treatment operations, rather than for each individual wastewater treatment process. Base your price information on a typical shipment size for each waste type. Circle "NA" in the column provided for any waste type that you do not treat. Enter price information in dollars and cents.)

			Average or Typical Price ($/ton)	Not Applicable	
Organic Liquids					
a.	Oily liquids	O449A1	$ __,___.__	NA	O449A2
b.	Halogenated liquids, including halogenated solvents	O449B1	$__,___.__	NA	O449B2
c.	Nonhalogenated liquids, including nonhalogenated solvents	O449C1	$__,___.__	NA	O449C2
d.	Organic water mixtures	O449D1	$__,___.__	NA	O449D2
Inorganic Liquids					
e.	Liquids containing toxic organics	O449E1	$__,___.__	NA	O449E2
f.	Liquids containing toxic inorganics (other than cyanide)	O449F1	$__,___.__	NA	O449F2
g.	Liquids containing cyanide (may contain toxic metals or inorganics)	O449G1	$__,___.__	NA	O449G2
h.	Liquids containing chromium (may contain other toxic metals or inorganics)	O449H1	$__,___.__	NA	O449H2
i.	Liquids containing toxic metals (other than chromium)	O449I1	$__,___.__	NA	O449I2
j.	Waste concentrated acids (may contain nontoxic metals or inorganics)	O449J1	$__,___.__	NA	O449J2
k.	Waste concentrated bases (may contain nontoxic metals or inorganics)	O449K1	$__,___.__	NA	O449K2
l.	Other aqueous liquids (may contain nontoxic metals, inorganics, or organics)	O449L1	$__,___.__	NA	O449L2
Organic Sludges					
m.	Halogenated organic sludges	O449M1	$__,___.__	NA	O449M2
n.	Nonhalogenated organic sludges	O449N1	$__,___.__	NA	O449N2
o.	Oil sludges	O449O1	$__,___.__	NA	O449O2
p.	Dye and paint sludge	O449P1	$__,___.__	NA	O449P2

CONTINUED ON THE NEXT PAGE

O.9, continued.

			Average or Typical Price ($/ton)	Not Applicable	
Inorganic Sludges					
q.	Sludges containing toxic metals	0449Q1	$__,___.__	NA	0449Q2
r.	Inorganic process sludges	0449R1	$__,___.__	NA	0449R2
s.	Sludges containing cyanide (may contain toxic metals or inorganics)	0449S1	$__,___.__	NA	0449S2
t.	Sludges containing toxic inorganics (other than cyanide)	0449T1	$__,___.__	NA	0449T2
u.	Inorganic sludges containing toxic organics	0449U1	$__,___.__	NA	0449U2
Other *(specify):*					
v.	0449V0	0449V1	$__,___.__	NA	0449V2
w.	0449W0	0449W1	$__,___.__	NA	0449W2
x.	0449X0	0449X1	$__,___.__	NA	0449X2

O.10. Did this facility perform aqueous liquid waste, sludge, and/or wastewater treatment on a non-commercial basis in 1989?

0410CBI
0410COM

(Circle one number.)

0410

01 Yes *(CONTINUE TO NEXT QUESTION. FACILITIES WITH BOTH COMMERCIAL AND NON-COMMERCIAL OPERATIONS ANSWER BOTH O.9 AND O.11)*

02 No *(GO TO QUESTION O.12 ON PAGE O-7)*

O.11. **Enter typical 1989 unit cross charges for each type of aqueous liquid waste, sludge, and/or wastewater that is currently treated in wastewater treatment processes onsite.**

O411 CBI
O411 COM

(This is the amount per ton charged facilities under the same ownership for treatment of each type of waste. Base your unit cross charge information on a typical shipment size for each waste type. Circle "NA" in the column provided for any waste type that you do not treat. Enter price information in dollars and cents.)

			Average or Typical Charge ($/ton)	Not Applicable	
Organic Liquids					
a.	Oily liquids	O411A1	$__,___.__	NA	O411A2
b.	Halogenated liquids, including halogenated solvents	O411B1	$__,___.__	NA	O411B2
c.	Nonhalogenated liquids, including nonhalogenated solvents	O411C1	$__,___.__	NA	O411C2
d.	Organic water mixtures	O411D1	$__,___.__	NA	O411D2
Inorganic Liquids					
e.	Liquids containing toxic organics	O411E1	$__,___.__	NA	O411E2
f.	Liquids containing toxic inorganics (other than cyanide)	O411F1	$__,___.__	NA	O411F2
g.	Liquids containing cyanide (may contain toxic metals or inorganics)	O411G1	$__,___.__	NA	O411G2
h.	Liquids containing chromium (may contain other toxic metals or inorganics)	O411H1	$__,___.__	NA	O411H2
i.	Liquids containing toxic metals (other than chromium)	O411I1	$__,___.__	NA	O411I2
j.	Waste concentrated acids (may contain nontoxic metals or inorganics)	O411J1	$__,___.__	NA	O411J2
k.	Waste concentrated bases (may contain nontoxic metals or inorganics)	O411K1	$__,___.__	NA	O411K2
l.	Other aqueous liquids (may contain nontoxic metals, inorganics, or organics)	O411L1	$__,___.__	NA	O411L2
Organic Sludges					
m.	Halogenated organic sludges	O411M1	$__,___.__	NA	O411M2
n.	Nonhalogenated organic sludges	O411N1	$__,___.__	NA	O411N2
o.	Oil sludges	O411O1	$__,___.__	NA	O411O2
p.	Dye and paint sludge	O411P1	$__,___.__	NA	O411P2

CONTINUED ON THE NEXT PAGE

O.11, continued.

		Average or Typical Charge ($/ton)	Not Applicable
Inorganic Sludges			
q. Sludges containing toxic metals	O φ11 Q1	$__,___.__	NA O φ11 Q2
r. Inorganic process sludges	O φ11 R1	$__,___.__	NA O φ11 R2
s. Sludges containing cyanide (may contain toxic metals or inorganics)	O φ11 S1	$__,___.__	NA O φ11 S2
t. Sludges containing toxic inorganics (other than cyanide)	O φ11 T1	$__,___.__	NA O φ11 T2
u. Inorganic sludges containing toxic organics	O φ11 U1	$__,___.__	NA O φ11 U2
Other *(specify):*			
v. O φ11 VO	O φ11 V1	$__,___.__	NA O φ11 V2
w. O φ11 WO	O φ11 W1	$__,___.__	NA O φ11 W2
x. O φ11 XO	O φ11 X1	$__,___.__	NA O φ11 X2

O.12. How was the value of aqueous liquid waste, sludge, and/or wastewater treatment computed for each of the following?

O φ12 CBI
O φ12 COM

a. Aqueous liquid waste, sludge, and/or wastewater received from offsite facilities under the same ownership:

O φ12 A

b. Aqueous liquid waste, sludge, and/or wastewater generated onsite *(estimated value of services):*

O φ12 B

O.13. **Does this facility have thermal processes onsite that generate aqueous liquid waste, sludge, and/or wastewater?**
(Circle one number.)

O♦13CBI
O♦13Com

O♦13

01 Yes *(CONTINUE TO NEXT QUESTION)*
02 No *(GO TO QUESTION O.15)*

O.14. **What quantity of wastewater was generated by this facility's thermal processes during 1987, 1988, and 1989, and what percentage of this wastewater was treated onsite?**

O♦14CBI
O♦14Com

Year	Quantity Generated	Percent Treated Onsite
1987	O♦14 A87 ___,___,___ tons	___ % O♦14 B87
1988	O♦14 A88 ___,___,___ tons	___ % O♦14 B88
1989	O♦14 A89 ___,___,___ tons	___ % O♦14 B89

O.15. **Does this facility have landfill operations onsite that generate aqueous liquid waste, sludge, and/or wastewater (e.g., leachate or pumped groundwater)?**
(Circle one number.)

O♦15CBI
O♦15Com

O♦15

01 Yes *(CONTINUE TO NEXT QUESTION)*
02 No *(GO TO PAGE O-10)*

O.16. **What quantity of wastewater was generated by this facility's landfill operations during 1987, 1988, and 1989, and what percentage of this wastewater was treated onsite?**

O♦16CBI
O♦16Com

Year	Quantity Generated	Percent Treated Onsite
1987	O♦16 A87 ___,___,___ tons	___ % O♦16 B87
1988	O♦16 A88 ___,___,___ tons	___ % O♦16 B88
1989	O♦16 A89 ___,___,___ tons	___ % O♦16 B89

FILE NAME OC

NOTES

OCA	OCB	OCC
OCCBI Question Number(s)	Line Number	Notes, comments, etc.
☐ ↓	1	
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YOU HAVE COMPLETED THE ECONOMIC AND FINANCIAL SECTION OF THIS QUESTIONNAIRE. PLEASE CHECK TO SEE THAT YOU HAVE ANSWERED ALL RELEVANT QUESTIONS, AND THAT YOU HAVE ATTACHED ANY ANNUAL REPORTS, 10K REPORTS, OR STANDARD CONTRACTS AVAILABLE.

APPENDIX B

SOURCES OF COMPANY FINANCIAL DATA

TABLE B-1. CALCULATIONS USED TO CONSTRUCT BASELINE FINANCIAL STATEMENTS

Financial Statement Category	Calculations
Income Statement	
Annual Revenues	Collected from data sources identified in Table 4-10 or (total assets) / (assets to sales benchmark).
Cost of Sales	Sales • (1-ROS benchmark) • [(cost of sales share from common size income statement) / (cost of sales share plus general and administrative expenses share from common size income statement)]
Gross Profit	Annual revenues – cost of sales.
Other Expenses and Taxes	Gross profit – net income.
Net Income	ROS benchmark • annual revenues.
Balance Sheet	
Cash	(Cash + accounts receivable) – accounts receivable.
Accounts Receivable	(Collection period benchmark / 365) • annual revenues.
Cash + Accounts Receivable	Total Assets • [(cash share from the common size balance sheet plus accounts receivable share from the common size balance sheet) / (total current assets share from the common size balance sheet)].
Other Current Assets	Total current assets – (cash + accounts receivable).
Total Current Assets	Total current liabilities • current ratio benchmark.
Fixed Assets	Fixed assets to net worth benchmark ratio • net worth.
Other Noncurrent Assets	Total assets – fixed assets – current assets.
Total Assets	Collected from data sources identified in Table 4-10 or (annual sales) • (assets to sales D&B benchmark ratio).
Accounts Payable	Annual revenues • accounts payable to sales benchmark.
Other Current Liabilities	Total current liabilities – accounts payable.
Total Current Liabilities	Current liabilities to net worth benchmark • net worth.
Noncurrent Liabilities	Total liabilities – total current liabilities.
Total Liabilities	Total assets – net worth.
Net Worth	Total assets / (1+total liabilities to net worth benchmark).
Total Liabilities and Owner's Equity	Total assets

Note: These calculations were used to set up financial statements for potentially affected firms for which actual financial statements were not available from published sources. Benchmark ratios are based on the Dun & Bradstreet Key Financial Ratios contained in Table 4-12.

TABLE B-2. DATA FROM THE COMMON SIZE FINANCIALS USED TO CONSTRUCT BASELINE FINANCIAL STATEMENTS

	Income Statement Items				Balance Sheet Items		
SIC Code	Cost of Sales	Gross Profit	General and Administrative Expenses	Net Income	Cash	Accounts Receivable	Total Current Assets
2819	0.629	0.371	0.312	0.059	0.108	0.285	0.626
2834	0.525	0.475	0.442	0.033	0.124	0.189	0.608
2869	0.633	0.367	0.314	0.053	0.113	0.248	0.587
2879	0.603	0.397	0.362	0.035	0.094	0.220	0.636
2911	0.725	0.275	0.241	0.034	0.080	0.186	0.514
2992	0.669	0.331	0.302	0.029	0.086	0.317	0.674
3312	0.689	0.311	0.255	0.056	0.107	0.287	0.609
3339	0.792	0.208	0.153	0.055	0.098	0.121	0.590
3351	0.834	0.166	0.181	-0.015	0.026	0.212	0.495
3523	0.679	0.321	0.268	0.053	0.104	0.196	0.715
3679	0.650	0.350	0.315	0.035	0.125	0.289	0.721
3724	0.705	0.295	0.247	0.048	0.080	0.227	0.634
4011	0.554	0.446	0.342	0.104	0.120	0.135	0.354
4226	0.563	0.437	0.357	0.080	0.133	0.194	0.428
4911	0.670	0.330	0.269	0.061	0.039	0.060	0.186
4953	0.614	0.386	0.319	0.067	0.113	0.221	0.421
5093	0.705	0.295	0.252	0.043	0.152	0.237	0.628
5169	0.697	0.303	0.264	0.039	0.139	0.368	0.763
5171	0.855	0.145	0.127	0.018	0.118	0.284	0.616
8999	0.538	0.462	0.402	0.060	0.187	0.268	0.617

Source: Dun & Bradstreet. 1990-1991. *Industry Norms and Key Business Ratios.* New York: Dun & Bradstreet. Desktop Edition.

TABLE B-3. LOWER QUARTILE BENCHMARK DEBT RATIO

SIC Code	Debt to Total Assets (%)
2819	71
2834	60
2869	66
2879	63
2911	74
2992	61
3312	70
3339	52
3351	73
3523	63
3679	67
3724	70
4011	65
4226	72
4911	69
4953	68
5093	62
5169	70
5171	65
8999	59

[a]Debt to assets benchmark values are computed based on lower quartile debt to equity ratios using the following formula: (lower quartile debt to equity) / [(lower quartile debt to equity) +1].

Source: Dun & Bradstreet. 1990-1991. *Industry Norms and Key Business Ratios.* New York: Dun & Bradstreet. Desktop Edition.

TABLE B-4. MEDIAN INDUSTRY BENCHMARK FINANCIAL RATIOS

SIC Code	Current Ratio	Total Asset Turn-over	Debt to Total Assets	Return on Sales	Return on Assets	Return on Net Worth	Fixed Assets to Net Worth	Collection Period	Total Liabilities to Net Worth
2819	1.7	53.5	52%	4.40%	8.20%	15.60%	49.3	46.0	109.0
2834	2.4	90.2	43%	5.00%	6.10%	12.60%	46.7	49.9	74.4
2869	1.9	49.9	48%	5.30%	7.80%	16.80%	58.0	42.7	92.4
2879	1.9	55.6	50%	3.50%	4.40%	9.00%	36.1	47.3	98.1
2911	1.4	53.6	59%	3.40%	4.90%	10.90%	132.5	39.8	146.9
2992	2.3	35.3	47%	3.00%	6.00%	13.50%	28.1	42.3	88.2
3312	1.8	43.9	55%	4.40%	7.20%	17.40%	68.1	42.7	122.0
3339	1.7	43.3	42%	4.90%	10.80%	16.40%	43.2	38.7	72.8
3351	1.8	60.0	71%	1.10%	-0.20%	-3.90%	156.0	48.2	245.5
3523	2.5	50.2	44%	4.30%	7.20%	14.80%	34.8	31.4	77.0
3679	2.2	46.9	46%	3.00%	5.20%	13.10%	30.8	47.8	85.2
3724	2.1	66.2	49%	3.80%	5.60%	12.60%	60.8	50.0	95.1
4011	1.2	199.5	48%	7.00%	4.30%	11.70%	116.6	62.8	91.1
4226	1.8	73.3	47%	7.10%	9.00%	16.90%	78.7	41.6	87.6
4911	1.7	209.3	61%	6.50%	3.20%	8.70%	174.6	34.7	158.6
4953	1.4	52.8	50%	6.70%	8.90%	20.50%	93.4	42.4	101.1
5093	2.2	30.6	40%	3.10%	8.40%	18.00%	44.7	22.6	66.6
5169	1.8	32.0	50%	2.30%	6.40%	15.30%	29.1	43.1	100.5
5171	1.8	21.6	46%	1.20%	5.20%	10.00%	59.0	20.1	86.1
8999	2.3	39.8	34%	6.80%	7.70%	18.50%	44.7	50.1	51.1

[a]Debt to assets benchmark values are computed based on lower quartile debt to equity ratios using the following formula: (lower quartile debt to equity) / [(lower quartile debt to equity) +1].

Source: Dun & Bradstreet. 1990-1991. *Industry Norms and Key Business Ratios.* New York: Dun & Bradstreet. Desktop Edition.

APPENDIX C

SIC Code Definitions

SIC Code	Industry
Agricultural Production—Crops	
0111	Wheat
0112	Rice
0115	Corn
0116	Soybeans
0119	Cash grains, nec
0131	Cotton
0132	Tobacco
0133	Sugar crops
0134	Irish potatoes
0139	Field crops, except cash grains, nec
0161	Vegetables and melons
0171	Berry crops
0172	Grapes
0173	Tree nuts
0174	Citrus fruits
0175	Deciduous tree fruits
0179	Fruits and tree nuts, nec
0181	Ornamental nursery products
0182	Food crops grown under cover
0189	Horticultural specialties, nec
0191	General farms, primarily crops
Agricultural Production—Livestock	
0211	Beef cattle feedlots
0212	Beef cattle, except feedlots
0213	Hogs
0214	Sheep and goats
0219	General livestock, nec
0241	Dairy farms
0251	Broiler, fryer, and roaster chickens
0252	Chicken eggs
0253	Turkeys and turkey eggs
0254	Poultry hatcheries
0259	Poultry and eggs, nec
0271	Fur-bearing animals and rabbits
0272	Horses and other equines
0279	Animal specialties, nec
0291	General farms, primarily livestock
Agricultural Services	
0711	Soil preparation services
0721	Crop planting and protection
0722	Crop harvesting
0723	Crop preparation services for market
0724	Cotton ginning
0729	General crop services
0741	Veterinary services, farm livestock
0742	Veterinary services, specialties
0751	Livestock services, except specialties
0752	Animal specialty services
0761	Farm labor contractors
0762	Farm management services
0781	Landscape counseling and planning
0782	Lawn and garden services
0783	Ornamental shrub and tree services
Forestry	
0811	Timber tracts
0821	Forest nurseries and seed gathering
0843	Extraction of pine gum
0849	Gathering of forest products, nec
0851	Forestry services
Fishing, Hunting, and Trapping	
0912	Finfish
0913	Shellfish
0919	Miscellaneous marine products
0921	Fish hatcheries and preserves
0971	Hunting, trapping, game propagation
Mining	
1011	Iron ores
1021	Copper ores
1031	Lead and zinc ores
1041	Gold ores
1044	Silver ores
1051	Bauxite and other aluminum ores
1061	Ferroalloy ores, except vanadium
1081	Metal mining services
1092	Mercury ores
1094	Uranium, radium, vanadium ores
1099	Metal ores, nec
1111	Anthracite
1112	Anthracite mining services
1211	Bituminous coal and lignite
1213	Bituminous and lignite services
1311	Crude petroleum and natural gas
1321	Natural gas liquids
1381	Drilling oil and gas wells
1382	Oil and gas exploration services
1389	Oil and gas field services, nec
1411	Dimension stone
1422	Crushed and broken limestone
1423	Crushed and broken granite
1429	Crushed and broken stone, nec
1442	Construction sand and gravel
1446	Industrial sand
1452	Bentonite
1453	Fire clay
1454	Fuller's earth
1455	Kaolin and ball clay
1459	Clay and related minerals, nec
1472	Barite
1473	Fluorspar
1474	Potash, soda and borate minerals

Note: nec = not elsewhere classified.

