Profile of the Healthcare Industry

EPA Office of Compliance Sector Notebook Project

SECTOR NOTEBOOKS

This report is one in a series of volumes published by the U.S. Environmental Protection Agency (EPA) to provide information of general interest regarding environmental issues associated with specific industrial sectors. A listing of available Sector Notebooks is included on the following page.

The Notebook will orient readers from a wide audience to the environmental responsibilities and challenges facing health service providers including major medical centers, ambulatory healthcare clinics, dental offices, doctors offices and veterinary clinics. The Notebook will be especially useful in educating those in industry as well as government and the general public who are unfamiliar with the complex environmental regulations that apply to the healthcare industry. With references for more detailed information, the Notebook will nicely complement new resources on compliance, environmental management systems, pollution prevention, and the nascent on-line healthcare environmental resource center.

Obtaining copies:

Electronic versions of all Sector Notebooks are available on EPA's web site at *www.epa.gov/compliance/sectornotebooks.html*.

A limited number of **complimentary volumes** are available to certain groups or subscribers, including public and academic libraries; federal, state, tribal, and local governments; and the media. You can order from EPA's National Service Center for Environmental Publications at **(800) 490-9198** or *www.epa.gov/ncepihom*. When ordering, use the applicable EPA publication number from those listed on the following page.

The Sector Notebooks were developed by the EPA's Office of Compliance. Direct general questions about the Sector Notebook Project to:

Coordinator, Sector Notebook Project
U.S. EPA Office of Compliance
1200 Pennsylvania Ave., NW (2224-A)
Washington, D.C. 20460
(202) 564-2310

AVAILABLE SECTOR NOTEBOOKS

Questions and comments regarding the individual documents should be directed to Compliance Assistance and Sector Programs Division at (202) 564-2310 unless otherwise noted below. **See the Notebook web page at: *www.epa.gov/compliance/sectornotebooks.html* for the most recent titles and links to refreshed data.**

EPA Publication Number	Industry
EPA/310-R-95-001.	Profile of the Dry Cleaning Industry
EPA/310-R-95-002.	Profile of the Electronics and Computer Industry*
EPA/310-R-95-003.	Profile of the Wood Furniture and Fixtures Industry
EPA/310-R-95-004.	Profile of the Inorganic Chemical Industry*
EPA/310-R-95-005.	Profile of the Iron and Steel Industry
EPA/310-R-95-006.	Profile of the Lumber and Wood Products Industry
EPA/310-R-95-007.	Profile of the Fabricated Metal Products Industry*
EPA/310-R-95-008.	Profile of the Metal Mining Industry
EPA/310-R-95-009.	Profile of the Motor Vehicle Assembly Industry
EPA/310-R-95-010.	Profile of the Nonferrous Metals Industry
EPA/310-R-95-011.	Profile of the Non-Fuel, Non-Metal Mining Industry
EPA/310-R-02-001.	Profile of the Organic Chemical Industry, 2nd Edition*
EPA/310-R-95-013.	Profile of the Petroleum Refining Industry
EPA/310-R-95-014.	Profile of the Printing Industry
EPA/310-R-02-002.	Profile of the Pulp and Paper Industry, 2nd Edition
EPA/310-R-95-017.	Profile of the Stone, Clay, Glass, and Concrete Industry
EPA/310-R-95-018.	Profile of the Transportation Equipment Cleaning Industry
EPA/310-R-97-001.	Profile of the Air Transportation Industry
EPA/310-R-97-002.	Profile of the Ground Transportation Industry
EPA/310-R-97-003.	Profile of the Water Transportation Industry
EPA/310-R-97-004.	Profile of the Metal Casting Industry
EPA/310-R-97-005.	Profile of the Pharmaceuticals Industry
EPA/310-R-97-006.	Profile of the Plastic Resin and Man-made Fiber Industry
EPA/310-R-97-007.	Profile of the Fossil Fuel Electric Power Generation Industry
EPA/310-R-97-008.	Profile of the Shipbuilding and Repair Industry
EPA/310-R-97-009.	Profile of the Textile Industry
EPA/310-R-98-001.	Profile of the Aerospace Industry
EPA/310-R-00-001.	Profile of the Agricultural Crop Production Industry Contact: Ag Center, (888) 663-2155
EPA/310-R-00-002.	Profile of the Agricultural Livestock Production Industry Contact: Ag Center, (888) 663-2155
EPA/310-R-00-003.	Profile of the Agricultural Chemical, Pesticide and Fertilizer Industry Contact: Agriculture Division, (202) 564-2320
EPA/310-R-00-004.	Profile of the Oil and Gas Extraction Industry
EPA/310-R-05-002.	Profile of the Healthcare Industry
EPA/310-R-05-003.	Profile of the Rubber and Plastic Industry, 2nd Edition
	Government Series
EPA/310-R-99-001.	Profile of Local Government Operations
EPA/300-B-96-003.	Profile of Federal Facilities
EPA/310-R-05-001.	Profile of Tribal Government Operations

* Spanish translations of 1st Editions available in electronic format only.

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Healthcare Industry - Including Hospitals, Physicians Offices, Dental Offices, Nursing Homes, etc. (NAICS 62)

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LIST OF ACRONYMS

ADA	American Dental Association
AFS	Air Facility Subsystem
AHA	American Hospital Association
AHCA	American Health Care Association
AHERA	Asbestos Hazard Emergency Response Act
AIRS	Air Facility Indexing and Retrieval System
AMA	American Medical Association
ANA	American Nurses Association
ANSI	American National Standards Institute
ASHE	American Society for Healthcare Engineers
ASHES	American Society for Healthcare Environmental Services
AST	Aboveground Storage Tanks
AVMA	American Veterinary Medical Association
BBP	Blood Borne Pathogens
BIF	Boilers and Industrial Furnaces
BOD	Biochemical Oxygen Demand
BRS	Biennial Reporting System
C&D	Construction and Demolition
CAA	Clean Air Act
CAM	Compliance Assurance Monitoring
CAP	College of American Pathologists
Cd	Cadmium
CDC	Centers for Disease Control
CERCLA	Comprehensive Environmental Response, Compensation, & Liability Act
CERCLIS	Comprehensive Environmental and Liability Information System
CESQG	Conditionally Exempt Small Quantity Generator
CFC	Chlorofluorocarbon
CFR	Code of Federal Register
CMS	Centers for Medicare and Medicaid Services
CSRD	Central Sterile Reprocessing and Distribution
CWA	Clean Water Act
DMR	Discharge Monitoring Reports
DOT	Department of Transportation
e-CFR	Electronic Code of Federal Regulations
ECHO	Enforcement and Compliance History Online
ECOS	Environmental Council of the States
EEG	Electroencephalograph
EMS	Environmental Management System
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
EPP	Environmentally Preferable Purchasing
EtO	Ethylene Oxide
FDA	Food and Drug Administration
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act

FQPA	Food Quality Protection Act
FRN	Federal Register Notice
FRS	Facility Registry Systems
GDP	Gross Domestic Product
H2E	Hospitals for a Healthy Environment
Hal	Hydrochloric Acid
HAP	Hazardous Air Pollutants
HAZWOPER	Hazardous Waste Operations and Emergency Response
HBN	Healthy Building Network
HCWH	Health Care Without Harm
Hg	Mercury
HHS	Health and Human Services
HMIWI	Hospital/Medical/Infectious Waste Incinerators
HVAC	Heating Ventilation and Air Conditioning
ICIS	Integrated Compliance Information System
IDEA	Integrated Data for Enforcement Analysis
IS	Information Services
ISO	International Organization for Standardization
JCAHO	Joint Commission on Accreditation of Healthcare Organizations
LDR	Land Disposal Restrictions
LEPC	Local Emergency Planning Committees
LQG	Large Quantity Generators
MACT	Maximum Achievable Control Technology
MCL	Maximum Containment Levels
MCLG	Maximum Containment Level Goals
MMS	Minerals Management Service
MOU	Memorandum of Understanding
MRI	Magnetic Resonance Imaging
MS4	Municipal Separate Storm Sewer Systems
MSDS	Material Safety Data Sheet
MSW	Municipal Solid Waste
MWTA	Medical Waste Tracking Act
NAAQS	National Ambient Air Quality Standards
NAICS	North American Industry Classification System
NCDB	National Compliance Database
NEETF	National Environmental Education & Training Foundation
NESHAP	National Emission Standards for Hazardous Air Pollutants
NET	National Emission Trends
NIHE	National Institute for Health and the Environment
NLIC	National Lead Information Center
NOVs	Notices of Violation
NO_x	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
NPIC	National Pesticide Information Center
NRC	Nuclear Regulatory Commission
NSPS	New Source Performance Standards

NSR	New Source Review
NTI	National Toxics Inventory
OAR	Office of Air and Radiation
OB/GYN	Obstetrics and Gynecology
OECA	Office of Enforcement and Compliance Assurance
OSHA	Occupational Health and Safety Administration
OSWER	Office of Solid Waste and Emergency Response
P2	Pollution Prevention
P2OSH	Pollution Prevention and Occupational Safety and Health
Pb	Lead
PCB	Polychlorinated Biphenyls
PCS	Permit Compliance System
PEER	Public Entity Environmental Resource Center
POTW	Publicly Owned Treatment Works
PSD	Prevention of Significant Deterioration
PVC	Polyvinyl Chloride
RCC	Resource Conservation Challenge
RCRA	Resource Conservation and Recovery Act
RCRAInfo	Resource Conservation and Recovery Act Information System
RMW	Regulated Medical Waste
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SERC	State Emergency Response Commissions
SHP	Sustainable Hospitals Project
SIC	Standard Industrial Classification
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
SPCC	Spill Prevention Control & Countermeasure
SQG	Small Quantity Generators
SWDA	Solid Waste Disposal Act
TCLP	Toxicity Characteristic Leaching Procedure
TIP	Tribal Implementation Plans
TRI	Toxic Release Inventory
TRIS	Toxic Release Inventory System
TSCA	Toxic Substances Control Act
TSS	Total Suspended Solids
UIC	Underground Injection Control
USDW	Underground Sources of Drinking Water
USPS	United States Postal Service
UST	Underground Storage Tanks
VOC	Volatile Organic Compounds

I. INTRODUCTION TO THE SECTOR NOTEBOOK PROJECT

I.A. Summary of the Sector Notebook Project

Environmental policies based upon comprehensive analysis of air, water, and land pollution (such as economic factors and community-based approaches) are becoming an important supplement to traditional single-media approaches to environmental protection. Environmental regulatory agencies are beginning to embrace comprehensive, multi-statute solutions to facility permitting, compliance assurance, education/outreach, research, and regulatory development issues. The central concepts driving this policy are that pollutant releases to each environmental medium (air, water, and land) affect each other, and that environmental strategies must actively identify and address these interrelationships by designing policies for the whole facility. One way to achieve a whole-facility focus is to design environmental policies for similar industrial facilities. By doing so, environmental concerns that are common to the manufacturing of similar products can be addressed in a comprehensive manner. Recognition of the need to develop the industrial sector-based approach within EPA's Office of Compliance led to the creation of this document.

The Sector Notebook Project was initiated by the Office of Compliance within the Office of Enforcement and Compliance Assurance (OECA) to provide its staff and managers with summary information for specific industrial sectors. As other EPA offices, states, the regulated community, environmental groups, and the public became interested in this project, the scope of the original project was expanded. The ability to design comprehensive, common-sense environmental protection measures for specific industries is dependent on knowledge of several interrelated topics. The key topics examined for this project are: general industry information (economic and geographic); a description of activities; pollution outputs; pollution prevention opportunities; federal statutory and regulatory framework; compliance history; and a description of partnerships that have been formed between regulatory agencies, the regulated community, and the public.

For any given industry, each topic listed above could alone be the subject of a lengthy volume. However, in order to produce a manageable document, this project focuses on providing summary information for each topic. This format provides the reader with a synopsis of each issue, and references where more in-depth information is available. Text within each profile was researched from a variety of sources, and was usually condensed from more detailed sources pertaining to specific topics. This approach allows for a wide coverage of activities that you can further explore using references listed at the end of this profile. As a check on the information included, each Notebook went through an external document review process. The Office of Compliance appreciates the efforts of all those who participated in this process and enabled us to develop more complete, accurate, and up-to-date summaries. Many of those who reviewed this Notebook are listed as contacts in Section IX and may be sources of additional information. The individuals and groups on this list do not necessarily concur with all statements within this Notebook.

I.B. Additional Information

Providing Comments

OECA's Office of Compliance plans to periodically review and update the Notebooks and will make these updates available both in hard copy and electronically. If you have any comments on the existing Notebooks, or if you would like to provide additional information, please send them to: EPA Office of Compliance, Sector Notebook Project (2224-A), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Comments can also be sent electronically via the Sector Notebooks web page at: *www.epa.gov/compliance/sectornotebooks.html*. If you are interested in assisting in the development of new Notebooks, or if you have recommendations on which sectors should have a Notebook, please contact the Office of Compliance at (202) 564-2310.

Adapting Notebooks to Particular Needs

This Sector Notebook is meant to generally describe the healthcare industry on a national basis. In many instances, facilities within specific geographic regions or states may have unique characteristics that are not fully captured in these profiles. The Office of Compliance encourages state, tribal, and local environmental agencies and other groups to supplement or repackage the information included in this Notebook to include more specific industrial and regulatory information that may be available. Additionally, interested states and tribal governments may want to supplement the "Summary of Applicable Federal Statutes and Regulations" section with state, tribal, and local requirements. Compliance or technical assistance providers may also want to develop the "Pollution Prevention" section in more detail.

Updated Web Site Links

An updated list of all of the web links contained in this Notebook can be found at *www.hercenter.org/links*.

II. INTRODUCTION TO THE HEALTHCARE INDUSTRY

This section provides background information on the size, geographic distribution, employment, and economic condition of the healthcare industry. Facilities described within the document are also described in terms of their North American Industry Classification System (NAICS) codes. The NAICS, which was developed jointly by the United States, Canada, and Mexico to provide new comparability in statistics about business activity across North America, has replaced the U.S. Standard Industrial Classification (SIC) system, under which Health Services is designated 80. Facilities in the healthcare industry are identified under NAICS code 62.

Note that, while there are benefits to the NAICS codes for organizing categories of business, there are disadvantages in the case of the healthcare sector. For the most part, healthcare organizations, whether large or small, in-patient or outpatient, have some level of complexity to their operations and functions. Even small multi-service hospitals have complex service offerings, and generate a large variety of waste. Therefore, the NAICS code information presented below is supplemented with a more robust picture of the rapidly changing healthcare universe.

II.A. Introduction, Background, and Scope of the Notebook

The healthcare and social assistance industry (NAICS code 62) comprises many subsectors including ambulatory healthcare services, hospitals, nursing and residential care facilities, and social assistance. This Notebook focuses primarily on the activities performed at hospitals. However, many of these activities can be performed by others in the healthcare industry, and as such, this notebook applies to those providers as well.

The specific subsectors covered in this industry document are:

- **NAICS 621. Ambulatory Healthcare Services**. The following types of facilities are covered under this NAICS code:
  - Physicians' offices,
  - Dentists' offices,
  - Other health practitioners' offices,
  - Outpatient care centers,
  - Medical and diagnostic laboratories,
  - Home healthcare services, and
  - Other ambulatory healthcare services.

  These entities may be free standing and perhaps privately owned or may be part of a hospital or health system. Currently, most hospitals (NAICS 622) also offer ambulatory healthcare services. For some facilities, these services represent as much as 60-70 percent of hospital business. Much of this change has been driven by adjustments in healthcare finance and reimbursement, advances in technology, and new and effective

pharmaceuticals, that eliminate the need for inpatient and invasive care services.

Also of note is the growing emergence of complementary healthcare services that are also ambulatory in nature. These include chiropractic care, massage, acupuncture, and acupressure.

- **NAICS 622. Hospitals**. The following types of facilities are covered under this NAICS code:
  - General medical and surgical hospitals,
  - Psychiatric and substance abuse hospitals, and
  - Specialty (except psychiatric and substance abuse) hospitals.

  This category potentially includes many types of hospitals such as academic medical center/university-based/teaching hospitals, community hospitals, speciality hospitals (i.e., orthopedic or pediatric), and tertiary care facilities that are qualified to handle major trauma cases (i.e., burns and catastrophic accidents). There are also distinctions between public and private hospitals, hospitals that are part of a healthcare system (i.e., organizations such as Kaiser Permanente), Veterans Administration hospitals, and other types of facilities.

  Hospitals and healthcare systems are continually changing their service offerings, and responding to various internal and external forces including reimbursement issues, advances in technology, and shifts in the populations they serve.

- **NAICS 623. Nursing and Residential Care Facilities**. The following types of facilities are covered under this NAICS code:
  - Nursing care and assisted living facilities,
  - Residential mental retardation/health and substance abuse facilities,
  - Community care facilities for the elderly, and
  - Other residential care facilities.

  Nursing care and residential care facilities offer nonacute care to individuals, either those suffering from a chronic condition (e.g., dementia, developmental delay, multiple sclerosis, Parkinson's disease, autism), aging, or mental health problems.

  As population demographics in the United States shift and demand for care services and facilities increases, more and more facilities offering some component of the above services will arise.

The veterinary services industry (NAICS 541940) also performs many activities similar to the healthcare industry. Veterinary facilities may find some of the information in this Notebook relevant and useful.

- **NAICS 541940. Veterinary Services.** This industry includes establishments of licensed veterinary practitioners primarily in the practice of veterinary medicine, dentistry, or surgery for animals, and establishments providing testing services for licensed veterinary practitioners.

II.B. Characterization of the Healthcare Industry

II.B.1. Service Characterization

The healthcare industry provides a variety of services to support the healthcare needs of a community or individuals. Many of the activities in healthcare result in waste outputs and air or water pollution. In order to understand which activities generate polluting waste outputs, it is necessary to look at various functions within healthcare, and understand the products and supplies used and the resulting wastes. Much of the waste in healthcare is solid waste consisting of paper, cardboard, glass, plastic, and metals. A subcomponent of healthcare waste is biohazardous, or infectious waste. Another component is Resource Conservation and Recovery Act (RCRA) hazardous waste.

