

Survey of Environmental Products and Services

Prepared for
The Environmental Protection Agency
and
The International Trade Administration
U.S. Department of Commerce
by
The Bureau of the Census

February 1998



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Foreword

We are pleased to present the ground-breaking results of the most extensive survey ever conducted of the U.S. environmental technology and services industry. This three-year project will allow the nation to better understand the environmental industry's size, scope, composition -- and its contribution to the national economy. The survey and accompanying report were jointly produced by the Department of Commerce's International Trade Administration and the U.S. Environmental Protection Agency, and the survey was carried out by the Department of Commerce's Bureau of the Census.

The effort is part of the Clinton Administration's National Environmental Technology Strategy, which has sought to spur the development of a new generation of technologies that cost effectively prevent pollution, promote the development and use of technologies to monitor the environment and clean up existing pollution, and encourage the application of environmental technologies to curb pollution throughout the world. These efforts are aimed at ensuring the competitiveness of the U.S. environmental technology industry while achieving environmental protection in a cost-effective manner.

The environmental industry is one of the fastest growing and evolving industry sectors worldwide. It has been difficult to assess and track its size and economic contribution because of the lack of standardized approaches to categorizing and measuring the sector. This survey sample of almost 10,000 manufacturing, construction, and service firms engaged in environmental business is the largest and most comprehensive ever undertaken and an important first step toward standardizing information on the industry.

The results of this survey clearly allow us to understand the industry better, and will help lay the groundwork for more targeted programs to assist the industry domestically, as well as to expand its exports to the burgeoning international market.

Enhancing U.S. environmental technologies exports has been a key objective of the Clinton Administration, and we are committed to working closely with the U.S. environmental industry to achieve this critical goal. The success of this industry is proof that a strong economy and a healthy environment are inextricably linked.

William M. Daley
Secretary
U.S. Department of Commerce

Carol M. Browner
Administrator
U.S. Environmental Protection Agency

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Introduction

Commercial environmental activity in the United States is an important and growing part of economic and social activity. Legislative initiatives and increased social awareness of the environment have increased business and government efforts to protect and enhance the quality of the environment. A major new area of industrial activity has emerged in response to these efforts, yet there have been no reliable data on the output of goods and services to help understand and monitor its development. Industry representatives, state governments, and environmental organizations have called for the development of data measuring environmental activities. In response to this need, the U.S. Environmental Protection Agency and the International Trade Administration of the U.S. Department of Commerce have sponsored this first *Survey of Environmental Products and Services*. This survey collects value of selected product shipments and revenues for specific services and construction projects defined for environmental use. It uses 1995 data, the latest available.

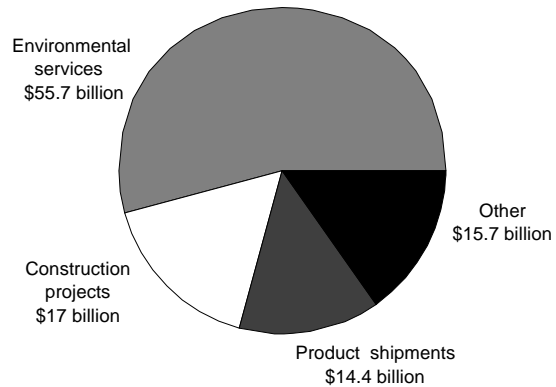
The survey is the first attempt to measure the extent of commercial environmental activity using a comprehensive list of products and services. For the purpose of this survey, the environmental industry is defined as the manufacture of products, performance of services and the construction of projects used, or that potentially could be used, for measuring, preventing, limiting, or correcting environmental damage to air, water, and soil. The industry also includes services related to the removal, transportation, storage, or abatement of waste, noise, and other contaminants. Currently, no single industry category exists for classifying these goods and services. Instead, businesses involved in environmental activity cut across industries in manufacturing, service, and construction sectors. For this reason, the environmental industry does not conform to the structure defined by the traditional standard industrial classification (SIC) system.

This survey is based on a sample of private businesses involved in the commercial activities of the environmental industry. All of the sampled businesses were asked to report only about selected products, services, or types of construction defined for environmental use. Responses ranged from no environmental activity to all environmental activity. A detailed description of the survey scope and sample design, the survey forms used and a note on data collection appear in the final sections of this report.

Summary of Findings

The value of products, revenues for services, and receipts for construction projects related to environmental activities totaled approximately \$102.8 billion in 1995. Of this amount, \$55.7 billion were revenues for environmentally related services. Revenues for environmental construction projects were \$17.0 billion, and the value of environmental product shipments was \$14.4 billion (Figure 1). Products and services can be broken out as follows: \$35.9 billion for solid waste management; \$31.1 billion for water and wastewater treatment; \$6.3 billion for environmental administration, management and engineering activities; \$5.9 billion for air treatment; and \$5.4 billion for environmental monitoring, assessment, and analysis. Revenues for energy conservation and noise pollution control products and services together were \$2.6 billion. Another \$15.7 billion in environmental activities were for products, services, and construction projects that could not be reported in the separate categories. Some 774,000 employees were involved in manufacturing these products, providing these services, or constructing these projects.

Figure 1: Value of Total Environmental Activities*



* Value of environmental product shipments, revenues for environmentally related services, and receipts for construction projects related to environmental activities. Source: Survey of Environmental Products and Services sponsored by the Environmental Protection Agency, the International Trade Administration, and the Bureau of the Census.

When comparing the data in this report with other environmental statistics, significant differences could occur for several reasons, including differences in the definition of the industry, in descriptions and instructions, in the reference periods, or because of statistical differences inherent in selecting samples.*

Description of the Tables

This report includes five tables of data. All data are for activities during 1995. The tables present data showing (1) the total value of shipments of selected products and receipts for services and construction regardless of whether the product or service was for environmental purposes, (2) the value known to be for environmental purposes, (3) the value known to be for other than environmental purposes, and (4) the value for which the purpose was unknown. These tables include estimates of the relative standard errors of the total values and of the values known to be for environmental purposes.

* The estimates of values given for environmental purposes are conservative for several reasons. In many cases, especially manufacturing, respondents could not identify whether the ultimate use of a product was environmental. These amounts are represented in column 4 of each table, "purpose unknown." It is safe to assume that some portion of this value is for environmental activity. Similarly, \$15.7 billion reported as "other environmental activity" in Tables 1a and 1b represent products, services, and construction activities that respondents could not report on a specific line or category. No information was available to allocate the amount across the products, services, or construction projects listed. Consequently, the specific products, services, and construction projects represent only the amounts that respondents could identify separately. Additionally, some businesses in industries not included in the survey may have environmental activities. The understatement from not covering these businesses is probably small, although no attempt was made to measure it.

Table 1a summarizes the activities for product shipments and services and construction receipts. Table 1b summarizes the activities by media. These tables also include the value of activities that could not be reported as products, services, or construction nor by media. This value is not included in Tables 2 through 5. For the selected products, services, and types of construction that are considered environmental in nature, Table 2 shows value of shipments of products, Table 3 shows receipts for services, and Table 4 shows receipts for construction projects. Table 5 consolidates Tables 2, 3, and 4 to present the data by media. Media include air treatment, water and wastewater treatment, and solid waste categories, as well as such other environmentally related activities as energy conservation; noise pollution control; monitoring, assessment, and analysis; and administrative, management, and engineering activities.

Exports of Environmental Products and Services

The survey collected shipments and revenues for exports of environmental products and services, but the results are not shown in this report. Respondents for manufactured products often did not know the ultimate destination of their products. Products may have been sent to company warehouses or distribution centers or to customers who are commercial exporters. The distinction between domestic customers and exporters is not always evident from the plant's records. In some instances, arrangements for purchases for export may be arranged at headquarters or a central office. Respondents from the service sector may not have considered services exported since a service is viewed differently than a traded commodity. Had more appropriate terminology regarding the transfer of funds been used, the results may have been different. The authors are continuing to review the responses and are considering alternative estimation techniques to account for the underreporting. If alternative estimation is feasible, the estimates will be released in a separate report.

Limitations of the Data

The user should be aware of several limitations in the data presented in this report. The survey estimates were subject to both sampling and nonsampling errors. Sampling errors arise because a scientifically drawn subset of the universe was chosen to be canvassed. Many possible subsets (samples) could have been selected, none of which was likely to have given the same result that would have been obtained if a complete canvass was done. Sampling error is the difference between the sample estimate and the value that would result from a complete canvass, which is unknown. Estimates of the size of the sampling error are provided by the relative standard errors of the estimates.

Nonsampling errors arise regardless of whether data are collected for a sample or the entire universe. They include errors in data collection, reporting, transcription, nonresponse bias, and so forth. The nonsampling errors related to routine survey processing are generally identified and corrected during the review and analysis of the data. Because this survey is the first of its kind, reporting errors are likely to be more extensive than in an ongoing survey because of the respondents' lack of familiarity with the form and potential misunderstanding of the definitions and concepts. The potential for these types of reporting errors became evident in discussions with respondents who had questions about the survey. Again, nonresponse bias may be more extensive than in an ongoing survey. Greater experience with the data would permit development of a more effective technique to account for nonresponse. There is no measure of the cumulative effect of nonsampling error for this survey, but because of the recognized conceptual issues and the adjustment for nonresponse, the total error may be significant. Sampling and nonsampling error is discussed in the final section of this report.