SIC Code	Industry
1475	Phosphate rock
1476	Rock salt
1477	Sulfur
1479	Chemical and fertilizer mining, nec
1481	Nonmetallic minerals services
1492	Gypsum
1496	Talc, soapstone, and pyrophyllite
1499	Nonmetallic minerals, nec
Construction	
1521	Single-family housing construction
1522	Residential construction, nec
1531	Operative builders
1541	Industrial buildings and warehouses
1542	Nonresidential construction, nec
1611	Highway and street construction
1622	Bridge, tunnel, and elevated highway
1623	Water, sewer, and utility lines
1629	Heavy construction, nec
1711	Plumbing, heating, air conditioning
1721	Painting, paper hanging, decorating
1731	Electrical work
1741	Masonry and other stonework
1742	Plastering, drywall, and insulation
1743	Terrazzo, tile, marble, mosaic work
1751	Carpentering
1752	Floor laying and floor work, nec
1761	Roofing and sheet metal work
1771	Concrete work
1781	Water well drilling
1791	Structural metal erection
1793	Glass and glazing work
1794	Excavating and foundation work
1795	Wrecking and demolition work
1796	Installing building equipment, nec
1799	Special trade contractors, nec
Food Products	
2011	Meat packing plants
2013	Sausages and other prepared meats
2016	Poultry dressing plants
2017	Poultry and egg processing
2021	Creamery butter
2022	Cheese, natural and processed
2023	Condensed and evaporated milk
2024	Ice cream and frozen desserts
2026	Fluid milk
2032	Canned specialties
2033	Canned fruits and vegetables
2034	Dehydrated fruits, vegetables, soups
2035	Pickles, sauces, and salad dressings
2037	Frozen fruits and vegetables
2038	Frozen specialties
2041	Flour and other grain mill products
2043	Cereal breakfast foods
2044	Rice milling
2045	Blended and prepared flour
2046	Wet corn milling
2047	Dog, cat, and other pet food
2048	Prepared feeds, nec
2051	Bread, cake, and related products
2052	Cookies and crackers
2061	Raw cane sugar
2062	Cane sugar refining
2063	Beet sugar
2065	Confectionery products
2066	Chocolate and cocoa products
2067	Chewing gum
2074	Cottonseed oil mills
2075	Soybean oil mills
2076	Vegetable oil mills, nec
2077	Animal and marine fats and oils
2079	Shortening and cooking oils
2082	Malt beverages
2083	Malt
2084	Wines, brandy, and brandy spirits
2085	Distilled liquor, except brandy
2086	Bottled and canned soft drinks
2087	Flavoring extracts and syrups, nec
2091	Canned and cured seafoods
2092	Fresh or frozen packaged fish
2095	Roasted coffee
2097	Manufactured ice
2098	Macaroni and spaghetti
2099	Food preparations, nec
Tobacco	
2111	Cigarettes
2121	Cigars
2131	Chewing and smoking tobacco
2141	Tobacco stemming and redrying
Textile Mill Products	
2211	Weaving mills, cotton
2221	Weaving mills, synthetics
2231	Weaving and finishing mills, wool
2241	Narrow fabric mills
2251	Women's hosiery, except socks
2252	Hosiery, nec
2253	Knit outerwear mills
2254	Knit underwear mills
2257	Circular knit fabric mills
2258	Warp knit fabric mills
2259	Knitting mills, nec
2261	Finishing plants, cotton
2262	Finishing plants, synthetics

Note: nec = not elsewhere classified.

SIC Code	Industry
2269	Finishing plants, nec
2271	Woven carpets and rugs
2272	Tufted carpets and rugs
2279	Carpets and rugs, nec
2281	Yarn mills, except wool
2282	Throwing and winding mills
2283	Wool yarn mills
2284	Thread mills
2291	Felt goods, except woven felts and hats
2292	Lace goods
2293	Paddings and upholstery filling
2294	Processed textile waste
2295	Coated fabrics, not rubberized
2296	Tire cord and fabric
2297	Nonwoven fabrics
2298	Cordage and twine
2299	Textile goods, nec
	Apparel and Related Textiles
2311	Men's and boys' suits and coats
2321	Men's and boy's shirts and nightwear
2322	Men's and boys' underwear
2323	Men's and boys' neckwear
2327	Men's and boys' separate trousers
2328	Men's and boys' work clothing
2329	Men's and boys' clothing, nec
2331	Women's and misses' blouses and waists
2335	Women's and misses' dresses
2337	Women's and misses' suits and coats
2339	Women's and misses' outerwear, nec
2341	Women's and children's underwear
2342	Brassieres and allied garments
2351	Millinery
2352	Hats and caps, except millinery
2361	Children's dresses and blouses
2363	Children's coats and suits
2369	Children's outerwear, nec
2371	Fur goods
2381	Fabric dress and work gloves
2384	Robes and dressing gowns
2385	Waterproof outergarments
2386	Leather and sheep lined clothing
2387	Apparel belts
2389	Apparel and accessories, nec
2391	Curtains and draperies
2392	House furnishings, nec
2393	Textile bags
2394	Canvas and related products
2395	Pleating and stitching
2396	Automotive and apparel trimmings
2397	Schiffli machine embroideries
2399	Fabricated textile products, nec

SIC Code	Industry
	Lumber and Wood Products
2411	Logging camps and logging contractors
2421	Sawmills and planing mills, general
2426	Hardwood dimension and flooring
2429	Special product sawmills, nec
2431	Millwork
2434	Wood kitchen cabinets
2435	Hardwood veneer and plywood
2436	Softwood veneer and plywood
2439	Structural wood members, nec
2441	Nailed wood boxes and shook
2448	Wood pallets and skids
2449	Wood containers, nec
2451	Mobile homes
2452	Prefabricated wood buildings
2491	Wood preserving
2492	Particleboard
2499	Wood products, nec
	Furniture and Fixtures
2511	Wood household furniture
2512	Upholstered household furniture
2514	Metal household furniture
2515	Mattresses and bedsprings
2517	Wood TV and radio cabinets
2519	Household furniture, nec
2521	Wood office furniture
2522	Metal office furniture
2531	Public building and related furniture
2541	Wood partitions and fixtures
2542	Metal partitions and fixtures
2591	Drapery hardware and blinds and shades
2599	Furniture and fixtures, nec
	Paper Products
2611	Pulp mills
2621	Paper mills, except building paper
2631	Paperboard mills
2641	Paper coating and glazing
2642	Envelopes
2643	Bags, except textile bags
2645	Die-cut paper and board
2646	Pressed and molded pulp goods
2647	Sanitary paper products
2648	Stationery products
2649	Converted paper products, nec
2651	Folding paperboard boxes
2652	Set-up paperboard boxes
2653	Corrugated and solid fiber boxes
2654	Sanitary food containers
2655	Fiber cans, drums, and similar products
2661	Building paper and board mills

Note: nec = not elsewhere classified.

SIC Code	Industry
Printing and Publishing Industries	
2711	Newspapers
2721	Periodicals
2731	Book publishing
2732	Book printing
2741	Miscellaneous publishing
2751	Commercial printing, letterpress
2752	Commercial printing, lithographic
2753	Engraving and plate printing
2754	Commercial printing, gravure
2761	Manifold business forms
2771	Greeting card publishing
2782	Blankbooks and looseleaf binders
2789	Bookbinding and related work
2791	Typesetting
2793	Photoengraving
2794	Electrotyping and stereotyping
2795	Lithographic platemaking services
Chemical Products	
2800	General chemical manufacturing
2812	Alkalies and chlorine
2813	Industrial gases
2816	Inorganic pigments
2818	Organic pesticide products
2819	Industrial inorganic chemicals, nec
2821	Plastics materials and resins
2822	Synthetic rubber
2823	Cellulosic man-made fibers
2824	Organic fibers, noncellulosic
2831	Biological products
2833	Medicinals and botanicals
2834	Pharmaceutical preparations
2841	Soap and other detergents
2842	Polishes and sanitation goods
2843	Surface active agents
2844	Toilet preparations
2851	Paints and allied products
2861	Gum and wood chemicals
2865	Cyclic crudes and intermediates
2869	Industrial organic chemicals, nec
2873	Nitrogenous fertilizers
2874	Phosphatic fertilizers
2875	Fertilizers, mixing only
2879	Agricultural chemicals, nec
2891	Adhesives and sealants
2892	Explosives
2893	Printing ink
2895	Carbon black
2899	Chemical preparations, nec
Petroleum and Coal Products	
2911	Petroleum refining
2951	Paving mixtures and blocks
2952	Asphalt felts and coatings
2992	Lubricating oils and greases
2999	Petroleum and coal products, nec
Rubber and Plastic Products	
3011	Tires and inner tubes
3021	Rubber and plastics footwear
3031	Reclaimed rubber
3041	Rubber and plastics hose and belting
3069	Fabricated rubber products, nec
3079	Miscellaneous plastics products
Leather Products	
3111	Leather tanning and finishing
3131	Boot and shoe cut stock and findings
3142	House slippers
3143	Men's footwear, except athletic
3144	Women's footwear, except athletic
3149	Footwear, except rubber, nec
3151	Leather gloves and mittens
3161	Luggage
3171	Women's handbags and purses
3172	Personal leather goods, nec
3199	Leather goods, nec
Stone, Clay, and Glass Products	
3211	Flat glass
3221	Glass containers
3229	Pressed and blown glass, nec
3231	Products of purchased glass
3241	Cement, hydraulic
3251	Brick and structural clay tile
3253	Ceramic wall and floor tile
3255	Clay refractories
3259	Structural clay products, nec
3261	Vitreous plumbing fixtures
3262	Vitreous china food utensils
3263	Fine earthenware food utensils
3264	Porcelain electrical supplies
3269	Pottery products, nec
3271	Concrete block and brick
3272	Concrete products, nec
3273	Ready-mixed concrete
3274	Lime
3275	Gypsum products
3281	Cut stone and stone products
3291	Abrasive products
3292	Asbestos products
3293	Gaskets, packing, and sealing devices
3295	Minerals, ground or treated
3296	Mineral wool
3297	Nonclay refractories
3299	Nometallic mineral products, nec

Note: nec = not elsewhere classified.

SIC Code	Industry
Primary Metal Industries	
3312	Blast furnaces and steel mills
3313	Electrometallurgical products
3315	Steel wire and related products
3316	Cold finishing of steel shapes
3317	Steel pipe and tubes
3321	Gray iron foundries
3322	Malleable iron foundries
3324	Steel investment foundries
3325	Steel foundries, nec
3331	Primary copper
3332	Primary lead
3333	Primary zinc
3334	Primary aluminum
3339	Primary nonferrous metals, nec
3341	Secondary nonferrous metals
3351	Copper rolling and drawing
3353	Aluminum sheet, plate, and foil
3354	Aluminum extruded products
3355	Aluminum rolling and drawing, nec
3356	Nonferrous rolling and drawing, nec
3357	Nonferrous wire drawing and insulating
3361	Aluminum foundries
3362	Brass, bronze, and copper foundries
3369	Nonferrous foundries, nec
3398	Metal heat treating
3399	Primary metal products, nec
Metal Fabrications	
3411	Metal cans
3412	Metal barrels, drums, and pails
3421	Cutlery
3423	Hand and edge tools, nec
3425	Hand saws and saw blades
3429	Hardware, nec
3431	Metal sanitary ware
3432	Plumbing fittings and brass goods
3433	Heating equipment, except electric
3441	Fabricated structural metal
3442	Metal doors, sash, and trim
3443	Fabricated plate work (boiler shops)
3444	Sheet metal work
3446	Architectural metal work
3448	Prefabricated metal buildings
3449	Miscellaneous metal work
3451	Screw machine products
3452	Bolts, nuts, rivets, and washers
3462	Iron and steel forgings
3463	Nonferrous forgings
3465	Automotive stampings
3466	Crowns and closures
3469	Metal stampings, nec
3471	Plating and polishing
3479	Metal coating and allied services
3482	Small arms ammunition
3483	Ammunition, except for small arms, nec
3484	Small arms
3489	Ordnance and accessories, nec
3493	Steel springs, except wire
3494	Valves and pipe fittings
3495	Wire springs
3496	Miscellaneous fabricated wire products
3497	Metal foil and leaf
3498	Fabricated pipe and fittings
3499	Fabricated metal products, nec
Nonelectrical Machinery	
3511	Turbines and turbine generator sets
3519	Internal combustion engines, nec
3523	Farm machinery and equipment
3524	Lawn and garden equipment
3531	Construction machinery
3532	Mining machinery
3533	Oil field machinery
3534	Elevators and moving stairways
3535	Conveyors and conveying machinery
3536	Hoists, cranes, and monorails
3537	Industrial trucks and tractors
3541	Machine tools, metal cutting types
3542	Machine tools, metal forming types
3544	Special dies, tools, jigs, and fixture
3545	Machine tool accessories
3546	Power driven hand tools
3547	Rolling mill machinery
3549	Metalworking machinery, nec
3551	Food products machinery
3552	Textile machinery
3553	Woodworking machinery
3554	Paper industries machinery
3555	Printing trades machinery
3559	Special industry machinery, nec
3561	Pumps and pumping equipment
3562	Ball and roller bearings
3563	Air and gas compressors
3564	Blowers and fans
3565	Industrial patterns
3566	Speed changers, drives, and gears
3567	Industrial furnaces and ovens
3568	Power transmission equipment, nec
3569	General industrial machinery, nec
3572	Typewriters
3573	Electronic computing equipment
3574	Calculating and accounting machines
3576	Scales and balances, except laboratory
3579	Office machines, nec
3581	Automatic merchandising machines

Note: nec = not elsewhere classified.

SIC Code	Industry
3582	Commercial laundry equipment
3585	Refrigeration and heating equipment
3586	Measuring and dispensing pumps
3589	Service industry machinery, nec
3592	Carburetors, pistons, rings, valves
3599	Machinery, except electrical, nec
Electrical and Electronic Machinery, Equipment, and Supplies	
3612	Transformers
3613	Switchgear and switchboard apparatus
3621	Motors and generators
3622	Industrial controls
3623	Welding apparatus, electrical
3624	Carbon and graphite products
3629	Electrical industrial apparatus, nec
3631	Household cooking equipment
3632	Household refrigerators and freezers
3633	Household laundry equipment
3634	Electric housewares and fans
3635	Household vacuum cleaners
3636	Sewing machines
3639	Household appliances, nec
3641	Electric lamps
3643	Current-carrying wiring devices
3644	Noncurrent-carrying wiring devices
3645	Residential lighting fixtures
3646	Commerical lighting fixtures
3647	Vehicular lighting equipment
3648	Lighting equipment, nec
3651	Radio and TV receiving sets
3652	Phonograph records
3661	Telephone and telegraph apparatus
3662	Radio and TV communication equipment
3671	Electron tubes, receiving type
3672	Cathode ray television picture tubes
3673	Electron tubes, transmitting
3674	Semiconductors and related devices
3675	Electronic capacitors
3676	Electronic resistors
3677	Electronic coils and transformers
3678	Electronic connectors
3679	Electronic components, nec
3691	Storage batteries
3692	Primary batteries, dry and wet
3693	X-ray apparatus and tubes
3694	Engine electrical equipment
3699	Electrical equipment and supplies, nec
Transportation Equipment	
3711	Motor vehicles and car bodies
3713	Truck and bus bodies
3714	Motor vehicle parts and accessories
3715	Truck trailers
3716	Motor homes on purchased chassis
3721	Aircraft
3724	Aircraft engines and engine parts
3728	Aircraft equipment, nec
3731	Ship building and repairing
3732	Boat building and repairing
3743	Railroad equipment
3751	Motorcycles, bicycles, and parts
3761	Guided missiles and space vehicles
3764	Space propulsion units and parts
3769	Space vehicle equipment, nec
3792	Travel trailers and campers
3795	Tanks and tank components
3799	Transportation equipment, nec
Instruments	
3811	Engineering and scientific instruments
3822	Environmental controls
3823	Process control instruments
3824	Fluid meters and counting devices
3825	Instruments to measure electricity
3829	Measuring and controlling devices, nec
3832	Optical instruments and lenses
3841	Surgical and medical instruments
3842	Surgical appliances and supplies
3843	Dental equipment and supplies
3851	Ophthalmic goods
3861	Photographic equipment and supplies
3873	Watches, clocks, and watchcases
Miscellaneous Manufacturing	
3911	Jewelry, precious metal
3914	Silverware and plated ware
3915	Jewelers' materials and lapidary work
3931	Musical instruments
3942	Dolls
3944	Games, toys, and children's vehicles
3949	Sporting and athletic goods, nec
3951	Pens and mechanical pencils
3952	Lead pencils and art goods
3953	Marking devices
3955	Carbon paper and inked ribbons
3961	Costume jewelry
3962	Artificial flowers
3963	Buttons
3964	Needles, pins, and fasteners
3991	Brooms and brushes
3993	Signs and advertising displays
3995	Burial caskets
3996	Hard surface floor coverings
3999	Manufacturing industries, nec

Note: nec = not elsewhere classified.