Healthcare is vastly different from the many industries that have a defined 'product line,' a finite number of input materials and defined and consistent 'waste outputs.' There are thousands of procedures, tests, processes, and activities, which encompass as many materials. The hazardous component in healthcare waste tends to be made up of small amounts of many different wastes, emanating from many different departments. Due to the decentralized nature of service delivery in healthcare, there can be various departments with different functions all generating various amounts of hazardous waste.

Hospitals are most often described by speciality or service areas. Some of these areas include, but are not limited to: cardiology, critical care, emergency services, family practice, facility engineering, general surgery, gynecology, infectious disease, internal medicine, laboratory and analysis, medical monitoring/computer services, morgue, neurology, neurosurgery, obstetrics, oncology, pathology, pharmacy, radiology, residential care, and urology.

II.B.2. Industry Size and Geographic Distribution

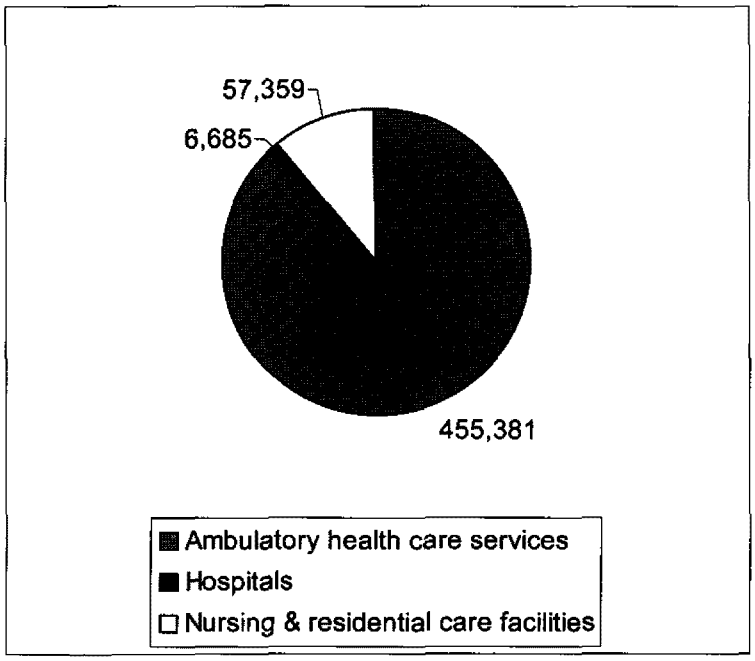
The healthcare industry impacts the lives of nearly every person in the United States. According to the 1997 Census of the Healthcare Industry (NAICS codes 621, 622, and 623), there are more than 500,000 healthcare facilities throughout the country, employing almost

12 million people, with an annual payroll of more than $353 billion. In 2002, the 5,794 registered[1] hospitals included 975,962 staffed beds and admitted 36,325,693 patients.

Hospitals alone contribute more than $1.3 trillion to the nation's economy, according to a TrendWatch report by the Lewin Group released at the 2004 AHA Annual Meeting in Washington. Hospitals employ nearly five million people, rank second as a source of private sector jobs, and directly or indirectly support one of every nine jobs in the United States.

Figure II-1 demonstrates how the healthcare industry is divided among ambulatory healthcare facilities, hospitals, and nursing and residential care facilities. The majority of the facilities, 88 percent, are ambulatory healthcare facilities. The remainder of the industry is divided between nursing and residential care facilities (11 percent) and hospitals (1 percent).

Figure II-1: Number of Establishments in the Healthcare Industry

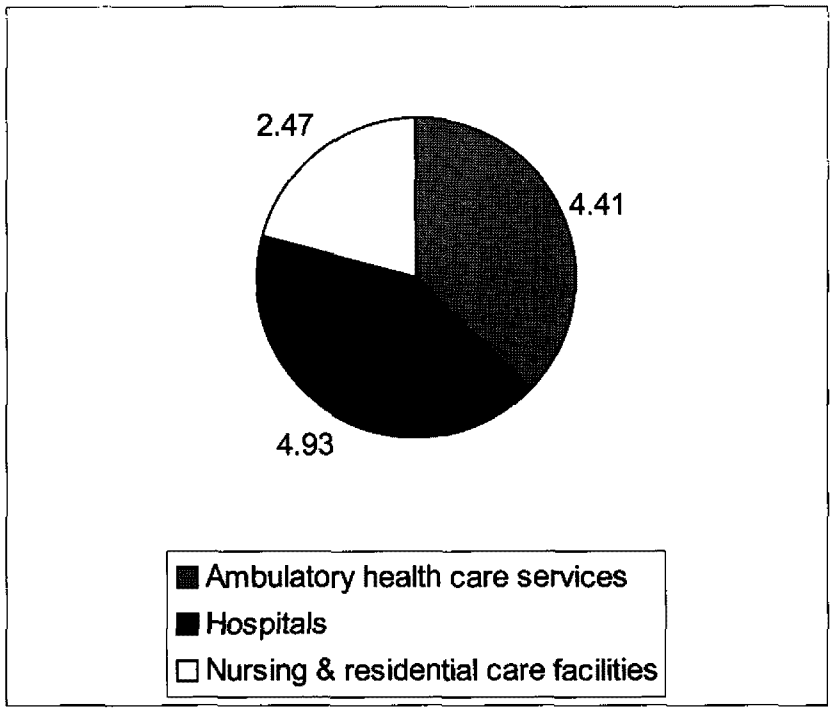


Source: The 1997 Economic Census of the Healthcare and Social Assistance Industry.

Although ambulatory healthcare facilities make up 88 percent of the healthcare facilities, hospitals have the most employees, totaling more than 42 percent of the industry. Ambulatory healthcare facilities have 37 percent of the healthcare staff, while nursing and residential care facilities have only 21 percent. Figure II-2 shows the number of employees by type of healthcare facility.

[1] Registered hospitals are those hospitals that meet the American Hospital Association's (AHA) criteria for registration as a hospital facility. Registered hospitals include AHA member hospitals as well as nonmember hospitals. For a complete list of the criteria used for registration, please see *http://www.hospitalconnect.com/aha/resource_center/*

Figure II-2: Number of Paid Employees (millions) by Type of Healthcare Facility

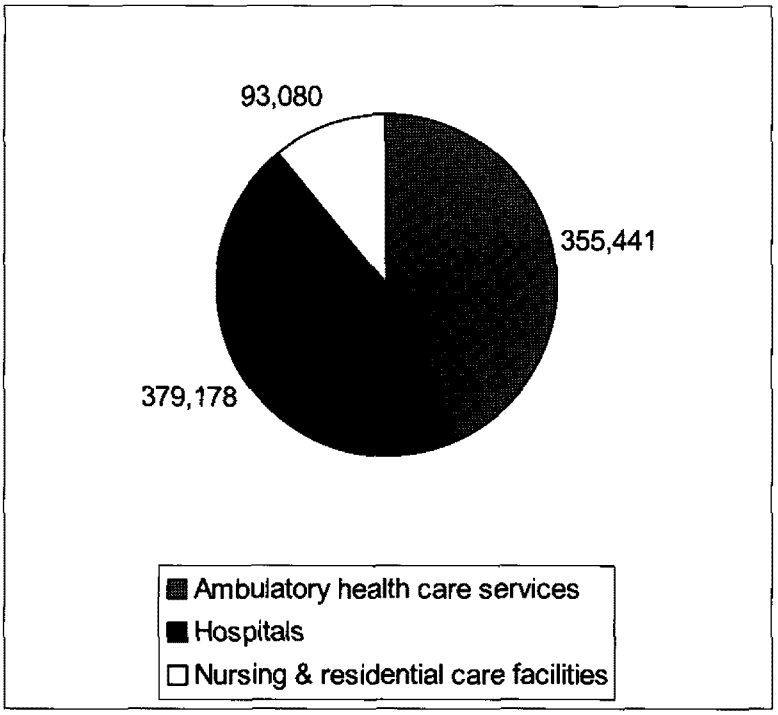


Source: The 1997 Economic Census of the Healthcare and Social Assistance Industry.

The revenue for healthcare facilities is divided unevenly across the number of ambulatory healthcare, hospitals, and nursing and residential care facilities. As shown in Figure II-3, the majority of the revenues, 46 percent, are from hospitals. It is important to once again note, however, that a large part of a hospital's service offerings are ambulatory healthcare offerings. There are also many hospitals/health systems that have affiliated nursing homes, residential care facilities and other healthcare sector entities that deliver service, which may not be reflected in the value of claims and revenues. The remainder is divided between ambulatory healthcare facilities (43 percent) and nursing and residential care facilities (11 percent). In the healthcare industry, these revenues come from:

- Patient care services (which includes laboratory services, diagnostic testing, and direct patient care);
- Home healthcare services, including sales of blood, blood products, organs and tissues, and ambulance services;
- Rental and leasing of goods and equipment, including both medical and "other"; and
- Other services and medical equipment related to prescription and nonprescription drugs, vision care services, orthopedic services, and other related needs.

Figure II-3: Value of Revenue in the Healthcare Industry (millions)



Source: The 1997 Economic Census of the Healthcare and Social Assistance Industry.

Healthcare establishments are concentrated in areas with high population density. California has the highest number of facilities, followed by New York, Texas, Florida, and Pennsylvania. California has more than 67,000 ambulatory healthcare, hospital, and nursing and residential facilities, which employ over one million people per year. Table II-1 presents the number of healthcare establishments, the number of healthcare employees, and the total healthcare receipts in each of the 50 states and the District of Columbia. The information is ordered by number of establishments.

Table II-1: Number of Healthcare Establishments, Number of Healthcare Employees, and Total Healthcare Receipts, by State

State	Establishments	Paid Employees	Receipts ($1,000)
California	67,049	1,084,719	93,742,883
New York	37,640	968,004	68,576,184
Texas	35,543	790,629	53,894,354
Florida	33,863	664,362	49,513,538
Pennsylvania	25,826	626,842	42,445,050
Illinois	21,107	519,598	36,820,144
Ohio	20,872	535,457	34,537,846
Michigan	19,135	431,813	29,168,412
New Jersey	18,508	354,546	27,056,992
Georgia	12,802	290,674	22,242,191
Massachusetts	12,799	389,529	25,146,242
North Carolina	11,669	319,631	21,908,538
Virginia	11,273	247,869	17,692,485
Washington	11,157	222,782	15,460,294
Maryland	10,709	225,103	15,968,224
Indiana	10,076	263,591	16,950,896
Missouri	9,813	274,628	17,365,887
Tennessee	9,756	257,050	18,489,619
Wisconsin	9,173	245,975	15,368,388
Arizona	8,800	159,723	11,947,321
Colorado	8,334	151,265	10,772,791
Minnesota	8,081	157,894	9,864,404
Louisiana	8,026	214,367	13,843,010
Connecticut	7,444	93,899	6,241,205
Oregon	7,212	127,530	8,518,910
Alabama	6,706	180,407	12,688,762
Kentucky	6,647	171,005	11,345,390
Oklahoma	6,601	147,287	8,832,649
South Carolina	5,783	136,320	9,597,946
Iowa	5,355	98,979	5,129,312
Kansas	4,868	66,756	3,667,767
Arkansas	4,471	108,101	6,870,149
Mississippi	3,828	112,359	7,577,714
Utah	3,658	71,790	4,795,081

Table II-1: Number of Healthcare Establishments, Number of Healthcare Employees, and Total Healthcare Receipts, by State (Continued)

State	Establishments	Paid Employees	Receipts ($1,000)
West Virginia	3,461	83,485	5,526,231
Nevada	3,010	49,295	4,434,559
New Mexico	2,933	64,709	4,134,335
Nebraska	2,847	48,392	2,865,939
Maine	2,777	37,388	2,272,419
Hawaii	2,430	22,932	2,090,765
Idaho	2,351	43,029	2,678,189
New Hampshire	2,256	55,401	3,618,105
Rhode Island	2,143	31,298	2,197,746
Montana	1,967	23,902	1,294,100
District of Columbia	1,496	47,742	4,194,304
South Dakota	1,363	41,507	2,371,023
Delaware	1,356	19,353	1,367,588
Vermont	1,274	27,330	1,589,182
Alaska	1,141	20,740	1,787,722
North Dakota	1,064	27,686	1,339,141
Wyoming	972	17,728	1,076,409

Source: The 1997 Economic Census of the Healthcare and Social Assistance Industry.

The 1997 Census information did not separate Veterinary Services (NAICS 541940) from the other industries within the 5419 code category. However, according to the American Veterinary Medical Association, as of September 2002, there are 61,477 veterinarians employed in about 21,044 veterinary practices located across the United States. These practices have a mean gross practice revenue of $677,823 per practice per year. This information includes both private clinical practices and public and corporate employment.

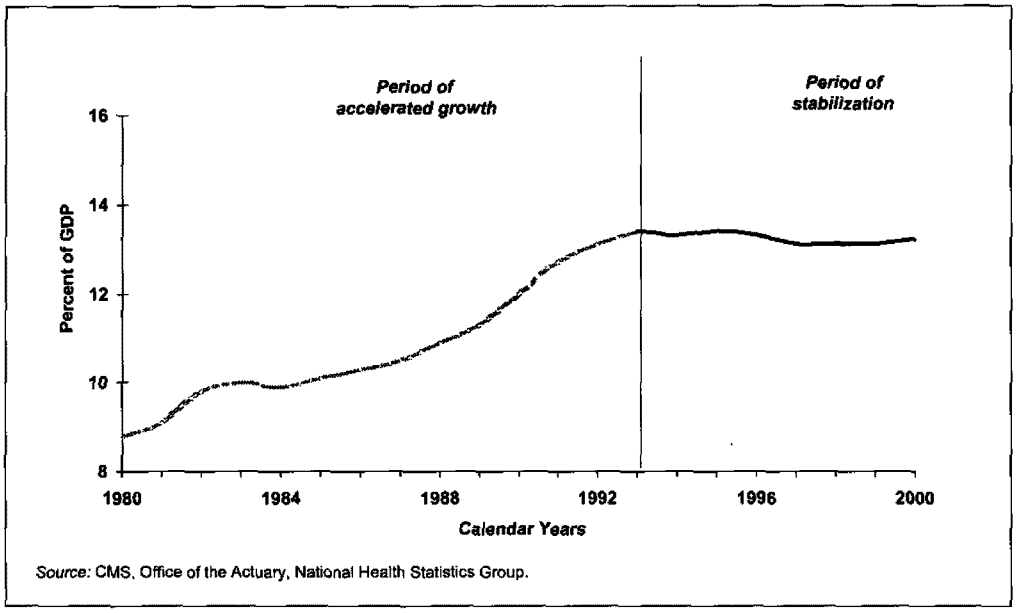
II.B.3. Economic Trends

Healthcare Expenditures as a Share of the Gross Domestic Product

According to the Centers for Medicare and Medicaid Services (CMS), the healthcare industry currently accounts for about 13 percent of the Gross Domestic Product (GDP) of the United States. By the year 2010, healthcare expenditures are expected to increase to 17 percent of the GDP. As shown in Figure II-4, the growth of spending has stabilized since 1993 because medical prices averaged only a 2.9 percent annual growth between 1993 and 1999. This growth is relatively minimal compared to the 11.2-percent average annual growth between 1980 and 1982, and the 6-percent average annual growth between 1982 and 1993. Another

factor to consider in this stabilization is the growth in the complementary care industry (i.e., nonallopathic healthcare services), which was reported to be about 42 billion dollars in the mid-1990s.

Figure II-4: National Healthcare Expenditures as a Share of the GDP



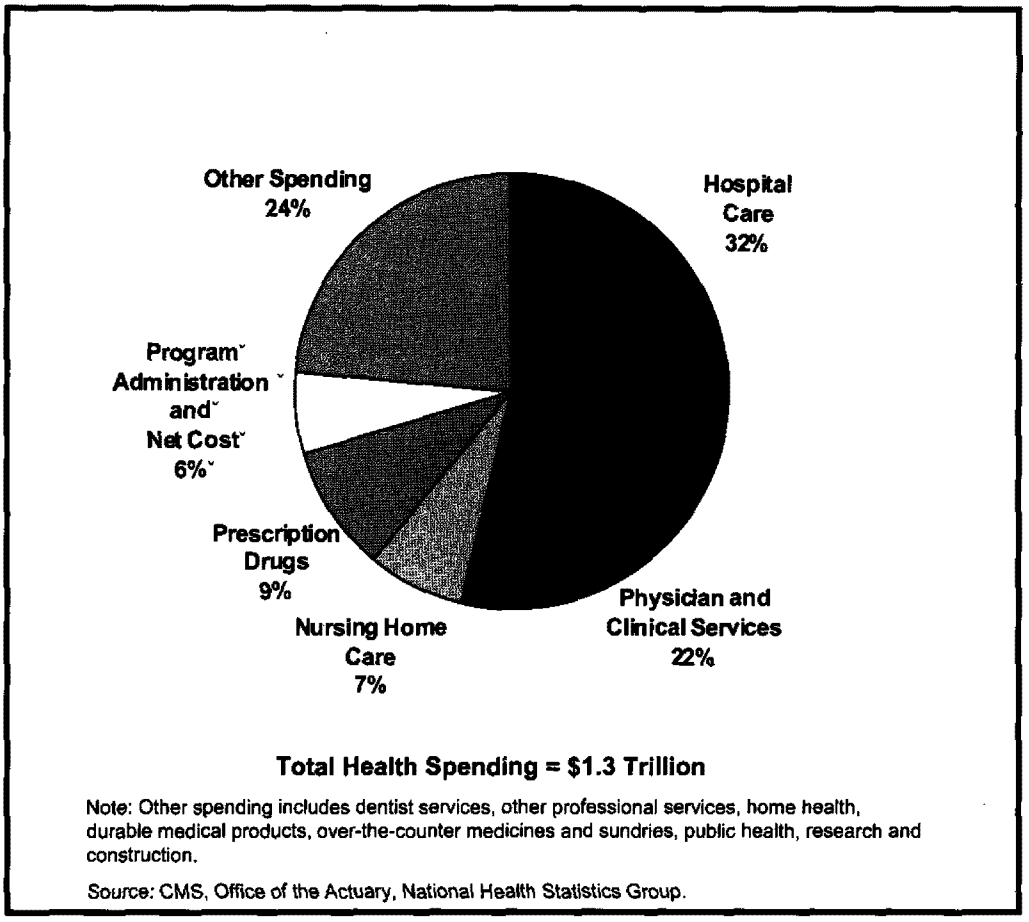
Source: June 2002 Centers for Medicare and Medicaid Services Report.