Table 1a: Summary of Value of Selected Product Shipments and Receipts for Selected Services and Types of Construction Projects for Environmental or Potential Environmental Purposes by Industries: 1995

Selected products, services, and types of construction projects	Value of product shipments and receipts for services and types of construction projects (in millions of dollars)				Relative standard error (in percent)	
	All	For environmental purposes	NOT for environmental purposes	Purpose unknown	All	For environmental purposes
All selected products, services, and types of construction projects	181,915	102,786	70,735	8,394	15	6
Selected products	36,864	14,378	15,199	7,287	13	7
Selected services	111,106	55,720	54,313	1,073	22	8
Selected construction projects	18,267	17,010	1,223	34	11	12
Other environmental activities not reported by industry or media	15,678	15,678	-	-	25	25

Table 1b: Summary of Value of Selected Product Shipments and Receipts for Selected Services and Types of Construction Projects for Environmental or Potential Environmental Purposes by Media: 1995

Selected products, services, and types of construction projects	Value of product shipments and receipts for services and types of construction projects (in millions of dollars)				Relative standard error (in percent)	
	All	For environmental purposes	NOT for environmental purposes	Purpose unknown	All	For environmental purposes
All selected products, services, and types of construction projects	181,915	102,786	70,735	8,394	15	6
Air treatment	5,988	5,877	82	29	15	15
Water and wastewater treatment	36,408	31,093	4,322	995	8	8
Solid waste	38,021	35,882	1,538	600	11	12
Energy conservation	7,633	2,448	4,880	304	14	11
Noise pollution control	1,462	168	1,246	47	41	43
Monitoring, assessment and analysis	17,042	5,367	6,094	5,582	26	19
Administrative, management and engineering	59,683	6,274	52,573	836	27	18
Other environmental activities not reported by industry or media	15,678	15,678	-	-	25	25

Source: Survey of Environmental Products and Services sponsored by the Environmental Protection Agency, the International Trade Administration, and the Bureau of the Census.

Table 2: Value of Selected Product Shipments for Environmental or Potential Environmental Purposes: 1995

Selected products	Value of shipments of selected products (in millions of dollars)				Relative standard error of selected products (in percent)	
	All	For environmental purposes	NOT for environmental purposes	Purpose unknown	All	For environmental purposes
All Selected Products	36,864	14,378	15,199	7,287	13	7
Air Treatment	4,740	4,629	82	28	18	19
Particulate emissions collectors	793	793	-	-	21	21
Gaseous emissions control systems and devices	382	382	-	-	19	19
Catalytic converters	2,702	2,702	-	-	30	30
Onboard monitoring and control systems	(Z)	(Z)	-	-	52	52
Gas detectors	242	174	46	22	25	28
Gas separating equipment	63	22	34	7	21	34
Odor control equipment	6	4	2	(Z)	19	23
Other air treatment equipment	551	551	-	-	41	41
Water and Wastewater Treatment	10,503	5,230	4,321	955	13	16
Desalination equipment	326	267	40	19	27	28
Storage tanks and process vessels (including pressure)	1,338	488	731	119	17	31
Industrial separators (including centrifuges)	399	228	136	35	14	20
Level and flow leak detectors and sensors	172	98	58	16	22	33
Fluid filters (including housings)	729	232	366	131	15	22
Sewage treatment equipment	792	792	-	-	12	12
Pack tower aerators	11	11	-	-	37	37
Deionization equipment	811	811	-	-	93	93
Automated sampling equipment	12	11	1	-	32	32
Manual sampling equipment	1	1	-	(Z)	43	46
Pumps	2,101	362	1,380	359	10	15
Other water and wastewater equipment	2,003	534	1,288	181	53	24
Water treatment boiler compounds	371	279	72	20	22	28
Water treatment cooling tower compounds	582	453	94	35	22	27
Other water and wastewater compounds	856	662	155	39	18	22
Solid Waste	1,741	713	609	418	17	16
Storage containers (including metal and concrete)	879	260	266	353	15	29
Incinerators (including metal and concrete)	78	78	-	-	44	44
Compactors	76	41	6	29	19	24
Tank trucks	7	4	2	1	42	48
Dump trucks	141	81	60	-	46	64
Other trucks	312	47	265	-	79	48
Tire shredding machinery	7	7	-	-	51	51
Scrap baling machinery	188	143	10	35	27	34
Spill clean-up and containment equipment	25	25	-	-	44	44
Gas management equipment	1	1	(Z)	-	43	51
Pit and landfill liners	28	28	-	-	44	44
Energy conservation	7,633	2,448	4,880	304	14	11
Solar collectors (including active and passive)	23	23	-	-	42	42
Wind energy conversion (including turbines, turbine sets, windmills, and parts)	4,054	12	4,042	-	24	98
Residential photovoltaics	-	-	-	-	-	-
Industrial heat exchangers	1,279	678	384	217	10	14
Nuclear heat exchangers	55	55	-	-	38	38
Industrial wood-fired boilers	10	10	-	-	88	88
Methanol (including natural and synthetic)	497	206	225	66	27	38
Ethanol	1,714	1,464	229	21	16	17
Noise pollution control	100	63	23	14	60	71
Highway barriers	100	63	23	14	60	71
Monitoring and analysis	12,148	1,296	5,284	5,568	35	12
Freezers and refrigerators	4	-	-	4	47	-
Microtomes	-	-	-	-	-	-
Laboratory separators (including centrifuges)	188	8	178	3	28	30
Chromatography instruments (including gas, liquid, and other)	676	195	391	90	20	22
Mass spectrometers	336	126	89	121	25	36
Industrial process monitoring devices	3,438	530	2,471	437	18	23
Radiation detection devices	332	120	148	64	19	23
Flow measurement devices	5,347	108	573	4,666	79	31
Continuing supply devices	23	-	-	23	41	-
Other scientific and analytical instruments	1,803	209	1,435	158	15	27

Note: Numbers may not add due to independent rounding.

(Z) Represents less than \$500,000.

Source: Survey of Environmental Products and Services sponsored by the Environmental Protection Agency, the International Trade Administration, and the Bureau of the Census.

Table 3: Receipts for Selected Services for Environmental or Potential Environmental Purposes: 1995

Selected services	Receipts for selected services (in millions of dollars)				The standard error of selected services (in percent)	
	All	For environmental purposes	NOT for environmental purposes	Purpose unknown	All	For environmental purposes
All Selected Services	111,106	55,720	54,313	1,073	22	8
Air Treatment	1,249	1,249	-	-	17	17
Air quality modeling	75	75	-	-	23	23
Emissions monitoring	704	704	-	-	29	29
Air sampling and analysis	117	117	-	-	22	22
Air quality assessment, evaluation and planning	353	353	-	-	17	17
Water and Wastewater Treatment	9,439	9,398	2	40	14	14
Hydrogeological services	1,036	1,036	-	-	56	56
Ground water resource analysis (including biomonitoring)	493	493	-	-	22	22
Health and ecological risk assessment	74	74	-	-	19	19
Water treatment planning and analysis	1,487	1,487	-	-	40	40
Water sampling and analysis	613	571	2	40	17	18
Sewerage systems (including design and operation)	2,569	2,569	-	-	25	25
Private water supply (including operation and management)	3,168	3,168	-	-	26	26
Solid Waste	35,839	34,728	929	182	12	12
Dump trucking	1,599	488	929	182	31	76
Waste collection and hauling	17,018	17,018	-	-	21	21
Hazardous material hauling	2,666	2,666	-	-	28	28
Waste disposal	6,331	6,331	-	-	25	25
Operation of sorting and separation systems	1,093	1,093	-	-	57	57
Landfill management	556	556	-	-	22	22
Landfill gas management	30	30	-	-	37	37
Ash management	35	35	-	-	46	46
Site remediation	2,743	2,743	-	-	13	13
Soil and surface treatment and management	607	607	-	-	18	18
Incinerator operations	837	837	-	-	44	44
Asbestos testing, inspection and disposal	325	325	-	-	21	21
PCB testing and disposal	58	58	-	-	23	23
Waste oil storage, processing and recovery	42	42	-	-	29	29
Oil spill clean-up	416	416	-	-	37	37
Hazardous clean-up and containment	1,235	1,235	-	-	33	33
Waste stabilization	201	201	-	-	57	57
Waste encapsulation	47	47	-	-	66	66
Monitoring, assessment, and analysis	4,895	4,071	809	15	20	24
Facility assessment and monitoring	2,263	2,263	-	-	43	43
Health, safety and toxicology support	196	196	-	-	21	21
Human health assessment	116	116	-	-	25	25
Ecological risk assessment	276	276	-	-	23	23
Ecological science services	350	350	-	-	27	27
Analytical laboratory services	1,694	870	809	15	14	14
Administrative, management, and engineering	59,684	6,275	52,573	836	41	13
Risk and liability assessment standards	211	211	-	-	30	30
Public education and training	561	68	492	1	63	33
Worker education and training	365	89	229	47	28	38
Management consulting	41,292	1,993	38,859	440	59	30
Standards and procedures development	179	179	-	-	37	37
Licensing and permitting	489	489	-	-	13	13
Information management	1,522	331	1,175	16	31	44
Regulatory and compliance reports (including Phase 1 and Phase 2 audits)	680	680	-	-	18	18
Engineering design	14,384	2,234	11,818	332	12	22

Note: Numbers may not add due to independent rounding.