SIC Code	Industry
Railroad Transportation	
4011	Railroads, line-haul operating
4013	Switching and terminal devices
4041	Railway express service
Local Passenger Transportation	
4111	Local and suburban transit
4119	Local passenger transportation, nec
4121	Taxicabs
4131	Intercity highway transportation
4141	Local passenger charter service
4142	Charter service, except local
4151	School buses
4171	Bus terminal facilities
4172	Bus service facilities
Trucking	
4212	Local trucking, without storage
4213	Trucking, except local
4214	Local trucking and storage
4221	Farm product warehousing and storage
4222	Refrigerated warehousing
4224	Household goods warehousing
4225	General warehousing and storage
4226	Special warehousing and storage, nec
4231	Trucking terminal facilities
4311	U.S. Postal Service
Water Transportation	
4411	Deep sea foreign transportation
4421	Noncontiguous area transportation
4422	Coastwise transportation
4423	Intercoastal transportation
4431	Great Lakes transportation
4441	Transportation on rivers and canals
4452	Ferries
4453	Lighterage
4454	Towing and tugboat service
4459	Local water transportation, nec
4463	Marine cargo handling
4464	Canal operation
4469	Water transportation services, nec
Air Transportation	
4511	Certified air transportation
4521	Noncertified air transportation
4582	Airports and flying fields
4583	Air terminal services
Pipelines	
4612	Crude petroleum pipelines
4613	Refined petroleum pipelines
4619	Pipelines, nec

SIC Code	Industry
Transportation Services	
4712	Freight forwarding
4722	Passenger transportation arrangement
4723	Freight transportation arrangement
4742	Railroad car rental with service
4743	Railroad car rental without service
4782	Inspection and weighing services
4783	Packing and crating
4784	Fixed facilities for vehicles, nec
4789	Transportation services, nec
Communications	
4811	Telephone communication
4821	Telegraph communication
4832	Radio broadcasting
4833	Television broadcasting
4899	Communication services, nec
Electrical, Gas, and Sanitary Services	
4911	Electric services
4922	Natural gas transmission
4923	Gas transmission and distribution
4924	Natural gas distribution
4925	Gas production and/or distribution
4931	Electric and other services combined
4932	Gas and other services combined
4939	Combination utility services, nec
4941	Water supply
4952	Sewerage systems
4953	Refuse systems
4959	Sanitary services, nec
4961	Steam supply
4971	Irrigation systems
Wholesale Trade	
5012	Automobiles and other motor vehicles
5013	Automotive parts and supplies
5014	Tires and tubes
5021	Furniture
5023	Home furnishings
5031	Lumber, plywood, and millwork
5039	Construction materials, nec
5041	Sporting and recreational goods
5042	Toys and hobby goods and supplies
5043	Photographic equipment and supplies
5051	Metals service centers and offices
5052	Coal and other minerals and ores
5063	Electrical apparatus and equipment
5064	Electrical appliances, TV and radios
5065	Electronic parts and equipment
5072	Hardware
5074	Plumbing and hydronic heating supplies
5075	Warm air heating and air conditioning

Note: nec = not elsewhere classified.

SIC Code	Industry
5078	Refrigeration equipment and supplies
5081	Commercial machines and equipment
5082	Construction and mining machinery
5083	Farm machinery and equipment
5084	Industrial machinery and equipment
5085	Industrial supplies
5086	Professional equipment and supplies
5087	Service establishment equipment
5088	Transportation equipment and supplies
5093	Scrap and waste materials
5094	Jewelry, watches, and precious stones
5099	Durable goods, nec
5111	Printing and writing paper
5112	Stationery supplies
5113	Industrial and personal service paper
5122	Drugs, proprietaries, and sundries
5133	Piece goods
5134	Notions and other dry goods
5136	Men's clothing and furnishings
5137	Women's and children's clothing
5139	Footwear
5141	Groceries, general line
5142	Frozen foods
5143	Dairy products
5144	Poultry and poultry products
5145	Confectionery
5146	Fish and seafoods
5147	Meats and meat products
5148	Fresh fruits and vegetables
5149	Groceries and related products, nec
5152	Cotton
5153	Grain
5154	Livestock
5159	Farm-product raw materials, nec
5161	Chemicals and allied products
5171	Petroleum bulk stations and terminals
5172	Petroleum products, nec
5181	Beer and ale
5182	Wines and distilled beverages
5191	Farm supplies
5194	Tobacco and tobacco products
5198	Paints, varnishes, and supplies
5199	Nondurable goods, nec
Retail Trade	
5211	Lumber and other building materials
5231	Paint, glass, and wallpaper stores
5251	Hardware stores
5261	Retail nurseries and gardens
5271	Mobile home dealers
5311	Department stores
5331	Variety stores
5399	Miscellaneous general merchandise stores
5411	Grocery stores
5422	Freezer and locker meat provisioners
5423	Meat and fish (seafood) markets
5431	Fruit stores and vegetable markets
5441	Candy, nut, and confectionery stores
5451	Dairy products stores
5462	Retail bakeries, baking and selling
5463	Retail bakeries, selling only
5499	Miscellaneous food stores
5511	New and used car dealers
5521	Used car dealers
5531	Auto and home supply stores
5541	Gasoline service stations
5551	Boat dealers
5561	Recreation and utility trailer dealers
5571	Motorcycle dealers
5599	Automotive dealers, nec
5611	Men's and boys' clothing and furnishings
5621	Women's ready-to-wear stores
5631	Women's accessory and specialty stores
5641	Children's and infants' wear stores
5651	Family clothing stores
5661	Shoe stores
5681	Furriers and fur shops
5699	Miscellaneous apparel and accessories
5712	Furniture stores
5713	Floor covering stores
5714	Drapery and upholstery stores
5719	Miscellaneous home furnishings stores
5722	Household appliance stores
5732	Radio and television stores
5733	Music stores
5812	Eating places
5813	Drinking places
5912	Drugstores and proprietary stores
5921	Liquor stores
5931	Used merchandise stores
5941	Sporting goods and bicycle shops
5942	Book stores
5943	Stationery stores
5944	Jewelry stores
5945	Hobby, toy, and game shops
5946	Camera and photographic supply stores
5947	Gift, novelty, and souvenir shops
5948	Luggage and leather goods stores
5949	Sewing, needlework, and piece goods
5961	Mail order houses
5962	Merchandising machine operators
5963	Direct selling organizations
5982	Fuel and ice dealers, nec
5983	Fuel oil dealers
5984	Liquefied petroleum gas dealers

Note: nec = not elsewhere classified.

SIC Code	Industry
5992	Florists
5993	Cigar stores and stands
5994	News dealers and newsstands
5999	Miscellaneous retail stores, nec
Financial	
6011	Federal Reserve banks
6022	State banks, Federal Reserve
6023	State banks, not Federal Reserve, FDIC
6024	State banks, not Federal Reserve, not FDIC
6025	National banks, Federal Reserve
6026	National banks, not Federal Reserve, FDIC
6027	National banks, not FDIC
6028	Private banks, not incorporated, not FDIC
6032	Mutual savings banks, Federal Reserve
6033	Mutual savings banks, nec
6034	Mutual savings banks, not FDIC
6042	Nondeposit trusts, Federal Reserve
6044	Nondeposit trusts, not FDIC
6052	Foreign exchange establishments
6054	Safe deposit companies
6055	Clearinghouse associations
6056	Corporations for banking abroad
6059	Functions related to banking, nec
6112	Rediscounting, not for agricultural
6113	Rediscounting, for agricultural
6122	Federal savings and loan associations
6123	State associations, insured
6124	State associations, noninsured, FHLB
6125	State associations, noninsured, nec
6131	Agricultural credit institutions
6142	Federal credit unions
6143	State credit unions
6144	Nondeposit industrial loan companies
6145	Licensed small loan lenders
6146	Installment sales finance companies
6149	Miscellaneous personal credit institutions
6153	Short-term business credit
6159	Miscellaneous business credit institutions
6162	Mortgage bankers and correspondents
6163	Loan brokers
6211	Security brokers and dealers
6221	Commodity contracts brokers, dealers
6231	Security and commodity exchanges
6281	Security and commodity services
Insurance	
6311	Life insurance
6321	Accident and health insurance
6324	Hospital and medical service plans
6331	Fire, marine, and casualty insurance
6351	Surety insurance
6361	Title insurance
6371	Pension, health, and welfare funds
6399	Insurance carriers, nec
6411	Insurance agents, brokers, and service
Real Estate	
6512	Nonresidential building operators
6513	Apartment building operators
6514	Dwelling operators, except apartments
6515	Mobile home site operators
6517	Railroad property lessors
6519	Real property lessors, nec
6531	Real estate agents and managers
6541	Title abstract offices
6552	Subdividers and developers, nec
6553	Cemetery subdividers and developers
6611	Combined real estate, insurance, etc.
Holding and Other Investment Offices	
6711	Holding offices
6722	Management investment, open-end
6723	Management investment, closed-end
6724	Unit investment trusts
6725	Face-amount certificate offices
6732	Educational, religious, etc. trusts
6733	Trusts, nec
6792	Oil royalty traders
6793	Commodity traders
6794	Patent owners and lessors
6798	Real estate investment trusts
6799	Investors, nec
Hotels and Personal Services	
7011	Hotels, motels, and tourist courts
7021	Rooming and boarding houses
7032	Sporting and recreational camps
7033	Trailering parks for transients
7041	Membership-basis organization hotels
7211	Power laundries, family and commercial
7212	Garment pressing and cleaners' agents
7213	Linen supply
7214	Diaper service
7215	Coin-operated laundries and cleaning
7216	Dry cleaning plants, except rug
7217	Carpet and upholstery cleaning
7218	Industrial launderers
7219	Laundry and garment services, nec
7221	Photographic studios, portrait
7231	Beauty shops
7241	Barber shops
7251	Shoe repair and hat cleaning shops
7261	Funeral service and crematories
7299	Miscellaneous personal services

Note: nec = not elsewhere classified.

SIC Code	Industry
Business Services	
7311	Advertising agencies
7312	Outdoor advertising services
7313	Radio, TV, publisher representatives
7319	Advertising, nec
7321	Credit reporting and collection
7331	Direct mail advertising services
7332	Blueprinting and photocopying
7333	Commerical photography and art
7339	Stenographic and reproduction, nec
7341	Window cleaning
7342	Disinfecting and exterminating
7349	Building maintenance services, nec
7351	News syndicates
7361	Employment agencies
7362	Temporary help supply services
7369	Personnel supply services, nec
7372	Computer programming and software
7374	Data processing services
7379	Computer related services, nec
7391	Research and development laboratories
7392	Management and public relations
7393	Detective and protective services
7394	Equipment rental and leasing
7395	Photofinishing laboratories
7396	Trading stamp services
7397	Commercial testing laboratories
7399	Business services, nec
Automotive Repair, Services, and Garages	
7512	Passenger car rental and leasing
7513	Truck rental and leasing
7519	Utility trailer rental
7523	Parking lots
7525	Parking structures
7531	Top and body repair shops
7534	Tire retreading and repair shops
7535	Paint shops
7538	General automotive repair shops
7539	Automotive repair shops, nec
7542	Car washes
7549	Automotive services, nec
Miscellaneous Repair Services	
7622	Radio and television repair
7623	Refrigeration service and repair
7629	Electrical repair shops, nec
7631	Watch, clock, and jewelry repair
7641	Reupholstery and furniture repair
7692	Welding repair
7694	Armature rewinding shops
7699	Repair services, nec

SIC Code	Industry
Entertainment	
7813	Motion picture production, except TV
7814	Motion picture production for TV
7819	Services allied to motion pictures
7823	Motion picture film exchanges
7824	Film or tape distribution for TV
7829	Motion picture distribution services
7832	Motion picture theaters except drive-in
7833	Drive-in motion picture theaters
7911	Dance halls, studios, and schools
7922	Theatrical producers and services
7929	Entertainers and entertainment groups
7932	Billiard and pool establishments
7933	Bowling alleys
7941	Sports clubs and promoters
7948	Racing, including track operation
7992	Public golf courses
7993	Coin-operated amusement devices
7996	Amusement parks
7997	Membership sports and recreation clubs
7999	Amusement and recreation, nec
Health Services	
8011	Offices of physicians
8021	Offices of dentists
8031	Offices of osteopathic physicians
8041	Offices of chiropractors
8042	Offices of optometrists
8049	Offices of health practitioners, nec
8051	Skilled nurse care facilities
8059	Nursing and personal care, nec
8062	General medical and surgical hospitals
8063	Psychiatric hospitals
8069	Specialty hospitals, except psychiatric
8071	Medical laboratories
8072	Dental laboratories
8081	Outpatient care facilities
8091	Health and allied services, nec
Legal, Educational, and Social Services	
8111	Legal services
8211	Elementary and secondary schools
8221	Colleges and universities, nec
8222	Junior colleges
8231	Libraries and information centers
8241	Correspondence schools
8243	Data processing schools
8244	Business and secretarial schools
8249	Vocational schools, nec
8299	Schools and educational services, nec
8321	Individual and family services
8331	Job training and related services
8351	Child day care services

Note: nec = not elsewhere classified.

SIC Code	Industry
8361	Residential care
8399	Social services, nec
8411	Museums and art galleries
8421	Botanical and zoological gardens
Professional Organizations	
8611	Business associations
8621	Professional organizations
8631	Labor organizations
8641	Civic and social associations
8651	Political organizations
8661	Religious organizations
8699	Membership organizations, nec
8811	Private households
Miscellaneous Services	
8911	Engineering and architectural services
8922	Noncommercial research organizations
8931	Accounting, auditing, and bookkeeping
8999	Services, nec
Government	
9111	Executive offices
9121	Legislative bodies
9131	Executive and legislative combined
9199	General government, nec
9211	Courts
9221	Police protection
9222	Legal counsel and prosecution
9223	Correctional institutions
9224	Fire protection
9229	Public order and safety, nec
9311	Finance, taxation, and monetary policy
9411	Administration of educational programs
9431	Administration of public health programs
9441	Administration of social and manpower programs
9451	Administration of veterans' affairs
9511	Air, water, and solid waste management
9512	Land, mineral, wildlife conservation
9531	Housing programs
9532	Urban and community development
9611	Administration of general economic programs
9621	Regulation, administration of transportation
9631	Regulation, administration of utilities
9641	Regulation of agricultural marketing
9651	Regulation miscellaneous commercial sectors
9661	Space research and technology
9711	National security
9721	International affairs
9999	Nonclassifiable establishment

Note: nec = not elsewhere classified.

APPENDIX D

Detailed Demand Elasticity Discussion

As explained above, waste treatment is an input into the production of other goods and services, whose production also creates waste. The demand for the CWT input is derived from the demand for the other goods and services. In the market model, the change in quantity demanded of CWT service i is described as a function of the change in the market price for CWT service i and the elasticity of demand for CWT service i. Thus, the change in quantity demanded is given by

$$dQ_i = \eta_i \bullet dP_i \bullet (Q_i/P_i),$$

where;

dQ_i = change in quantity demanded of CWT service i,

η_i = price-elasticity of demand for CWT service i,

dP_i = change in price of CWT service i,

Q_i = baseline quantity demanded of CWT service i, and

P_i = baseline price of CWT service i.

CWT service markets are characterized as regional markets. Based on information provided in the CWT survey, the Agency believes that most of a CWT's customers are located within the same state as the CWT or a few adjacent states. For our market model, the continental United States was divided into six regional markets for CWT services. All the generators within that region are assumed to send their off-site waste to a CWT facility located within the region. Thus, competition for customers is assumed to occur essentially within the region, although CWT facilities located outside the region do offer a (very costly) alternative to CWT facilities within the region. The presence of these "treaters of last resort" affects the assumptions made about the price-elasticity of demand for CWT services.

The price-elasticity of demand (which will be referred to as the elasticity of demand from here on) measures the responsiveness of demand for a service to changes in its price. It is defined as the percentage change in the quantity demanded of a service divided by the percentage change in its price:

$$\eta_i = (dQ_i/Q_i) / (dP_i/P_i),$$

where the right-hand side variables are defined as above.

Economic theory states that the elasticity of the derived demand for an input is a function of the following:

- demand elasticity for the final good it will be used to produce;
- the cost share of the input in total production cost;
- the elasticity of substitution between this input and other inputs in production; and
- the elasticity of supply of other inputs.[1,2,3]

Using Hicks' formula,

$$\eta_i = [s(n + e) + Ke(n - s)] / [n = e - K(n - s)]$$

where;

η_i = elasticity of demand for the CWT service i,

s = elasticity of substitution between CWT service i and all other inputs,

n = elasticity of demand for final product,

e = elasticity of supply of other inputs, and

K = cost share of CWT service i in total production cost.

Hicks, in the Appendix to *The Theory of Wages*, shows that, if $n > s$, the demand for the input is less elastic the smaller its cost share.[4] If the data were available, this formula could be used to actually compute the elasticity of demand for each CWT service. As noted above, however, nearly every production activity generates some waste that is managed off-site. The number of final products whose elasticity of demand (n) would need to be included is very large, and the elasticities of demand for those products vary widely. Thus, resources do not permit determination of a value for n. This makes direct computation of the elasticity of demand, η, impossible. In spite of this, the formula is useful because it identifies factors that influence the magnitude of the elasticity of derived demand. Knowledge of the general magnitude of those factors makes it possible to make an educated assumption about the magnitude of η.

The elasticity of substitution, s, between a given waste treatment service and other inputs is low but not zero. This means that waste generators do have some limited options in the way they produce their final goods or services. Some limited substitution is possible between treatment technologies for a given waste form. In addition, generators may choose to substitute out-of-region CWT services for within-region CWT services, although transportation costs

would increase greatly. Further, generating facilities may substitute on-site capital, labor, and/or materials for off-site waste treatment either by choosing to manage the waste on-site or by undertaking on-site pollution prevention activities. These options are quite limited, however, so s is expected to be small, and n is likely to be larger than s.

Thus, the magnitude of η is proportional to the magnitude of K, the cost share of CWT in final goods production. Other analyses done on the CWT industry found that the cost share for waste treatment was historically very small, frequently hundredths of a percent of total production costs. Recent regulatory changes may have increased the unit cost somewhat, but it is still expected to be fairly small.

Insufficient data exist to enable the Agency to estimate the elasticity of demand for CWT services econometrically. Instead, assumptions were made about the relative magnitudes of the parameters of the Hicks equation describing the elasticity of demand for intermediate goods and services. Based on these assumptions, a reasonable assumption was made about the magnitude of the elasticity of demand for CWT services in each regional market.

Overall, the demand for CWT services is assumed to be just slightly elastic (between -1.0 and -1.5). Demand elasticity in this range means that, when the price of CWT services increases, the quantity of CWT services demanded will decrease by slightly more, in percentage change, than the price has increased. In fact, the demand elasticity may be slightly inelastic rather than slightly elastic. Mathematical characteristics of the economic impact analysis model being used require that the absolute value of the demand elasticity in a given CWT market exceed the largest market share of any facility in the market. Because some of the markets being modeled are regional monopolies, they would need to have a price elasticity of demand exceeding 1 in absolute value. For simplicity, -1.01 is the minimum elasticity used for any of the markets. It is possible that some of the markets have lower elasticities, so the analysis reported here may be overstating the decreases in market quantity that result from the regulatory costs, and therefore overstating some of the facility-level impacts.

Typically, when assumptions are made regarding parameters of a model, a sensitivity analysis is performed to assess the impact that those assumptions have on the outcome of the analysis. In this case, the model itself constrains the parameter values that can be used. Thus, this model can not be used to test the impact of less elastic demand. As a sort of sensitivity analysis, a discounted cash flow analysis was performed assuming various degrees of compliance cost "pass through." The results of this DCF analysis indicate that if demand were infinitely elastic and the same quantity of CWT services were provided (full cost absorption at the CWT

facility), 14 facilities would become unprofitable under Option 1, and 17 under Option 2. If 20 percent of the compliance costs were passed through to the customers of CWT facilities, and the same quantity of CWT services were performed, ten facilities would become unprofitable under Option 1 and 14 under Option 2. If, on the other hand, 80 percent of compliance costs were passed through to consumers and the same quantity of CWT services were performed, only 2 facilities would become unprofitable under either EPA Regulatory Option. This is an imperfect type of sensitivity analysis, because the assumptions about market behavior used for a discounted cash flow analysis are much more rigid than the assumptions embodied in the market model (neither producers nor demanders are assumed to adjust their quantities in response to changing market conditions). Nevertheless, it indicates that the intermediate assumptions about the elasticity of demand may result in an over-estimate of the impact on facility profitability if they are not accurate. It should be emphasized, however, that the Agency believes that the assumed elasticities of demand are reasonable given the nature of CWT services and the regional markets in which they are traded.