Healthcare Spending

In calendar year 2000, the United States spent $1.3 trillion on healthcare (NAICS code 62). Most of this money was split between hospital care (32 percent) and physician and clinical services (22 percent).

As shown in Figure II-5, prescription drugs accounted for 9 percent of the total healthcare spending in 2000. According to the CMS, between 1990 and 2000, prescription drug spending increased by more than 3 percent while the amount of money spent at hospitals decreased by 4.8 percent.

Figure II-5: The Nation's Health Dollar, CY 2000

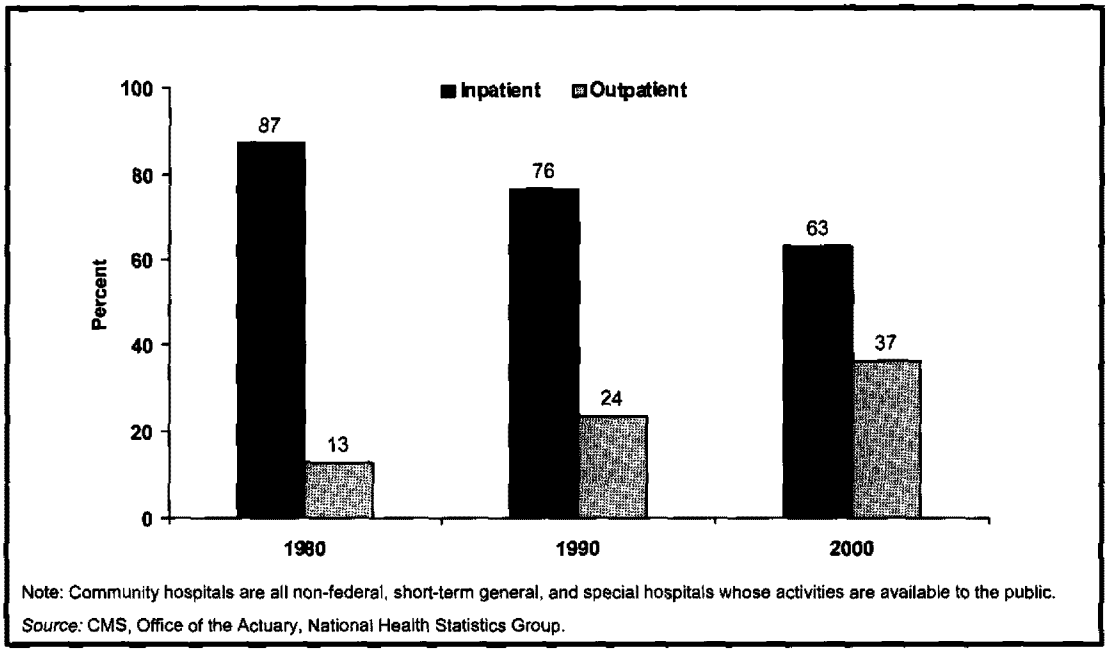


Source: June 2002 Centers for Medicare and Medicaid Services Report.

Inpatient Care Versus Outpatient Care

The implementation of Medicare prospective payment systems and the increased enrollment into various managed care programs have contributed to the decreased length of patient hospital stays since 1980. According to the CMS, in 1980, the average length of a hospital stay was between 7 and 8 days. In 1999, it was about 2 to 3 days. These factors, along with advances in technology and pharmaceuticals available to treat diseases, have also led to a decline in the number of inpatient hospital procedures. As shown in Figure II-6, inpatient care accounted for 87 percent of hospital procedures in 1980. In 2000, that number was down to 63 percent.

Figure II-6: Community Hospital Expenditures: Inpatient and Outpatient Shares for All Payers



Source: June 2002 Centers for Medicare and Medicaid Services Report.

III. ACTIVITY DESCRIPTIONS

As discussed in Section II.B.1 of this Notebook, the healthcare industry is most often described by speciality or service area. This section describes key functions within the healthcare industry that create wastes that must be carefully managed to mitigate environmental pollution.

Healthcare is a very dynamic field. Institutions are changing at a rapid rate, adding new activities and shedding others. To understand what wastes might be generated in any given facility, it is important to have a clear understanding of the activities that are housed in the facility. This section describes selected key activities and the wastes these activities create, and discusses issues related to proper handling and disposal. In some cases, it is the disposal decisions that are responsible for the pollution created, as in the case of waste incineration (i.e., dioxins and mercury air emissions) or mislabeled red bag waste. In other cases, it is the actual materials necessary to be used in healthcare processes that create the pollution (e.g., ethylene oxide used in sterilizing critical healthcare devices).

III.A. Healthcare Activities

Thousands of activities take place daily within the healthcare sector. While the desired outcome of delivering healthcare services is improved health for patients and the community, many of the activities of the healthcare sector are not directly related to patient care. Maintaining physical facilities, substantial amounts of diagnostic and testing activities, key administrative services, and research activities are not direct forms of patient care. In fact, the majority of wastes produced in a hospital (more than 50 percent of waste can be cardboard and office paper) never comes in direct contact with patients.

In some healthcare facilities, activity areas may be separately owned and operated, or run by contractors. It would not be unusual to find laboratory services at a hospital owned and run by a private firm, housekeeping run by a contract cleaning service, food service operated by another vendor or series of vendors, and dialysis run by another private service. As a result, knowledge of and control over environmental issues and wastes can be decentralized and scattered.

Producing an exhaustive list of every healthcare activity would be extremely cumbersome and ultimately would not focus on those functions within healthcare that create problem wastes and pollution. Nor would it equip the reader with information and strategies for identifying and mitigating the waste. Instead, this Notebook identifies 17 key functions and major activities that are the major sources of waste and pollution within health sector institutions. These activities, and the wastes produced and environmental impacts that may be associated with them, are described below.

Administrative Activities and Services

All healthcare settings include administrative functions, which can include offices, billing services, medical records, public relations/marketing, nursing care documentation, human resources, security services, social services/care management, retail services, shipping and receiving, and printing/copying.

From this standpoint, healthcare institutions can be viewed similarly to office settings. From an environmental management perspective, the majority of waste from these functional areas is paper. Specific activity locations within this category that deserve closer scrutiny include:

- **Shipping and Receiving** - The majority of "product" coming into any facility will pass through a central receiving area, where it is inventoried, temporarily warehoused, and then distributed to various departments. A number of hazardous materials used in any facility pass through this point, and some are stored here. It is important to note that some individual departments in some facilities may have direct ordering, bypassing shipping and receiving. These may include areas such as the lab, facilities management, food service, or housekeeping.

- **Retail Services** - Increasingly, hospitals are changing to respond to patient demands and to seek alternative revenue streams. To accomplish these goals, some facilities are bringing banking, childcare centers, shopping, and food services onto the hospital campus through a lease or other arrangements to provide patients with the ability to access their daily needs without running to different locations.

- **Printing and Copying Services** - These services range from individual printers and copiers found throughout the facility to centralized copy shops or even professional print shops.

Support Services

Both large and small facilities have a wide range of support services. These support services can include information services, food services, laundry services, pharmacy, central sterile reprocessing, and biomedical engineering. In some cases, the support services are contracted services. Wastes from support services vary greatly by support area.

- **Information Services (IS)** - The reliance on computers and electronic technologies for all levels of function is growing at a rapid pace. IS might be responsible for managing portable electronic devices and repairing or disposing of dysfunctional or older equipment including computers and monitors.

- **Purchasing** - All of the products that are handled by shipping and receiving are bought through the purchasing department. Wastes in this department consist mostly of paper and paper products but can also include pallets, shrink wrap, and cardboard.

- **Food Services** - Facilities use a large number and amount of products, from meats and vegetables, to canned goods, cleansers, disinfectants, and pesticides which generate solid and organic wastes. The food service at a large healthcare facility can be the largest restaurant in the community, and should be examined in that light from a compliance standpoint. These facilities store and use numerous chemical cleaners, and if "pest" control is not contracted out, a number of pest control devices and chemicals can be present. Additionally, chlorofluorocarbons might be present in freezer and refrigeration units. Special wastes, such as kitchen grease from fryalators need separate collection and disposal to avoid drain disposal or disposal as a "solid" waste. Drain disposal of wastewater from dishwashing and food preparation must also be monitored to avoid excess grease, harsh chemicals, or an excessive amount of organic substances (increased BOD) from being discharged to the sanitary sewer.

- **Laundry Services** - Although many healthcare facilities have contracted out to commercial laundries, some laundry services still exist within hospitals. Water use, boilers for hot water, detergents and disinfectants are all environmental areas of concern. Hospital laundries may process large quantities of linens contaminated by blood and body fluids. This is seldom of concern to a publicly owned treatment works (POTW) directly, but is the reason for the use of industrial detergents and disinfectants.

- **Pharmacy Services** - This is an essential service that includes the compounding and dispensing of pharmaceuticals. As they are received and prepared, large quantities of paper and plastic waste from product packaging and inserts are generated. Administering pharmaceuticals to patients and the resulting residual waste can take place in any number of clinical areas within a healthcare setting, including patient care floors, surgical suites, and free-standing clinic settings. Pharmaceuticals can also be packaged for administration in home-care settings. There are a number of common pharmaceuticals that are listed as RCRA P- or U- listed waste and many others that meet the criteria for RCRA characteristic waste. The pharmacy function may take place in one central location, may be off site, or may have a number of satellite sites throughout a facility. Of particular importance is the management of the large amounts of expired, unused, or partially used pharmaceuticals, the control of chemotherapeutic agents, and management of contaminated materials and containers, as well as residual or bulk amounts of chemotherapy product. Drug classes to be concerned about include: antineoplastic (toxic, mutagenic, persistent, accumulative), steroids (persistent, reproductive effects), antibiotics

(persistent, bacterial resistance), antifungal (toxic, mutagenic, target organs, endocrine effects), antiviral (toxic, mutagenic, chronic effects), vaccines with thimerosal (contains mercury), and contrast reagents (with barium). Of less concern are recombinant proteins, analgesics, antihistamines, antiemetics, and electrolytes.

- **Central Sterile Reprocessing and Distribution (CSRD)** - This service function provides support for surgical services and other departments requiring sterile products. Typically a CSRD unit includes a 'dirty' or decontamination area that receives and cleans used equipment, and a 'clean' area that manages sterilized and cleaned products for redistribution throughout the facility. CSRD units usually work very closely with surgical services units, endoscopy units and other care units requiring a ready supply of key materials routinely cleaned and distributed from within the organization. Often these areas house ethylene oxide sterilizers, steam sterilizers (autoclaves) and chemical treatment (steris, sterrad) units. Solid and biohazardous wastes are regularly generated in these areas. Select hazardous chemical wastes may be generated depending upon the types of processes used at a given site. Water discharges from chemical processes and autoclaves should be monitored. Air discharges should be monitored if ethylene oxide (EtO) is usedd.

- **Biomedical Engineering** - This service function provides support to the many types of equipment and devices used in providing direct patient care and support services. Biomedical engineering can be an in-house function or a contracted service and would include calibrating blood pressure monitoring devices (both mercury and nonmercury). Often, a mercury sphygmomanometer and/or barometer is used to aid in calibration. Biomedical engineering often handles the increasingly large quantity of batteries (including NiCD, NiHydride, Lead acid, Lithium, dry cell) that have to be tested and changed out in many different types of equipment.

Facilities Management, Maintenance, and Plant Operations

The maintenance of a hospital or healthcare facility includes housekeeping, maintenance shops (paint, electric, plumbing), heating ventilation and air conditioning (HVAC) systems, water treatment, waste treatment, aboveground tanks, underground tanks, fleet management, groundskeeping, and pest management. It is similar in many ways to the maintenance of a large commercial or light manufacturing facility. It has many of the same functions and generates many of the same environmental concerns involving waste, air, and water issues.

- **Housekeeping or Environmental Services** - Cleaning complex facilities with many varying needs for cleanliness, ranging from "clean" to "sterile," requires the use of chemical agents, technologies, and water. Maintaining surfaces (e.g., floors, walls, counters, sinks, toilets, furniture,

and equipment) requires the use of a large range of cleaners, disinfectants, and treatments. Cleaning floors can involve the use of strippers and waxes, as well as cleansers. Housekeepers are also often charged with collecting, transporting, and overseeing the storage of all the wastes generated, including solid waste, biohazardous waste, and hazardous chemical wastes. In addition, housekeepers often operate equipment that uses hydraulic fluids (compacters and balers).

- **Engineering and Maintenance** - These functions and the scope of this service is defined differently in different settings. Often, there is overlap between the housekeeping staff, maintenance staff, and engineering staff duties. Maintenance functions, including painting, electrical work, plumbing, and carpentry, are sometimes internal functions with full shop areas in place to provide these services. Solvents, degreasers, cleaners, oil paints, and a number of toxic and often flammable products are regularly used, stored, and disposed of. Large amounts of chemicals are required in maintaining the HVAC and water treatment systems, boilers, and coolers. Monitoring systems for air emissions and water discharges must be maintained. Staff serving in these functions also are often responsible for changing out lighting fixtures and bulbs, generating waste fluorescent bulbs and lighting ballasts. Mercury management is often a primary concern in this service, as mercury is often found in devices throughout the facility in thermostats, mercuric oxide batteries, switches and relays in alarms and other electrical equipment, gauges and switches on boilers, as well as in additives to paints, cleaners, and other chemicals.

- **Waste Treatment** - Technologies might be on site and in operation to treat the facility wastes. These technologies could range from wastewater pre-treatment, an incinerator (solid and biohazardous waste), to an autoclave (biohazardous waste) to distillation units for solvents, alcohols, and formalin (usually located in conjunction with the lab), to bulb crushers (fluorescent bulbs). Emissions (primarily air) are of concern with all of these, as are residual wastes. Additionally, the treatment and disposal process may convert some materials that are nonhazardous into hazardous waste. Incineration of PVC plastics, products, and packaging (which comprise a portion of plastic wastes in healthcare) can create dioxins when incinerated. Many facilities collect biohazardous waste in red bags and red sharps containers and certain chemotherapy wastes in yellow bags. The colors in these containers can be from cadmium-based pigments, although the use of cadmium has been phased out in recent years. Cadmium, a hazardous air pollutant, can be released if these containers are combusted as part of the treatment process.

- **Fleet Management** - Vehicles of various kinds can be owned, leased, or used through a contracted service. Facilities that maintain a fleet (this can range from golf carts, to cars, trucks and vans, to ambulances, to

helicopters) must determine how to address maintenance and cleaning of the vehicles, as well as fuel storage. Wastes to be addressed include waste oil, solvents, tires, batteries, and coolants/CFCs.

- **Groundskeeping** - Landscaping, mowing, snow removal, and pest management increasingly are services that are contracted out. Use of fertilizers, herbicides, pesticides, and deicing substances needs to be carefully monitored for releases and run-off. Similarly, pest control is often a contracted service.

Laboratory Services

Thousands of medical and diagnostic tests and services are performed on a daily basis, even in small labs serving healthcare facilities. These services can include hematology, microbiology, chemistry, blood bank, surgical pathology, and histology. The functions of laboratory testing are highly varied, and involve a number of separate processes. Labs use large volumes of a few chemicals (e.g., xylene, alcohol, formalin) and small quantities of a large number of other substances. Labs tend to expend many of the chemicals used in testing through evaporation or dilution and disposal to the sanitary sewer. Both air and water emissions are of concern. Larger quantities of some chemicals may be collected for disposal, or in some cases may be reprocessed for reuse within the lab. More information is available at: *Environmental Management Guide for Small Laboratories*, EPA 233-B-00-001, May 2000, Office of the Administrator (2131), *http://www.epa.gov/sbo/smalllabguide_500.pdf*.

Labs can be free-standing entities or part of a larger facility. If they are within a larger facility, they still may be privately owned and operated, or operated under contract. Consequently, responsibility for managing hazardous materials and wastes can be complicated.

Disinfecting equipment and materials is important to the accuracy of lab functions, so a range of disinfecting solutions is often found in labs. Autoclaves are often used to sterilize equipment that has been cleaned for reuse, and they may be available in labs to pretreat some wastes (e.g., culture plates) prior to disposal.

Many labs have automated chemical analyzer systems. These systems contain many reagent reservoirs and reagents with preservatives. It is often necessary to contact the manufacturer to identify all potential chemical waste locations within the system.

A range of mercury-containing devices in labs is still not uncommon, sometimes due to the age of equipment or interpretation of laboratory accreditation standards that require mercury calibration equipment.

Wastes that are commingled (biological samples and chemicals) are also common, especially in surgical pathology where tissue samples in formalin have to be processed and in many cases stored for extended periods.

Diagnostic Services

An increasingly diverse and large number of diagnostic services are now available. These can include, but are not limited to endoscopy, cardiac catheterization, radiology (CT, MRI, digital imaging), nuclear medicine, sleep studies labs, and electroencephalograph studies (EEG). Diagnostic services are often found in association with medical centers but in some cases can be free-standing facilities.

- **Endoscopy and Cardiac Catheterization** - New techniques in these areas have resulted in less biohazardous waste generation but an increased use of high-level disinfectants (e.g., glutaraldehyde) or sterilants (e.g., ethylene oxide (EtO) gas), both of which represent significant hazards as releases to water or air.

- **Radiology** - These functions have traditionally involved the use of film and film-developing chemicals. Radiology activities can occur within a hospital center, urgent care setting, outpatient clinic, dental offices, or other care areas that require X-rays to help evaluate healthcare conditions. Although many healthcare organizations are transitioning away from wet processing and silver-containing films to digital imaging and PAX-it brand systems, heavy metals waste is generated through a number of activities in Radiology. In particular, lead shields are used to shield patients from exposure. These shields wear out over time, and should be managed as a hazardous waste or sent back to the supplier for remanufacture into a smaller shield device. Additionally, contrast reagents are not always fully consumed by the patient and will result in hazardous waste if discarded unused.