Source: Survey of Environmental Products and Services sponsored by the Environmental Protection Agency, the International Trade Administration, and the Bureau of the Census.

Table 4: Receipts for Selected Types of Construction Projects for Environmental or Potential Environmental Purposes: 1995

Selected types of construction projects	Receipts for selected types of construction projects (in millions of dollars)				Relative standard error (in percent)	
	All	For environmental purposes	NOT for environmental purposes	Purpose unknown	All	For environmental purposes
All Construction Projects	18,267	17,010	1,223	34	11	12
Water and Wastewater Treatment	16,465	16,465	-	-	12	12
Water treatment plants	2,710	2,710	-	-	34	34
Water lines	4,578	4,578	-	-	17	17
Sewage treatment plants	2,685	2,685	-	-	43	43
Sewage collection and disposal systems	329	329	-	-	46	46
Sewers	4,975	4,975	-	-	20	20
Storm catchments and barriers	1,188	1,188	-	-	19	19
Solid Waste	440	440	-	-	52	52
Waste disposal plants	368	368	-	-	61	61
Industrial incinerators	25	25	-	-	32	32
Nuclear reactor containment structures	47	47	-	-	35	35
Noise pollution control	1,361	105	1,223	34	44	55
Highway barriers	1,361	105	1,223	34	44	55

Note: Numbers may not add due to independent rounding.

Source: Survey of Environmental Products and Services Sponsored by the Environmental Protection Agency, the International Trade Administration, and the Bureau of the Census.

Table 5: Value of Selected Product Shipments and Receipts for Selected Services and Types of Construction Projects for Environmental or Potential Environmental Purposes by Media: 1995

Selected products, services, and types of construction projects by media	Value of product shipments and receipts for services and types of construction projects (in millions of dollars)				Relative standard error (in percent)	
	All	For environmental purposes	NOT for environmental purposes	Purpose unknown	All	For environmental purposes
All products, services, and construction	166,237	87,109	70,735	8,393	15	6
Air Treatment	5,988	5,877	82	29	15	15
Manufacture of:						
Particulate emissions collectors	793	793	-	-	21	21
Gaseous emissions control systems and devices	382	382	-	-	19	19
Catalytic converters	2,702	2,702	-	-	30	30
Onboard monitoring and control systems	(Z)	(Z)	-	-	52	52
Gas detectors	242	174	46	22	25	28
Gas separating equipment	63	22	34	7	21	34
Odor control equipment	6	4	2	(Z)	19	23
Other air treatment equipment	551	551	-	-	41	41
Services for:						
Air quality modeling	75	75	-	-	23	23
Emissions monitoring	704	704	-	-	29	29
Air sampling and analysis	117	117	-	-	22	22
Air quality assessment, evaluation, and planning services	353	353	-	-	17	17
Water and Wastewater Treatment	36,408	31,093	4,322	995	8	8
Manufacture of:						
Desalination equipment	326	267	39	19	27	28
Storage tanks and process vessels (including pressure)	1,338	488	731	119	17	31
Industrial separators (including centrifuges)	399	228	136	35	14	20
Level and flow leak detectors and sensors	172	98	58	16	22	33
Fluid filters (including housings)	729	232	366	131	15	22
Sewage treatment equipment	792	792	-	-	12	12
Pack tower aerators	11	11	-	-	37	37
Deionization equipment	811	811	-	-	93	93
Automated sampling equipment	12	11	1	-	32	32
Manual sampling equipment	1	1	-	(Z)	43	46
Pumps	2,101	362	1,380	359	10	15
Other water and wastewater equipment	2,003	534	1,288	181	53	24
Water treatment boiler compounds	371	279	72	20	22	28
Water treatment cooling tower compounds	582	453	94	35	22	27
Other water and wastewater compounds	856	662	155	39	18	22
Services for:						
Hydrogeological services	1,036	1,036	-	-	56	56
Groundwater resource analysis (including bio-monitoring)	493	493	-	-	22	22
Health and ecological risk assessment	74	74	-	-	19	19
Water treatment, planning, and analysis	1,487	1,487	-	-	40	40
Water sampling and analysis	613	571	2	40	17	17
Sewerage system (including design and operation)	2,569	2,569	-	-	25	25
Private water supply systems (including operation and management)	3,168	3,168	-	-	26	26
Construction of:						
Water treatment plants	2,710	2,710	-	-	34	34
Water lines	4,578	4,578	-	-	17	17
Sewage treatment plants	2,685	2,685	-	-	43	43
Sewage collection and disposal systems	329	329	-	-	46	46
Sewers	4,975	4,975	-	-	20	20
Storm catchments and barriers	1,188	1,188	-	-	19	19

Note: Numbers may not add due to independent rounding.

(Z) Represents less than \$500,000.

Source: Survey of Environmental Products and Services sponsored by the Environmental Protection Agency, the International Trade Administration, and the Bureau of the Census.

Table 5. continued: Value of Selected Product Shipments and Receipts for Selected Services and Types of Construction Projects for Environmental or Potential Environmental Purposes by Media: 1995

Selected products, services, and types of construction projects by media	Value of product shipments and receipts for services and types of construction projects (in millions of dollars)				Relative standard error (in percent)	
	All	For environmental purposes	NOT for environmental purposes	Purpose unknown	All	For environmental purposes
Solid Waste	38,021	35,882	1,538	600	11	12
Manufacture of:						
Storage containers (including metal and concrete)	879	260	266	353	15	29
Incinerators (including metal and concrete)	78	78	-	-	44	44
Compactors	76	41	6	29	19	24
Tank trucks	7	4	2	1	42	48
Dump trucks	141	81	60	-	46	64
Other trucks	312	47	265	-	79	48
Tire shredding machinery	7	7	-	-	51	51
Scrap baling machinery	188	143	10	35	27	34
Spill clean-up and containment equipment	25	25	-	-	44	44
Gas management equipment	1	1	(Z)	-	43	51
Pit and landfill liners	28	28	-	-	44	44
Services for:						
Dump trucking	1,599	488	929	182	31	76
Waste collection and hauling	17,018	17,018	-	-	21	21
Hazardous material hauling	2,666	2,666	-	-	28	28
Waste disposal	6,331	6,331	-	-	25	25
Operation of sorting and separation systems	1,093	1,093	-	-	57	57
Landfill management	556	556	-	-	22	22
Landfill gas management	30	30	-	-	37	37
Ash management	35	35	-	-	46	46
Site remediation	2,743	2,743	-	-	13	13
Soil and surface treatment and management	607	607	-	-	18	18
Incinerator operations	837	837	-	-	44	44
Asbestos testing, inspection and disposal	325	325	-	-	21	21
PCB testing and disposal	58	58	-	-	23	23
Waste oil storage, processing and recovery	42	42	-	-	29	29
Oil spill clean-up	416	416	-	-	37	37
Hazardous clean-up and containment	1,235	1,235	-	-	33	33
Waste stabilization	201	201	-	-	57	57
Waste encapsulation	47	47	-	-	66	66
Construction of:						
Industrial incinerators	25	25	-	-	32	32
Waste disposal plants	368	368	-	-	61	61
Nuclear reactor containment structures	47	47	-	-	35	35
Energy conservation	7,633	2,448	4,880	304	14	11
Manufacture of:						
Solar collectors (including active and passive)	23	23	-	-	42	42
Wind energy conversion (including turbines, turbine sets, windmills, and parts)	4,054	12	4,042	-	24	98
Residential photovoltaics	-	-	-	-	-	-
Industrial heat exchangers	1,279	678	384	217	10	14
Nuclear heat exchangers	55	55	-	-	38	38
Industrial wood fired boilers	10	10	-	-	88	88
Methanol (including natural and synthetic)	497	206	225	66	27	38
Ethanol	1,714	1,464	229	21	16	17
Noise pollution control	1,462	168	1,246	47	41	43
Manufacture of highway barriers	100	63	23	14	60	71
Construction of highway barriers	1,362	105	1,223	34	44	55

Note: Numbers may not add due to independent rounding.

(Z) Represents less than \$500,000.

Source: Survey of Environmental Products and Services sponsored by the Environmental Protection Agency, the International Trade Administration, and the Bureau of the Census.

Table 5. continued: Value of Selected Product Shipments and Receipts for Selected Services and Types of Construction Projects for Environmental or Potential Environmental Purposes by Media: 1995

Selected products, services, and types of construction projects by media	Value of product shipments and receipts for services and types of construction projects (in millions of dollars)				Relative standard error (in percent)	
	All	For environmental purposes	NOT for environmental purposes	Purpose unknown	All	For environmental purposes
Monitoring, assessment, and analysis	17,042	5,367	6,094	5,582	26	19
Manufacture of:						
Freezers and refrigerators	4	-	-	4	47	-
Microtomes	-	-	-	-	-	-
Laboratory separators (including centrifuges)	188	8	178	3	28	30
Chromatography instruments (including gas, liquid, and other)	676	195	391	90	20	22
Mass spectrometers	336	126	89	121	25	36
Industrial process monitoring devices	3,438	530	2,471	437	18	23
Radiation detection devices	332	120	148	64	19	23
Flow measurement devices	5,347	108	573	4,666	79	31
Continuing supply devices	23	-	-	23	41	-
Other scientific and analytical instruments	1,803	209	1,435	158	15	27
Services for:						
Facility assessment and monitoring	2,263	2,263	-	-	43	43
Health, safety and toxicology support	196	196	-	-	21	21
Human health assessment	116	116	-	-	25	25
Ecological risk assessment	276	276	-	-	23	23
Ecological science services	350	350	-	-	27	27
Analytical laboratory services	1,694	870	809	15	14	14
Administrative, management and engineering	59,683	6,274	52,573	836	27	18
Risk and liability assessment standards	211	211	-	-	30	30
Public education and training	561	68	492	1	63	33
Worker education and training	365	89	229	47	28	38
Management consulting	41,292	1,993	38,859	440	59	30
Standards and procedures development	179	179	-	-	37	37
Licensing and permitting	489	489	-	-	13	13
Information management	1,522	331	1,175	16	31	44
Regulatory and compliance reports (including Phase 1 and Phase 2 audits)	680	680	-	-	18	18
Engineering design	14,384	2,234	11,818	332	12	22

Note: Numbers may not add due to independent rounding.