REFERENCES

1. Allen, R.G.D. *Mathematical Analysis for Economists.* New York, St. Martin's Press. 1938. 509 pp.

2. Hicks, J.R. "Marshall's Third Rule: A Further Comment." *Oxford Economic Papers* 13:262-65. 1961.

3. Hicks, J.R. *The Theory of Wages.* 2nd ed. New York, St. Martin's Press. 1966. 247 pp.

4. Hicks, J.R. *The Theory of Wages.* 2nd ed. New York, St. Martin's Press. 1966. 247 pp.

APPENDIX E

Detailed Market Model Discussion

The imperfect competition economic model discussed in this appendix analyzes the market response of CWT facilities to EPA regulatory control options. This interactive model enables the user to introduce an exogenous shock in the form of compliance costs in order to determine post-regulatory equilibria. The results of this model provide market-level, facility-level, and employment impacts expected to result from each of the 13 control options that were at some point under consideration by EPA. The following discussion provides an overview of the CWT economic model.

This study modeled certain aspects of the CWT industry, focusing on market identification and characterization, definition of CWT services provided, and producer characteristics within each of six defined geographic regions. The analysis employed modeled markets as imperfectly competitive (either monopolistic or oligopolistic). In this appendix, we introduce model variables, equations, and matrix algebra.

E.1 BASELINE DATA

Producers of CWT services are defined as facilities that accept waste from offsite for treatment (including treatment or recovery of metals, oils, or organics). Because of the nature of the industry, CWT facilities provide many different services while competing in multistate regions within the U.S. In this study, these regions are represented by six regional market models. Each regional model was constructed to analyze the market responses of CWT facilities to the costs of complying with EPA's proposed regulatory options.

As described in Chapters 3 and 4, the best available data suggest that CWT facilities compete within six regional markets; therefore, six regional models were constructed to analyze the CWT industry. The following six regional markets are illustrated in Figure 3-2.

- Northeast
- Southeast
- Upper Midwest
- Lower Midwest
- Northwest
- Southwest

CWT facilities differ widely from one another in terms of their size and the types of waste management services they offer. Facilities in each of the regional markets listed above engage in one or more of the following waste treatment processes:

- metals recovery
- oils recovery
- metals wastewater treatment
- oils wastewater treatment
- organics wastewater treatment

Within each broad CWT service category, treatment methods and costs vary as a result of variations in the waste being treated and the specific treatment technologies used. Thus, each broad CWT service category may include as many as three separate markets in each region differentiated by per-unit treatment costs. For example, a regional market may include a market for high cost metals recovery and a separate market for low cost metals recovery. The model treats these as two distinct markets. Table E-1 identifies the service markets modeled in each regional market in this analysis and provides regional market summary statistics (market prices and quantities).

E.1.1 Market Structure

Most economic impact analyses that include a market analysis assume a perfectly competitive market structure. Perfectly competitive markets are characterized by a large number of producers, each small relative to the industry, so that each facility's market share (ratio of facility output to total market output) is low. Facilities engaged in perfect competition are not able to influence prices.

Because of the small number of facilities competing within each CWT market, market concentration tends to be high (i.e., a small number of facilities are responsible for a high percentage of the total production in each market); therefore, CWT markets cannot be treated as perfectly competitive. As modeled, from one to twelve facilities supply CWT services in each market. Therefore, the markets must be characterized as imperfectly competitive and modeled accordingly. Markets with only one producer are monopolistic; markets with a small number of producers are oligopolistic.

Most CWT markets are highly concentrated regional markets with a small number of facilities engaged in competition. In such oligopolistic markets, suppliers are aware of their competitors' actions and have the ability to influence prices. Other CWT markets can be characterized as monopolies, in which only one facility supplies a product for an entire market. The monopolist has 100 percent market share and is a price setter, constrained only by market disciplines.

TABLE E-1. REGIONAL MARKET SUMMARY STATISTICS

Market/Process	Number of Facilities	Market Price	Market Quantity (10^3 gallons)
Northeast	19		
High-Cost Metals Recovery	1	$93.22	14
Low-Cost Metals Recovery	1	$3.14	61,698
High-Cost Oil Recovery	3	$0.67	9,771
Low-Cost Oil Recovery	2	$0.17	14,615
High-Cost Metals Treatment	2	$1.35	1,477
Low-Cost Metals Treatment	12	$0.31	226,573
Oil Treatment	2	$0.28	18,254
Organics Treatment	7	$0.38	53,625
Northwest	6		
High-Cost Oil Recovery	1	$18.17	500
Low-Cost Oil Recovery	3	$0.25	13,451
Metals Treatment	5	$0.92	17,443
Oil Treatment	2	$0.16	190
Organics Treatment	2	$0.16	627
Southeast	8		
Metals Recovery	1	$6.33	2,442
High-Cost Oil Recovery	3	$0.15	7,058
Low-Cost Oil Recovery	1	$0.05	330
Metals Treatment	3	$0.24	79,106
Oil Treatment	3	$0.24	11,580
Organics Treatment	3	$0.22	15,059
Southwest	10		
High-Cost Metals Recovery	2	$0.26	7,279
Low-Cost Metals Recovery	1	$2.80	605
Oil Recovery	1	$0.48	5,705

(continued)

TABLE E-1. REGIONAL MARKET SUMMARY STATISTICS (CONTINUED)

Market/Process	Number of Facilities	Market Price	Market Quantity (10^3 gallons)
Southwest (continued)			
High-Cost Metals Treatment	5	$1.28	2,887
Low-Cost Metals Treatment	4	$0.08	43,026
Oil Treatment	3	$0.59	22,467
Organics Treatment	1	$1.76	837
Lower Midwest	9		
Metals Recovery	1	$0.90	773
Oils Recovery	1	$0.07	8,074
High Cost Metals Treatment	2	$1.13	1,605
Low Cost Metals Treatment	6	$0.09	118,248
Oil Treatment	1	$0.15	2,275
High-Cost Organics Treatment	1	$1.94	124
Low-Cost Organics Treatment	5	$0.17	13,124
Upper Midwest	22		
Metals Recovery	2	$12.77	94
High-Cost Oil Recovery	2	$0.86	674
Medium-Cost Oil Recovery	5	$0.29	35,006
Low-Cost Oil Recovery	5	$0.11	47,213
High-Cost Metals Treatment	1	$4.87	2,749
Medium-Cost Metals Treatment	2	$0.71	2,509
Low-Cost Metals Treatment	12	$0.22	131,585
Oil Treatment	5	$0.16	7,638
Organics Treatment	4	$0.22	674

E.2 MODEL METHODOLOGY

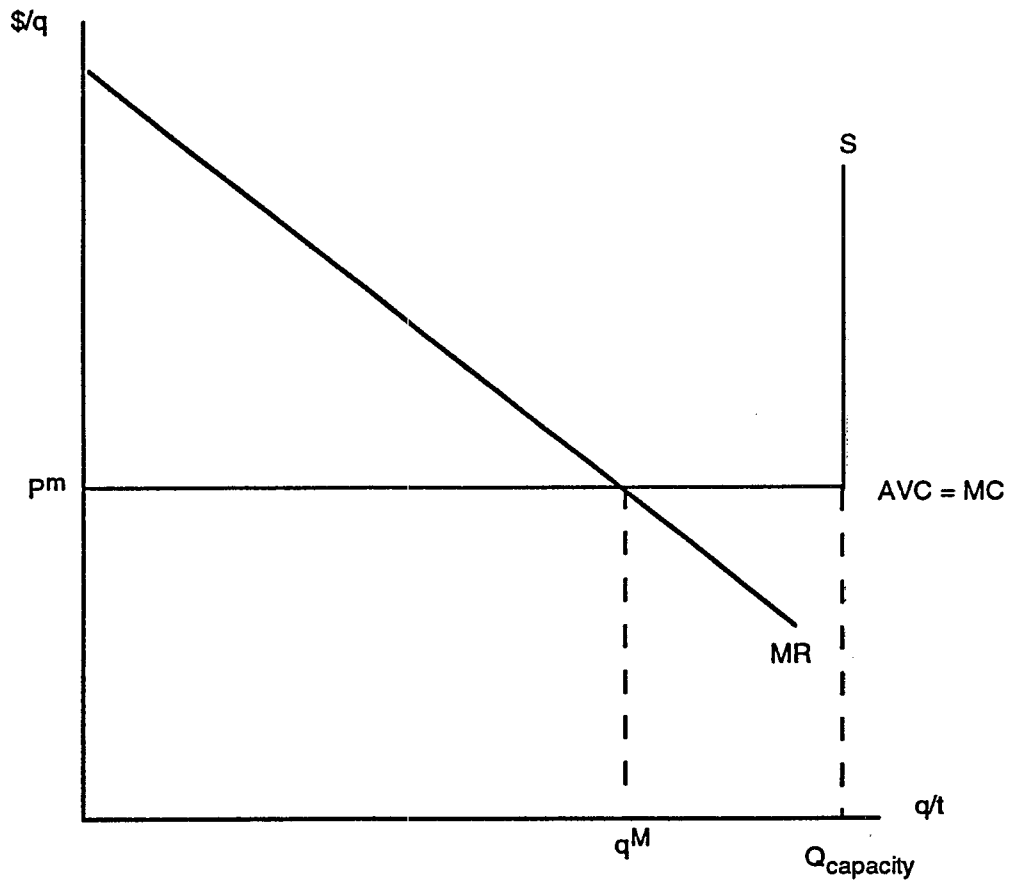
When a supplier in a competitive market makes its production decision, it only needs to examine market price. By definition, the supplier is such a small part of the market that it views itself as unable to influence the market price through its own actions. Thus, the supplier can ignore the impact of its own production decision on market price. However, when a supplier in an oligopolistic market makes its production decision, it must consider the behavior of other suppliers and the effect of their output decisions on market price. In an oligopolistic market, each supplier forms expectations, or conjectures, about its competitors' production decisions to make decisions on its own optimal production level. Obviously, a wide variety of conjectures are possible. We model oligopolistic behavior using the Cournot-Nash model of producers' conjectures.

The Cournot-Nash model is the most common model of oligopolistic behavior found in empirical analysis. Following this model, each supplier maximizes its profits, given its conjecture that all other suppliers will not respond directly to its change in output. Furthermore, those beliefs are confirmed in equilibrium (i.e., each supplier optimally chooses to produce the amount of output that the other suppliers expect it to produce). Thus, in a Cournot-Nash equilibrium no supplier will find it profitable to change its production decision once it discovers the choices actually made by the other suppliers. Figures E-1 and E-2 illustrate the facility under oligopolistic competition without and with the regulatory control costs.

As illustrated in Figure E-1, the oligopolistic facility faces a downward sloping marginal revenue curve (MR) derived from a downward sloping *residual* demand curve (not shown). The demand curve is a residual demand curve in the sense that it is the demand for this facility's output, taking into account the output of all the other competitors in the market. The production costs of the facility are characterized by the inverted L-shaped cost function or supply curve (S). This shape implies that the average cost (cost per unit) of supplying the CWT service is constant up to the facility's treatment capacity. The profit-maximizing facility will choose to produce at the intersection of its marginal cost (MC) and MR curves. Because average variable cost is constant, average variable cost (AVC) equals marginal cost (MC). Thus, the optimal production level for this facility is q^*. The price (P*) is determined by the demand curve at the chosen production level.

As Figure E-2 shows, imposing the regulation will shift the horizontal portion of the facility's marginal cost curve up by the per-unit output variable compliance costs (i.e., from MC to MC'). Given this shift, the facility's optimal production level is reduced to $q^{*'}$ at the

Figure E-1. Oligopolistic Facility



intersection of the MC' and MR curves. Figure E-2 depicts the new higher price level (P*') associated with the regulation-induced lower production level at the facility.

E.1.3 Variables

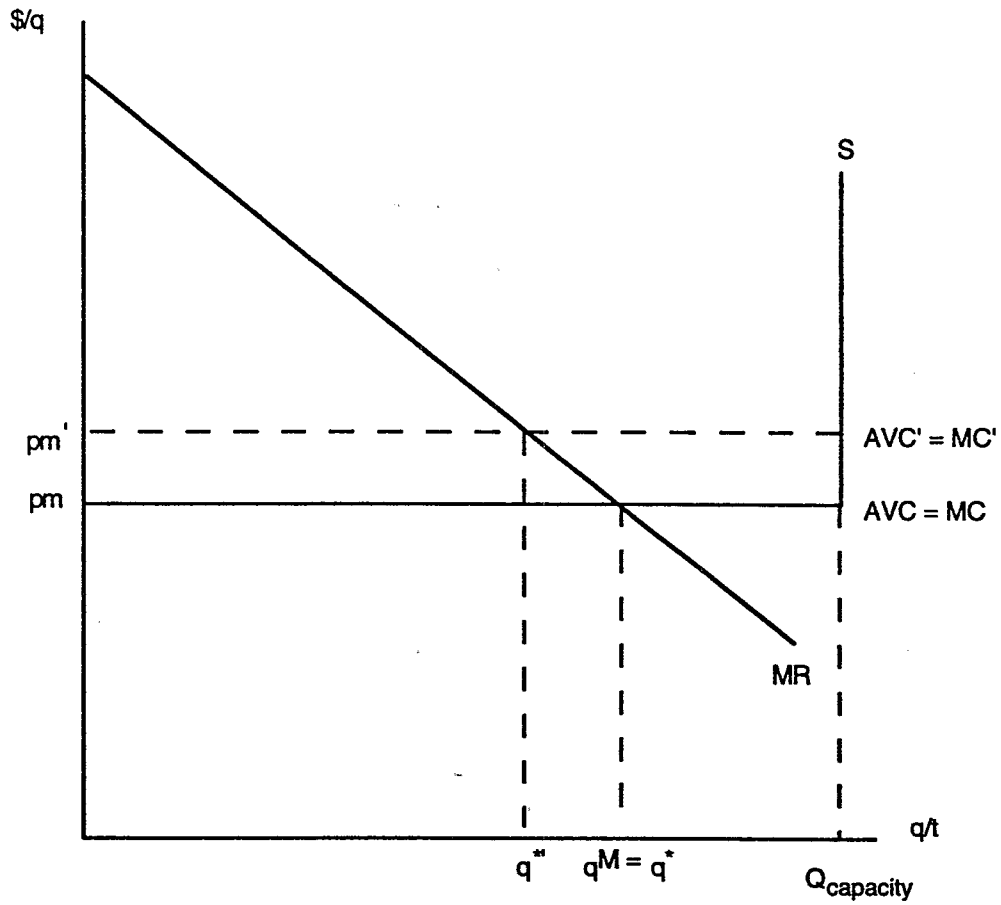
Exogenous variables (i.e., predetermined by factors outside the scope of the model) and endogenous variables (i.e., determined by the model) are included in the economic model. These exogenous and endogenous variables are identified by symbols in the model equations defined in Section E.1.4.

Exogenous Variables

ηj = Demand elasticity for consumers of CWT service j

Sij = Market share for producer i of CWT service j

Figure E-2. Effects of Compliance on Oligopolistic Facility



Endogenous Variables

Pj = Price of CWT service j

qji = Quantity of CWT service j provided by and producer i

Qj = Market quantity for service i

E.3 EQUATIONS OF THE MODEL

The economic model for centralized waste treatment incorporates the Cournot-Nash assumption regarding facilities' conjectures or perceptions about the response of other producers in the market to an exogenous shock. This model consists of a small number of suppliers (N) within a defined market, each with the ability to influence market price, P. Each supplier i maximizes profits by choosing its level of production (q_i):

$$\text{Max } \pi_i = P(Q)\, q_i - C(q_i) - F \tag{E.1}$$

where Q is market output, $C(q_i)$ is the supplier's variable cost function, and F reflects fixed net costs (fixed costs minus fixed revenues). The first-order condition (the derivation of π_i) with respect to q_i is:

$$\frac{\partial \pi_i}{\partial q_i} = P + \frac{\partial P}{\partial Q}\frac{\partial Q}{\partial q_i} q_i + \sum_{j \neq i}^{N} \frac{\partial P}{\partial Q}\frac{\partial Q}{\partial q_{j \neq i}}\frac{\partial q_j}{\partial q_i} - C'(q_i) = 0 \tag{E.2}$$

The second term in Eq. (E.2) drops out by imposing the Cournot-Nash assumption that each supplier expects that all other suppliers will not respond directly to its change in production $\left(\text{i.e., } \frac{\partial q_j}{\partial q_i} = 0\right)$ Further, the partial derivative of market output (Q) with respect to the output level of a single supplier (q_i), thereby holding all other suppliers' output decisions constant, is equal to 1 $\left(\text{i.e., } \frac{\partial Q}{\partial q_i} = 1 \text{ and } \frac{\partial Q}{\partial q_{j \neq i}} = 1\right)$ Thus, rearranging terms and dropping the second term in Eq. (E.2) yields:

$$P + \frac{\partial P}{\partial Q} q_i = C'(q_i) \tag{E.2a}$$

Multiplying the second term on the left-hand side of Eq. (E.2a) $\frac{Q}{P} * \frac{P}{Q}$, or 1, results in an expression that includes the inverse demand elasticity $\left(\frac{1}{n} = \frac{\partial P}{\partial Q} * \frac{Q}{P}\right)$, the market share of supplier i $\left(s_i = \frac{q_i}{Q}\right)$ and the market price (P):

$$P + P\left(\frac{1}{n}\right) s_i = C'(q_i) \tag{E.2b}$$

Therefore, after rearranging the terms of Eq. (E.2b), each profit-maximizing supplier determines the optimal level of output by equating marginal revenue (MR) and marginal cost (MC):

$$MR_i = P\left[1 + \frac{s_i}{\eta}\right] = MC_i \tag{E.3}$$

where P is the market price, s_i is the market share of supplier i defined as $\frac{q_i}{Q}$ with Q being market output, and η is the market demand elasticity. In the case of a large number of producers, the market share (s_i) for all suppliers goes to zero so that the profit-maximizing condition stated in Eq. (E.3) becomes that observed for suppliers under perfect competition (i.e., $P = MC_i$). Alternatively, in the case of a single producer, the market share (s_i) equals one and the profit-maximizing condition stated in Eq. (E.3) becomes that observed for monopoly suppliers,

$\left(\text{i.e., } MR_i = P\left[1 + \frac{1}{\eta}\right] = MC_i\right)$ As shown in Table E-1, the case is observed for a number of services marketed across the various regions modeled for this analysis.