- **Nuclear Medicine** - This branch of diagnostic testing primarily offers diagnostic imaging and radioisotope treatment. Radionuclides are used in various tests and procedures and require careful management, storage, and monitoring until they are safe for disposal. Radioactive waste may also be RCRA hazardous waste, which should be separated from the nonhazardous waste prior to decay storage.

Surgical Services

Surgical services include anesthesia, preoperative services, ambulatory outpatient services, surgery, and post-anesthesia care. Advances in surgery have vastly reduced the invasive nature of different procedures and correspondingly reduced the amount of biohazardous wastes (e.g., blood and body-fluid-contaminated wastes) generated. However, surgery functions still represent one of the highest waste-generating areas. Many of the new surgical devices represent environmental challenges, such as batteries with heavy metals that must be managed, or devices that require special chemical disinfection or sterilization.

In most areas, the majority of surgery is performed as ambulatory, or "day" surgery. These procedures do not require that patients stay overnight. As a result, what was previously a highly centralized function is now very decentralized, with many of the specialized wastes being generated outside of large institutions.

Special wastes can be found in anesthesia services and surgical pathology units. Anesthesiologists and nurse anesthetists administer to patients during surgical procedures and provide pain management services. Waste anesthetic gases from care delivery must be managed to prevent releases. Careful management of compressed gas cylinders (e.g., oxygen, nitrogen, and argon) is also a safety concern. Surgical pathology units can present a host of hazardous chemicals to monitor, as tissue samples are taken and preserved in formaldehyde, or a dilute version, formalin (e.g., biopsies and surgical excisions).

Inpatient Care Services

The need for inpatient care services has declined in the last decade, with an increasing number of services being offered on an out-patient basis (e.g., stay at the facility is less than 24 hours). Specialized treatment for many acute and chronic conditions or more serious illness or injury still requires overnight and longer terms stays in hospitals and other types of healthcare institutions. The primary concerns in waste are usually limited to the management of biohazardous wastes (mostly sharps), the use of cleaners and disinfectants, and, as in all patient care areas, the possible presence of mercury-containing devices (e.g., fever thermometers, sphygmomanometers, and a variety of pharmaceutical products). Some services, such as dialysis and oncology (discussed below), can be delivered in these areas. Inpatient care services include medical surgical care, orthopedic care, neurology care, urology care, cardiac care, psychiatric/behavioral health, geriatric care, palliative care, cancer care, maternal child care (labor and delivery/birthing, postpartum care, nursery, pediatrics), pediatric care, and rehabilitative care.

Critical Care Services

Critical care inpatient services such as surgical intensive care, medical intensive care, pediatric intensive care, cardiac intensive care, burn care, and neonatal intensive care are conducted in hospital facilities. Many critical care waste concerns are the same as in other inpatient service areas (discussed above). In addition, specialized monitoring equipment and an array of pharmaceuticals are used in these areas. Two common drugs used in critical care areas that become hazardous when disposed of are epinephrine and warfarin (Coumarin).

Emergency Care Services

Emergency care services are offered in different types of settings, both in very large and small hospitals, as well as in free-standing units. While care offered in these types of service units is meant to be limited in time and scope, they are often designed to provide a wide range of services, as their goal is to respond to "emergencies." These services entail a large degree of response to unpredictable situations, including emergency response to industrial accidents and bioterrorism incidents. Additionally, as the ranks of uninsured Americans grows,

it is common for individuals to seek routine care in emergency department settings, rather than at physicians' offices.

Emergency service areas are also responsible for disaster response management, and many institutions have set up decontamination rooms in association with emergency services. Such rooms are designed to allow individuals who have been exposed to chemicals or biological agents to be safely decontaminated before entering the emergency service area. Decontamination can involve using chemicals and copious amounts of water. Facilities should have a system of trapping the wastewater so that they can test and then properly manage the wastes.

Many emergency service waste concerns are the same as in other patient care service areas (see above) and include biohazardous wastes, chemicals for cleaning and high-level disinfection or sterilants, the possible presence of mercury-containing devices, and the possibility of pharmaceutical wastes.

Other activities that may also be present as part of emergency services include storing formalin for preserving specimens, operating X-ray technology, and managing photographic chemicals, wastewater, silver recovery, and films. Given the range of instruments used, there may also be disinfectant chemicals, such as glutaraldehyde, or other high-level disinfectants present.

Respiratory Care Services

A variety of wastes are generated through respiratory care functions, which include pulmonary function testing and oxygen therapies. Reprocessing some equipment may involve using high-level disinfectants. As in other patient care areas, mercury devices and batteries could be used. Special management concerns include pressurized tanks such as oxygen.

Dialysis

Dialysis can be conducted in a wide variety of settings, from homes to specialty clinics to large hospital facilities. There are different types of dialysis. Hemodialysis involves external technologies that filter the blood using a mechanical dialyzer. Peritoneal dialysis involves pumping dialyser fluids into the patient's abdominal cavity and using the peritoneum liner as a natural filter. Areas conducting hemodialysis can generate larger amounts of biohazardous wastes due to the nature of the process. The waste often contains large amounts of liquid and is heavy.

Hemodialysis equipment requires water treatment and the use of high-level disinfectants. In the past, formaldehyde was commonly used to clean machinery. Today, less toxic disinfectants are primarily used.

Physical Therapy/Occupational Therapy

Generally, these areas generate little waste of concern. As in other patient care areas, mercury devices could be used. Biohazardous waste, such as sharps, forceps, blades, or lancets may be generated, especially if wounds/burns are debrided and treated in these areas. If prosthetic devices are made on site, chemicals related to leather working (tanning chemicals, adhesives) and plastics molding may be used.

Outpatient Services (Nonsurgical)

Outpatient services include womens' health/gynecology, general medicine, family practice, specialty clinics (e.g., orthopedics, urology, pulmonology, allergy), pediatrics, and rehabilitative services.

Generally, these areas generate little waste of concern. As in other patient care areas, mercury devices could be used. In some cases, formalin may be used to preserve tissue samples (biopsy). Sharps management is the biohazardous waste management concern. As in many patient care functions, a variety of pharmaceutical products may be present. For example, trichloroacetic acid and potassium hydroxide, both characteristic (corrosive) wastes are usually used in OB/GYN practices.

Oncology/Cancer Care Services

Oncology care includes administering chemotherapy medications to cancer patients. In radiation oncology, treatment can involve intravenously administering radioactive isotopes and applying radiation externally to cancer patients. These treatment activities are sometimes grouped together but are often found separately. They may take place in either outpatient or inpatient settings. In some cases, chemotherapy is administered through home-based treatment programs.

Antineoplastic, or cytotoxic, agents that are used to produce chemotherapy solutions are generally procured through a central purchasing area or directly from the pharmacy. Chemotherapy medications may either be prepared in a special area within the hospital pharmacy or prepared in a special area in the oncology unit (in-patient or outpatient type of unit). The amount and type of chemotherapy found in any institution depends on the amount of care/ number of procedures provided and physician preferences for ordering pharmaceuticals. In the preparation area, work is conducted in a safety cabinet equipped with the appropriate filters. Facilities must maintain the filters and determine if they require special disposal, which is often done under a maintenance contract. Residuals from preparation include any contaminated materials including vials, bottles, IV bags, packaging, and personal protective equipment. Proper segregation containers need to be available for materials determined to be RCRA waste, or as nonhazardous materials (often personal protective equipment and packaging) that can be collected separately. Chemotherapy wastes that are not classified as RCRA waste must be properly labeled as chemotherapy-containing materials (e.g., collected in yellow bags) but they can be sent out for incineration (or other technologies as they become available) with the institution's biohazardous waste. Note that if an unregulated chemotherapy waste is

contaminated with a RCRA hazardous waste, RCRA regulations apply. Radiation therapy areas will contain radioactive materials that must be properly handled and monitored.

Dentistry

Dentistry services, including oral surgery, periodontics, and oral healthcare, are provided in a wide range of settings from individual private practices to dental surgery centers that are free standing or located within large teaching and research hospitals. It is estimated that dental facilities in the United States used 40 metric tons of mercury in 1997, which may be placed in teeth, recycled, discharged into wastewater, or disposed of as waste.[2] About 50 percent of dental amalgam is mercury. A study by the Association of Metropolitan Sewerage Agencies found that dental offices are the largest source of mercury to POTWs, contributing more than 35 percent of mercury influent to the POTWs studied.[3] Other studies have estimated the contributions to be as high as 80 percent.[4]

Mercury in dental amalgam can enter the environment in a variety of ways. Dental amalgam waste that is generated (for instance, excess amalgam that is not placed in a tooth, or amalgam that is captured by traps and filters in the dental office) can release mercury into the environment if it is not managed properly. When amalgam restorations are placed in or removed from teeth during dental work, amalgam can enter dental wastewater; when it reaches a wastewater treatment plant, a small percentage of the mercury in the amalgam will be discharged by the plant.

While amalgam has very low solubility in water, a small percentage can be released in a bioavailable form and be converted to methylmercury, the form that accumulates in the food chain, presenting potential health risks to humans and wildlife who consume contaminated fish. Most of the mercury that reaches sewage treatment plants (in excess of 90 percent) is likely to be captured by the treatment plant and enter the sewage sludge, or biosolids.[5] These biosolids may be land-applied, landfilled, or incinerated. Incineration will likely volatilize mercury back into the environment.

Other wastes from dentistry include X-ray wastes (developer chemicals, silver discharges, lead shields), high-level disinfectants, chemical sterilizers, nitrous oxide, and biohazardous wastes, especially sharps. A simple guide to waste management specific to dentistry practices and wastewaters can be found at the following web sites:

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[2] Stone, Mark E., DDS, 2004. "The Effect of Amalgam Separators on Mercury Loadings to Wastewater Treatment Plants," *CDA Journal*, Vol. 32, No.7, July 2004.

[3] Association of Metropolitan Sewerage Agencies (2002). *Mercury Source Control & Pollution Prevention Program Evaluation: Final Report.* March 2002 (Amended July 2002).

[4] Stone, 2004.

[5] Options for Dental Mercury Reduction Programs: Information for State/Provincial and Local Governments, A Report of the Binational Toxics Strategy, Mercury Workgroup Co-chairs
Alexis Cain, U.S. Environmental Protection Agency, Robert Krauel, Environment Canada,
http://www.epa.gov/region5/air/mercury/dentaloptions3.pdf, December 16, 2003, Revised August 4, 2004.

- A Guide for Dentists: How to Manage Waste From Your Dental Practice University of Wisconsin—Extension *http://www.uwex.edu/shwec/Pubs/pdf/guidefordentists.pdf*

- Guidelines for New Mexico Dental Facilities Waste-Management, Education and Research Consortium *http://www.cabq.gov/p2/pdfs/dentalbooklet.pdf*

- Characteristics and Treatment of the Dental Wastewater Stream University of Illinois, Chicago *http://www.wmrc.uiuc.edu/main_sections/info_services/library_docs/rr/RR-97.pdf*

- Options for Dental Mercury Reduction Programs: Information for State/Provincial and Local Governments, U.S. EPA and Environment Canada *http://www.epa.gov/region5/air/mercury/dentaloptions3.pdf*

- Northeast Waste Management Officials' Association (NEWMOA) has both a Dental Mercury Topic Hub *http://www.newmoa.org/Newmoa/htdocs/prevention/topichub/toc.cfm?hub=103&subsec=7&nav=7* and a list of links to articles , fact sheets, and case studies *http://www.newmoa.org/Newmoa/htdocs/prevention/topichub/bibliography.cfm?hub=103&subsec=7&nav=100*

- The Environmentally Responsible Dental Office: A Guide to Proper Waste Management http://www.delta-institute.org/pollprev/mercury/linkfiles/VTdentalguide.pdf

Animal Research and Testing

This testing represents a wide rage of activities that can occur at free-standing research laboratories or in association with healthcare facilities. The research is usually independently funded, varied, and conducted out of the usual system of procurement at the facility. The activities and wastes of concern can encompass all of those usually encountered in labs, with the addition of animal care and housing. Animal care facilities may have antibiotics and pharmaceuticals in the animal's drinking water. Also, the facility may wash the animal cages with corrosive reagents. The waste can also include chemicals and materials not usually associated with the general delivery of healthcare services. Any facility sponsoring animal research and testing should maintain an inventory of materials currently in use and stored at the facility.

Clinical Research

Like animal research and testing, clinical research represents a wide rage of activities that can take place at free-standing research laboratories or in association with healthcare facilities. The research is usually independently funded, varied, and conducted out of the usual system of procurement at the facility. The activities and wastes of concern can

encompass all of those usually encountered in labs and under many patient care and treatment activities. It can also include chemicals and materials not usually associated with the general delivery of healthcare services. Any facility sponsoring clinical research should maintain an inventory of materials currently in use and stored at the facility.

Construction and Renovation

Construction and renovation are constant activities in healthcare settings. The largest portion of wastes is that common in any construction and demolition (C&D) waste stream, mainly solid waste. However, there may be some special concerns, including stormwater control, asbestos and lighting ballasts, as well as less obvious ones like mercury. While mercury would be commonly associated with thermostats and other switches or gauges, a number of healthcare facilities undergoing renovation projects have found residual mercury in drains and traps.

III.B. Waste Streams Generated by the Healthcare Industry

There are many variables affecting healthcare waste generation, including:

- The type of products and materials purchased for use;
- The type of waste segregation systems in place;
- The degree to which problem wastes are identified and mitigation strategies are implemented; and
- The location of care delivery (in a hospital, clinic, or home).

This subsection presents a brief overview of the major waste streams in healthcare. Chapter IV of this Notebook will provide a broader profile of the major wastes and waste streams. Note that states and local regulating bodies may impose more stringent definitions of waste and more stringent waste requirements than those established by EPA and other federal agencies.

In response to the Medical Waste Tracking Act (MWTA) of 1988, the Society for Hospital Epidemiology produced a position paper entitled *Medical Waste*[6]. Its focus was on the majority of wastes that are produced by healthcare activities and are generally classified as solid waste or biohazardous wastes. It did not address the chemical or radioactive wastes from the sector. This paper provided the most authoritative and comprehensive definition, characterization, profiling, and analysis of risks from healthcare wastes to date.

[6] (Rutala WA, Mayhall CG, "The Society for Hospital Epidemiology of American (SHEA) Position Paper: Medical Waste." *Infection Control Hospital Epidemiology.* 1992; 13:38-48).

Healthcare wastes can be categorized as follows:

- Municipal solid waste;
- Biohazardous waste (regulated medical waste);
- Hazardous waste:
  - Listed and characteristic waste,
  - Commingled waste,
  - Pressurized containers and ignitable compressed gas, and
  - Universal waste; and
- Waste by media category:
  - Wastewater,
  - Stormwater, and
  - Air emissions.

Each of these areas is described in detail below.

III.B.1. Municipal Solid Waste

The majority of healthcare wastes are produced under circumstances identical to restaurants and food industry facilities, hotels, and office complexes. The industry generates large volumes of solid wastes (much of what could be subcategorized as recyclable wastes). Studies indicate that 1 percent of all solid waste produced in the United States is generated by healthcare facilities. There have been numerous studies of these wastes, including ways to manage them to minimize waste and environmental impacts. In 1993, the American Hospital Association (AHA) published a manual for its members, *An Ounce of Prevention: Waste Reduction Strategies for Health Care Facilities* (Bisson, McRae and Shaner). Since then, state hospital associations, state solid waste agencies, and a number of private organizations have produced additional manuals. A cooperative program between the EPA and the American Hospital Association, Hospitals for a Health Environment (H2E) is compiling recent materials; this compilation can be found at: *http://www.h2e-online.org/*.

A special subcategory of municipal solid waste to be considered is construction and demolition (C&D) debris. During remodeling, C&D debris can fall into several categories of waste. Healthcare facilities must identify which materials are RCRA Subtitle C hazardous waste (discussed in Section VI of this document), including lead shielding, lead paint, and demolished equipment containing lead, mercury, silver and/or cadmium (especially batteries, fluorescent light bulbs, and computer monitors). Facilities may identify some construction and demolition debris that is recyclable, which can reduce disposal cost. Also, some C&D debris is municipal solid waste, but is generated at a large enough volume to warrant separate disposal in a construction and debris landfill.

III.B.2. Biohazardous Waste (Regulated Medical Waste)

The concern with and need for better management of healthcare waste that triggered the Medical Waste Tracking Act largely relates to those wastes in healthcare that can potentially harbor and transmit infectious diseases. This includes a wide range of materials that are considered contaminated or pose special risks (e.g., sharps). This category of wastes is defined by regulation at the state, tribal, or local level.

There is general agreement on certain characteristics and components of this waste as noted in the list below, but the specific definitions of this waste are defined on a state-by-state basis, and there are sometimes significant differences in those definitions between states. Further, what and how much waste falls into this category can vary widely depending on the interpretation of these regulations by the generator on a facility-by-facility basis, even within states.

Terminology used to describe this waste category is often confusing and used interchangeably. Words such as "*biohazardous waste*," "*infectious waste*," "*infectious medical waste*," "*potentially infectious material*," "*contaminated trash*," and "*regulated medical waste*," are examples of the terms used in describing this segment of healthcare wastes.

Wastes usually considered in this category include[7]:

- Cultures and stocks of infectious agents and associated biologicals, including: cultures from medical and pathological laboratories; cultures and stocks of infectious agents from research and industrial laboratories; wastes from the production of biologicals; discarded live and attenuated vaccines; and culture dishes and devices used to transfer, inoculate, and mix cultures.

- Human pathological waste, including tissues, organs, and body parts and body fluids that are removed during surgery or autopsy, or other medical procedures, and specimens of body fluids and their containers.

- Human blood and blood products including: (i) liquid waste human blood; (ii) products of blood; (iii) items saturated and or dripping with human blood; or (iv) items that were saturated and or dripping with human blood that are now caked with dried human blood, including serum, plasma, and other blood components, and their containers, which were used or intended for use in either patient care, testing and laboratory analysis or the development of pharmaceuticals. Intravenous bags are also included in this category.

[7] Definition taken from the Federal Plan Requirements for Hospital/Medical/Infectious Waste Incinerators Constructed On or Before June 20, 1996.

- Sharps that have been used in animal or human patient care or treatment or in medical, research, or industrial laboratories, including hypodermic needles, syringes (with or without the attached needle), Pasteur pipettes, scalpel blades, blood vials, needles with attached tubing, and culture dishes (regardless of presence of infectious agents). Also included are other types of broken or unbroken glassware that were in contact with infectious agents, such as used slides and cover slips.