Source: Survey of Environmental Products and Services sponsored by the Environmental Protection Agency, the International Trade Administration, and the Bureau of the Census.

Survey Scope and Sample Design

Survey Scope

The survey objective was to measure the size of the environmental industry. However, no official system for classifying goods and services for environmental purposes exists. In 1994, an interagency committee began the development of a list of these products and services. It drew on various definitions and informal classification systems, both private and public, as well as private sector input. A draft version of these products and services was published in the *Federal Register* for comments on September 1, 1995, and a public hearing was held September 22. The products and services used for this survey are designed to be compatible with the international system being developed by the Organization for Economic Cooperation and Development.

The organizations that comprise the industry are private businesses that manufacture the products or provide the services. However, several activities that may be considered environmental were specifically excluded, along with the organizations that primarily perform these activities. The excluded activities fall into three categories:

- a. *Public sector activities.* Public sector activities are performed by federal, state, or local governments. As an example, revenues for municipal solid waste removal performed by local government employees are excluded. Revenues to private waste removal companies for the same service under contract to a local government or private concern are included. Likewise, operational costs for publicly owned and operated water and wastewater treatment facilities are excluded, while revenues to private companies operating publicly owned water and wastewater treatment facilities are included. In general, products and services provided by governments are excluded. The same products and services provided by private businesses are included.
- b. *Services performed internally.* Costs of activities provided within a business for its own needs are excluded. Many large organizations have environmental offices that design and monitor systems for reducing or eliminating pollutants generated by the companies' facilities. These offices may develop internal standards and procedures for controlling pollution, obtaining licenses and permits, or preparing and submitting regulatory and compliance reports. All of these activities are within the scope of the survey when performed for the external market. If the office also provides these services for other organizations, the revenues generated are within this survey's scope.
- c. *Legal services.*

Reporting Units

A reporting unit was defined as a private business that made the products or provided the services deemed to be environmental, or potentially environmental. The manufacturing plant is the reporting unit for product information. Experience has shown that information about the shipments of products is likely to be available for individual plants.

The consolidated business enterprise is the reporting unit for service activities. While services would most likely be performed by operating establishments classified in SIC industries

to which the service is primary, our experience with service organizations indicates that information usually is available and controlled at the business headquarters or central office.

The construction projects of interest are generally built by establishments classified in one of three construction industries. Construction establishments often are formed temporarily to support current construction projects. They can be dissolved and a new establishment created for the next project. Therefore, the construction enterprise is the reporting unit for construction activities.

Creating the Frames

The first step in creating the frames was to determine which industries were likely to include the providers of the products and services. We identified 49 four-digit SIC industries to which the product, service, or construction project is primary. These industries are listed in Figure 2. In order to select samples of manufacturing plants, companies with service activities, and companies with construction activities which involve different types of reporting units and differing source information, we created a frame for each sector based on the 49 SIC industries. Some overlap occurred among the separate frames. There were 564 service and construction companies that also had establishments in the manufacturing frame. There were 197 companies that were in both the service frame and the construction frame.

The Manufacturing Frame. The ideal frame for selecting the sample of manufacturing plants would include plants that were known to make environmental products in 1995. With the extensive information available from other surveys on the types of products made in manufacturing plants, we were able to identify plants that made many of the selected products or similar products. The *1992 Census of Manufactures* was the most recent source of information containing comprehensive detailed product data. Plants that had reported values of shipments for at least one of the environmental products* in 1992 were included in the frame.

Plants may change product lines over time. Therefore, plants that made environmental products in 1992 may not have made the same products in 1995. Conversely, some plants may have made environmental products in 1995 but not in 1992. To represent this latter group, plants classified in the same SIC industry to which the product is primary were included in the frame. In addition, the frame was augmented with new plants in the primary industries that began operation after 1992 and which were identified in the 1993 and 1994 *Annual Survey of Manufactures*. The final frame contained over 32,000 distinct manufacturing establishments that made, or were likely to make, the selected product. These plants are often classified in the SIC industry to which the product is primary, but not always.

Service Companies. Without information to isolate specific establishments that provided environmental services in 1995, we selected companies with establishments likely to provide the services. For example, to represent environmental engineering activities, it was necessary to include companies with engineering establishments of all types. Therefore, a company was included in the frame for reporting environmental service activities if at least one of its establishments was classified in an SIC industry of establishments that primarily provide like ser-

* Products for environmental use can be classified in one of three ways: (1) the product is described by a unique classification code of seven digits, (2) the product is included in the description of a seven-digit code along with other products, or (3) the product is described by an aggregation of seven-digit codes. In some cases, an environmental product may be determined only by its ultimate use. For example, the category of pumps may include identical pumps that can be used in a variety of situations, some of which are environmental.

Figure 2: Industries Included in the Survey

<i>Manufacturing establishments that produce selected products in the following industries:</i>		<i>Service companies with activities in the following industries:*</i>	
2861	Gum and Wood Chemicals	4212	Local Trucking Without Storage
2869	Industrial Organic Chemicals, nec	4213	Trucking, Except Local
2899	Chemicals and Chemical Preparations, nec	4226	Special Warehousing and Storage, nec
3081	Unsupported Plastics Film and Sheet	4911	Electric Services
3272	Concrete Products, Except Block and Brick	4939	Combination Utilities, nec
3412	Metal Shipping Barrels, Drums, Kegs, and Pails	4941	Water Supply
3433	Heating Equipment, Except Electric and Warm Air Furnaces	4952	Sewerage Systems
3443	Fabricated Plate Work (Boiler Shops)	4953	Refuse Systems
3511	Steam, Gas, and Hydraulic Turbines, and Turbine Generator Set Units	4959	Sanitary Services, nec
3559	Special Industry Machinery, nec	7549	Automotive Services, Except Repair and Car Washes
3561	Pumps and Pumping Equipment	8711	Engineering Services
3564	Industrial and Commercial Fans and Blowers and Air Purification Equipment	8712	Architectural Services
3567	Industrial Process Furnaces and Ovens	8713	Surveying Services
3569	General Industrial Machinery and Equipment, nec	8731	Commercial Physical and Biological Research
3589	Service Industry Machinery, nec	8732	Commercial Economic, Sociological, and Educational Research
3599	Industrial and Commercial Machinery and Equipment, nec	8733	Noncommercial Research Organizations
3674	Semiconductors and Related Devices	8734	Testing Laboratories
3713	Truck and Bus Bodies	8741	Management Services
3714	Motor Vehicle Parts and Accessories	8742	Management Consultant Services
3821	Laboratory Apparatus and Furniture	8744	Facilities Support Management Services
3823	Industrial Instruments for Measurement, Display, and Control of Process Variables; and Related Products	8748	Business Consulting Services, nec
3824	Totalizing Fluid Meters and Counting Devices	8999	Services, nec
3826	Laboratory Analytical Instruments		
3829	Measuring and Controlling Devices, nec		
		<i>Construction companies with activities in the following industries:</i>	
		1611	Highway and Street Construction, Except Elevated Highways
		1623	Water, Sewer, Pipeline, and Communications and Power Line Construction
		1629	Heavy Construction, nec

nec = not elsewhere classified.

* Excludes companies in Major Group 49 owned by state or local government.

vices. The frame for services contained nearly 90,000 companies that had at least one operating unit classified in an industry to which the service was primary.

Construction Companies. The frame for construction contained over 16,300 companies that had at least one establishment classified in one of the three SIC industries.

Selecting the Sample

We planned a total sample of about 10,000 units, consisting of 3,000 manufacturing establishments and 7,000 service and construction companies. The breakout was based on the

judgment of the survey consultant whose experience indicated that the service sector is the largest component of environmental activity. The manufacturing sample was selected using a probability-proportionate-to size (PPS) design. The value of shipments of a given environmental product defined for the survey served as the basis for the plant's measure of size, or probability of selection for that product. Plants that manufactured more than one of the environmental products were assigned a probability of selection for each product. The plant's final probability of selection for the survey was the largest of these separate probabilities.

In addition to the plants known to have made one or more of the environmental products in 1992, we selected a sample of plants classified in the same industries in which the product is primary. The total value of shipments for these plants served as the basis for calculating their probabilities of selection. The level of reliability from the sample in this group was designed to be less than the level specified for the well-defined products since we did not expect much environmental activity from these plants. Under the PPS design, the larger the value of shipments of the product, the higher the plant's probability of selection for that product. The resulting sample size was 3,203 plants.