The regulatory compliance costs provide the exogenous shock to the model: the variable compliance cost (c_i) is the change in the marginal cost of production for each affected supplier (dMC_i), that is, the shift in the supply curve of each service, and the fixed compliance costs (F^A) affecting the profitability of the facility as a whole.

First, the change in marginal revenue (dMR_i) must equal the change in the marginal cost (dMC_i) for each supplier in the post-compliance equilibrium so that:

$$dMR_i = dMC_i \tag{E.4}$$

For each supplier, the change in marginal cost (dMC_i) is equal to the unit compliance cost (c_i), while the change in marginal revenue (dMR_i) is the expected change in the marginal revenue expression (Eq. E.3) with respect to price, $\left(dMR = \frac{\partial MR}{\partial P}\right)$ so that (Eq. E.4) is now:

$$dP\left[1 + \frac{s_i}{\eta}\right] + \frac{P}{\eta} dq_i \left[\frac{Q}{Q^2}\right] - \frac{P}{\eta} dQ \left[\frac{q_i}{Q^2}\right] = c_i \tag{E.4a}$$

Note that for single producers this monopoly condition is:

$$dP\left(1 + \frac{1}{\eta}\right) = C_i \tag{E.4b}$$

so that the change in price equals the change in costs due to regulation, that is $dP = C_i$.

Second, the market demand condition must hold:

$$dQ = \eta \, dP\left[\frac{Q}{P}\right] \tag{E.5}$$

Third, the change in market quantity must equal the sum of the changes in quantity of individual suppliers:

$$dQ = \sum_{i=1}^{N} dq_i \tag{E.6}$$

Eqs. (E.4), (E.5), and (E.6) provide us with N + 2 linear equations in N + 2 unknowns (dq_i, dQ, and dP) for each oligopolistic market within a region, where N is the number of

facilities offering that individual CWT service in that region. A monopolistic market will have two linear equations and two unknowns. (Since market supply and facility supply are identical, there is no need to model both.) Each regional model is thus represented by a system of equations: N + 2 equations for each oligopolistic market, and two equations for each monopolistic market. These systems of equations can be solved using linear algebra:

$$B = A^{-1}C'$$

where B is the vector containing (dP, dq_i, and dQ), A^{-1} is the inverse of A, an N + 2 x N + 2 matrix, and B is the vector containing (c_i, 0, 0,).

For example, assume that our model market consists of three regional facilities (i.e., N = 3) competing in two markets (one market is a monopoly and the other is an oligopoly with two competitors). Therefore, we have six linear equations in six unknowns that can be expressed in matrix notation as

$$\underset{A}{\begin{bmatrix} \left(1+\frac{S_1}{\eta}\right) & 0 & \frac{P_1}{\eta}\left(\frac{Q_1}{Q_1^2}\right) & 0 & -\frac{P_1}{\eta}\left(\frac{q_1}{Q_1^2}\right) & 0 \\ \left(1+\frac{S_2}{\eta}\right) & 0 & 0 & \frac{P_1}{\eta}\left(\frac{Q_1}{Q_1^2}\right) & -\frac{P_1}{\eta}\left(\frac{q_2}{Q_1^2}\right) & 0 \\ 0 & \left(1+\frac{S_3}{\eta}\right) & 0 & 0 & 0 & 0 \\ \eta\left(\frac{Q_1}{P_1}\right) & 0 & 0 & 0 & -1 & 0 \\ 0 & \eta\left(\frac{Q_2}{P_2}\right) & 0 & 0 & 0 & -1 \\ 0 & 0 & -1 & -1 & 1 & 0 \end{bmatrix}} \underset{B}{\begin{bmatrix} dP \\ dP_2 \\ dq_1 \\ dq_2 \\ dQ_1 \\ dQ_2 \end{bmatrix}} = \underset{C}{\begin{bmatrix} c_1 \\ c_2 \\ c_3 \\ 0 \\ 0 \\ 0 \end{bmatrix}}$$

Rows 1 and 2 of the A matrix above represent the marginal conditions (Eq. E.4) for the two facilities competing in the oligopoly market. Row 3 of the A matrix represents the marginal condition for the single supplier in the monopolistic market (Eq. E.4a). The fourth row of the A matrix is the market demand condition (Eq. E.5) for the oligopoly market, and Row 5 is the market demand condition for the monopolist. The final row of the A matrix represents the supply condition (Eq. E.6) for the oligopoly facilities. There is no supply condition (Eq. E.6) in the matrix algebra calculations for a monopolist because the change in market quantity will always equal the change in quantity of the individual supplier because there is only one supplier.

The C vector contains the average variable compliance costs associated with each facility and service. When the inverse of the A matrix is multiplied by the C vector, the model solves for the unknown price and quantity changes shown in the B vector.

The model must consider the given capacity constraints of each supplier. If faced with little or no variable control costs, a supplier may wish to increase its current level of output. However, its increase must be limited to the difference between plant capacity and current production, that is, $q_{max} - q^*$. A decrease in production also must be restricted to the negative of the facilities' baseline production quantity. Operationally, this step involves running the model and determining for each supplier whether its optimal decision (dMR = dMC) is feasible given its capacity constraint (q_{max}). For each supplier where $q^* > q_{max}$, the model adjusts the A matrix presented above to account for the constraint placed on each supplier due to limited capital capacity. For each supplier where $q^* < 0$, the model adjusts the A matrix above to set the new production quantity to 0, representing a process closure.

After solving for the unknowns (i.e., dq_i, dQ, and dP), the post-compliance output level for each supplier (q_i^*) and product price (P_i^*) are inserted into the profit function of each individual supplier to determine the supplier's post-regulation profits:

$$P(Q)\, q_i - C(q_i) - C^V(q_i) - F - F^A \qquad \text{(E.8)}$$

where $C^V(q_i)$ is the total variable compliance costs, F^A is the total fixed compliance cost, and the other variables are defined as above.

E.4 MODEL OUTPUT

For each market for a specific type of CWT service in a region, the model projects market-level adjustments in price and quantity. For each facility in a CWT service market, the model projects adjustments in quantity of waste treated, revenues, costs, and profits.

Employment changes are also calculated at the facility level. The model is capable of determining facility closures, eliminating those closed facilities, and providing a new equilibrium based on market interaction of the remaining facilities; however, for reasons described in Chapter 5 of this report, the Agency does not estimate facility closures in this analysis.

These model outputs are used as inputs into various other modules of the economic impact analysis. The facility-level changes in revenues and profits are aggregated to the company level and are used to estimate changes in profitability and the likelihood of bankruptcy for companies owning CWT facilities. Facility-specific changes in employment are aggregated to the community level and are used to estimate impacts on the communities in which CWT facilities are located.

APPENDIX F

Detailed Market Model Results

The market impacts model described in Appendix E was used to evaluate not only the proposed regulatory options, but also other possible control options for each subcategory. Three control options were evaluated for metals, four for oils, and two for organics. This appendix presents the results of the market and facility impacts estimation for each of those control options and for the combined EPA regulatory options. The model results presented include changes in market prices and quantities and changes in facility profitability.

F.1 MARKET IMPACTS

Table F-1 shows the changes in market prices and quantities that are projected to occur with each control option and the two combined regulatory options, in each regional market for each specialized type of CWT service. Table F-2 shows the with-regulation equilibrium price and quantity in each regional market for each specialized CWT service. Results are shown for the two combined regulatory options, EPA 1 and EPA 2, in the first two columns. Then, results are shown for the individual control options for the Metals Subcategory, Oils Subcategory, and Organics Subcategory.

F.1.1 Metals Subcategory

The Metals Subcategory costs increase the costs of performing metals recovery and metals treatment. Therefore, the impacts are felt on only those markets. The metals costs increase sharply from Option 1 to Option 2 and increase slightly from Option 2 to Option 3. The magnitude of the market impacts reflects this pattern.

The Northeast region is home to a large number of metals treatment and recovery facilities. Because of the historical importance of metals fabrication and metals finishing in that region, a large number of facilities generate metal-bearing waste; therefore the region includes a large number of treaters of metal-bearing waste. The Northeast region includes two metals recovery markets and two metals treatment markets. The price for low cost metals recovery is not affected by the controls, but the price of high cost metals recovery increases by 1.7 percent under Option 1 and more than 5 percent under Options 2 and 3. The quantity of metals recovery performed falls by 2.6 percent under Option 1, by 7.7 percent under Option 2, and by 8 percent under Option 3. The price of low cost metals treatment increases by 3 percent under Option 1 and by 15 percent under Options 2 and 3. The quantity of low cost metals treatment performed falls by 2.7 percent under Option 1 and by 16 percent under Options 2 and 3.

TABLE F-1. MARKET LEVEL IMPACTS: CHANGES IN PRICES AND QUANTITIES OF CWT SERVICES

	EPA 1	EPA 2	Metals 1	Metals 2	Metals 3	Oils 2	Oils 3	Oils 4	Organics 1	Organics 2
Northeast										
Price Changes										
Metals Recovery (high cost)	$5.09	$5.09	$1.61	$4.84	$5.09	$0.00	$0.00	$0.00	$0.00	$0.00
Metals Recovery (low cost)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Oils Recovery (high cost)	$0.10	$0.37	$0.00	$0.00	$0.00	$0.10	$0.37	$0.37	$0.00	$0.00
Oils Recovery (low cost)	$0.02	$0.08	$0.00	$0.00	$0.00	$0.02	$0.08	$0.08	$0.00	$0.00
Metals Treatment (high cost)	$1.17	$1.17	$0.26	$1.17	$1.17	$0.00	$0.00	$0.00	$0.00	$0.00
Metals Treatment (low cost)	$0.05	$0.05	$0.01	$0.05	$0.05	$0.00	$0.00	$0.00	$0.00	$0.00
Oils Treatment	$0.01	$0.05	$0.00	$0.00	$0.00	$0.01	$0.05	$0.06	$0.00	$0.00
Organics Treatment	$0.02	$0.02	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.02	$0.05
Quantity Changes										
Metals Recovery (high cost)	(1,130)	(1,130)	(357)	(1,074)	(1,130)	0	0	0	0	0
Metals Recovery (low cost)	0	0	0	0	0	0	0	0	0	0
Oils Recovery (high cost)	(1,493,683)	(5,357,039)	0	0	0	(1,493,683)	(5,357,039)	(5,467,460)	0	0
Oils Recovery (low cost)	(1,936,643)	(7,122,938)	0	0	0	(1,936,643)	(7,122,938)	(7,122,938)	0	0
Metals Treatment (high cost)	(1,293,201)	(1,293,201)	(289,315)	(1,293,201)	(1,293,201)	0	0	0	0	0
Metals Treatment (low cost)	(35,862,554)	(35,862,554)	(6,182,203)	(35,384,077)	(35,862,554)	0	0	0	0	0
Oils Treatment	(443,188)	(3,470,685)	0	0	0	(443,188)	(3,470,685)	(4,186,765)	0	0
Organics Treatment	(2,857,468)	(2,857,468)	0	0	0	0	0	0	(2,857,468)	(7,211,174)
Southeast										
Price Changes										
Metals Recovery	$0.12	$0.12	$0.00	$0.12	$0.12	$0.00	$0.00	$0.00	$0.00	$0.00
Oils Recovery (high cost)	$0.00	$0.01	$0.00	$0.00	$0.00	$0.00	$0.01	$0.02	$0.00	$0.00
Oils Recovery (low cost)	$0.03	$0.03	$0.00	$0.00	$0.00	$0.03	$0.03	$0.03	$0.00	$0.00
Metals Treatment	$0.03	$0.03	$0.00	$0.03	$0.03	$0.00	$0.00	$0.00	$0.00	$0.00
Oils Treatment	$0.01	$0.04	$0.00	$0.00	$0.00	$0.01	$0.04	$0.04	$0.00	$0.00
Organics Treatment	$0.14	$0.14	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.14	$0.14

(continued)

TABLE F-1. MARKET LEVEL IMPACTS: CHANGES IN PRICES AND QUANTITIES OF CWT SERVICES (CONTINUED)

	EPA 1	EPA 2	Metals 1	Metals 2	Metals 3	Oils 2	Oils 3	Oils 4	Organics 1	Organics 2
Southeast (continued)										
Quantity Changes										
Metals Recovery	(69,199)	(69,199)	(2,290)	(69,199)	(69,199)	0	0	0	0	0
Oils Recovery (high cost)	(87,759)	(684,803)	0	0	0	(87,759)	(684,803)	(826,434)	0	0
Oils Recovery (low cost)	(330,000)	(330,000)	0	0	0	(330,000)	(330,000)	(330,000)	0	0
Metals Treatment	(10,455,515)	(10,455,515)	(386,419)	(10,401,881)	(10,455,515)	0	0	0	0	0
Oils Treatment	(390,037)	(2,049,876)	0	0	0	(390,037)	(2,049,876)	(2,071,302)	0	0
Organics Treatment	(9,858,851)	(9,858,851)	0	0	0	0	0	0	(9,858,851)	(9,858,851)
Upper Midwest										
Price Changes										
Metals Recovery	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Oils Recovery (low cost)	$0.02	$0.11	$0.00	$0.00	$0.00	$0.02	$0.11	$0.11	$0.00	$0.00
Oils Recovery (medium cost)	$0.01	$0.12	$0.00	$0.00	$0.00	$0.01	$0.12	$0.13	$0.00	$0.00
Oils Recovery (high cost)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Metals Treatment (high cost)	$0.36	$0.36	$0.02	$0.36	$0.36	$0.00	$0.00	$0.00	$0.00	$0.00
Metals Treatment (medium cost)	$0.70	$0.70	$0.70	$0.70	$0.70	$0.00	$0.00	$0.00	$0.00	$0.00
Metals Treatment (low cost)	$0.05	$0.05	$0.00	$0.03	$0.05	$0.00	$0.00	$0.00	$0.00	$0.00
Oils Treatment	$0.14	$0.14	$0.00	$0.00	$0.00	$0.14	$0.14	$0.14	$0.00	$0.00
Organics Treatment	$0.16	$0.16	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.16	$0.16
Quantity Changes										
Metals Recovery	(12)	(12)	(5)	(12)	(12)	0	0	0	0	0
Oils Recovery (low cost)	(6,753,401)	(47,213,405)	0	0	0	(6,753,401)	(47,213,405)	(47,213,405)	0	0
Oils Recovery (medium cost)	(742,623)	(14,838,119)	0	0	0	(742,623)	(14,838,119)	(15,441,040)	0	0
Oils Recovery (high cost)	(112)	(649)	0	0	0	(112)	(649)	(820)	0	0
Metals Treatment (high cost)	(350,526)	(350,526)	(15,432)	(350,526)	(350,526)	0	0	0	0	0
Metals Treatment (medium cost)	(2,490,512)	(2,490,512)	(2,490,512)	(2,490,512)	(2,490,512)	0	0	0	0	0
Metals Treatment (low cost)	(27,590,374)	(27,590,374)	(2,035,832)	(20,415,548)	(27,590,374)	0	0	0	0	0
Oils Treatment	(6,692,307)	(6,892,815)	0	0	0	(6,692,307)	(6,892,815)	(6,908,902)	0	0
Organics Treatment	(490,988)	(490,988)	0	0	0	0	0	0	(490,988)	(490,988)

(continued)

TABLE F-1. MARKET LEVEL IMPACTS: CHANGES IN PRICES AND QUANTITIES OF CWT SERVICES (CONTINUED)

	EPA 1	EPA 2	Metals 1	Metals 2	Metals 3	Oils 2	Oils 3	Oils 4	Organics 1	Organics 2
Lower Midwest										
Price Changes										
Metals Recovery	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Oils Recovery	$0.02	$0.05	$0.00	$0.00	$0.00	$0.02	$0.05	$0.05	$0.00	$0.00
Metals Treatment (high cost)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Metals Treatment (low cost)	$0.01	$0.01	$0.00	$0.01	$0.01	$0.00	$0.00	$0.00	$0.00	$0.00
Oils Treatment	$0.03	$0.10	$0.00	$0.00	$0.00	$0.03	$0.10	$0.10	$0.00	$0.00
Organics Treatment (high cost)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Organics Treatment (low cost)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Quantity Changes										
Metals Recovery	(3,033)	(3,033)	(3,033)	(3,033)	(3,033)	0	0	0	0	0
Oils Recovery	(3,126,069)	(8,074,415)	0	0	0	(3,126,069)	(8,074,415)	(8,074,415)	0	0
Metals Treatment (high cost)	0	0	0	0	0	0	0	0	0	0
Metals Treatment (low cost)	(11,300,145)	(11,300,145)	(5,640,912)	(11,300,145)	(11,300,145)	0	0	0	0	0
Oils Treatment	(655,457)	(2,274,739)	0	0	0	(655,457)	(2,274,739)	(2,274,739)	0	0
Organics Treatment (high cost)	0	0	0	0	0	0	0	0	0	0
Organics Treatment (low cost)	(137,539)	(137,539)	0	0	0	0	0	0	(137,539)	(137,539)
Northwest										
Price Changes										
Oils Recovery (high cost)	$0.17	$1.79	$0.00	$0.00	$0.00	$0.17	$1.79	$2.11	$0.00	$0.00
Oils Recovery (low cost)	$0.02	$0.15	$0.00	$0.00	$0.00	$0.02	$0.15	$0.17	$0.00	$0.00
Metals Treatment	$0.07	$0.07	$0.00	$0.06	$0.07	$0.00	$0.00	$0.00	$0.00	$0.00
Oils Treatment	$0.16	$0.16	$0.00	$0.00	$0.00	$0.16	$0.16	$0.16	$0.00	$0.00
Organics Treatment	$0.16	$0.16	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.16	$0.16
Quantity Changes										
Oils Recovery (high cost)	(9,538)	(98,333)	0	0	0	(9,538)	(98,333)	(115,855)	0	0
Oils Recovery (low cost)	(1,024,201)	(8,072,225)	0	0	0	(1,024,201)	(8,072,225)	(9,235,111)	0	0
Metals Treatment	(1,259,791)	(1,259,791)	(79,655)	(1,242,138)	(1,259,791)	0	0	0	0	0
Oils Treatment	(190,982)	(190,982)	0	0	0	(190,982)	(190,982)	(190,982)	0	0
Organics Treatment	(627,923)	(627,923)	0	0	0	0	0	0	(627,923)	(627,923)

(continued)

TABLE F-1. MARKET LEVEL IMPACTS: CHANGES IN PRICES AND QUANTITIES OF CWT SERVICES (CONTINUED)