- Animal waste including contaminated animal carcasses, body parts, and bedding of animals that were known to have been exposed to infectious agents during research (including research in veterinary hospitals), production of biologicals, or testing of pharmaceuticals.

- Isolation wastes including biological waste and discarded materials contaminated with blood, excretions, exudates, or secretions from humans who are isolated to protect others from certain highly communicable diseases, or isolated animals known to be infected with highly communicable diseases.

- Unused sharps including unused, discarded hypodermic needles, suture needles, syringes, and scalpel blades.

III.B.3. Hazardous Waste

There are some special waste streams that fall most logically under the heading of "hazardous" but because of their unique nature and the risks inherent in each of them, they are discussed separately below as Mixed Waste, Pharmaceutical Waste, Pressurized Containers and Ignitable Compressed Gas, and Universal Waste. The RCRA standard is cited below. States must at least accept these standards but have the right to impose stricter standards and list additional wastes.

To be considered hazardous waste under RCRA, waste must either be listed or characteristic. Listed wastes are specifically named in 40 CFR Section 261. Characteristic wastes are either ignitable, reactive, corrosive, or toxic. This subsection gives a quick overview of listed and characteristic hazardous wastes, and lists the most common healthcare hazardous wastes. The following EPA web site provides a flowchart that outlines the major steps in the hazardous waste identification process: *www.fedcenter.gov/resources/facilitytour/hazardous/whatis/flowchart/*

RCRA Listed and Characteristic Wastes

- **Listed Waste** - The four types of RCRA listed waste are F, K, P, or U, with a three-digit identifier (e.g., F005, P039, U135). EPA listed these wastes as hazardous because they are known to be harmful to human health and the environment when not managed properly, regardless of their concentrations. Some states may list more wastes as hazardous than

EPA. Visit *www.hercenter.org* to locate state-listed wastes. The lists include the following four types of waste:

— F-listed wastes. These non-specific-source wastes are material-specific, such as solvents, generated by several different industries. Waste codes range from F001 to F039. Examples of healthcare facility wastes that fit this category are solvents often used in research laboratories, pharmacies, and morgues (e.g., methanol, acetone, and methylene chloride).

— K-listed wastes. These source-specific wastes are from specifically identified industries and range from K001 to K161. Healthcare facilities typically do not produce K-listed wastes.

— U-listed wastes. These discarded commercial chemical products include off-specification products, container residuals, spill residue runoff (pure or mixed with non-active ingredients such as colorants, flavoring agents, emulsifiers, fragrances, water, etc.), technical grades (e.g., 95% pure Acetone), off-specification species, or active ingredients that have spilled or are unused and that have been, or are intended to be, discarded. Waste codes range from U001 to U411. Examples of healthcare facility wastes that fit into this category are ethylene oxide (U115), some waste pharmaceuticals such as lindane (U129) and selenium sulfide (U205), and some waste chemotherapy drugs such as chloroambucil (U035).

— P-listed wastes. Like U-listed wastes, these discarded commercial chemical products include off-specification products, container residuals, spill residue runoff spill residue runoff (pure or mixed with non-active ingredients such as colorants, flavoring agents, emulsifiers, fragrances, water, etc.), technical grades (e.g., 95% pure Acetone), off-specification species, or active ingredients that have spilled or are unused and that have been, or are intended to be, discarded. Waste codes range from P001 to P205. These wastes are considered acutely hazardous waste and as little as 2.2 lbs of these wastes generated in a given calendar month, or one quart of these wastes stored in a satellite accumulation area designates a facility as a large quantity generator. An example of a healthcare facility waste in this category is epinephrine (P-042).

Table III-1 below lists some specific examples of RCRA hazardous waste from healthcare facilities.

Table III-1: Examples of RCRA Listed Hazardous Waste Found in Healthcare Facilities

Chemical or Device Containing Chemical	RCRA Listing
Note: This list is not exhaustive but provides some common healthcare hazardous wastes.	
Solvents used in the laboratory such as xylene, ethanol, toluene, and methanol. Solvents are also used in inks for forms and menus.	Xylene, U239 Methanol, U154 Several ethanol compounds are U-listed
2-Chloroethyl Vinyl Ether	U042
3-Methylchloranthrene	U157
Acetone	U002
Acetyl Chloride	U006
Acrylonitrile	U009
Aniline	U012
Bromoform	U225
Cacodylic Acid	U136
Carbon Tetrachloride	U211
Chloral Hydrate	U034
Chlorambucil	U035
Chloroform	U044
Creosote	U051
Cresols	U052
Cyclophosphamide	U058
Daunomycin	U059
Dichlorobenzenes	U070, U071, U072
Ethyl Acetate	U112
Ethyl Carbamate	U238
Ethyl Ether	U117
Ethylene Oxide	U115
Formaldehyde	U122
Formic Acid	U123
Hexachloroethane	U131
Hexachlorophene	U132
Lindane	U129
Maleic Anhydride	U147
Melphalan	U150
Mercury	U151
Methanol/Methyl alcohol	U154
Mitomycin C	U010

Table III-1: Examples of RCRA Listed Hazardous Waste From Healthcare Facilities (Continued)

Chemical or Device Containing Chemical	RCRA Listing
Naphthalene	U165
N-butyl Alcohol	U031
Paraldehyde	U182
p-Chloro-m-Cresol	U039
Phenol	U188
Reserpine	U200
Resorcinol	U201
Saccharin	U202
Selenium Sulfide	U205
Streptozotocin	U206
Tetrachloroethylene	U210
Thiram	U244
Trichloroethylene	U228
Uracil Mustard	U237
Warfarin (Coumarin) < 0.3%	U248
Waste codes range from P001 to P205 and should be noted as acutely hazardous waste, as 2.2 lbs of these wastes generated in a given calendar month designates a facility as a large quantity generator.	
3-Benzyl Chloride	P028
Arsenic	P012
Arsenic Trioxide	P012
Chloropropionitrile	P027
Cyanide Salts	P030
Epinephrine	P042
Nicotine	P075
Nitroglycerin (unless the state adopted the federal exclusion for healthcare facilities)	P081
Osmium Tetroxide	P087
Phentermine	P046
Phenylmercuric Acetate	P092
Physotigmine	P204
Physotigmine Salicylate	P188
Potassium Silver Cyanide	P099

Table III-1: Examples of RCRA Listed Hazardous Waste From Healthcare Facilities (Continued)

Chemical or Device Containing Chemical	RCRA Listing
Sodium Azide Sodium azide is often used as a preservative in a variety of laboratory reagents usually at concentrations of less than 0.1%. It is not the sole active ingredient in these cases and would not be a P-listed waste.	P105
Warfarin (Coumarin) > 0.3%	P001
Mercury compounds such as thimerosal, amalgam, and mercury-containing fixatives. Mercury-containing equipment such as thermometers, sphygmomanometers (blood pressure measuring device), thermostats, weighted feeding tubes and fluorescent bulbs. If the state adopted the Universal Waste Rule, then fluorescent bulbs are considered universal waste.	Mercury is listed as U151, but several other mercury compounds are also listed. The RCRA toxicity characteristic (discussed below) also lists mercury (D009) and requires a limit of 0.2 mg/L.
Lead-containing equipment such as lead aprons, bitewings, lead pigs, lead shielding removed during construction or renovation, batteries, and computer monitors. If the state adopted the Universal Waste Rule, then batteries are considered universal waste.	The RCRA toxicity characteristic (discussed below) lists lead (D008) and requires a limit of 5.0 mg/L.
Silver from X-rays. Silver can come from fixer/developer solutions or from film or from devices employed to harvest silver.	The RCRA toxicity characteristic (discussed below) lists silver (D011) and requires a limit of 5.0 mg/L.

Sources: EPA Region 2 presentation dated February 2004, entitled "Identification and Management of Regulated Hazardous Waste, A Workshop Geared Toward Healthcare Facilities" and H2E's web page, at *http://www.h2e-online.org/pubs/chemmin/master.pdf*.

Note that some chemicals used in healthcare are toxic and harmful to the environment, but RCRA does not list them as hazardous waste. These include glutaraldehyde and many chemotherapy drugs (other than the nine that are listed). A best management practice is to handle such materials as if they were hazardous waste, to protect workers, patients, and the environment. For an explanation of RCRA requirements, see Section VI of this Notebook.

- **Characteristic Waste** - Even if waste does not appear on one of the hazardous waste lists, it still might be regulated as hazardous waste if it exhibits one or more of the following characteristics:

  — Ignitability. (40 CFR § 261.21) Ignitable wastes create fires under certain conditions, are spontaneously combustible, and have a flash point of less than 60°C (140°F), are ignitable compressed gas, or are an oxidizer (such as a chlorate or peroxide). The waste code for these materials is D001. They are liquids, other than aqueous solutions containing less than 24 percent alcohol by volume and with a flash point less than 60 °C (140 °F).

  — Corrosivity. (40 CFR § 261.22) Corrosive wastes are acids or bases that are aqueous and have a pH less than or equal to 2 or greater than or equal to 12.5; or are liquid capable of corroding

metal containers, such as storage tanks, drums, and barrels. A liquid is considered corrosive if it can corrode steel at a rate of at least 0.25 inches per year at 55° C (130° F). Wastes are aqueous if they contain 20 percent water, measured quantitatively or separated from the waste by pressure or vacuum filtration as described in EPA Method 1311. Note, waste that is not aqueous and contains no liquid falls outside the definition of EPA corrosivity. Examples include pharmaceutical compounding chemicals such as sodium hydroxide solution. The waste code for these materials is D002.

— Reactivity. (40 CFR § 261.23) Reactive wastes are unstable under normal conditions. They can cause explosions, toxic fumes, gases, or vapors when mixed with water. They can be a cyanide or sulfide-bearing waste that can generate fumes in a quantity sufficient to present a danger to human health when mixed with an acid or base. They may be capable of detonation or a forbidden explosive, or a Class A or Class B explosive, as defined in Department of Transportation regulations in 49 CFR Part 173. Examples include picric acid and lithium-sulfur batteries (such as those used in electronic thermometers). The waste code for these materials is D003.

— Toxicity Characteristic. (40 CFR § 261.24) Toxicity characteristic wastes are harmful or fatal when ingested or absorbed. When toxicity characteristic wastes are disposed of on land, contaminated rain or liquid may drain (leach) from the waste and pollute ground water. Toxicity is defined through a laboratory procedure called the Toxicity Characteristic Leaching Procedure (TCLP). Toxicity characteristic healthcare wastes include those exceeding regulatory values for chloroform, lindane, m-cresol, mercury and mercury compounds (thimerosal), and certain metals (such as arsenic). A number of other pesticides and solvents are also regulated under the TCLP rule. The waste codes for these materials range from D004 to D043. Research chemicals (TSCA exempt) do not always have toxicity data established for them. Most of the time these chemicals are incinerated as hazardous waste because not enough information is available. For mixed reagents, the toxic effects should be considered additive.

Highlighted below are eight hazardous waste types that are commonly used in healthcare facilities: mercury, chemotherapy and antineoplastic chemicals, formaldehyde, photographic chemicals, radionuclides, solvents, anesthetic gases, and toxic, corrosive, and miscellaneous chemicals.

- **Mercury** - The primary sources of mercury waste at most hospitals include:

  — Broken or obsolete medical equipment – sphygmomanometers, thermometers, tilt switches (e.g. in electric wheel chairs), intraocular pressure reducers (little bags of mercury used in past for eye surgery), esophageal dilators, cantor tubes, and miller abbott tubes.

  — Broken or obsolete components of facility equipment or capital medical equipment and or calibration or process monitoring devices – manometers, barometers, oven and refrigerator thermometers, thermostats, mercury switches (tilt switches, reed switches, float switches), flow meters, flame sensors, boiler gauge controls, and fluorescent light bulbs. These can be found in pulmonary and blood gas labs, HVAC and facilities areas, laundry, kitchen, and laboratories as well as general areas.

  — Laboratory reagents and chemicals – as a preservative (e.g., thimerosol) or contaminant.

  — Plumbing – pipes and fittings, especially drain traps, can be contaminated with mercury because of spills that occurred in the past.

  Mercury wastes are decreasing in quantity due to the substitution of solid state electronic sensing instruments (thermometers, blood pressure gauges, etc.), and greater awareness of the hazards of mercury in the workplace. Mercury is also found as a preservative in many pharmaceuticals (thimerosal or phenylmercuric acetate); however, this is less common as awareness of the health and environmental hazards has increased. Finally, mercury has been identified as a "tramp" contaminant in a number of other common products including bleach. In these cases, the mercury is not intentionally added to the product.

- **Chemotherapy and Antineoplastic Chemicals** - Nine of the chemotherapy and antineoplastic drugs of concern from a waste perspective are on either the P or the U list of RCRA hazardous wastes, which was created in the 1970s. These are: Chlorambucil (Leukeran) (U035), Cyclophosphamide (Cytoxan, CTX, Neosar, Procytox) (U058), Daunomycin (Daunorubicin, Cerubidine, DaunoXome, Rubidomycin, Liposomal Daunorubicin) (U059), Diethylstilbestrol (Diethylstilbesterol, DES, Stilbestrol, Honvol, Stilbesterol) (U089), Melphalan (Alkeran, L-PAM) (U150), Mitomycin C (Mitomycin, Mutamycin) (U010), Streptozotocin (Streptozocin, Zanosar) (U206), Uracil Mustard (U237), and Arsenic Trioxide (Trisenox) (P012). Since that time, hundreds of new

formulations have come into the healthcare marketplace due to advances in pharmaceutical research. Some of these substances may have RCRA characteristics, which would place them in the hazardous waste category. It is important to note that not all chemotherapy medications are considered RCRA characteristic or listed wastes. However, because a single drug may have more than a dozen synonym names, determining collection and disposal methods for these drugs can be confusing and time-consuming. Healthcare facilities will need to determine the best collection method (e.g., maintain a list of RCRA characteristic or listed chemotherapy and antineoplastic drugs so that they may be collected and disposed of as RCRA waste or collect all chemotherapy and antineoplastic as RCRA waste) for their facility.

- **Formaldehyde** - Formaldehyde can be a significant source of hazardous waste at many hospitals. Formaldehyde (usually found in a dilute form called formalin) may be used in pathology, autopsy, dialysis, and in some nursing units. Formaldehyde is a U-listed waste that is regulated as an unused chemical product. Formaldehyde use in healthcare applications has diminished in recent years as greater understanding of the occupational risks and hazards has been recognized. In some cases, formalin that had been used to preserve specimens is discharged to the sewer. Healthcare facilities should determine if the spent formalin meets the definition of a characteristic waste (e.g. ignitability). Even if the waste is not hazardous, it is still a best management practice not to dispose of formalin down the drain, even if sanitation authorities allow such disposal. Some facilities that still use formalin in quantity have found that commercially available distillation and filtration technologies are cost-effective ways to reclaim reusable formalin. Additionally, some states may permit the use of formalin recycling units.

- **Photographic Chemicals** - Many healthcare facilities offer X-ray and radiology services. In the past, nearly all X-rays were developed using wet processing and chemicals. The photographic developing solutions used in X-ray departments consisted of two parts, a fixer and a developer. For facilities using the wet processing method for developing, the silver-containing effluent from the fixer solution is passed through a filter or is otherwise treated to recover this precious metal. The remaining aqueous waste, containing about 1.4 percent glutaraldehyde, 0.3 percent hydroquinone, and 0.2 percent potassium hydroxide, is typically discharged to the sewer. Discharges containing potentially regulated chemicals should be evaluated to determine if they contain hazardous waste, and if allowed by the POTW, approved for discharge in writing (See Section VI.A. RCRA Domestic Sewage Exclusion). Some hospitals use X-ray services that also provide silver recovery, through ion exchange or electrostatic techniques, as part of the customer service package.

Much has changed in radiology in the past decade. New films contain less silver and can be developed with dry processing. Digital imaging has taken the place of the standard X-ray. Many facilities are moving away from traditional radiology practice and going to a PAX-it brand system and digital X-rays. Facilities that have made this change have dramatically reduced the pollution outputs of fixer/developer and silver associated with films. New low-silver content films are also available on the market.

- **Radionuclides** - Radioactive wastes are generated in nuclear medicine and clinical testing laboratory departments. At some hospitals, short-lived radioactive materials in nuclear medicine are retained on site until they decay to nonhazardous levels. Depending on what the waste material is, it is then disposed of as solid or hazardous waste. For longer-lived radionuclides, storage times may be more limited and decay might only reduce the radionuclide to levels that can be more easily managed as low-level waste. Note that "mixed wastes" (defined by RCRA as low-level radioactive waste that is also hazardous) must be identified as such and disposed of properly. In cases where 'sharps' waste is associated with the radioactive material, such wastes are stored on site for proper decay, then disposed of as biohazardous waste once they are judged to be indistinguishable from natural background radiation.

- **Solvents** - Solvent wastes are typically generated by various activities throughout a hospital, such as pathology, histology, engineering, morgue, and laboratories. Volumes of solvent wastes generated at many hospitals are small. Specific solvents used in medical settings include halogenated compounds such as methylene chloride, chloroform, freon, trichloroethylene, and 1,1,1-trichloromethane. Other solvents include nonhalogenated compounds such as xylene, acetone, ethanol, isopropanol, methanol, toluene, ethyl acetate, and acetonitrile. Xylene, methanol, and acetone are the most frequently used solvents at many hospitals.

  Solvent waste (e.g., xylene, acetone, and methanol) are normally handled as hazardous waste. Some of these wastes are absorbed in tissue specimens, which are then treated instead as infectious wastes. Solvent wastes are typically stored in 30- or 55-gallon drums and can be recycled on site in solvent distillation units, or transported off site for recycling or for disposal as hazardous waste. Healthcare facilities should check with their state regulations before installing recycling units.

- **Anesthetic Gases** - Nitrous oxide, the halogenated agents halothane (Fluothane), enflurane (Ethrane), isoflurane (Forane), and other substances are used as inhalation anesthetics. Nitrous oxide is supplied as a gas in cartridges or cylinders that are attached directly to the anesthesia equipment. Used containers may be returned to the supplier. The

halogenated anesthetic agents are supplied in liquid form, in glass bottles. Once empty, the bottles and any residual must be properly disposed of.