The samples from the service and construction frames were selected using the same design. Each company was assigned a measure of size based on the payroll of its establishments classified in the environmental service or construction industries. Total payroll served as the measure of size because we did not have values of receipts or revenues for establishments in these industries. As in manufacturing plants, companies with activity in more than one of the industries were assigned a probability of selection for each industry. A company's final probability was the maximum of these individual probabilities. Uniform relative standard error constraints were assigned for service industries and for construction industries so that target sample sizes of about 6,400 companies from the service industries and about 600 companies from the construction industries would be drawn. The resulting sample size was 6,312 companies with service activities, 573 companies with construction activities, and 70 companies selected from both the service and construction frames.

Survey Forms and Instructions

Designing the Forms and Instructions

We used mail-out/mail-back paper survey forms to collect the data. The forms were designed using the list of products and services announced in the *Federal Register* as defining the environmental industry. While some of the products and services are clearly for environmental use, others have multiple end-uses. Since respondents may not know the end-use of their products or services, we asked them first to report the value of the products or services listed. Then, we asked them if any portion was for environmental use. We gave them the opportunity to answer by means of a check box indicating “yes,” “no,” or “don’t know.” If they indicated “yes,” we asked them to report the part of the value for environmental use. Using this sequence, we were able to learn if respondents could distinguish products and services for environmental use from other products and services. Also, we learned whether they could report an associated value of the environmental portion. In addition to the value of environmental products and services, we asked respondents to report the value of products shipped that were exported and the revenues for services that were exported.

Distinctions Among Forms

As a means of reducing the burden on respondents and to avoid imposing a lengthy list of products on manufacturers, we grouped products into three lists that would likely be made by manufacturers with similar activities. These three manufacturing forms, a form listing service activities, and a form listing construction projects comprised the five forms we believed were manageable and at the same time somewhat tailored to the respondents.

The number of plants and companies that received forms was slightly lower than the number selected since the operational status of some of the businesses changed between the time the sample was selected and the time the forms were ready to mail. Before mailing, we updated the operational status of the selected businesses with more current information that showed some businesses had closed, had merged with, or been bought by another company.

One of the three manufacturing forms was sent to each selected manufacturing plant based on the products that brought it into the manufacturing frame. The service form was sent to companies selected because of their service activities. The construction form was sent to companies with construction activities. In total, 1,844 plants received Form EPS-1(M), 473 plants received Form EPS-2(M), and 714 plants received Form EPS-3(M) for manufactured products; 6,367 companies received Form EPS-1(S) for service activities; and 642 companies received Form EPS-1(C) for construction projects. Some companies received more than one form to cover multiple activities.

Excerpts from the forms and corresponding instructions follow. Page 17 shows the first page of Form EPS-1(M) for selected manufactured products. Forms EPS-2(M) and EPS-3(M) use the same first page differing only in the references to the form number. Pages 18 and 19 are the first pages of Forms EPS-1(S) and EPS-1(C). The structure of these pages is the same as the manufacturing forms with references to value of shipments and products changed to reflect service activities and construction projects. Page 20 is an example of the second page of each manufactured products and service activities form. The general instructions and the column headings are the same for each form. The manufacturing forms each include a subset of products listed in

Table 2 of the report. The service form includes the services listed in Table 3 of the report. Page 21 is the second page of the construction projects form, which does not include columns for export information. Following each list of products, services, or construction projects is a place for respondents to record all other activities of the organization and to record receipts for miscellaneous activities as shown on page 22.

All forms include a sheet of instructions shown on page 23. This page differs in references to the form numbers and to value of shipments or receipts as appropriate. Some instructions include definitions of selected products and services, pages 24 through 26.

NOTICE — Response to this inquiry is required by law (Title 13, United States Code). By section 9 of the same law, your report to the Census Bureau is confidential. It may be seen only by sworn Census employees and used only for statistical purposes. The law also provides that copies retained in your files are immune from legal process.

FORM **EPS-1(M)**
(7-5-96)

U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS

SURVEY OF ENVIRONMENTAL PRODUCTS

In correspondence pertaining to this report refer to this **CENSUS FILE NUMBER (11 digits)** ▶

IMPORTANT

Refer to the instructions and definitions before completing this form. Complete for the establishment specified in the address block.

RETURN COMPLETED FORM TO:

BUREAU OF THE CENSUS
1201 East 10th Street
Jeffersonville, IN 47132-0001

Item 1A OPERATIONAL STATUS (Mark (X) ONE box which best describes this company at the end of 1995.)

- 1 In operation
- 2 Temporarily idle
- 3 Sold or leased to another company – Report new owner or operator in item 1B – Give date
- 4 Permanently ceased operations – Give date

Date	
Month	Year

Item 1B NEW OWNER OR OPERATOR (If you marked "3" in item 1A)

Name

Number and street

City

State

ZIP Code

Employer identification number

SURVEY OBJECTIVE

This survey is designed to measure the size of the environmental industry. Please report the value of shipments or receipts for products you produce, that are used or can potentially be used, for measuring, preventing, limiting, or correcting environmental damage (both natural and man-made) to air, water, soil and the conservation of energy. Also report receipts for services related to the removal, transportation, storage, or abatement of waste, noise and contaminants. See the instruction sheet for detailed instructions and definitions.

GENERAL INSTRUCTIONS

1. Please complete and return this form in the envelope provided by the date printed on the top of this form.
2. **Reasonably accurate estimates are acceptable.**
3. If after reading the instructions, you have any questions pertaining to this survey or need help in completing it, call (301) 457-1907.
4. To request an extension of time for filing, please call 1-812-288-3331.

Item 2A TOTAL EMPLOYMENT

Report the average total employment for calendar year 1995. (If you report on Annual Survey of Manufactures form MA-1000, this is the same number you reported in Item 2e. If you do not, see Part B, item 2 of the instruction sheet.)

Number	
1	

Item 2B TOTAL WAGES

Report the total wages for the number of employees reported in item 2A, above, for 1995. (If you report on Annual Survey of Manufactures, form MA-1000, this is the same number you reported in Item 3A, line c.)

Dollars	
Mil.	Thou.
2	
\$	

Item 2C TOTAL VALUE OF SHIPMENTS

Report the total value of shipments for calendar year 1995. (If you report on Annual Survey of Manufactures, form MA-1000, this is the same figure you reported in Item 9A.)

3	
\$	

Item 3A ENVIRONMENTAL PRODUCTS

Did this company manufacture any products for environmental use during calendar year 1995? (See Item 4 for examples of these products.)

- 4 1 Yes – Continue with item 3B
 - 2 No
 - 3 Don't know
- } Skip to item 4 on page 2

Item 3B EMPLOYMENT DEDICATED TO ENVIRONMENTAL PRODUCTS

Of the total employment reported in item 2A, report the employment dedicated to the manufacture of environmental products.

Number	
5	

Item 3C WAGES DEDICATED TO ENVIRONMENTAL PRODUCTS

Report the wages for the environmental employment reported in Item 3B.

Dollars	
Mil.	Thou.
6	
\$	

Item 3D VALUE OF SHIPMENTS FOR ENVIRONMENTAL PRODUCTS

Of the total value of shipments in Item 2C, report the amount for environmental products.

7	
\$	

NOTICE — Response to this inquiry is required by law (Title 13, United States Code). By section 9 of the same law, your report to the Census Bureau is confidential. It may be seen only by sworn Census employees and used only for statistical purposes. The law also provides that copies retained in your files are immune from legal process.

FORM **EPS-1(S)**
(7-5-96)

U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS

SURVEY OF ENVIRONMENTAL SERVICES

In correspondence pertaining to this report refer to this **CENSUS FILE NUMBER (11 digits)** ▶

IMPORTANT

Refer to the instructions and definitions before completing this form. Complete for the entire company specified in the address block, exclude manufacturing facilities.

RETURN COMPLETED FORM TO:

BUREAU OF THE CENSUS
1201 East 10th Street
Jeffersonville, IN 47132-0001

Item 1A OPERATIONAL STATUS (Mark (X) ONE box which best describes this company at the end of 1995.)

- 1 In operation
- 2 Temporarily idle
- 3 Sold or leased to another company – Report new owner or operator in item 1B – Give date
- 4 Permanently ceased operations – Give date

Date	
Month	Year

Item 1B NEW OWNER OR OPERATOR (If you marked "3" in item 1A)

Name

Number and street

City

State

ZIP Code

Employer identification number

SURVEY OBJECTIVE

This survey is designed to measure the size of the environmental industry. Please report the value of shipments or receipts for products or services you produce, that are used or can potentially be used, for measuring, preventing, limiting, or correcting environmental damage (both natural and man-made) to air, water, soil and the conservation of energy. Also report receipts for services related to the removal, transportation, storage, or abatement of waste, noise and contaminants. See the instruction sheet for detailed instructions and definitions.

GENERAL INSTRUCTIONS

1. Please complete and return this form in the envelope provided by the date printed on the top of this form.
2. **Reasonably accurate estimates are acceptable.**
3. If after reading the instructions, you have any questions pertaining to this survey or need help in completing it, call (301) 457-1907.
4. To request an extension of time for filing, please call 1-812-288-3331.

Item 2A TOTAL EMPLOYMENT

Report the average total employment for calendar year 1995.

Number	
1	

Item 2B TOTAL WAGES

Report the total wages for the number of employees reported in item 2A, above, for 1995.

Dollars	
Mil.	Thou.
2	
\$	

Item 2C TOTAL VALUE OF RECEIPTS

Report the total value of receipts for services rendered for calendar year 1995.