	EPA 1	EPA 2	Metals 1	Metals 2	Metals 3	Oils 2	Oils 3	Oils 4	Organics 1	Organics 2
Southwest										
Price Changes										
Metals Recovery (high cost)	$0.07	$0.07	$0.00	$0.07	$0.07	$0.00	$0.00	$0.00	$0.00	$0.00
Metals Recovery (low cost)	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Oils Recovery	$0.01	$0.06	$0.00	$0.00	$0.00	$0.01	$0.06	$0.07	$0.00	$0.00
Metals Treatment (high cost)	$0.24	$0.24	$0.04	$0.23	$0.24	$0.00	$0.00	$0.00	$0.00	$0.00
Metals Treatment (low cost)	$0.06	$0.06	$0.01	$0.06	$0.06	$0.00	$0.00	$0.00	$0.00	$0.00
Oils Treatment	$0.03	$0.19	$0.00	$0.00	$0.00	$0.03	$0.19	$0.22	$0.00	$0.00
Organics Treatment	$0.08	$0.08	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.08	$0.08
Quantity Changes										
Metals Recovery (high cost)	(2,128,538)	(2,128,538)	(62,754)	(2,031,004)	(2,128,538)	0	0	0	0	0
Metals Recovery (low cost)	0	0	0	0	0	0	0	0	0	0
Oils Recovery	(164,306)	(1,339,196)	0	0	0	(164,306)	(1,339,196)	(1,608,400)	0	0
Metals Treatment (high cost)	(535,133)	(535,133)	(82,099)	(516,643)	(535,133)	0	0	0	0	0
Metals Treatment (low cost)	(35,032,962)	(35,032,962)	(4,072,395)	(35,032,962)	(35,032,962)	0	0	0	0	0
Oils Treatment	(1,073,162)	(7,234,521)	0	0	0	(1,073,162)	(7,234,521)	(8,599,073)	0	0
Organics Treatment	(57,432)	(57,432)	0	0	0	0	0	0	(57,432)	(57,432)

TABLE F-2. MARKET LEVEL IMPACTS: NEW PRICES AND QUANTITIES

	EPA 1	EPA 2	Metals 1	Metals 2	Metals 3	Oils 2	Oils 3	Oils 4	Organics 1	Organics 2
Northeast										
Price Changes										
Metals Recovery (high cost)	98.31	98.31	94.83	98.06	98.31	93.22	93.22	93.22	93.22	93.22
Metals Recovery (low cost)	3.14	3.14	3.14	3.14	3.14	3.14	3.14	3.14	3.14	3.14
Oils Recovery (high cost)	0.77	1.04	0.67	0.67	0.67	0.77	1.04	1.05	0.67	0.67
Oils Recovery (low cost)	0.19	0.25	0.17	0.17	0.17	0.19	0.25	0.25	0.17	0.17
Metals Treatment (high cost)	2.51	2.51	1.61	2.51	2.51	1.35	1.35	1.35	1.35	1.35
Metals Treatment (low cost)	0.36	0.36	0.32	0.36	0.36	0.31	0.31	0.31	0.31	0.31
Oils Treatment	0.29	0.34	0.28	0.28	0.28	0.29	0.34	0.35	0.28	0.28
Organics Treatment	0.40	0.40	0.38	0.38	0.38	0.38	0.38	0.38	0.40	0.43
Quantity Changes										
Metals Recovery (high cost)	12,665	12,665	13,437	12,721	12,665	13,794	13,794	13,794	13,794	13,794
Metals Recovery (low cost)	61,697,757	61,697,757	61,697,757	61,697,757	61,697,757	61,697,757	61,697,757	61,697,757	61,697,757	61,697,757
Oils Recovery (high cost)	8,277,405	4,414,049	9,771,088	9,771,088	9,771,088	8,277,405	4,414,049	4,303,628	9,771,088	9,771,088
Oils Recovery (low cost)	12,678,705	7,492,410	14,615,348	14,615,348	14,615,348	12,678,705	7,492,410	7,492,410	14,615,348	14,615,348
Metals Treatment (high cost)	184,136	184,136	1,188,022	184,136	184,136	1,477,337	1,477,337	1,477,337	1,477,337	1,477,337
Metals Treatment (low cost)	190,710,419	190,710,419	220,390,770	191,188,896	190,710,419	226,572,973	226,572,973	226,572,973	226,572,973	226,572,973
Oils Treatment	17,810,998	14,783,501	18,254,186	18,254,186	18,254,186	17,810,998	14,783,501	14,067,421	18,254,186	18,254,186
Organics Treatment	50,767,718	50,767,718	53,625,185	53,625,185	53,625,185	53,625,185	53,625,185	53,625,185	50,767,718	46,414,011
Southeast										
Price Changes										
Metals Recovery	6.45	6.45	6.33	6.45	6.45	6.33	6.33	6.33	6.33	6.33
Oils Recovery (high cost)	0.15	0.16	0.15	0.15	0.15	0.15	0.16	0.16	0.15	0.15
Oils Recovery (low cost)	0.08	0.08	0.05	0.05	0.05	0.08	0.08	0.08	0.05	0.05
Metals Treatment	0.27	0.27	0.24	0.27	0.27	0.24	0.24	0.24	0.24	0.24
Oils Treatment	0.25	0.28	0.24	0.24	0.24	0.25	0.28	0.28	0.24	0.24
Organics Treatment	0.36	0.36	0.22	0.22	0.22	0.22	0.22	0.22	0.36	0.36

(continued)

TABLE F-2. MARKET LEVEL IMPACTS: NEW PRICES AND QUANTITIES (CONTINUED)

	EPA 1	EPA 2	Metals 1	Metals 2	Metals 3	Oils 2	Oils 3	Oils 4	Organics 1	Organics 2
Southeast (continued)										
Quantity Changes										
Metals Recovery	2,372,450	2,372,450	2,439,358	2,372,450	2,372,450	2,441,648	2,441,648	2,441,648	2,441,648	2,441,648
Oils Recovery (high cost)	6,969,744	6,372,700	7,057,503	7,057,503	7,057,503	6,969,744	6,372,700	6,231,069	7,057,503	7,057,503
Oils Recovery (low cost)	0	0	330,000	330,000	330,000	0	0	0	330,000	330,000
Metals Treatment	0	0	10,069,096	53,634	0	10,455,515	10,455,515	10,455,515	10,455,515	10,455,515
Oils Treatment	4,439,552	2,779,713	4,829,589	4,829,589	4,829,589	4,439,552	2,779,713	2,758,287	4,829,589	4,829,589
Organics Treatment	0	0	9,858,851	9,858,851	9,858,851	9,858,851	9,858,851	9,858,851	0	0
Upper Midwest										
Price Changes										
Metals Recovery	14.00	14.00	14.00	14.00	14.00	13.99	13.99	13.99	13.99	13.99
Oils Recovery (low cost)	0.13	0.22	0.11	0.11	0.11	0.13	0.22	0.22	0.11	0.11
Oils Recovery (medium cost)	0.30	0.41	0.29	0.29	0.29	0.30	0.41	0.42	0.29	0.29
Oils Recovery (high cost)	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Metals Treatment (high cost)	4.62	4.62	4.28	4.62	4.62	4.26	4.26	4.26	4.26	4.26
Metals Treatment (medium cost)	1.41	1.41	1.41	1.41	1.41	0.71	0.71	0.71	0.71	0.71
Metals Treatment (low cost)	0.27	0.27	0.22	0.25	0.27	0.22	0.22	0.22	0.22	0.22
Oils Treatment	0.29	0.30	0.16	0.16	0.16	0.29	0.30	0.30	0.16	0.16
Organics Treatment	0.38	0.38	0.22	0.22	0.22	0.22	0.22	0.22	0.38	0.38
Quantity Changes										
Metals Recovery	10,525	10,525	10,532	10,525	10,525	10,537	10,537	10,537	10,537	10,537
Oils Recovery (low cost)	40,460,004	0	47,213,405	47,213,405	47,213,405	40,460,004	0	0	47,213,405	47,213,405
Oils Recovery (medium cost)	34,263,615	20,168,119	35,006,238	35,006,238	35,006,238	34,263,615	20,168,119	19,565,198	35,006,238	35,006,238
Oils Recovery (high cost)	674,128	673,591	674,240	674,240	674,240	674,128	673,591	673,420	674,240	674,240
Metals Treatment (high cost)	2,398,137	2,398,137	2,733,231	2,398,137	2,398,137	2,748,663	2,748,663	2,748,663	2,748,663	2,748,663
Metals Treatment (medium cost)	18,983	18,983	18,983	18,983	18,983	2,509,495	2,509,495	2,509,495	2,509,495	2,509,495
Metals Treatment (low cost)	103,994,706	103,994,706	129,549,248	111,169,532	103,994,706	131,585,081	131,585,081	131,585,081	131,585,081	131,585,081
Oils Treatment	945,990	745,482	7,638,297	7,638,297	7,638,297	945,990	745,482	729,395	7,638,297	7,638,297
Organics Treatment	182,570	182,570	673,558	673,558	673,558	673,558	673,558	673,558	182,570	182,570

(continued)

TABLE F-2. MARKET LEVEL IMPACTS: NEW PRICES AND QUANTITIES (CONTINUED)

	EPA 1	EPA 2	Metals 1	Metals 2	Metals 3	Oils 2	Oils 3	Oils 4	Organics 1	Organics 2
Lower Midwest										
Price Changes										
Metals Recovery	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Oils Recovery	0.09	0.12	0.07	0.07	0.07	0.09	0.12	0.12	0.07	0.07
Metals Treatment (high cost)	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13
Metals Treatment (low cost)	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
Oils Treatment	0.18	0.25	0.15	0.15	0.15	0.18	0.25	0.25	0.15	0.15
Organics Treatment (high cost)	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94	1.94
Organics Treatment (low cost)	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17
Quantity Changes										
Metals Recovery	769,707	769,707	769,707	769,707	769,707	772,740	772,740	772,740	772,740	772,740
Oils Recovery	4,948,346	0	8,074,415	8,074,415	8,074,415	4,948,346	0	0	8,074,415	8,074,415
Metals Treatment (high cost)	1,605,013	1,605,013	1,605,013	1,605,013	1,605,013	1,605,013	1,605,013	1,605,013	1,605,013	1,605,013
Metals Treatment (low cost)	106,948,347	106,948,347	112,607,580	106,948,347	106,948,347	118,248,492	118,248,492	118,248,492	118,248,492	118,248,492
Oils Treatment	1,619,282	0	2,274,739	2,274,739	2,274,739	1,619,282	0	0	2,274,739	2,274,739
Organics Treatment (high cost)	123,016	123,016	123,016	123,016	123,016	123,016	123,016	123,016	123,016	123,016
Organics Treatment (low cost)	12,986,047	12,986,047	13,123,586	13,123,586	13,123,586	13,123,586	13,123,586	13,123,586	12,986,047	12,986,047
Northwest										
Price Changes										
Oils Recovery (high cost)	18.35	19.96	18.17	18.17	18.17	18.35	19.96	20.28	18.17	18.17
Oils Recovery (low cost)	0.27	0.40	0.25	0.25	0.25	0.27	0.40	0.42	0.25	0.25
Metals Treatment	0.98	0.98	0.92	0.98	0.98	0.92	0.92	0.92	0.92	0.92
Oils Treatment	0.32	0.32	0.16	0.16	0.16	0.32	0.32	0.32	0.16	0.16
Organics Treatment	0.32	0.32	0.16	0.16	0.16	0.16	0.16	0.16	0.32	0.32
Quantity Changes										
Oils Recovery (high cost)	490,462	401,667	500,000	500,000	500,000	490,462	401,667	384,145	500,000	500,000
Oils Recovery (low cost)	12,427,145	5,379,121	13,451,346	13,451,346	13,451,346	12,427,145	5,379,121	4,216,235	13,451,346	13,451,346
Metals Treatment	16,183,360	16,183,360	17,363,495	16,201,012	16,183,360	17,443,150	17,443,150	17,443,150	17,443,150	17,443,150
Oils Treatment	0	0	190,982	190,982	190,982	0	0	0	190,982	190,982
Organics Treatment	0	0	627,923	627,923	627,923	627,923	627,923	627,923	0	0

(continued)

TABLE F-2. MARKET LEVEL IMPACTS: NEW PRICES AND QUANTITIES (CONTINUED)

	EPA 1	EPA 2	Metals 1	Metals 2	Metals 3	Oils 2	Oils 3	Oils 4	Organics 1	Organics 2
Southwest										
Price Changes										
Metals Recovery (high cost)	0.33	0.33	0.26	0.33	0.33	0.26	0.26	0.26	0.26	0.26
Metals Recovery (low cost)	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
Oils Recovery	0.26	0.31	0.26	0.26	0.26	0.26	0.31	0.32	0.26	0.26
Metals Treatment (high cost)	0.49	0.49	0.29	0.48	0.49	0.26	0.26	0.26	0.26	0.26
Metals Treatment (low cost)	0.32	0.32	0.26	0.32	0.32	0.26	0.26	0.26	0.26	0.26
Oils Treatment	0.28	0.44	0.26	0.26	0.26	0.28	0.44	0.48	0.26	0.26
Organics Treatment	0.34	0.34	0.26	0.26	0.26	0.26	0.26	0.26	0.34	0.34
Quantity Changes										
Metals Recovery (high cost)	5,150,333	5,150,333	7,216,117	5,247,866	5,150,333	7,278,871	7,278,871	7,278,871	7,278,871	7,278,871
Metals Recovery (low cost)	605,030	605,030	605,030	605,030	605,030	605,030	605,030	605,030	605,030	605,030
Oils Recovery	5,540,538	4,365,648	5,704,844	5,704,844	5,704,844	5,540,538	4,365,648	4,096,444	5,704,844	5,704,844
Metals Treatment (high cost)	2,351,676	2,351,676	2,804,710	2,370,166	2,351,676	2,886,809	2,886,809	2,886,809	2,886,809	2,886,809
Metals Treatment (low cost)	7,993,300	7,993,300	38,953,867	7,993,300	7,993,300	43,026,262	43,026,262	43,026,262	43,026,262	43,026,262
Oils Treatment	21,393,984	15,232,625	22,467,146	22,467,146	22,467,146	21,393,984	15,232,625	13,868,073	22,467,146	22,467,146
Organics Treatment	779,813	779,813	837,245	837,245	837,245	837,245	837,245	837,245	779,813	779,813

The Southeast region has one metals recovery market and one metals treatment market. The price of metals recovery in the Southeast increases by 0.06 percent under Option 1 and by 1.9 percent under Options 2 and 3. The price of metals treatment increases by 0.48 percent under Option 1 and by about 13 percent under Options 2 and 3. The quantity of metals recovery in the Southeast falls by 0.09 percent under Option 1 and by 13 percent under Options 2 and 3.

In the Upper Midwest, the metals recovery markets are essentially unaffected by the controls under all three metals options. The markets for high cost metals treatment and low cost metals treatment experience very small changes under Metals Option 1 and moderate changes under Metals Options 2 and 3. The market for medium cost metals treatment experiences a dramatic reduction in quantity and increase in price under all three metals options, because one large producer nearly stops offering medium cost metals treatment, while another small producer that does not incur compliance cost expands its quantity of metals treatment services performed.

In the Lower Midwest, the market for metals recovery shows a 0.2 percent increase in price and a 0.39 percent decrease in quantity under all three control options. The market for high cost metals treatment is unaffected by the metals control options, because neither facility in that market incurs compliance costs. The market for low cost metals treatment, on the other hand, experiences a 4.5 percent increase in price and a 4.8 percent decrease in quantity under Metals Option 1, and a 9 percent increase in price and a 9.6 percent decrease in quantity under Metals Options 2 and 3. In that market, two facilities significantly decrease the production of metals treatment services, while three others increase the quantity of metals treatment services performed.

The Northwest has no market for metals recovery. The market for metals treatment experiences a small increase in price and decrease in quantity under Metals Option 1 and a moderate roughly 7 percent increase in price and decrease in quantity under Metals Options 2 and 3.

The Southwest includes two metals recovery markets and two metals treatment markets. Low cost metals recovery is unaffected by the controls under any metals option. High cost metals recovery experiences a small price increase and quantity decrease under Metals Option 1 but a fairly large (27 to 29 percent) increase in price and decrease in quantity under Metals Options 2 and 3. High cost metals treatment experiences small price and quantity changes under Metals Option 1 and moderate changes under Options 2 and 3.

The market for low cost metals treatment, on the other hand, experiences 9 to 10 percent changes in price and quantity under Option 1 and a 77 percent increase in price and 81 percent

decrease in quantity under Metals Options 2 and 3. Under Option 1, two of the four facilities in the market increase production while the other two decrease production. Under Options 2 and 3, however, all four facilities experience significant decreases in the quantity of metals treatment services performed.

F.1.2 Oils Subcategory

EPA evaluated four oils control options. The first, Oils Option 1, represents the baseline level of treatment and has no costs of compliance associated with it. Oils Option 2 and Oils Option 3 are the two control options proposed by the Agency as part of EPA 1 and EPA 2, respectively. Oils 4 has higher costs than Oils 3, but according to the data collected by the Agency, this method provides no improvement in pollutant removals; it is therefore not cost-effective.

The Northeast region has two oils recovery markets and one oils treatment market. The oils recovery markets experience moderate (13 and 15 percent) changes in price and quantity under Oils Option 2 but much larger (55 and 49 percent) changes in price and quantity under Options 3 and 4. Oils treatment experiences a very small change in price and quantity under Option 2 and moderate changes in price and quantity under Options 3 and 4.

The Southeast region also has two oils recovery markets and one oils treatment market. In the market for high cost oils recovery, costs of complying with Oils Option 2 cause a small change in price and quantity, and costs of Options 3 and 4 result in moderate changes (9 and 11 percent). In the market for low cost oils treatment, on the other hand, the only facility in that market is projected to stop performing this service in response to all three options. Thus, in spite of a significant increase in price, quantity falls by 100 percent.

The Upper Midwest has three oils recovery markets and one oils treatment market. High cost oils recovery experiences only very small changes in price and quantity under all three control options. Medium cost oils recovery experiences small changes in price and quantity under Option 2 and fairly large changes (43 to 44 percent) under Options 3 and 4. The market for low cost oils recovery incurs the highest impacts. Under Option 2, prices and quantities change by about 14 percent. Under Options 3 and 4, however, in spite of significant price increases, all the facilities offering the service are projected to close their oils recovery processes. Another way of looking at this occurrence is that the price rises sufficiently that, given the elasticity of demand for the service, demand falls to zero. The market for oils treatment experiences significant increases in price and decreases in quantity under all three oils control options.

The Lower Midwest has one oils recovery market and one oils treatment market. Both markets experience moderate changes in price and quantity under Oils Option 2. Under Oils Options 3 and 4, however, the single facility offering services in the oils recovery market is projected to close that process. The same facility, which is also the sole provider of oils treatment services, is projected to greatly reduce its quantity of treatment services performed.