Waste anesthetic gases are generally removed from the operating room, or the site of application, in one of two ways. At some larger hospitals, a scavenging unit is attached to the anesthesia unit to remove the waste gases. The scavenging unit may have a charcoal filter that absorbs halogenated anesthetic gases but not nitrous oxide. Spent charcoal filters are sent off site as hazardous waste. If there is no scavenging unit, or if the scavenging unit does not have a filter, then vacuum lines are used to collect waste anesthetic gases and vent them to the outside. These waste gases may cause air emission concerns.

- **Toxics, Corrosives, and Miscellaneous Chemicals** - Poisons, oxidizers, and caustics are used throughout most hospitals, generally in small quantities. Waste oils and solvents from maintenance may also be considered hazardous wastes as may some boiler water conditioning chemicals. Major toxic, corrosive, and miscellaneous chemical wastes include:

  — Sterilants (e.g., ethylene oxide),

  — Disinfecting cleaning solutions,

  — Utility wastes: boiler feed water treatment residuals (resin regeneration brine, spent resin), boiler blowdown, boiler cleaning (layup) wastes, cooling tower blowdown, and cooling tower sludges/sediments, and

  — Maintenance wastes: waste lube oils, vacuum pump oils, cleaning solvents, paint stripping wastes, and leftover paints and painting accessories.

Certain Pharmaceutical Waste

Pharmacies store and dispense medications and maintain a small inventory of chemicals for compounding purposes. Healthcare facilities routinely discard partial vials, IVs, and other unused drugs. In cases where medication formularies change, and unused pharmaceuticals accumulate, these items must be properly managed (see the discussion of reverse distribution below). In some cases, the items are RCRA listed or RCRA characteristic wastes. Some preparations of pharmaceuticals may also involve the use of solvents, which also may be RCRA hazardous waste. For these chemicals, disposal should follow the RCRA hazardous waste requirements explained in Section VI. Table III-1 lists more pharmaceutical wastes. For resources and more overview information refer to:
http://www.h2e-online.org/tools/chem-pharm.htm

Reverse distribution is a product management strategy that allows pharmacies to return unused products to the manufacturer for potential credit, often through a reverse distributor. Pharmacies can remove pharmaceuticals that are not going to be used from their inventory, and quarantine them as a "product for return." The reverse distributor will either return them to the manufacturer for credit and final disposition or properly discard them if they cannot be used. (Note: It is not legal for a reverse distributor to redistribute outdated drugs, which are considered adulterated by FDA.) With this practice, unused/unexpired pharmaceuticals can be returned as product. This includes materials that have gone beyond the manufacturer's expiration date. Healthcare facilities should be careful not to use reverse distribution as a waste management strategy or as a means of avoiding proper disposal of waste (i.e., items that are obviously waste with no potential for reuse.) See the Returns Industry Association web page for more information: *http://www.returnsindustry.com*.

Commingled Waste

There are several examples of commingled wastes that need special consideration. These are wastes that include characteristics of different waste streams, that fall under different regulatory regimes, and pose special management concerns.

- **Commingled "biohazardous" and chemical wastes (e.g., tissue soaked in formalin)** - Many tissue samples are kept by healthcare institutions, labs, and research facilities in containers of formalin or formaldehyde. As a commingled waste, management techniques should be applied to separate the substances, as appropriate, and properly characterize, treat, and dispose of the residuals.

- **Mixed radioactive wastes** - Many healthcare facilities generate low-level radioactive waste as a by-product of administrating radiopharmaceuticals, radioimmunology, and nuclear medicine procedures. Contaminated materials may include solid wastes, biohazardous wastes, and chemical wastes. For healthcare facilities, low-level waste includes clothing, linens, cleaning materials, medical tubes, swabs, injection needles, syringes, and laboratory animal carcasses and tissues that came into contact with radioactivity. To manage low-level radioactive waste, hospitals normally store materials on site, either until the materials are no longer radioactive (and can be handled as municipal solid waste (MSW) or state Regulated Medical Waste (RMW)), or until enough material has accumulated for transfer to a proper disposal facility. If the low-level radioactive waste is mixed with a hazardous waste, it meets the RCRA definition of a "mixed waste" and cannot be disposed of as MSW or RMW. Separating the hazardous and nonhazardous radioactive wastes prior to decay storage will help prevent hazardous waste from entering the solid waste stream during post-decay disposal.

- **Commingled nonhazardous and hazardous wastes** - EPA's "Mixture Rule" states that mixtures of solid waste and listed hazardous waste must

be regulated as hazardous waste. There are two ways to determine if a material is regulated under the mixture rule: (1) if the material is a mixture of a solid waste and a hazardous waste, and the mixture exhibits one or more of the characteristics of hazardous waste; or (2) if the material is a mixture of a solid waste and a listed waste. The mixture rule is intended to discourage generators from mixing wastestreams.

However, the mixture rule does have a number of exemptions for wastewaters that are subject to the Clean Water Act [see 40 CFR 261(a)(2)(iv)]. One exemption is for laboratory wastewater that either (1) does not exceed one percent of the total wastewater flow, or (2) has an average concentration of toxic constituents less than one part per million.

Pressurized Containers and Ignitable Compressed Gas

Pressurized containers sometimes use a flammable propellant (the can is labeled "Flammable"), in which case they are hazardous waste (D001, ignitable). Ignitable compressed gas is also hazardous waste (D001). Healthcare facilities should dispose of these as D001 waste.

Some examples of pressurized containers and ignitable compressed gas include:

- Oxygen gas cylinders;
- Liquid nitrogen cylinders;
- Ethyl chloride (chloroethane); and
- Fluoro-ethyl (25 percent ethyl chloride, 75 percent dichlorotetrafluorethane).

In addition, propellants may contain chlorofluorocarbons (CFCs), which may be F- or U-listed hazardous wastes. CFC-containing wastes should be managed separately from incineration wastes. Finally, large quantities of aerosols should be stored in a secure, fire-safe area to prevent fire hazards.

Universal Waste

Under a special provision of RCRA, universal waste is exempted from Subtitle C requirements and are regulated under the Universal Waste Rule (40 CFR §273). There are four types of universal waste: batteries containing hazardous substances (e.g., lead, acid, nickel, or cadmium), pesticides containing RCRA hazardous components that are recalled or sent to a collection program, mercury-containing thermostats, and spent fluorescent lamps and other hazardous lamps (e.g., with mercury or lead). Note that many states manage their own universal waste programs and many have included electronic wastes in their universal waste programs.

EPA created the Universal Waste Rule (40 CFR §273) in May 1995. Universal waste labeling and storage requirements are less stringent than for hazardous waste. This allows hospitals to more easily recycle batteries, thermostats, and fluorescent lamps. However, hospitals must still comply with special requirements for labeling, storage, and manifesting. More specific information can be found at the EPA web site: *http://www.epa.gov/epaoswer/hazwaste/id/univwast.htm* More information on management of universal wastes at hospitals can be found at: *http://www.h2e-online.org/tools/univwast.htm*

III.B.4. Wastes by Media Category

Hospitals generate several types of media-specific wastes, as described below.

Wastewater

Healthcare facilities wastewater sources include:

- Sinks, floor drains, showers, toilets, dish and laundry washing machines, and tubs;
- Photographic development drains from radiology (X-rays), other imaging, and dentists; and
- Stormwater.

A large healthcare facility contains thousands of drains. Proper drain disposal practices should be in place in each area. Most facilities discharge sink, shower, toilet, and tub wastewater to POTWs, known as indirect discharge. Some facilities may discharge this wastewater directly to surface water, known as direct discharge. All drains that discharge directly should be given special consideration to ensure that no hazardous chemicals are being sent down the drain. Photographic development (X-ray) wastewater is generally filtered to recover silver before it is discharged. Section VI discusses the Clean Water Act (CWA) regulatory requirements for stormwater and direct and indirect discharges from healthcare facilities. Mechanical shop floor drains should drain to a POTW and not simply empty into the soil. Drains that empty to the soil would be considered a Class V Injection Well, which would require a permit under the Underground Injection Control Program of the Safe Drinking Water Act.

EPA conducted a Preliminary Data Summary[8] on hospitals in 1989 and sampled four hospitals. Although five pollutants were detected at levels higher than expected for municipal wastewater (e.g., silver, phenols, barium, acetone, and mercury), the discharge concentrations of these pollutants were determined to be low enough that they would not cause pass-through or interference at POTWs.

[8] EPA, 1989. *Preliminary Data Summary for the Hospital Point Source Category*, EPA-440-1-89-060-n, September 1989.

Healthcare facilities generate stormwater from building and parking lot areas or from aboveground or underground oil or fuel storage tank areas. Hospitals with construction areas of one acre or larger need stormwater permits. Public hospitals in urban areas may discharge to municipal separate storm sewer systems (MS4s) and must also comply with stormwater regulations, as discussed in Section VI of this Notebook.

Healthcare facilities with underground storage tanks (USTs) or aboveground storage tanks (ASTs) need to consider the Oil Pollution Prevention requirements (discussed in Section VI of this Notebook). Facilities with fleet vehicles, such as ambulances, may keep fuel or oil in USTs or ASTs and may also have USTs for on-site diesel generators.

The management of unused prescription drugs may involve oversight by state and local governments and several federal agencies, including the EPA. The Agency does not currently have specific regulations regarding the disposal of expired or waste prescription medications into sanitary sewer systems, nor does EPA's Office of Water have analytical methods to assess the existence of many pharmaceutical compounds in water or wastewater. The Agency, however, is aware of increasing concerns about the potential for pharmaceuticals in water and is reviewing the current state of knowledge and coordinating with other governmental and research agencies.

Air Emissions

At hospitals, air emissions come from air conditioning and refrigeration, boilers, medical waste incinerators (if on site), asbestos, paint booths, ethylene oxide sterilization units, emergency generators, anesthesia, laboratory chemicals, and laboratory fume hoods.

Hospital/medical/infection waste incinerators (HMIWI) are used by hospitals, healthcare facilities, and commercial waste disposal companies to burn hospital waste and or medical/infectious waste. When burned, hospital waste and medical/infectious waste may emit various air pollutants, including hydrochloric acid, dioxin/furan, and the toxic metals lead, cadmium, and mercury (as discussed in Section IV.C of this Notebook).

III.C. Assessment of Wastes Generated by Functional Activity

Table III-2 identifies 18 key functions and major activities that are likely to be found within health sector institutions. The chart can be used to identify the types of EPA regulated wastes likely to be found and the areas in which they would be generated.

Table III-2: Healthcare Facility Wastes

Functional Activities	Wastes Produced
Administrative Activities and Services • Offices • Billing services • Medical records • Public relations/marketing • Nursing care documentation • Human resources • Security • Social services/care management • Retail services • Shipping and receiving • Printing/copying	• Municipal solid waste from all service areas • Batteries from cell phones, special pagers, PDAs, digital cameras, and communication devices • Mercury-containing switches from greeting cards and other 'gifts' in the gift shop • Solvents possibly associated with a print shop • Oils from a printing press • Toner cartridges from copiers and printers • Cleaning chemicals associated with retail establishments • Kitchen grease associated with retail food establishments • Wastewater from retail services
Support Services • Information services • Food services • Laundry services • Pharmacy • Central sterile reprocessing • Biomedical engineering	• Municipal solid waste from all service areas • Biohazardous waste from laundry services and central sterile reprocessing • Electronics/computer wastes (CRTs, hard drives) from information services, and biomedical engineering • Chemicals associated with cleaning, laundry, and food services (decalcifiers, degreasers, chlorine bleach) • Pesticides associated with cleaning services or food services • RCRA listed and RCRA characteristic pharmaceuticals from the pharmacy • EtO from central sterile reprocessing • High-level disinfecting agents associated with central sterile reprocessing • Cleaning chemicals • Peracetic acid from central sterile reprocessing • Batteries (nicad, lithium, mercuric oxide, and others) from biomedical engineering • Kitchen grease from food services • Degreasers, solvents from food services or laundry • Mercury-containing devices such as thermometers in refrigerators, incubators, and heating units • Wastewater from all service areas including food services and laundry services • Air emissions from laundry services, refrigeration, and sterilization • Sharps waste from the pharmacy, central sterile, and from accidental disposal in laundry and food service

Table III-2: Healthcare Facility Wastes (Continued)

Functional Activities	Wastes Produced
Facilities Management, Engineering and Maintenance, and Plant Operations Housekeeping • Maintenance shops (paint, electric, plumbing) • Heating Ventilation and Air Conditioning (HVAC) • Waste treatment • Water treatment • Fleet management • Grounds keeping • Pest management	• Municipal solid waste from all facility areas • Air emissions from boilers • Cleaning chemicals • Chemicals associated with paint shop - turpentine, strippers, solvents, adhesives • Chemicals associated with electric and plumbing shop including oils, adhesives • Chemicals associated with air handling system • Chemicals associated with water treatment systems (decalcifiers, disinfecting solutions) • Radioactive or mixed waste residues in water treatment system, drains and piping • Chemicals associated with elevator care and maintenance (hydraulic fluids) • Chemical associated with groundskeeping and pest management • Mercury-containing switches, manometers, pressure gauges, fluorescent lamps, and thermostats • PCB-containing fluorescent light ballasts and electrical transformers • Asbestos • Pressurized gas canisters/containers from all facility areas • Wastewater from drains, water treatment, and fleet management • Air emissions from HVAC systems and maintenance shops (paint booths)
Laboratory Services • Hematology • Microbiology • Chemistry • Blood Bank • Surgical Pathology • Histology	• Municipal solid waste from all service areas • Biohazardous waste from all service areas • Mixed biohazardous wastes • Chemicals associated with laboratory testing including: alcohols, xylene, toluene, formaldehyde, b5 fixatives, picric acid, other acids and bases chemicals, and cleaning solutions (see chemical inventory in each laboratory area to identify RCRA listed and characteristic wastes) • Mercury-containing devices such as calibration manometer, water bath thermometer, incubator and refrigerator thermometers • Cleaning chemicals • Radioactive or mixed waste residues • Pressurized gas cylinders (blood gas analysis area) • Wastewater from sinks and drains • Air emissions from laboratory chemicals and hoods

Table III-2: Healthcare Facility Wastes (Continued)

Functional Activities	Wastes Produced
Diagnostic Services • Endoscopy • Cardiac Catherization lab • Radiology (CT, MRI, digital imaging) • Nuclear medicine • Sleep studies (EEG)	• Municipal solid waste from all service areas • Biohazardous waste from all service areas • Mixed waste from tissue samples and chemical, or radioactive and solid, or radioactive and chemical • Glutaraldehyde or other disinfectant/cleaner associated with endoscopy • RCRA listed and RCRA characteristic pharmaceuticals • Formalin for tissue samples obtained from any of the listed diagnostic services • Silver from radiology films, fixer and developer • Radioisotopes from nuclear medicine • Collodion (ether/alcohol) from EEG areas • Cleaning chemicals • Lead shielding from radiology • Wastewater from sinks and drains and photographic developing • Air emissions from sterilization and disinfection
Surgical Services • Ambulatory outpatient services • Surgery • Post-anesthesia care • Preoperative services • Anesthesia	• Municipal solid waste from all service areas • Biohazardous waste from all service areas • Mixed waste from tissue samples • RCRA listed and RCRA characteristic pharmaceuticals • Mercury-containing monitoring equipment (thermometers, sphygmomanometers, and esophageal dilators) • Used batteries (Nicad, lithium, other) • Waste anesthetic gases and compressed gas cylinders • Cleaning solutions; high-level disinfectants • Phenol • Collodion • Formalin • If surgical pathology unit is present in surgical services area, look for xylene, toluene • Wastewater from sinks and drains • Air emissions from anesthetic gases
Inpatient Care Services • Medical surgical care • Orthopedic care • Neurology care • Urology care • Cardiac care • Psychiatric/behavioral health • Geriatric care • Palliative care • Maternal child care (labor and delivery/birthing, postpartum care, nursery, pediatrics) • Pediatric care • Cancer care • Rehabilitative care	• Municipal solid waste from all service areas • Biohazardous waste from most service areas • RCRA listed and RCRA characteristic pharmaceuticals • Mercury-containing monitoring equipment (thermometers and sphygmomanometers) • Cleaning solutions; high-level disinfectants • Chemicals related to leatherwork, plastic casting, etc. for rehabilitation/prosthesis device producing settings • Wastewater from sinks and drains • Air emissions from sterilization and disinfection

Table III-2: Healthcare Facility Wastes (Continued)

Functional Activities	Wastes Produced
Critical Care Services • Surgical intensive care • Medical intensive care • Pediatric intensive care • Cardiac intensive care • Burn care • Neonatal intensive care	• Municipal solid waste from all service areas • Biohazardous waste from all service areas • RCRA listed and RCRA characteristic pharmaceuticals • Mercury-containing monitoring equipment (thermometers and sphygmomanometers) • Used batteries (Nicad, lithium, other) • Cleaning solutions; high-level disinfectants • Wastewater from sinks and drains • Air emissions from sterilization and disinfection
Emergency Care Services	• Municipal solid waste from all service areas • Biohazardous waste from all service areas • RCRA listed and RCRA characteristic pharmaceuticals • Mercury-containing monitoring equipment (thermometers, sphygmomanometers, and especially hypothermia thermometers) • Chemical or biological agents from decontamination (chemical/biological) area for incoming patients • Waste anesthetic gases and compressed gas cylinders • Cleaning solutions; high-level disinfectants • Formalin • Silver from radiology films, fixer and developer • Lead shielding from radiology • Wastewater from sinks and drains, ensure that decontamination area drains connect to containment tank for potentially hazardous fluids. • Air emissions from sterilization and disinfection, ensure that decontamination area ventilation system connects to filter or separate system for potentially hazardous pollutants
Respiratory Care Services • Pulmonary function testing • Oxygen therapies	• Municipal solid waste from all service areas • RCRA listed and RCRA characteristic pharmaceuticals • Mercury-containing monitoring equipment (thermometers and sphygmomanometers) • Compressed gas cylinders (oxygen tank management) • Used batteries • Cleaning solutions; high-level disinfectants • Wastewater from sinks and drains • Air emissions from sterilization and disinfection
Dialysis • Hemodialysis • Peritoneal dialysis	• Municipal solid waste from all service areas • Biohazardous waste from all service areas • RCRA listed and RCRA characteristic pharmaceuticals • Mercury-containing monitoring equipment (thermometers and sphygmomanometers) • Formaldehyde, formalin • Cleaning solutions; high-level disinfectants • Wastewater from sinks and drains