3	
\$	

Item 3A ENVIRONMENTAL SERVICES

Did this company render any services for environmental purposes during calendar year 1995? (See Item 4 for a list of these services.)

- 4 1 Yes – Continue with item 3B
 - 2 No
 - 3 Don't know
- } Skip to item 4 on page 2

Item 3B EMPLOYMENT DEDICATED TO ENVIRONMENTAL SERVICES

Of the total employment reported in item 2A, report the employment dedicated to the rendering of environmental services.

Number	
5	

Item 3C WAGES DEDICATED TO ENVIRONMENTAL SERVICES

Report the wages for the environmental employment reported in Item 3B.

Dollars	
Mil.	Thou.
6	
\$	

Item 3D VALUE OF RECEIPTS FOR ENVIRONMENTAL SERVICES

Of the total value of receipts reported in Item 2C, report the amount for environmental services.

7	
\$	

NOTICE — Response to this inquiry is required by law (Title 13, United States Code). By section 9 of the same law, your report to the Census Bureau is confidential. It may be seen only by sworn Census employees and used only for statistical purposes. The law also provides that copies retained in your files are immune from legal process.

FORM **EPS-1(C)**
(5-20-96)

U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS

SURVEY OF ENVIRONMENTAL CONSTRUCTIONS

In correspondence pertaining to this report refer to this **CENSUS FILE NUMBER (11 digits)** 

IMPORTANT

Refer to the instructions and definitions before completing this form. For construction facilities, complete for the entire company specified in the address block.

RETURN COMPLETED FORM TO:

BUREAU OF THE CENSUS
1201 East 10th Street
Jeffersonville, IN 47132-0001

Item 1A OPERATIONAL STATUS (Mark (X) ONE box which best describes this company at the end of 1995.)

- 1 In operation
- 2 Temporarily idle
- 3 Sold or leased to another company – Report new owner or operator in item 1B – Give date
- 4 Permanently ceased operations – Give date

Date	
Month	Year

Item 1B NEW OWNER OR OPERATOR (If you marked "3" in item 1A)

Name		
Number and street	City	
State	ZIP Code	Employer identification number

SURVEY OBJECTIVE

This survey is designed to measure the size of the environmental industry. Please report the value of shipments or receipts for products or services you produce, that are used or can potentially be used, for measuring, preventing, limiting, or correcting environmental damage (both natural and man-made) to air, water, soil and the conservation of energy. Also report receipts for services related to the removal, transportation, storage, or abatement of waste, noise and contaminants. See the instruction sheet for detailed instructions and definitions.

GENERAL INSTRUCTIONS

1. Please complete and return this form in the envelope provided by the date printed on the top of this form.
2. **Reasonably accurate estimates are acceptable.**
3. If after reading the instructions, you have any questions pertaining to this survey or need help in completing it, call (301) 457-1907.
4. To request an extension of time for filing, please call 1-812-288-3331.

Item 2A TOTAL EMPLOYMENT

Report the average total employment for calendar year 1995.

Number	
1	

Item 2B TOTAL WAGES

Report the total wages for the number of employees reported in item 2A, above, for 1995.

Dollars	
Mil.	Thou.
2	
\$	

Item 2C TOTAL VALUE OF RECEIPTS

Report the total value of receipts for work done for calendar year 1995.

3	
\$	

Item 3A ENVIRONMENTAL PROJECTS

Did this company construct any projects for environmental use during calendar year 1995? (See Item 4 for a list of these projects.)

- 1 Yes – Continue with item 3B
- 2 No – Skip to item 4 on page 2

Item 3B EMPLOYMENT DEDICATED TO ENVIRONMENTAL PROJECTS

Of the total employment reported in item 2A, report the employment dedicated to the construction of environmental projects.

Number	
5	

Item 3C WAGES DEDICATED TO ENVIRONMENTAL PROJECTS

Report the wages for the environmental employment reported in Item 3B.

Dollars	
Mil.	Thou.
6	
\$	

Item 3D VALUE OF RECEIPTS FOR ENVIRONMENTAL PROJECTS

Of the total value of receipts reported in Item 2C, report the amount for environmental projects.

7	
\$	

Item 4 ENVIRONMENTAL PRODUCTS OF THIS ESTABLISHMENT DURING 1995

INSTRUCTIONS

1. General – The products listed below are manufactured by establishments in your industry. If you manufacture products not listed, describe and report them in the "all other products or services" section near the end of item 4. PLEASE DO NOT COMBINE PRODUCT LINES. If the information cannot be taken directly from your book records, REASONABLE ESTIMATES ARE ACCEPTED. Report all values in millions of dollars.

2. Value of shipments – Report, in column (a) below, the value of shipments for each of the products below for calendar year 1995.

3. Environmental shipments – In column (b) below, mark (X) the appropriate box to indicate whether or not products were manufactured for

environmental purposes for calendar year 1995. If yes, indicate, of the total in column (a), the value for each environmental product.

4. Exports – In column (c), mark (X) the appropriate box to indicate whether or not you exported products or services for calendar year 1995. If yes, indicate, of the total in column (a), the value exported.

5. All other products or services – Describe and report separately the value of shipments for all other products not listed and services rendered.

6. Miscellaneous receipts – Includes receipts for resales, (products bought and resold without further manufacturing) transportation, rental of equipment, etc.

ENVIRONMENTAL PRODUCTS	(a) Value of Shipments		(b) Environmental Shipments		(c) Exports			
	Dollars		Dollars		Dollars			
	Mil.	Thou.	Mil.	Thou.	Mil.	Thou.		
AIR TREATMENT	1011		1012		1013		1014	1015
Particulate emissions collectors (Item codes 4251-4258 on CIR MA-35J)	\$		1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know		\$		1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know	\$
Gaseous emissions control systems and devices (Item codes 4270-4376 on CIR MA-35J)	\$		1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know		\$		1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know	\$
Mobile Source Control	1031		1032		1033		1034	1035
Catalytic converters	\$		1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know		\$		1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know	\$
Gas separating equipment	1051		1052		1053		1054	1055
	\$		1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know		\$		1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know	\$
Odor control equipment	1061		1062		1063		1064	1065
	\$		1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know		\$		1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know	\$
Other air pollution equipment – <i>Specify</i>	1071		1072		1073		1074	1075
	\$		1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know		\$		1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know	\$
WATER and WASTEWATER TREATMENT	1081		1082		1083		1084	1085
Water treatment equipment			1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know				1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know	
Desalinization	\$				\$			\$
Storage tanks and process vessels (including pressure)	1091		1092		1093		1094	1095
	\$		1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know		\$		1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know	\$
Industrial separators (including centrifuges)	1101		1102		1103		1104	1105
	\$		1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know		\$		1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know	\$
Fluid filters (including housings)	1111		1112		1113		1114	1115
	\$		1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know		\$		1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know	\$

Item 4 CONSTRUCTION PROJECTS OF THIS COMPANY DURING 1995

INSTRUCTIONS

1. General – The projects listed below are constructed by companies in your industry. If you construct projects not listed, describe and report them in the "all other projects or services" section near the end of item 4. PLEASE DO NOT COMBINE CONSTRUCTION LINES. If the information cannot be taken directly from your book records, REASONABLE ESTIMATES ARE ACCEPTED.

2. Value of construction – Report all values in millions of dollars. The value of construction work done by general contractors and special trades contractors includes new construction, additions and alterations or reconstruction, and maintenance and repair construction work. Also include any construction work done by the reporting company for themselves.

3. Value of receipts – Report, in column (a) below, the value of receipts for work done on each project listed below for calendar year 1995.

4. Environmental receipts – In column (b) below, mark (X) the appropriate box to indicate whether or not any part of the work was for environmental purposes for calendar year 1995. If yes, indicate, of the total in column (a), the value of these environmental receipts.

5. Exports – In column (c), mark (X) the appropriate box to indicate whether or not you exported products or services for calendar year 1995. If yes, indicate, of the total in column (a), the value exported.

6. All other projects or services – Describe and report separately receipts for all other construction work not listed. Also report receipts for manufacturing and services rendered (i.e., analyzing, testing, designing, engineering, etc.)

7. Miscellaneous receipts – Includes receipts for resales, (products bought and resold without further manufacturing) transportation, rental of equipment, etc.