The Northwest has two oils recovery markets and one oils treatment market. In the high cost oils recovery market, small changes in price and quantity occur in responses to Oils Option 2, and moderate changes (10 to 11 percent changes in price and 20 to 23 percent changes in quantity) occur in response to Options 3 and 4. The impacts on the market for low cost oils recovery are higher, in percentage terms. Under Option 2, price and quantity change by slightly more than 7.5 percent. Under Options 3 and 4, prices and quantities change by 60 and 68 percent, respectively. Under all three control options, the two facilities offering oils treatment are predicted to close down those processes.

The Southwest region has one oils recovery market and one oils treatment market. Both markets experience small changes in price and quantity (1.5 to 4.8 percent) under Oils Option 2 and moderate changes (23 to 38 percent) in quantity under Options 3 and 4.

F.1.3 Organics Subcategory

EPA evaluated two control options for control of organics. Of these, Organics 1 is the Agency's preferred option. In the Northeast region, Option 1 results in a 5.3 percent increase in price and decrease in quantity, while Option 2 causes a 13.5 percent increase in price and decrease in quantity in the market for organics treatment services. In the Southeast, both options result in a 64 to 65 percent increase in price and decrease in quantity. In the Upper Midwest, prices and quantities in the organics treatment market change by approximately 72 percent. In the Lower Midwest, prices and quantities in the market for high cost organics treatment are unchanged, and prices and quantities in the market for low cost organics treatment change by only 1 percent. In the Northwest, the two facilities offering organics treatment are predicted to close those processes under both organics options. In the Southwest, the market for organics treatment experiences a 5 percent increase in price and a 7 percent decrease in quantity under both organics control options.

F.1.4 Regulatory Options

The market impacts of the combined regulatory options reflect the market impacts of the individual control options for each subcategory that are combined to form the regulatory options.

Thus, the price and quantity changes associated with EPA's Regulatory Option 1 are the same as the price and quantity changes for Metals Option 3, Oils Option 2, and Organics Option 1. Similarly, the price and quantity changes associated with EPA's Regulatory Option 2 reflect the changes in prices and quantities associated with Metals Option 3, Oils Option 3, and Organics Option 1.

To assess the overall impacts of the regulatory options on the markets for prices and quantities, the Agency computed the median change in price and quantity for each general type of waste treatment (metals recovery, oils recovery, metals treatment, oils treatment, and organics treatment). These overall measures of market impact, shown in Table 7-1, indicate moderate changes in market prices and quantities in most markets. Under Regulatory Option 2, however, the median changes in price and quantity for oils recovery are significant: a 42 percent change in price and a 65 percent change in quantity. It should be noted that this represents the change in only one market for oil recovery; other markets experience price and quantity impacts that are smaller or larger than these median values.

F.2 IMPACTS ON FACILITY PROFITS

As described in Appendix E, each commercial CWT facility experiences changes in its costs and revenues as a result of the compliance costs and market adjustments associated with the control options and combined regulatory options. This section discusses the projected changes in profits at commercial CWT facilities.

The market adjustments discussed above have a profound effect on the profits of commercial CWT facilities. In nearly all CWT markets, prices are projected to increase in response to the combined regulatory options. Thus, some facilities may find that their revenues increase as a result of the regulation. Overall, market quantities decrease in response to the regulatory options. For most facilities incurring compliance costs under a regulatory option, the equilibrium quantity of waste treated in each process declines due to the increased cost of treatment. Thus, while the unit cost of treatment increases, total costs may decline because of decreases in the quantity of waste treated. Similarly, even though the market price has increased for each CWT service market, facilities experiencing significant declines in the quantity of waste treated will earn lower total revenues. Tables F-3 and F-4 explore changes in the total revenues and costs earned by commercial CWT facilities under each individual control option and under the combined regulatory options.

TABLE F-3. WITH-REGULATION CHANGES IN REVENUE

	EPA 1	EPA 2	Metals 1	Metals 2	Metals 3	Oils 2	Oils 3	Oils 4	Organics 1	Organics 2
National										
Average	(243,956)	(458,206)	(38,162)	(213,888)	(226,184)	(52,327)	(493,812)	(542,252)	(115,340)	(130,923)
Minimum	(7,405,182)	(8,100,993)	(1,772,074)	(6,809,417)	(6,809,417)	(941,476)	(4,805,460)	(4,805,460)	(2,100,541)	(2,300,116)
Maximum	6,236,865	6,236,865	1,571,414	6,342,503	6,236,865	490,835	2,331,995	2,149,348	704,547	1,836,032
Northeast										
Average	(216,924)	(368,352)	(10,753)	(223,755)	(227,062)	(42,608)	(557,463)	(591,231)	(9,819)	(56,568)
Minimum	(7,405,182)	(8,100,993)	(1,503,184)	(6,809,417)	(6,809,417)	(492,160)	(1,187,971)	(1,187,971)	(1,079,966)	(2,300,116)
Maximum	6,236,865	6,236,865	1,571,414	6,342,503	6,236,865	153,470	61,560	99,712	704,547	1,836,032
Southeast										
Average	(694,233)	(740,780)	(28,512)	(879,347)	(884,176)	(14,800)	(79,966)	(81,840)	(1,066,553)	(1,066,553)
Minimum	(2,447,471)	(3,141,437)	(107,570)	(2,296,603)	(2,311,088)	(136,384)	(830,350)	(830,350)	(2,100,541)	(2,100,541)
Maximum	48,695	446,630	26,872	(154,182)	(154,182)	81,260	479,195	479,328	(32,565)	(32,565)
Upper Midwest										
Average	(229,352)	(564,982)	(105,019)	(183,060)	(217,564)	(74,191)	(577,637)	(588,813)	(19,783)	(19,783)
Minimum	(6,695,685)	(6,695,982)	(1,772,074)	(1,916,138)	(6,695,623)	(941,476)	(4,805,460)	(4,805,460)	(142,676)	(142,676)
Maximum	3,148,788	2,863,507	356,992	1,274,965	2,718,198	490,835	2,331,995	2,137,939	59,390	59,390
Lower Midwest										
Average	(40,960)	(145,505)	(4,849)	(17,162)	(17,162)	NA	NA	NA	(92)	(92)
Minimum	(987,769)	(1,719,580)	(884,042)	(884,042)	(884,042)	NA	NA	NA	(24,933)	(24,933)
Maximum	916,854	916,854	465,518	908,053	908,053	NA	NA	NA	22,445	22,445
Northwest										
Average	(56,265)	(418,309)	(211)	(18,319)	(18,811)	(28,237)	(462,691)	(582,458)	(51,175)	(51,175)
Minimum	(497,696)	(2,580,391)	(73,474)	(389,907)	(389,907)	(107,789)	(2,190,484)	(2,543,536)	(101,890)	(101,890)
Maximum	722,953	911,676	71,024	843,298	844,566	83,633	911,676	964,371	(460)	(460)
Southwest										
Average	(260,098)	(431,758)	(4,070)	(273,652)	(276,225)	(25,536)	(597,734)	(819,396)	NA	NA
Minimum	(2,690,885)	(3,550,924)	(143,890)	(2,690,885)	(2,690,885)	(182,016)	(3,407,280)	(4,429,155)	NA	NA
Maximum	585,768	1,792,461	205,208	590,951	585,768	283,789	1,792,461	2,149,348	NA	NA

TABLE F-4. OVERALL CHANGES IN COSTS

	EPA 1	EPA 2	Metals 1	Metals 2	Metals 3	Oils 2	Oils 3	Oils 4	Organics 1	Organics 2
National										
Average	(265,816)	(412,485)	(36,161)	(243,792)	(286,609)	11,212	(287,418)	(297,054)	(52,521)	(34,926)
Minimum	(6,908,056)	(7,579,037)	(1,375,628)	(6,486,369)	(6,455,533)	(354,975)	(4,692,105)	(4,678,641)	(1,930,681)	(1,921,484)
Maximum	2,027,586	1,422,214	1,325,144	2,327,619	2,368,154	225,959	1,085,446	1,045,817	250,458	666,550
Northeast										
Average	(589,253)	(744,547)	(115,192)	(603,954)	(587,565)	(105,445)	(633,445)	(659,884)	(34,941)	12,713
Minimum	(6,908,056)	(7,579,037)	(1,036,723)	(6,486,369)	(6,455,533)	(354,975)	(1,359,776)	(1,507,962)	(812,167)	(1,434,255)
Maximum	2,027,586	1,394,851	1,325,144	2,327,619	2,368,154	151,301	(216,992)	(215,786)	250,458	666,550
Southeast										
Average	(554,096)	(593,884)	34,528	(724,268)	(725,415)	40,830	(14,874)	825	(865,112)	(854,178)
Minimum	(2,265,156)	(2,965,595)	(7,916)	(2,156,747)	(2,163,175)	(15,787)	(716,226)	(712,816)	(1,930,681)	(1,921,484)
Maximum	212,344	377,097	63,610	48,070	48,070	117,333	482,639	548,010	200,458	213,127
Upper Midwest										
Average	(172,498)	(463,005)	(52,490)	(69,978)	(238,759)	22,355	(404,557)	(397,989)	129,770	135,803
Minimum	(4,238,221)	(5,701,969)	(1,375,628)	(1,339,435)	(4,243,439)	(245,493)	(4,692,105)	(4,678,641)	2,197	2,197
Maximum	1,071,239	1,422,214	200,823	678,465	1,071,239	150,476	1,085,446	1,045,817	217,662	240,894
Lower Midwest										
Average	9,657	(20,145)	(20,625)	15,967	17,499	NA	NA	NA	18,731	18,928
Minimum	(765,595)	(765,595)	(813,475)	(769,873)	(760,682)	NA	NA	NA	(1,209)	(1,209)
Maximum	384,673	384,673	384,673	384,673	384,673	NA	NA	NA	48,800	49,317
Northwest										
Average	6,808	(249,077)	54,558	25,317	31,017	29,616	(278,469)	(346,521)	(18,798)	(18,554)
Minimum	(256,292)	(1,602,987)	12,157	(268,102)	(256,292)	(47,674)	(1,544,857)	(1,785,329)	(101,890)	(101,890)
Maximum	205,233	358,800	107,260	203,482	216,810	83,518	358,800	408,016	64,295	64,782
Southwest										
Average	(66,551)	12,405	38,452	(95,728)	(97,694)	76,585	339,772	331,947	NA	NA
Minimum	(743,355)	(743,355)	(89,799)	(743,355)	(743,355)	(124,019)	(113,998)	(111,528)	NA	NA
Maximum	324,622	561,515	191,584	313,406	324,622	225,959	571,799	665,835	NA	NA

Tables F-3 and F-4 indicate that, in most markets, the average facility experiences both decreased revenues and decreased costs. This occurs because the quantity of waste treated by most facilities declines. In all markets, the average facility experiences decreases in revenues; this shows that, on average, decreases in quantities override increases in prices in their effects on facility revenues. In nearly all markets under all regulatory and control options, however, the maximum change in revenue is positive; that is, some facilities experience increased revenues. Similarly, in most markets under most control and regulatory options, the average facility experiences a decrease in costs. This decrease indicates that the decrease in quantity associated with market adjustments to the controls overrides the increased per-gallon cost of treatment in its effect on facilities' costs. At the same time, some facilities in each market experience increased costs. It is the relative changes in facility revenues and facility costs that determines the impact of the regulatory and control options on facility profits.

Facility profit is defined as earnings before taxes:

$$EBT = TR - TC,$$

where;

EBT = earnings before taxes,
TR = total revenues, and
TC = total costs including interest payments.

Thus, the change in a facility's profits resulting from the regulatory options depends on the combined changes in revenues and costs at that facility. Tables F-5 through F-8 examine the impacts of the control options and combined regulatory options on commercial CWT facilities' profits. Table F-5 shows average, minimum, and maximum changes in facility profits by regional market, and Table F-6 shows average, minimum, and maximum with-regulation facility profits by regional market. Table F-7 tabulates the effects of each control and regulatory option on facility profitability by regional market, and Table F-8 shows the same tabulation by discharge status.

F.2.1 Metals Control Options

Nationwide, the mean facility experiences a slight decrease in profits under Metals Option 1 and a slightly larger increase in profits under Metals Options 2 and 3. In the Northeast region, the mean facility experiences significant increases in profits under all three metals

TABLE F-5. CHANGES IN PROFITS (10^3 $1990)

	Baseline EBT	EPA 1	EPA 2	Metals 1	Metals 2	Metals 3	Oils 2	Oils 3	Oils 4	Organics 1	Organics 2
National											
Average	7,812	22	(46)	(3)	22	52	(66)	(213)	(253)	(60)	(94)
Minimum	(7,930)	(2,457)	(4,012)	(495)	(1,948)	(2,452)	(924)	(3,979)	(4,871)	(268)	(882)
Maximum	320,704	4,842	4,842	1,326	4,980	4,842	430	1,247	1,484	655	1,712
Northeast											
Average	26,240	372	376	104	380	361	63	76	69	25	(69)
Minimum	(4,454)	(1,504)	(1,504)	(495)	(1,493)	(1,504)	(137)	(387)	(388)	(268)	(882)
Maximum	320,704	4,842	4,842	1,326	4,980	4,842	385	703	645	655	1,712
Southeast											
Average	251	(140)	(147)	(63)	(155)	(159)	(56)	(65)	(83)	(201)	(212)
Minimum	(853)	(205)	(622)	(100)	(202)	(202)	(123)	(540)	(620)	(233)	(246)
Maximum	1,160	2	197	(37)	(123)	(126)	24	384	378	(170)	(179)
Upper Midwest											
Average	2,953	(57)	(102)	(67)	(137)	(8)	(97)	(173)	(191)	(146)	(152)
Minimum	(1,967)	(2,457)	(2,465)	(426)	(870)	(2,452)	(924)	(1,524)	(1,539)	(239)	(246)
Maximum	36,375	2,273	1,647	194	611	1,843	430	1,247	1,092	2	2
Lower Midwest											
Average	935	(51)	(125)	16	(33)	(35)	NA	NA	NA	(19)	(19)
Minimum	(3,697)	(915)	(1,438)	(145)	(747)	(747)	NA	NA	NA	(74)	(74)
Maximum	5,622	584	584	270	574	574	NA	NA	NA	21	21
Northwest											
Average	1,786	(63)	(169)	(55)	(44)	(50)	(72)	(230)	(295)	(65)	(65)
Minimum	(720)	(417)	(997)	(125)	(373)	(376)	(163)	(742)	(887)	(65)	(65)
Maximum	8,912	711	711	59	709	711	0	553	556	(65)	(65)
Southwest											
Average	(56)	(194)	(444)	(43)	(178)	(179)	(102)	(938)	(1,151)	NA	NA
Minimum	(7,930)	(1,948)	(4,012)	(197)	(1,948)	(1,948)	(408)	(3,979)	(4,871)	NA	NA
Maximum	8,616	443	1,231	62	426	443	156	1,231	1,484	NA	NA

TABLE F-6. WITH-REGULATION PROFITS (10^3 $1990)

	Baseline EBT	EPA 1	EPA 2	Metals 1	Metals 2	Metals 3	Oils 2	Oils 3	Oils 4	Organics 1	Organics 2
National											
Average	7,812	7,833	7,768	7,810	7,828	7,851	7,783	7,716	7,698	7,794	7,784
Minimum	(7,930)	(8,314)	(8,314)	(7,901)	(8,314)	(8,314)	(7,930)	(7,930)	(7,930)	(7,930)	(7,930)
Maximum	320,704	324,854	324,854	321,423	324,469	324,484	320,704	320,704	320,704	321,030	319,822
Northeast											
Average	26,240	26,592	26,596	26,327	26,557	26,541	26,258	26,261	26,259	26,250	26,213
Minimum	(4,454)	(4,656)	(4,656)	(4,265)	(4,656)	(4,656)	(4,454)	(4,454)	(4,454)	(4,454)	(4,454)
Maximum	320,704	324,854	324,854	321,423	324,469	324,484	320,704	320,704	320,704	321,030	319,822
Southeast											
Average	251	111	104	224	184	183	211	204	192	193	190
Minimum	(853)	(1,056)	(1,056)	(906)	(1,056)	(1,056)	(853)	(853)	(853)	(853)	(853)
Maximum	1,160	990	990	1,160	1,160	1,160	1,160	1,160	1,160	990	980
Upper Midwest											
Average	2,953	2,896	2,851	2,905	2,855	2,947	2,888	2,837	2,826	2,918	2,917
Minimum	(1,967)	(2,107)	(2,110)	(2,016)	(2,018)	(2,020)	(2,016)	(2,020)	(2,020)	(2,095)	(2,095)
Maximum	36,375	36,195	36,140	36,253	36,201	36,195	36,264	36,209	36,206	36,230	36,229
Lower Midwest											
Average	935	895	837	945	913	912	NA	NA	NA	924	924
Minimum	(3,697)	(3,729)	(3,729)	(3,738)	(3,729)	(3,729)	NA	NA	NA	(3,697)	(3,697)
Maximum	5,622	5,622	5,622	5,622	5,622	5,622	NA	NA	NA	5,622	5,622
Northwest											
Average	1,786	1,723	1,617	1,740	1,750	1,744	1,738	1,632	1,589	1,775	1,775
Minimum	(720)	(916)	(941)	(778)	(879)	(879)	(786)	(806)	(811)	(785)	(785)
Maximum	8,912	9,623	9,623	8,971	9,622	9,623	8,912	8,912	8,912	8,912	8,912
Southwest											
Average	(56)	(249)	(500)	(94)	(216)	(216)	(86)	(337)	(401)	NA	NA
Minimum	(7,930)	(8,314)	(8,314)	(7,901)	(8,314)	(8,314)	(7,930)	(7,930)	(7,930)	NA	NA
Maximum	8,616	8,175	4,708	8,562	8,545	8,537	8,208	4,637	4,348	NA	NA

TABLE F-7. CHANGES IN PROFITABILITY STATUS BY REGION

	EPA 1	EPA 2	Metals 1	Metals 2	Metals 3	Oils 2	Oils 3	Oils 4	Organics 1	Organics 2
Facilities for which EBT is 0 or positive with and without the controls, and EBT is higher with the controls										
Northeast	6	6	6	5	5	8	8	8	7	6
Southeast	1	1	4	4	4	3	3	3	4	4
Upper Midwest	7	7	9	10	11	9	8	8	15	15
Lower Midwest	4	4	4	4	4	5	5	5	4	4
Northwest	2	2	2	2	2	3	3	3	5	5
Southwest	2	2	2	2	2	4	4	4	5	5
National Total	22	22	27	27	28	32	31	31	40	39
Facilities for which EBT is 0 or positive with and without the controls, but EBT is lower with the controls										
Northeast	2	2	2	3	3	0	0	0	1	2
Southeast	3	3	2	2	2	2	1	1	1	1
Upper Midwest	6	6	9	7	5	6	6	6	3	3
Lower Midwest	2	2	2	2	2	1	1	1	2	2
Northwest	3	2	3	3	3	2	2	2	0	0
Southwest	2	2	3	3	3	2	2	2	1	1
National Total	18	17	21	20	18	13	12	12	8	9
Facilities for which EBT is 0 or positive without the controls but EBT is negative with the controls										
Northeast	0	0	0	0	0	0	0	0	0	0
Southeast	2	2	0	0	0	1	2	2	1	1
Upper Midwest	5	5	0	1	2	3	4	4	0	0
Lower Midwest	0	0	0	0	0	0	0	0	0	0
Northwest	0	1	0	0	0	0	0	0	0	0
Southwest	2	2	1	1	1	0	0	0	0	0
National Total	9	10	1	2	3	4	6	6	1	1