Table III-2: Healthcare Facility Wastes (Continued)

Functional Activities	Wastes Produced
Physical Therapy Occupational Therapy	• Municipal solid waste from all service areas • Mercury-containing monitoring equipment (thermometers and sphygmomanometers) • Cleaning solutions • Chemicals related to leatherwork, plastic casting, etc. for rehabilitation/prosthesis device producing settings • Wastewater from sinks and drains
Outpatient Services (Nonsurgical) • Womens' health/gynecology • General medicine • Family practice • Specialty clinics (orthopedics, urology, pulmonology, allergy) • Pediatrics • Rehabilitative services	• Municipal solid waste from all service areas • Biohazardous waste (mostly sharps) • RCRA listed and RCRA characteristic pharmaceuticals from sample medications • Mercury-containing monitoring equipment (thermometers and sphygmomanometers) • Cleaning solutions; high-level disinfectants • Wastewater from sinks and drains
Oncology/Cancer Care Services • Radiation oncology • Chemotherapy • Lead molds - Cerrobend	• Municipal solid waste from all service areas • Biohazardous waste • RCRA listed and RCRA characteristic pharmaceuticals • Mercury-containing monitoring equipment (thermometers and sphygmomanometers) • Chemotherapy waste - RCRA listed and RCRA characteristic • Chemotherapy waste - non-RCRA regulated • Mixed radioactive and hazardous waste • Radioisotopes from nuclear medicine • Cleaning solutions; high-level disinfectants • Wastewater from sinks and drains
Dentistry • Oral surgery • Periodontics • Oral healthcare	• Municipal solid waste from all service areas • RCRA listed and RCRA characteristic pharmaceuticals • Waste anesthetic gases and compressed gas cylinders • Residual mercury amalgam • X-Ray materials; lead shields • Cleaners, disinfectants • Wastewater from sinks and drains • Air emissions from sterilization and disinfection • Biohazardous and sharps waste
Animal Research and Testing	• Municipal solid waste from all service areas including animal care • Biohazardous waste from all service areas • RCRA listed and RCRA characteristic pharmaceuticals • Mercury-containing monitoring equipment (thermometers and sphygmomanometers) • Research chemicals • Radioactive or mixed waste residue • Wastewater from sinks and drains • Air emissions from laboratory chemicals and hoods, and from sterilization and disinfection

Table III-2: Healthcare Facility Wastes (Continued)

Functional Activities	Wastes Produced
Clinical Research	• Municipal solid waste from all service areas • Biohazardous waste from all service areas • RCRA listed and RCRA characteristic pharmaceuticals • Mercury-containing monitoring equipment (thermometers and sphygmomanometers) • Research chemicals • Wastewater from sinks and drains • Air emissions from laboratory chemicals and hoods, and from sterilization and disinfection
Construction and Renovation	• Municipal solid waste from all service areas • Mercury-containing monitoring equipment (thermometers and sphygmomanometers) • PCB-contaminated light ballasts • Asbestos • Radioactive or mixed waste residue in drains and piping • Stormwater • Lead paint

III.D. Management of Waste Streams

Healthcare facilities may treat, recycle, or dispose of the waste streams that they produce. This subsection presents some examples of management techniques (and example waste types). This is not meant to be a comprehensive list, but an introduction only; refer to the sources at the end of this Notebook for more detail.

EPA ranks options for managing waste in descending order of preference. This ranking encourages reliance on those approaches that minimize the generation of waste and environmental releases. SOURCE REDUCTION is assigned the highest priority because it emphasizes eliminating or reducing wastes at the point of generation. Purchasing a digital thermometer, rather than one containing mercury, for example, reduces the heavy metal content in the waste and reduces the need for recycling, treatment, or disposal. Source reduction is typically less expensive than collecting, treating, and disposing of waste. It also reduces risks for workers, the community, and the broader environment.

REUSE is the next preferred option. Implementing measures to reuse products and packages for their original purpose reduces purchasing costs and packaging wastes as well as wastes from patient care activities. Healthcare facilities find that reusable linens, reusable patient supplies, such as bedpans and emesis basins, as well as reusable dishes and cutlery for food service are generally economically and environmentally preferable to their disposable counterparts, although there are costs incurred in cleaning and sterilizing equipment for reuse.

RECYCLING encourages regenerating materials or reclaiming constituents of the waste stream into usable items. Paper and paper products, such as corrugated cardboard, glass food and beverage containers, metals, and certain plastics may be recyclable. However, facilities

should evaluate the local environmental and economic consequences associated with collecting and recycling materials as well as the associated energy and resource costs.

TREATMENT to reduce the volume or the potentially harmful environmental impacts of the waste is ranked at the lower end of the hierarchy. Medical waste treatment technologies include autoclaving, hydropulping, pyrolysis, microwave, incineration, chemical treatment, and irradiation. Treatment precedes disposal, the least favored option. Ultimately, however, some wastes and medical waste treatment residues require land disposal. The costs of treatment and disposal are significant, and both have inherent environmental impacts, including emissions to air and water.

Reduction/Prevention

The amount of almost all wastes produced through healthcare activities can be reduced. This can be as easy as a manufacturer using less packaging or replacing corrugated shipping containers with reusable totes. It can also mean not using certain materials (e.g., mercury) that become problematic wastes, through a technique called Environmentally Preferable Purchasing (EPP). This technique can be used by the purchasing agency for any healthcare facility. For more information regarding EPP go to *http://www.epa.gov/opptintr/epp/*.

Waste can also be prevented through vendor return programs, which encourage product stewardship. A common program is returning cartridges from printers and copiers. Many healthcare facilities are now signing contracts for computers and peripherals that require the vendor to take back units when new units are purchased. There is also a "returns" industry for pharmaceuticals that takes back unused pharmaceuticals as product, not waste.

Segregation

As wastes are generated, the most important management technique to ensure worker safety, ensure proper treatment and disposal, and minimize environmental risk, is to strictly segregate wastes. The general principle is to segregate wastes so that most of the waste ends up in categories that can be reused, recycled, or that are safer and cheaper to dispose of (e.g., municipal solid waste). The principle of segregation is most commonly used to reduce the generation of biohazardous wastes, to ensure that only those wastes truly contaminated or posing a risk are placed in "red" bags or sharps containers. This principle is also very important when considering separating wastes for recycling and for management of chemical wastes.

Reuse

Common chemicals (xylene, formalin, alcohol) used in some activities can be reprocessed and reused. Newer technologies have made this option safer and more affordable.

A number of common medical devices have now been designed for reprocessing and reuse (e.g., pulse oximeters). Numerous other reusable items can be used in healthcare activities including linens, gowns, drapes, bedpans, dishware, utensils, and cutlery.

Recycling

Much of the municipal solid waste generated from healthcare activities is easily recyclable, when one considers that up to 40-50 percent of the waste from most activities is paper and cardboard. Another large portion consists of other commonly recycled metals, plastics and glass. Aggressive recycling programs can divert a very large portion of waste from healthcare activities.

Pressurized containers, universal wastes, and construction and demolition debris are also commonly recycled materials generated at healthcare institutions.

Composting

Some hospitals have identified options for segregating and disposing of food waste and landscaping discards at authorized composting operations.

Landfill

Waste from healthcare activities that is classified as municipal solid waste is often sent to a landfill for final disposal. In some states or tribal regions, untreated biohazardous wastes may be sent to landfills under special conditions. Proper segregation is important to keep hazardous materials from being disposed of in landfills, many of which have specific bans on such items.

Incineration (Off-site Municipal Plant)

Waste from some healthcare activities classified as municipal solid wastes may be sent to a municipal solid waste incinerator. The waste ash will then have to be disposed of as either municipal solid waste or hazardous ash depending on testing. A key issue in the incineration of healthcare wastes is that the municipal solid waste stream from healthcare tends to be rich in PVC plastics, which when combusted can produce dioxins.

Medical Waste Incinerator (On-site or Off-site)

Depending on state or tribal regulation, at least a small portion of biohazardous waste, including sharps, may have to be incinerated. This will likely include pathological wastes and wastes contaminated with small amounts of chemotherapy substances. The incineration of large amounts of biohazardous wastes has decreased in the United States, due to concerns over emissions and the implementation of the EPA air emission regulations for Hospital/Medical/ Infectious Waste Incinerators (HMIWI). Most treatment has moved to other noncombustion technologies.

Noncombustion Biohazardous Treatment Technologies (e.g., Autoclave/ Microwave Treatment/Chemical Mechanical Treatment) (On-site or Off-site)

The majority of biohazardous wastes is now being treated using noncombustion technologies. More than 40 certified noncombustion treatment technologies are in use or being tested in the United States. These devices use heat and pressure or chemicals to render the wastes generally noninfectious and suitable for disposal in landfills.

Hazardous Waste Treatment Facilities, Incinerators, Landfills

Of the wide variety of hazardous materials generated through healthcare activities, some will have to be packaged and transported for special treatment and disposal at specialized licensed facilities to manage hazardous waste. These range from waste oils to toxic chemicals such as phenol.

Treatment at POTWs

Many wastes, from body fluids, to kitchen food scraps, to a wide mix of chemicals, cleaners and disinfectants are discharged to the wastewater system, and must be managed by a POTW. Stormwater run-off from facilities may also have to be discharged to these treatment plants or to a municipally maintained stormdrain network. Local and state regulations may specifically require pollutant prevention measures, waste segregation, and or treatment of these waste streams prior to discharge.

Treatment/Control On-site

A variety of technologies to pretreat wastewater and various air emissions (e.g., ethylene oxide) have been used at healthcare facilities to reduce direct emissions.

IV. WASTE AND EMISSIONS PROFILE

This section provides information on the volume of waste released by the healthcare industry. The Toxics Release Inventory (TRI) is a publicly available EPA database that contains information on toxic chemical releases and other waste management activities reported annually by certain covered industry groups as well as federal facilities. Because only federal facilities in the healthcare industry are required to report pollutant release and other waste management information to TRI, little quantitative waste information is available for this sector. The data provided in this section are for hospitals, the segment of the healthcare industry for which the most data are available.

IV.A. Solid, Biohazardous, and Hazardous Waste Production Data for the Healthcare Industry

According to the information published in the SHEA[9] position paper on medical waste, the United States healthcare industry generates 6,670 tons per day of waste, most of which is solid or municipal waste. In January 1992, it was estimated that about 15 percent of this waste was infectious waste, or about 1,000 tons per day. A small fraction of healthcare waste is hazardous chemical or radioactive waste.

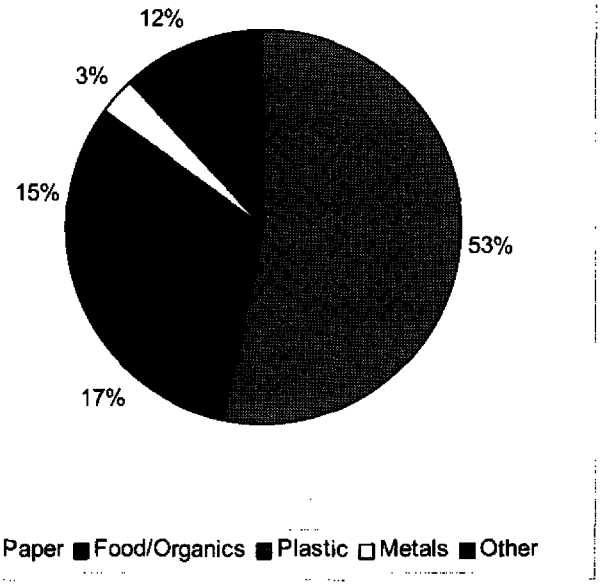
There have been limited studies evaluating healthcare waste comprehensively. Those studies were often conducted in preparation for a waste treatment technology, or were conducted on a small segment of healthcare wastes. Healthcare waste has continued to shift qualitatively as medical advances have occurred, changing the nature of many procedures, and thus wastes, within the industry. Laparoscopic procedures, cautery devices, and laser surgery have all contributed to procedures that generate less biological waste. Advances in pharmaceutical technology have reduced the need for surgical interventions. Adjustments in healthcare reimbursements have contributed to decreased length of stay in hospitals and increases in home care and outpatient or ambulatory healthcare. The supply industry has streamlined many aspects of product packaging, and the use of plastics instead of glass has lessened the weight of many products. Medical waste definitions vary from state to state, which can impact the waste segregation programs set up in a given facility.

IV.A.1. Municipal Solid Waste

Of the about 3.4 billion pounds of solid waste produced annually by hospitals, more than half is composed of paper and cardboard. Figure IV-1 demonstrates the composition of hospital solid waste.

[9] Rutala WA, Mayhall CG, "The Society for Hospital Epidemiology of American (SHEA) Position Paper: Medical Waste." *Infection Control Hospital Epidemiology*. 1992; 13:38-48.

Figure IV-1: Hospital Solid Waste Composition



Source: Healthcare Without Harm, "Setting Healthcare's Environmental Agenda" Conference Proceedings: Waste Management White Paper.

Much of the waste that is considered municipal solid waste (MSW) is composed of corrugated cardboard, paper, glass, plastics, wood, metals, food waste, leaf and yard waste, and a variety of mixed materials. For hospitals in areas that have community infrastructures to support recycling, up to 40 percent of the solid waste can be recyclable. Other wastes that can also be recycled include kitchen grease, durable goods (furnishings), toner cartridges, and X-ray film.

IV.A.2. Biohazardous Waste

As stated above, in January 1992, it was estimated that about 15 percent (an estimated 1,000 tons per day) of hospital waste was infectious waste. Biohazardous waste, also referred to as infectious waste or regulated medical waste, is that component of healthcare waste that includes sharps, pathological waste, blood and blood products, blood-soaked items, and non-regulated chemotherapy waste.

In evaluating biohazardous waste handling, it is important to understand the distinctions between state EPA biohazardous waste definitions, which help define this category of waste for treatment and disposal, and Universal Precautions, an OSHA blood-borne pathogens (BBP) rule, which is designed to protect workers from exposure to blood-borne diseases. The OSHA BBP rule provides guidance on the use of personal protective equipment when caring for patients, and has requirements for labeling and handling biohazardous waste, along with other types of waste.

It is not uncommon for workers in a healthcare facility to refer to biohazardous waste as contaminated trash, infectious waste, medical waste, medical infectious waste, regulated medical waste, or some other similar term. From a regulatory perspective, this waste stream should be collected in a consistent manner, with sharps being segregated at the source of generation in leakproof, puncture-resistant containers, and other regulated medical waste collected in biohazard containers or bags. Pathological wastes, or tissue waste, are also considered biohazardous waste, and should be collected and labeled for disposal via incineration (or as otherwise regulated by the state). Nonregulated chemotherapy wastes are also collected in distinctive containers with the chemotherapy label, packaged for disposal along with biohazardous waste, and labeled for incineration only (or other technologies that may become available).

IV.A.3. Hazardous Chemical Waste

The healthcare industry is not required to report pollutant release and other waste management information to the TRI. Therefore, little quantitative hazardous chemical waste generation information is available for this sector. However, healthcare facilities tend to generate small quantities of various hazardous chemicals relative to the amount of municipal solid waste or biohazardous waste. The amount and type of hazardous chemical waste generated is directly related to the type of facility and the quantity of various products used.

Hazardous chemical waste generation is related to key functions within the healthcare sector. These include laboratory testing areas, facility maintenance areas, groundskeeping areas, and some diagnostic areas. Facilities that include research units usually generate greater volumes and more diverse hazardous chemicals. A small amount of pharmaceuticals commonly in use are also listed or characteristic RCRA wastes. EPA has found that many hospitals are small quantity generators unless they are part of a large facility, such as a university or military base, in which case they tend to be large quantity generators. Facilities may also be temporarily large quantity generators when disposing of waste chemicals during laboratory cleanouts.

IV.B. Wastewater Discharge Data for the Healthcare Industry

A majority of healthcare facilities discharge wastewater to POTWs. These facilities complete discharge monitoring reports (DMR) according to their state, tribal, and local water discharge guidelines, but there is not a centralized data collection system for the information.

Facilities that discharge directly to waters of the United States are considered direct dischargers. Effluent discharge data from these facilities are collected in EPA's Permit Compliance System (PCS). According to calendar year 2000 data from PCS, there are only three major dischargers in the healthcare industry. Dischargers are classified as major based on an assessment of six characteristics: (1) toxic pollutant potential; (2) flow/stream flow volume; (3) conventional pollutant loading; (4) public health impact; (5) water quality factors; and (6) proximity to nearby coastal waters.

The database includes data for only a limited set of minor dischargers when the states choose to include these data. As a consequence, extensive data are not available for minor dischargers in PCS; data for 103 minor direct dischargers are in PCS.

The 106 direct dischargers in healthcare that are included in PCS fall into the categories in Table IV-1 (note that PCS uses Standard Industrial Classification (SIC) codes).

Table IV-1: Direct Dischargers Included in PCS

SIC Code	SIC Description	Minor Dischargers	Major Dischargers
8011	Offices & Clinics of Medical Doctors	4	0
8021	Outpatient Care Facilities	2	0
8051	Skilled Nursing Care Facilities	21	0
8052	Intermediate Care Facilities	18	0
8059	Nursing and Personal Care, NEC	18	0
8062	General Medical & Surgical Hospitals	20	2
8063	Psychiatric Hospitals	7	1
8069	Specialty Hospitals, Except Psychiatric	4	0
8071	Medical Laboratories	3	0
8082	Home Health Care Services	1	0
8092	Kidney Dialysis Centers	1	0
8099	Health & Allied Services, NEC	4	0
	Total	**103**	**3**

Source: PCS 2000 data.

Table IV-2 provides the total pounds of pollutants discharged annually by these 106 facilities. The totals shown are a result of summing the pounds per year contained in the PCS 2000 data. Note that only annual discharges of one pound or greater are shown.