CONSTRUCTION PROJECTS	(a) Value of Receipts		(b) Environmental Receipts	
	Dollars		Dollars	
	Mil.	Thou.	Mil.	Thou.
Highway barriers	4011 \$		4012 1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know	4013 \$
Sewage collection and disposal	4021 \$		4022 1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know	4023 \$
Sewer	4031 \$		4032 1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know	4033 \$
Storm catchments and barriers	4041 \$		4042 1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know	4043 \$
Water line	4051 \$		4052 1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know	4053 \$
Industrial incinerator	4061 \$		4062 1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know	4063 \$
Nuclear reactor containment structure	4071 \$		4072 1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know	4073 \$
Sewage treatment plant	4081 \$		4082 1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know	4083 \$
Waste disposal plant	4091 \$		4092 1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know	4093 \$
Water treatment plant	4101 \$		4102 1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know	4103 \$

Item 4 ENVIRONMENTAL PRODUCTS OF THIS ESTABLISHMENT DURING 1995 - Continued

ENVIRONMENTAL PRODUCTS	(a)		(b)				(c)					
	Value of Shipments		Environmental Shipments				Exports					
	Dollars		Dollars				Dollars					
	Mil.	Thou.	Mil.		Thou.		Mil.		Thou.			
ALL OTHER PRODUCTS OR SERVICES – Describe and report separately all other products or services rendered.	6351		6352	1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know		6353		6354	1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know		6355	
	\$		\$		\$		\$					
	6361		6362	1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know		6363		6364	1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know		6365	
	\$		\$		\$		\$					
	6371		6372	1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know		6373		6374	1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know		6375	
	\$		\$		\$		\$					
	6381		6382	1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know		6383		6384	1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know		6385	
	\$		\$		\$		\$					
	6391		6392	1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know		6393		6394	1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know		6395	
	\$		\$		\$		\$					
MISCELLANEOUS RECEIPTS	9011		9012	1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know		9013		9014	1 <input type="checkbox"/> Yes – How much? → 2 <input type="checkbox"/> No 3 <input type="checkbox"/> Don't know		9015	
	\$		\$		\$		\$					
TOTAL Total value of shipments and receipts (totals in columns a and b should equal the totals reported in items 2c and 3d respectively)	9021					9023					9025	
	\$		\$		\$		\$					

REMARKS – Use this space for explanations in understanding your reported numbers or comments

Item 5 CERTIFICATION – This report is substantially accurate and has been prepared in accordance with instructions.

Name of person to contact regarding this report – <i>Print or type</i>				Telephone	Area code	Number	Extension
Company name							
Address							
Signature				Title		Date	

INSTRUCTIONS FOR COMPLETING FORM EPS-1(M) SURVEY OF ENVIRONMENTAL PRODUCTS AND SERVICES Environmental Products

GENERAL

Introduction

This survey covers establishments manufacturing products and companies, both service and construction, engaged in activities for an environmental industry. **Form EPS-1(M) and these instructions are for establishments that manufacture products for environmental use.** Keep a copy of this report for your files.

Scope of Survey

The environmental industry has been defined as any product or service used, or which can potentially be used for measuring, preventing, limiting, or correcting environmental damage (both natural and man-made) to air, water, soil, and the conservation of energy. It also includes receipts for the removal, transportation, storage, or abatement of waste, noise, and contaminants.

Burden Hour Statement

Public reporting burden for this collection of information is estimated at 2 hours per response, including time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or any other aspect of the collection of information, including suggestions for reducing this burden, to the Associate Director for Administration, Attn: Paperwork Reduction Project 0607-0392, Room 3104, FB-3, Bureau of the Census, Washington, DC 20233-6900.

Legal Authority and Confidentiality of Data

Response to this inquiry is required by law (Title 13, United States Code, sections 131 and 193). By section 9 of the same law, your report to the Census Bureau is confidential. It will be seen only by sworn Census Bureau employees and used only for statistical

purposes. The law also provides that copies retained in your files are immune from legal process. Response is not required to any information collection unless it displays a valid approval number from the Office of Management and Budget. This 8-digit number appears in the upper right corner of the form.

Filing the Report

Your completed report form should be returned to the Bureau of the Census, 1201 East 10th Street, Jeffersonville, IN 47132-0001, by the date printed on the top of the form. If your figures are not available within this time period, we will accept reasonable estimates.

Correspondence About Your Report

In any correspondence with the Census Bureau about your report, please include the title and number of the survey and the first 10 digits of the census file number shown in the address box of your report form. Direct any questions to the Bureau of the Census, Manufacturing and Construction Division, Washington, DC 20233-6900, or call (301) 457-1907 or fax (301) 457-1318. To request additional time to file, call our processing office on 1-812-288-3331.

Publication of Results of this Survey

The Census Bureau will publish industry totals as soon as possible after the necessary reports are received. Companies reporting in this survey may receive copies of this publication upon request to the Bureau of the Census, Manufacturing and Construction Division, Washington, DC 20233-6900.

REPORTING INSTRUCTIONS

Figures to be Reported

The figures to be reported are for calendar year 1995. Report all dollar amounts in thousands. If you cannot answer a question from your company records, **estimates are acceptable.** Report figures for the establishment shown in the address box. Do not combine plant locations.

Item 2A – TOTAL EMPLOYMENT

Report the average total employment. Report all full-time and part-time employees on the payroll of this establishment for calendar year 1995. This includes all persons on paid sick leave, paid holidays, and paid vacations. To calculate the average total employment, take the average employment for each quarter, sum, and divide by 4, enter this figure in Item 2A. (If you report on Annual Survey of Manufactures form MA-1000, this is the same number you reported in Item 2e.)

Item 2B – TOTAL WAGES

Report the gross earnings of all employees on the payroll of this establishment for calendar year 1995. (Total wages for the employees reported in Item 2A.) Include all forms of compensation, such as salaries, wages, commissions, dismissal pay, bonuses, vacation and sick leave pay, and compensation in kind, prior to such deductions as employees' Social Security contributions, withholding taxes, group insurance, union dues, and savings bonds. (If you report on Annual Survey of Manufactures, form MA-1000, this is the same number you reported in Item 3A, line c.)

Item 2C – TOTAL VALUE OF SHIPMENTS

Report the total value of shipments for this establishment. (If you report on Annual Survey of Manufactures, form MA-1000, this the same figure you reported in Item 9A.)

Item 3A – ENVIRONMENTAL PRODUCTS

Mark (X) the appropriate box to indicate whether or not your establishment manufactured products for environmental use. A list of these products appears in Item 4. If yes, continue with Item 3B; otherwise go to Item 4.

Item 3B – EMPLOYMENT DEDICATED TO ENVIRONMENTAL PRODUCTS

Of the total employment reported in Item 2A, report the employment dedicated to the manufacture of environmental products.

Item 3C – WAGES DEDICATED TO ENVIRONMENTAL PRODUCTS

Report the wages for the environmental employment reported in Item 3B.

Item 3D – VALUE OF SHIPMENTS FOR ENVIRONMENTAL PRODUCTS

Of the total in Item 2C, report the value of shipments for environmental products.

Item 4 – ENVIRONMENTAL PRODUCTS OF THIS ESTABLISHMENT DURING 1995

• Column (a) – Value of Shipments

Column (a) is a breakout of the total reported in Item 2c. Report the value of shipments for each of the products listed. Please do not combine product lines.

• Column (b) – Environmental Shipments

Column (b) is a breakout of Item 3D. Mark (X) the appropriate box indicating whether or not your establishment manufactured products for environmental purposes. If yes, indicate, of the total in column (a), the value of these environmental products.

• Column (c) – Exports

Mark (X) the appropriate box indicating whether or not you exported any products or services. If yes, indicate, of the total in column (a), the value of these exports.

SEE DEFINITIONS ON REVERSE SIDE

DEFINITIONS

AIR

Particular Emissions Collectors

Include –

- **Electrostatic precipitator** – A device which separates aerosol particulate matter (solid or liquid) from industrial gases by imparting an electric charge to the particles and removing them from the gas stream with the force created by an electric field.
- **Fabric filter** – A device in which the dust-bearing gas is passed through a fabric in such a manner that the dust particles are retained on the upstream or "dirty" gas side of the fabric, while the cleaned gas passes through the fabric to the downstream or "clean" gas side where it is removed by natural and/or mechanical means. The fabric may be of any fibrous material either natural or manmade.
- **Mechanical collector** – A device for which the separation in a dry state of entrained particulate material from a gas stream by the application of one or a combination of the following forces: centrifugal, inertial, and gravitational.
- **Wet scrubber** – A device for the removal of particulate contaminants from a gas stream by means of intimate contact with the scrubbing liquid. (If water is added in any form, consider it a scrubber, except wetted wall electronic precipitators and those devices which are primarily mechanical collectors.)

Gaseous Emissions Control Devices

Include –

- **Catalytic oxidation system (including heat recovery systems which are an integral part of the system)** – A device for the removal of combustible air contaminants in which the contaminant-laden stream is preheated by a suitable heating mechanism, then passed through a catalyst bed that initiates and promotes oxidation of the combustible contaminants to carbon dioxide, water vapor, and other compounds less noxious than those originally in the gas stream.
- **Thermal oxidation system** – A device for the correction of combustible air contaminants in which the contaminant-laden gas stream is passed over a burner or other suitable preheat device to a thermal residence chamber where the contaminant materials are oxidized to carbon dioxide, water vapor, and other materials less noxious than those originally in the gas stream.

- **Direct oxidation system** – A device for the destruction of concentrated combustible or oxidant streams in which the air contaminant is reacted directly with a fuel or with oxidizing air in a burner flame and the products of combustion exhausted into the atmosphere directly or through a suitable incineration chamber and stack.
- **Nitric oxide (NO) control systems** – Include both front-end control (e.g., low-noxious burners) and back-end control (e.g., selective catalytic reductions systems.)
- **Scrubber (gas absorber non-FGD)** – A device for the removal of soluble or reactive gaseous material from gas streams by contacting the stream with water, aqueous chemical solution, or other scrubbing liquid. This involves a chemical reaction.
- **Flue gas desulfurization systems (FGD)** – Chemical process plants designed primarily for the removal of sulfur oxides and other acid gases from gaseous products of combustion emitted to the atmosphere from the use of fossil fuels in boilers or other combustion devices operated for generation of thermal or electric energy. The system extends from gas inlet to gas discharge, including all required auxiliaries and controls.
- **Gas absorber** – A device for the removal of air contaminants by absorption on a surface-active solid, such as activated carbon or molecular sieves. Depending on the application, the absorbent is either discarded or regenerated.