(continued)

TABLE F-7. CHANGES IN PROFITABILITY STATUS BY REGION (CONTINUED)

	EPA 1	EPA 2	Metals 1	Metals 2	Metals 3	Oils 2	Oils 3	Oils 4	Organics 1	Organics 2
Facilities for which EBT is negative with and without the controls, but EBT is less negative with the controls										
Northeast	0	0	2	1	1	8	7	7	6	6
Southeast	0	0	0	0	0	1	1	1	1	1
Upper Midwest	1	1	1	1	1	2	2	2	2	2
Lower Midwest	2	2	2	2	2	3	3	3	3	3
Northwest	0	0	0	0	0	0	0	0	0	0
Southwest	2	2	2	2	2	4	4	4	4	4
National Total	5	5	7	6	6	18	17	17	16	16
Facilities for which EBT is negative with and without the controls, and EBT is more negative with the controls										
Northeast	10	10	8	9	9	2	3	3	4	4
Southeast	1	1	1	1	1	0	0	0	0	0
Upper Midwest	2	2	2	2	2	1	1	1	1	1
Lower Midwest	1	1	1	1	1	0	0	0	0	0
Northwest	1	1	1	1	1	1	1	1	1	1
Southwest	2	2	2	2	2	0	0	0	0	0
National Total	17	17	15	16	16	4	5	5	6	6

TABLE F-8. PROFITABILITY IMPACTS BY DISCHARGE STATUS

	EPA 1	EPA 2	Metals 1	Metals 2	Metals 3	Oils 2	Oils 3	Oils 4	Organics 1	Organics 2
Facilities for which EBT is 0 or positive with and without the controls, and EBT is higher with the controls										
Indirect Dischargers	12	12	17	17	18	20	19	19	29	29
Direct Dischargers	2	2	2	2	2	4	4	4	3	2
Zero Dischargers	8	8	8	8	8	8	8	8	8	8
National Totals	22	22	27	27	28	32	31	31	40	39
Facilities for which EBT is 0 or positive with and without the controls, but EBT is lower with the controls										
Indirect Dischargers	15	14	18	17	15	12	11	11	6	6
Direct Dischargers	3	3	3	3	3	1	1	1	2	3
Zero Dischargers	0	0	0	0	0	0	0	0	0	0
National Totals	18	17	21	20	18	13	12	12	8	9
Facilities for which EBT is 0 or positive without the controls but EBT is negative with the controls										
Indirect Dischargers	9	10	1	2	3	4	6	6	1	1
Direct Dischargers	0	0	0	0	0	0	0	0	0	0
Zero Dischargers	0	0	0	0	0	0	0	0	0	0
National Totals	9	10	1	2	3	4	6	6	1	1
Facilities for which EBT is negative with and without the controls, but EBT is less negative with the controls										
Indirect Dischargers	0	0	1	1	1	11	10	10	9	9
Direct Dischargers	0	0	1	0	0	2	2	2	2	2
Zero Dischargers	5	5	5	5	5	5	5	5	5	5
National Totals	5	5	7	6	6	18	17	17	16	16
Facilities for which EBT is negative with and without the controls, and EBT is more negative with the controls										
Indirect Dischargers	15	15	14	14	14	4	5	5	6	6
Direct Dischargers	2	2	1	2	2	0	0	0	0	0
Zero Dischargers	0	0	0	0	0	0	0	0	0	0
National Totals	17	17	15	16	16	4	5	5	6	6

options. In the other regions of the country, the mean facility experiences small to moderate decreases in profits under almost all the metals options (the exception being a slight increase in profits for the average facility in the Lower Midwest under Metals Option 1). Note that the largest increase in profits in the Northeast is approximately three times the largest decrease in profits under the metals options. This suggests that the positive mean change in profits may be due to one or two facilities with relatively large increases in profits.

Nationwide, 27 profitable facilities are made better off by Metals Option 1, and 21 profitable facilities remain profitable but are made worse off. One previously profitable facility is projected to become unprofitable under Metals Option 1. Seven unprofitable facilities are made better off under Metals Option 1, and 15 unprofitable facilities are made worse off. Metals Option 2 is projected to make 27 profitable facilities and six unprofitable facilities better off. Twenty-two profitable and 16 unprofitable facilities are made worse off, including two facilities that were profitable but are projected to become unprofitable under Metals Option 2. Metals Option 3 is projected to make 28 profitable facilities more profitable and six unprofitable facilities less unprofitable. Twenty-one profitable and 16 unprofitable facilities are projected to be made worse off by Metals Option 3, including three profitable facilities that are projected to become unprofitable. The Southeast, Upper Midwest, and Lower Midwest generally have more facilities whose profitability is projected to improve under the metals control options, while the Northeast, Northwest, and Southwest have more facilities whose profitability is projected to get worse under the metals control options.

In Table F-4, there are 51 indirect dischargers, 7 direct dischargers, and 13 zero dischargers. Eighteen of the indirect dischargers are projected to experience improved profitability under Metals Options 1 and 2, and 19 are projected to experience improved profitability under Metals Option 3. Thirty-three indirect dischargers are projected to experience decreased profitability under Metals Options 1 and 2, and 32 under Metals Option 3. Three direct dischargers are projected to be made better off under Option 1, and two under Metals Options 2 and 3, while four or five facilities are made worse off. Predictably, zero dischargers are at worst unaffected and at best made more profitable under the metals control options. Because they experience no compliance costs, but the price of the services they provide increases, their profitability generally increases. Eight profitable and five unprofitable facilities are unaffected or made better off by the metals control options. Thus, zero dischargers are generally benefited by the metals control options, roughly 65 percent of indirect dischargers are made worse off under the metals control options, and roughly 31 percent of direct dischargers are made worse off.

F.2.2 Oils Control Options

Under Oils Option 2, the average facility nationwide experiences a moderate ($66,000) decline in profits, while under Oils Options 3 and 4, the average facility experiences a significant decrease in profits (more than $200,000). In the Northeast, the average facility experiences a slight increase in profits, while in all other regions slight to significant decreases in profits are experienced by the mean facility. In the Lower Midwest, only one facility experiences a change in profitability due to the oils control options. To avoid revealing facility-specific projections, no data are reported.

Under Oils Option 2, 32 profitable facilities and 18 unprofitable facilities experience improved profitability; 21 facilities are made worse off, including four profitable facilities that are projected to become unprofitable. Under Oils Options 3 and 4, 31 profitable and 17 unprofitable facilities experience improved profitability. Twenty-three facilities are projected to become less profitable, including six profitable facilities that are projected to become unprofitable under Oils Options 3 and 4. In three regions (Northeast, Lower Midwest, and Southwest) a much higher percentage of facilities are made more profitable than are made less profitable under the oils control options. In the remaining regions, the shares of facilities made better off and facilities made worse off are relatively equal.

Thirty-one indirect dischargers are made better off under Oils Option 2, while 20 facilities are made worse off. Four indirect dischargers that are profitable without the regulation are projected to be unprofitable with it. Under Oils Options 3 and 4, 29 indirect discharger facilities are made better off while 22 are made worse off, including six that were profitable and are projected to become unprofitable.

F.2.3 Organics Control Options

The mean facility nationwide is projected to experience a moderate decrease in profits ($60,000) under Organics Option 1 and a somewhat larger ($94,000) decrease in profits under Organics Option 2. Again, the mean facility in the Northeast experiences a slight increase in profitability under Organics Option 1 but a larger decrease under Organics Option 2. In all other regions, the mean facility experiences a decrease in profits under both organics control options. In the Southwest only one facility experiences a change in profitability due to the organics control options. To avoid revealing facility-specific projections, no data are reported.

Fifty-six facilities are made better off under Organics Option 1, while 15 are made worse off including one that was profitable that is projected to become unprofitable. Under Organics

Option 2, 55 facilities are unaffected or made better off; 16 facilities are made worse off including one that becomes unprofitable. In all regions, more facilities are unaffected or made better off in terms of profitability than are made worse off by the organics control options. Most striking is the Upper Midwest, in which 17 facilities are unaffected or made better off, while only four are made less profitable.

Thirty-eight indirect dischargers are unaffected or made better off by both organics control options. Thirteen are made worse off, including one facility projected to become unprofitable. Five direct dischargers are unaffected or made better off under Organics Option 1, and two are made worse off. Four direct dischargers are unaffected or made better off under Organics Option 2, while three are made worse off. As always, the 13 zero dischargers are unaffected or made better off.

F.2.4 Regulatory Options

Under Regulatory Options 1 and 2, facilities experience the combined effects of the compliance costs associated with controls for each subcategory. Unlike the market impacts, the profitability impacts associated with the regulatory options cannot be discerned by examining the profitability effects of the individual control options; rather, the profitability effects of the combined regulatory options must be evaluated by imposing the control costs associated with each control option simultaneously. Table F-7 shows the regional pattern of changes in profitability associated with the combined regulatory options. Table F-8 shows the pattern of profitability changes by discharge status. As noted previously, the Agency assumes that the BPT/BAT controls and the PSES controls are imposed simultaneously. Thus, the profitability impacts on direct discharging facilities are not the impacts of the BPT/BAT controls imposed by themselves; rather, they are the impacts on direct dischargers of the market and facility adjustments associated with the simultaneous imposition of both the BPT/BAT controls and the PSES controls.

As shown in Table F-8, two direct dischargers, 12 indirect dischargers, and 13 zero dischargers have improved profitability as a result of Regulatory Options 1 and 2. This includes facilities that were profitable without the effluent limitations guidelines and standards and are at least as profitable with the regulation in effect. It also includes facilities that were losing money without the proposed regulation and are projected to lose less money with the regulation in effect. Overall, therefore, under both regulatory options, 27 facilities experience at least as high profits with the regulation in effect as without it. The most severe negative profitability impacts are experienced by facilities that are profitable without the proposed regulation in effect but are

projected to be unprofitable with the regulation. Nine indirect dischargers are projected to become unprofitable under Regulatory Option 1 and ten under Regulatory Option 2.

As discussed in text of the report (Chapter 4) the Agency has reason to believe that facilities that become unprofitable are not immediately closed by their owner companies. For this reason, the facilities becoming unprofitable are assumed to continue operating. Changes in each CWT facility's costs and revenues are passed along to the company owning the CWT facility and result in changes in the parent company's profits. These changes in profits, combined with estimated changes in the parent company's cost of capital, and changes in assets and liabilities, result in changes in company's financial status. The economic achievability of the effluent limitations guidelines and standards is evaluated by examining the impacts of the regulatory options on the likelihood of bankruptcy for companies owning CWT facilities.

APPENDIX G

Detailed Company-Level Results

TABLE G-1. SUMMARY STATISTICS OF CWT FACILITY OWNERS' ESTIMATED BASELINE AND WITH-REGULATION COSTS OF CAPITAL BY COMPANY SIZE CATEGORY

Regulatory Option and Statistic	Company Size in Annual Receipts (10^6/year)			
	$0 to $6	$6 to $30	$30 to $340	Over $340
Number of Observations	13	14	9	21
Baseline				
Mean (percent)	9.50	7.88	9.07	8.38
Standard Deviation (percentage points)	2.34	1.92	1.99	1.92
Quartiles (percent)				
Upper	11.36	9.68	11.16	9.53
Median	10.90	7.96	8.74	8.36
Lower	8.74	6.46	8.27	7.51
Regulatory Option 1				
Mean (percent)	14.97	8.55	9.66	8.53
Standard Deviation (percentage points)	18.69	2.27	2.21	2.00
Quartiles (percent)				
Upper	11.36	10.44	11.16	9.53
Median	10.90	8.29	9.59	8.98
Lower	8.75	6.46	8.27	7.51
Regulatory Option 2				
Mean (percent)	9.50	7.88	9.07	8.38
Standard Deviation (percentage points)	2.34	1.92	1.99	1.92
Quartiles (percent)				
Upper	13.01	10.44	11.16	9.53
Median	11.36	8.29	9.62	8.98
Lower	8.75	6.83	8.27	7.51

TABLE G-2. SUMMARY STATISTICS OF CWT FACILITY OWNERS' ESTIMATED BASELINE AND WITH-REGULATION COSTS OF CAPITAL BY DISCHARGE STATUS OF THEIR CWT FACILITIES

Regulatory Option and Statistic	Discharge Status[a]		
	Direct	Indirect	Zero
Number of Observations	14	36	10
Baseline			
Mean (percent)	9.46	8.38	9.14
Standard Deviation (percentage points)	2.04	2.14	1.92
Quartiles (percent)			
Upper	11.36	9.81	11.36
Median	9.82	8.62	8.42
Lower	7.96	6.51	8.27
Regulatory Option 1			
Mean (percent)	9.97	10.67	9.21
Standard Deviation (percentage points)	2.32	11.54	1.91
Quartiles (percent)			
Upper	11.36	10.80	11.36
Median	10.61	9.00	8.75
Lower	7.96	6.90	8.27
Regulatory Option 2			
Mean (percent)	10.01	11.46	9.21
Standard Deviation (percentage points)	2.28	14.01	1.91
Quartiles (percent)			
Upper	11.36	11.13	11.36
Median	10.61	8.88	8.75
Lower	8.56	7.03	8.27

[a]Companies owning more than one type of discharger are included in each discharge category that describes CWT facilities that they own.

TABLE G-3. WITH-REGULATION LIKELIHOOD OF BANKRUPTCY BY DISCHARGE STATUS

Likelihood of Bankruptcy[b,c]	Discharge Status of Companies' CWT Facilities[a]											
	Direct			Indirect			Zero			All Companies		
	Baseline	Regulatory Option 1	Regulatory Option 2	Baseline	Regulatory Option 1	Regulatory Option 2	Baseline	Regulatory Option 1	Regulatory Option 2	Baseline	Regulatory Option 1	Regulatory Option 2
Likely	1	1	1	5	9	8	1	1	1	6	10	9
Indeterminate	2	2	2	11	12	10	4	3	3	16	16	14
Unlikely	10	11	11	17	18	21	2	6	6	26	31	34
Subtotal	13	14	14	33	39	39	7	10	10	48	57	57
Missing Values	1	0	0	6	0	0	3	0	0	9	0	0
Total	14	14	14	39	39	39	10	10	10	57	57	57

[a]Companies owning more than one type of discharger are are included in each category that corresponds to the discharge status of CWT facilities that they own, but are only counted once in the column for all companies.

[b]Bankruptcy prediction is based on the Z-score for companies with publicly traded stock. If a company's Z-score is less than 1.81, the model predicts that bankruptcy is likely. If a company's Z-score is greater than 2.99, the model predicts that bankruptcy is unlikely. Z-scores between 1.81 and 2.99 fall in the indeterminate range, and the model makes no prediction for these companies.

[c]Bankruptcy prediction is based on the Z"-score for companies that do not issue publicly traded stock. If a company's Z"-score is less than 1.10, the model predicts that bankruptcy is likely. If a company's Z"-score is greater than 2.60, the model predicts that bankruptcy is unlikely. Z"-scores between 1.10 and 2.60 fall in the indeterminate range, and the model makes no prediction for these companies.

TABLE G-4. WITH-REGULATION LIKELIHOOD OF BANKRUPTCY BY COMPANY OWNERSHIP TYPE

Ownership Type / Likelihood of Bankruptcy	Regulatory Context		
	Baseline	Regulatory Option 1	Regulatory Option 2
Publicly-traded companies[a]			
Likely	4	4	4
Indeterminate	7	7	7
Unlikely	8	8	8
Subtotal	19	19	19
Other companies[b]			
Likely	2	6	5
Indeterminate	8	9	7
Unlikely	19	23	26
Subtotal	29	38	38
All companies			
Likely	6	10	9
Indeterminate	16	16	14
Unlikely	26	31	34
Subtotal	48	57	57
Missing Values	9	0	0
Total	57	57	57

[a]Bankruptcy prediction is based on the Z-score for companies with publicly traded stock. If a company's Z-score is less than 1.81, the model predicts that bankruptcy is likely. If a company's Z-score is greater than 2.99, the model predicts that bankruptcy is unlikely. Z-scores between 1.81 and 2.99 fall in the indeterminate range, and the model makes no prediction for these companies.

[b]Bankruptcy prediction is based on the Z"-score for companies that do not issue publicly traded stock. If a company's Z"-score is less than 1.10, the model predicts that bankruptcy is likely. If a company's Z"-score is greater than 2.60, the model predicts that bankruptcy is unlikely. Z"-scores between 1.10 and 2.60 fall in the indeterminate range, and the model makes no prediction for these companies.

TABLE G-5. WITH-REGULATION LIKELIHOOD OF BANKRUPTCY BY COMPANY SIZE CATEGORY

Likelihood of Bankruptcy[a,b]	Firm Size in Annual Receipts (10^6/year)														
	$0 to $6			$6 to $30			$30 to $340			Over $340			Total		
	Baseline	Regulatory Option 1	Regulatory Option 2	Baseline	Regulatory Option 1	Regulatory Option 2	Baseline	Regulatory Option 1	Regulatory Option 2	Baseline	Regulatory Option 1	Regulatory Option 2	Baseline	Regulatory Option 1	Regulatory Option 2
Likely	1	4	2	1	1	2	1	2	2	3	3	3	6	10	9
Indeterminate	3	3	1	4	4	4	2	1	1	7	8	8	16	16	14
Unlikely	8	6	10	6	9	8	4	6	6	8	10	10	26	31	34
Subtotal	12	13	13	11	14	14	7	9	9	18	21	21	48	57	57
Missing Values	1	0	0	3	0	0	2	0	0	3	0	0	9	0	0
Total	13	13	13	14	14	14	9	9	9	21	21	21	57	57	57

[a]Bankruptcy prediction is based on the Z-score for companies with publicly traded stock. If a company's Z-score is less than 1.81, the model predicts that bankruptcy is likely. If a company's Z-score is greater than 2.99, the model predicts that bankruptcy is unlikely. Z-scores between 1.81 and 2.99 fall in the indeterminate range, and the model makes no prediction for these companies.

[b]Bankruptcy prediction is based on the Z"-score for companies that do not issue publicly traded stock. If a company's Z"-score is less than 1.10, the model predicts that bankruptcy is likely. If a company's Z"-score is greater than 2.60, the model predicts that bankruptcy is unlikely. Z"-scores between 1.10 and 2.60 fall in the indeterminate range, and the model makes no prediction for these companies.