WATER AND WATER TREATMENT

Desalinization – Equipment that removes salt from water to make it drinkable.

Sewerage treatment equipment – Any equipment used in the primary, secondary, or tertiary treatment of municipal sewage, black water, etc., to render it environmentally benign.

Pack tower aerators – Any device using air to degasify water.

Gas management equipment – Any equipment used to capture, direct, and/or flare landfill gas.

ENERGY CONSERVATION

Residential photovoltaic – Photovoltaic cells used to provide heating, cooling, and/or power.

Heat exchangers – Any device used for transferring heat from a hotter fluid (gas or liquid) to a colder fluid (gas or liquid) or vice versa.

DEFINITIONS

AIR

On board monitoring/control system – Any device or instrument that is part of the vehicle and is used to monitor and/or control air emissions.

MONITORING AND ANALYSIS EQUIPMENT

Microtomes – Any instrument used for cutting very thin sections for microscopic examinations.

Chromatography – Any device used for the separation of mixtures.

Mass spectrometers – Optical instrument used for observing and measuring the deviation of refracted rays.

Industrial process monitoring devices – Instruments and related products used to measure and/or monitor process variables. Exclude flow measurement devices and gas detectors.

Flow measurement devices – Any device which monitors and/or measures the rate of flow of gas or liquids.

Gas detectors – Any device used to measure, detect, or monitor the leakage and/or presence of gas.

DEFINITIONS

AIR

Emission monitoring – Monitoring of organic and inorganic contaminants (include bio-monitoring).

Analytical – Imperical and modeled analysis of air gathered at waste sites and/or simulated in labs.

WATER AND WASTEWATER

Hydrogeology – The geology of surface water and underground aquifers.

Ground water resource analysis – Measuring and evaluating physical and chemical properties and changes in aquifers.

Treatment planning and analysis – The development and testing of water and wastewater treatment regimes.

WASTE, MUNICIPAL AND INDUSTRIAL

Ash management – The handling, storage, and treatment of fly and bottom ash from coal fired power plants.

Site remediation – The restoration of a mining or other site subject to RCRA (Resource Conservation Recovery Act) and/or SMCRA (Surface Mine Conservation Recovery Act) provisions and the like. The neutralization and/or removal of soil and water contaminants left at a formerly used site.

Soil and surface treatment and management – The application of chemical and/or physical processes to remove contaminants and/or neutralize them.

PCB testing and disposal – Testing and/or disposal of polychlorinated biphenyl and related organics.

Waste stabilization – The process where volatile, often hazardous, waste is rendered inert.

Waste encapsulation – The process where waste is totally enclosed so that it cannot chemically or physically interact with anything outside.

ENGINEERING, RESEARCH, AND RELATED SERVICES

Standard and procedure development – Participation in the design of internal company manuals and operating procedures as well as assistance to government agencies.

Licensing and permitting – Assisting clients in obtaining required environmental permits and licenses.

Risk and liability assessment standards – Development of standards to measure environmental risk and potential liability from actions and waste stream discharge.

Data Collection Methods

Survey Mailing and Follow-up

The initial mailout of the forms began in August 1996. Companies were asked to return the form within 30 days. For companies that did not respond, we sent letters and duplicate forms at 45-day intervals encouraging their response. The last attempt to follow-up with companies not reporting was completed in December 1996. After allowing time to respond to this last request, we concluded data collection with 81 percent of the forms returned. These returns included companies that completed the entire form, companies that indicated they had no environmental activity, and companies that reported some data but could not provide the detail we requested.

Data Review

In January 1997, the review process began with a review of all forms that were returned. Some activities that were described in other categories were assigned to existing product or activity lines when possible. These entries showed that respondents did not find their entry on the list or did not recognize the terminology used. Some entries that appeared frequently but were not on the list were assigned separate codes so that they could be identified for further consideration.

The review identified inconsistency among data items on each return. During the initial review, it was apparent that many respondents omitted some entries that could be derived by default. For example, if the respondent indicated in Item 4 that some portion of their activity was for environmental purposes, then the check box entry in Item 3A was, by default, a “yes” response—the business manufactured products or provided services for environmental use. We applied logical tests and inserted this default response and others in mass to correct these reporting errors. After these two phases of review, the data were subjected to tests to identify other types of errors such as incorrect addition, reporting in incorrect units, errors of omission, and so forth.

Response

After correcting the forms for inconsistencies, we tallied the returns by those with and without environmental activities, those that indicated use unknown, and those that had no information. This tally is shown in Table 6. Of the 8,117 forms returned, 1,431 did not have sufficient information to include in the estimates. The balance of 6,686 returns were used in the calculations. These responses were adjusted to account for responses that were not used and for companies that did not return a form at all. The adjustment technique for nonresponse is discussed in the next section.

Table 6: Responses By Type of Form and With and Without Environmental Activity

Type of form	Number Mailed	Amount Returned		Environmental activity							
				Yes		No		“Don’t know”		Blank or indeterminate	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
EPS-1(M)	1,844	1,509	82	420	28	909	60	135	9	45	3
EPS-2(M)	473	358	76	110	31	187	52	49	14	12	3
EPS-3(M)	714	588	82	110	19	418	71	47	8	13	2
EPS-1(S)	6,367	5,159	81	1,147	22	3,687	71	122	2	203	4
EPS-1(C)	642	503	78	187	38	289	57	0	0	27	5
Total	10,040	8,117	81	1,974	24	5,490	68	353	4	300	4

Estimation Methods and Limitations of the Data

Estimation Methods

Most manufacturing estimates were generated using ratio estimation since 1992 Census shipments were available to serve as a benchmark for most of the items of interest. Though slightly biased, under most conditions ratio estimation is a more reliable estimator than the simple weighted estimator. For a given item, the ratio of the 1995 simple weighted estimate for that item to the 1992 simple weighted estimate of total shipments for the item was formed for plants in the sample. The final estimate was the product of this ratio and the 1992 Census value of shipments for the item. For some items, no Census data were available. Simple weighted estimation was used in these cases. All weights of manufacturing respondents were adjusted to account for nonresponse.

Simple weighted estimation was used to develop all estimates for the service and construction sectors. Simple weighted estimates for a given item were formed by applying the sample weight (adjusted for nonresponse) to the item value and summing over all companies. Simple weighted estimation is an unbiased estimation procedure. However, the nonresponse weight adjustment described below introduced some bias to the resulting estimates.

Adjustment for Nonresponse

Since this was a first survey measuring specific environmental activities, we had no previous data on which to base estimates for nonrespondents or those who did not respond. Therefore, we chose to adjust weights of respondents to account for the nonrespondents. The adjustment was based on a measure that was known for all sample cases. The adjustment factor was the ratio of this weighted measure over the entire sample to the weighted measure for respondents. This factor was calculated for each SIC level for manufacturing. A slightly modified procedure resulted in two adjustment factors each for service and construction. While any adjustment for nonresponse introduces some bias in the estimates, the weight adjustment technique may have introduced more than imputation for each nonrespondent. The amount and direction of the bias is unknown, but the absolute amount is believed to be small.

Sampling Variability

The sample chosen for this survey is but one of many possible samples that could have been drawn utilizing the sampling methodology previously described. For a given item, each of these possible samples would likely yield different estimates. A measure of the variability of these possible estimates is provided by the standard error of the estimate. The standard error, in conjunction with the estimate itself, can be used to construct confidence intervals about the estimate. These intervals ascribe a probability or confidence that the coverage value falls within them. More precisely,

- a. the interval defined by one standard error above and below the sample estimate can be expected to include the complete coverage value with 67 percent confidence;
- b. the interval defined by two standard errors above and below the sample estimate can be expected to include the complete coverage value with 95 percent confidence; and

c. the interval defined by three standard errors above and below the sample estimate can be expected to include the complete coverage value with 99 percent confidence.

For the selected estimates, the tables provide estimated relative standard errors which are formed by dividing the standard errors by the associated estimates. A relative standard error can therefore be converted to a standard error by multiplying it by its associated estimate.

Nonsampling Error

Nonsampling errors inherent in any data collection arise from such sources as inaccurate identification of the appropriate person or location to respond, reporting errors from misunderstandings of the survey or deficiencies in the survey instructions and definitions, transcription errors, and nonresponse bias. Nonsampling errors related to routine survey processing are generally identified and corrected during the data review and analysis cycles using established mechanisms developed for other surveys. Because this survey is the first of its kind, we expected reporting errors to be more extensive than would be expected in an ongoing survey because of the respondents' lack of familiarity with the form and potential misinterpretation of the definitions and concepts.

The survey was designed to provide comprehensive measures of environmental activity only for the predefined list of products and services. In many instances, reporting these products and services depended on the respondents' perception of environmental activity. For some businesses, respondents may have indicated no environmental activity based on their perception that their company is not in an environmental business. For example, a respondent for a management consulting organization may not consider management consulting, in general, environmentally related and, consequently, may overlook management consulting services related to environmental projects. Likewise, businesses may not consider their products environmental. For example, some construction businesses reported receipts for erecting noise barriers but did not indicate that the noise barriers were for environmental purposes when, by definition, noise barriers are considered to be for the purpose of controlling noise pollution.

Some respondents indicated that they did not know the purpose of the product or service. The value represented by this category is included in the tables because we believe that some portion of it should be considered environmental. However, we have no measure of that portion.