Table IV-2: Pollutant Discharge from Direct Discharging Healthcare Facilities

Parameters	Pounds Per Year
Solids, Total Dissolved	8,065,304
Oxygen, Dissolved (DO)	822,943
Phosphorus, Total (As P)	739,632
Solids, Total Dissolved- 180 Deg. C	430,840
Oil & Grease Freon Extr-grav Meth	300,913
Solids, Total Dissolved (TDS)	199,682
Chloride (As Cl)	190,842

Table IV-2: Pollutant Discharge from Direct Discharging Healthcare Facilities (Continued)

Parameters	Pounds Per Year
Solids, Total Suspended	100,996
BOD, 5-day (20 Deg. C)	36,244
BOD, Carbonaceous 05 Day, 20C	20,821
Sulfate (As S)	15,504
Nitrogen, Ammonia Total (As N)	10,061
Hardness, Total (As CaCO3)	7,796
Oxygen Demand, Chem. (Low Level) (Cod)	4,961
Chlorine, Total Residual	1,374
Nitrogen, Total (As n)	730
Nitrite Plus Nitrate Total 1 Det. (As N)	632
Nitrogen, Nitrate Total (As N)	547
Nitrogen, Kjeldahl Total (As N)	413
Carbon, Tot Organic (TOC)	205
Oxygen Demand, Chem. (High Level) (COD)	176
Sulfide, Total (As S)	106
Magnesium, Total (As Mg)	77
Bromine Chloride	40
Zinc, Total (As Zn)	30
Fluoride, Total (As f)	16
Copper, Total (As Cu)	9
Hydrocarbons, in H2O, IR, CC14 Ext. Chromat	4
Surfactants (MBAS)	3
Zinc Total Recoverable	2
Copper Total Recoverable	2
Silver, Total (As Ag)	1

Source: PCS 2000 data.

IV.C. Air Emissions from the Healthcare Industry

Hospitals generate air emissions from medical waste incinerators, boilers, sterilization chemicals, air conditioning and refrigeration, and laboratory fume hoods. Air emissions data for certain pollutants are available from the National Emission Trends (NET) database (1999), and hazardous air pollutant emissions data are available from the National Toxics Inventory (NTI) database (1996). These databases have since been replaced by the National Emission Inventory database, but no final data are yet available. For the SIC codes

80xx (Health Services), the total emissions for volatile organic compounds (VOC), nitrogen oxides (NO_x) and hazardous air pollutants (HAPs) are shown in Table IV-3.

Table IV-3: Total Emissions for VOC, NOx, and HAPs (Tons/Year)

SIC Code	SIC Description	VOC	NOx	HAP
8011	Offices and Clinics of Medical Doctors	7	74	5
8051	Skilled Nursing Care Facilities	16	88	0
8052	Intermediate Care Facilities		1	5
8059	Nursing And Personal Care, NEC	9	228	0
8061	Hospitals	0	6	
8062	General Medical & Surgical Hospitals	1,204	12,440	607
8063	Psychiatric Hospitals	115	3,412	53
8069	Specialty Hospitals, Except Psychiatric	53	760	31
8071	Medical Laboratories	17	15	15
8081	Outpatient Care Facilities (1977)		0	
8082	Home Health Care Services			1
8092	Kidney Dialysis Centers	2	126	0
8093	Specialty Outpatient Clinics, NEC	0	2	
8099	Health And Allied Services, NEC	16	68	14
8050	Nursing and Personal Care Facilities	0	4	
	Total, All Health Services Subsectors	1,445	17,429	731

Source: Environmentally Conscious Manufacturing Strategic Initiative Group at the National Center for Manufacturing Sciences (NCMS).

Incinerator Emissions

In the September 15, 1997 Federal Register Notice (FRN) for the Hospital/ Medical/Infectious Waste Incinerators (HMIWI) Final Rule, EPA identified about 1,139 small HMIWI, 692 medium HMIWI, 463 large HMIWI, and 79 commercial HMIWI in operation. EPA estimated that, as a result of the final rule, 93 to 100 percent of small "nonremote" HMIWI, 60 to 95 percent of medium HMIWI, and as many as 35 percent of large HMIWI would cease operation. All 79 commercial units and 114 small units meeting the "remote" criteria were assumed to remain in operation. Facilities that ceased operation were assumed to find alternate methods of waste disposal.

As a result of the HMIWI rule, most facilities have phased out their on-site incinerators. Based on the January 2004 inventory conducted of the existing hospital/infectious/ medical waste incinerators, only 111 units are in operation in all the EPA regions. A list of those facilities currently operating incinerators can be found at: *http://www.epa.gov/ttn/atw/129/hmiwi/2004hmiwi_inventory.xls*.

Boilers

Many hospitals operate industrial boilers, which can generate criteria pollutants (e.g., NO_x, SO_2, particulates, CO) and hazardous air pollutants (HAPs). NO_x emissions from combustion in boilers and waste incinerators is the most serious criteria air pollutant generated by the healthcare industry. Currently, information is not available on the number of boilers, and their associated emissions, in the healthcare industry. EPA recently finalized a rule for industrial/commercial/institutional boilers. EPA's air toxics web site *http://www.epa.gov/ttn/atw/boiler/boilerpg.html* provides information regarding EPA's HAP regulations for industrial/commercial/institutional boilers and process heaters. Because the rule only applies to major sources (i.e., those that emit at least 10 tons per year of a specific HAP or a combined total of 25 tons per year of all HAPs), most medical facilities will be exempt from the regulations. However, medical facilities that are colocated with other HAP-emitting facilities, such as on military bases or college/university campuses, could be subject to the new standards if the "site" as a whole meets the definition of major.

Most hospital boilers are subject to the federal New Source Performance Standards (NSPS) regulations. The applicable regulations can be found at 40 CFR Part 60 Subparts Db and Dc. Depending on the type of fuel combusted, the regulations have emission standards for sulfur dioxide, nitrogen oxides and particulate matter. Additionally, expansion of the facility may lead to Clean Air Act Prevention of Significant Deterioration (PSD)/New Source Review (NSR) requirements. See Section VI of this Notebook for more information.

V. POLLUTION PREVENTION OPPORTUNITIES

Pollution prevention is a way to reduce the impact that a business makes on the environment. This includes reducing waste, emissions, accidental releases, fires, global waste and emissions, and depletion of raw materials and using nonrenewable energy. The healthcare industry has numerous opportunities to prevent pollution. By implementing well-planned pollution prevention strategies, facilities can improve efficiencies, save money, minimize adverse environmental impacts, and offer a healthier workplace. Opportunities vary from facility to facility and relate to the volumes and types of activities.

This section is intended to provide the reader with an understanding of some of the most common pollution prevention opportunities available to the healthcare industry. Many programs are not specifically covered by this document. For more information on the various pollution prevention opportunities available to the healthcare industry, visit the industry web sites discussed in Section VIII of this document.

V.A. General Pollution Prevention Opportunities

V.A.1. Environmental Management Systems (EMS)

Environmental Management Systems work to apply the building blocks of effective organizational management (accountability, assigned responsibilities, employee involvement, written policies, training, periodic review and corrective action, senior management support and involvement) to environmental performance. They do this by challenging a hospital to identify all of its significant environmental impacts, determine which are most important, and set performance-based objectives and targets to minimize these impacts on an ongoing basis. A comprehensive EMS will include all feasible aspects of pollution prevention.

EPA has developed a resource titled "Healthcare Guide to Pollution Prevention Implementation through Environmental Management Systems," which is a comprehensive resource for understanding the components of an EMS and for developing an EMS specific to a healthcare facility. The first edition of this document can be found at: *http://www.epa.gov/region02/healthcare/*.

V.A.2. Purchasing/Product Substitution/Source Reduction

Selection of less toxic or less polluting products can reduce pollution generation. Source reduction opportunities exist in many functional areas within healthcare. Purchasing products with minimum waste or minimum toxicity (i.e., environmentally preferable purchasing (EPP) strategy) can reduce the waste generated at the facility. Web sites with resource information for source reduction include Hospitals for a Healthy Environment (H2E) at *www.h2e-online.org* and the Sustainable Hospitals project at *www.sustainablehospitals.org*.

Examples of these approaches in healthcare include:

- **Non-mercury-containing products and devices** - Purchasing and using non-mercury-containing fixatives in the laboratory and technologies for vital sign monitoring (thermometers and sphygmomanometers) help to reduce mercury pollution.

- **Purchasing a less hazardous product for use in adhering electrodes to the scalp for EEGs** - Using less hazardous products instead of flexible collodion, which is made from alcohol and ether, is a direct strategy for source reduction.

- **Mattress selection (reduces solid waste generation)** - Using mattresses with built-in egg crates reduces the need for foam mattress overlays. Healthcare bedding items are changed out every 5 to 7 years, or more frequently depending on usage. Patient comfort, ease of cleaning, and bed sore prevention are goals to be considered in bedding purchases. Selecting mattresses with built-in, rather than disposable, egg-crate foam layers, allows for the desired attributes to be available in a semidurable, versus readily disposable, product.

- **Respiratory care products (reduces solid waste generation)** - Using reusable respiratory therapy products can help reduce waste volumes. Specific products such as ambu bags (used in respiratory resuscitation) and ventilator circuit tubing (used as a channel for air in ventilators) are available as reusable products. The energy, chemicals, labor, and space needs for having a reusable/reprocessing function on site should be evaluated. In cases where the cost benefit is favorable, this strategy makes sense.

- **Microfiber mopping** - This type of product substitution can have multiple benefits including reduced water and cleaner/disinfectant use and disposal (reduces cost, chemical hazards, storage space), less weight to lift (ergonomic benefit, lower potential for injury), reduced mopping time (more productive use of staff, lower labor cost), reduced opportunity for slips and falls on a wet floor, no cross-contamination, and preferred by patients because it is quieter and less intrusive.

V.A.3. Process Change

Process changes are intentional modifications in activities that reduce pollution. Examples of this are abundant in healthcare. Some of the process changes that have environmental benefits also have other benefits, such as cost containment or improved quality of a service or product.

Examples of process changes in healthcare include:

- **Switch to digital imaging for radiology processing (reduces silver waste outputs).** Digital imaging and PAX-it brand systems use digital images instead of silver-laden X-ray films; this negates the need for fixer/ developer solutions, which also contain silver, and reduces water consumption.

- **Right-sizing formaldehyde collection containers (reduces formalin waste outputs).** This practice involves having a variety of sizes of collection containers filled with the preserving fluid (usually formalin), and matching the tissue sample to the appropriate container size. Previously, many facilities stocked only a few sizes of container, with the smallest being a 4-ounce container. Carrying seven or eight different size containers allows the practitioner to select the most appropriate size container based on specimen size. In one case study, this approach reduced formalin use by as much as 70 percent, and minimized waste formalin by a similar amount. The facility saved money by using less formalin, purchasing smaller containers, and saving on space, as greater quantities of the smaller containers could be stored on site.

- **Pharmaceutical Return Programs (reduces pharmaceutical product outputs).** Implementing a pharmaceutical returns program can be a valuable practice in reducing pollution associated with pharmaceuticals. The change involves switching from disposal via drains, solid waste receptacles, and biohazard waste receptacles to a system where unused and partially used pharmaceutical products are returned to a reverse distribution company for cataloging, return credit, characterization, and disposal. Note, reverse distribution should only be used for items that are not expired and not for pharmaceuticals that are obviously waste with no potential for reuse. More information on the return program can be found at *http://www.returnsindustry.com*.

- **Improve pharmaceutical dispensing practices and minimize product packaging.** Minimizing the amount of wasted pharmaceuticals produced through inefficient dispensing practices can help reduce the amount of pharmaceuticals that the healthcare facility needs to purchase. Additionally, minimizing the amount of packaging will help reduce the amount of municipal waste produced.

- **Improved segregation and management of chemotherapy medications**. Setting up concise waste segregation programs for managing chemotherapy wastes can reduce pollution and improve worker safety. Some chemotheraputic drugs are RCRA listed. Other chemotherapy medications may be RCRA characteristic. Best management of such wastes involves setting up management programs to

separate bulk chemotherapy wastes (where there is an identifiable residual amount present) from non-regulated chemotherapy wastes (e.g., gloves, personal protective equipment, and packaging from non-regulated materials), which can usually be packaged and disposed of with biohazard waste. These are fine distinctions and require careful planning and staff education. This type of program, coupled with a reverse distribution program for unused pharmaceutical products, can mitigate pharmaceutical waste outputs that can impact all media.

- **Improved waste segregation systems (reduces biohazardous waste outputs, can increase solid waste outputs and recyclable waste outputs).** Establishing waste segregation systems that allow for the separate collection of solid wastes, recyclable wastes, and biohazardous wastes increases the likelihood that wastes can be collected and handled in the most appropriate and cost-effective fashion. In the case of biohazardous waste collection, by implementing staff education, installing appropriately labeled and convenient containers, and establishing relevant collection schedules, an organization can realize substantive reductions in biohazardous waste outputs and costs. In large part, this results from staff having the option to discard packaging wastes and other waste materials that are not contaminated, as solid waste or a recyclable waste.

V.A.4. Recycling

Waste volumes can dramatically be reduced if systems are in place to capture recyclable materials such as cardboard, paper, glass and aluminum beverage containers, scrap metals, wood waste, kitchen grease, and selected plastics. Recycling success and opportunities are usually linked to recycling infrastructure at the community level.

Opportunities for Reducing Solid Waste

Setting up programs to recycle paper, cardboard, glass, plastic, wood and other types of waste can dramatically reduce a facility's solid waste output. Other factors to consider include:

- Paper wastes - measures must be implemented to ensure the confidentiality of patient information.

- Beverage container collection/recycling (aluminum and plastic) - suitable storage and timely collection schedules are needed to prevent rodent and insect problems and foul odors, and to minimize the environmental benefit if the facility has to use pesticides.

- Durable goods such as furniture, equipment, pallets - these items can be recycled and reduce waste volumes. Mattresses are a bulky and

problematic waste for many facilities; they can hire companies that recycle bedding materials to collect and recycle bedding.

- Environmentally Preferable Purchasing (EPP) - Purposely purchasing recycled materials or materials made of recycled products in place of non-recycled materials reduces solid waste generation. Examples of products containing recycled materials are available on *www.epa.gov/cpg*.

- Universal Wastes - Collecting universal wastes separately helps streamline recycling efforts for facilities as these wastes are regulated by streamlined management rules. Universal wastes found in healthcare facilities include nickel cadmium or sealed lead-acid batteries, mercury-containing thermostats, and lamps that have a hazardous component.

Opportunities for Reducing Hazardous Waste Through Recycling Initiatives

As technologies continue to advance, more opportunities for recycling hazardous waste become available. For example,

- Reducing waste solvents, alcohols, formalin, and formaldehyde - hospital laboratories can use technologies that recycle solvents, formalin, and alcohols, making them essentially continually reusable products, that can be used over and over. There is a very small residual, referred to as 'still bottoms' that is generated during the recycling process and requires disposal as a hazardous waste. Healthcare facilities should check with their state regulations before installing recycling units.

- Reducing fluorescent bulb wastes - Collecting fluorescent bulbs for recycling as a universal waste reduces the measurable volume of hazardous waste.

V.B. Pollution Prevention Opportunities by Waste Type

Table V-1 highlights some examples of pollution prevention and waste management strategies by each waste type. Facilities can use this table with Table III-2 in Section III of this Notebook to help recognize the areas where these waste categories are generated. These strategies are meant to be illustrative examples and not a comprehensive list. For more information on recycling opportunities in the healthcare industry, visit the web sites discussed in Section VIII of this document.

Table V-1: Pollution Prevention and Waste Management Strategies by Waste Category (Continued)

Waste Category	Specific Wastes/Emissions Found in this Category	Waste Management Strategy
Biohazardous Waste, Regulated Medical Waste (RMW)	Sharps waste, blood and blood products, pathological waste, selected isolation wastes, cultures and stocks from laboratories, blood-soaked bandages, etc.	Sharps - collect sharps waste in leakproof, puncture-resistant, cadmium-free containers. In some regions, reusable sharps collection container programs are available. This can reduce overall volumes associated with collection container wastes. Educate staff to ensure that sharps containers are solely for sharps, and items such as batteries or broken mercury thermometers should NEVER be discarded in such containers. RMW - use cadmium-free red bags to collect waste. Where feasible, explore using reusable packing/shipping containers to eliminate cardboard shipping boxes. Ensure that staff have proper education about what items can be discarded into biohazardous waste containers/red bags. Note: in Oncology and Pharmacy, ensure that only non-regulated chemotherapy is disposed of in biohazard waste containers. Non-regulated chemotherapy waste is allowed to be discarded in biohazardous waste in some states while other states require that it is collected in yellow bags. Set up systems that collect 'soft' non-regulated chemotherapy wastes in the required bags and 'sharp' non-regulated chemotherapy wastes in rigid leakproof containers. This measure will reduce the volume of packaging wastes. Label this waste 'for incineration only" (or for other technologies as they become available) and label the waste at point of generation. Pathological waste - label pathological wastes for appropriate treatment such as incineration only, or other treatment technologies that become available such as plasma arc or alkaline treatment. Ensure that formalin or formaldehyde has been decanted from specimens prior to packaging for disposal. Pollution prevention strategies for this category of wastes can also be associated with selection of disposal route/technology.

Table V-1: Pollution Prevention and Waste Management Strategies by Waste Category (Continued)

Waste Category	Specific Wastes/Emissions Found in this Category	Waste Management Strategy
Biohazardous Waste, Regulated Medical Waste (RMW) (cont.)		These can include: 1) Minimizing use of incineration. 2) Consider on-site treatment technologies such as autoclaving or chemical/mechanical systems for the majority of RMW to reduce pollution associated with transporting wastes great distances over roadways. 3) Use drain disposal for liquid wastes (such as common body fluids) that are routinely generated and flushed down the toilet in household settings.
Hazardous Waste	Solvents	Collect and recycle solvents.
	Selected pharmaceuticals	Identify RCRA listed and characteristic pharmaceuticals. Implement inventory control and management options. As a product management strategy, use a reverse distribution company for unused/unexpired product returns. Monitor auto dispensing machines for expired pharmaceuticals. Dispose of residual amounts of liquid properly.
	Ethylene oxide (EtO)	Minimize use of EtO where possible.
	Mercury-containing equipment or compounds	Discontinue use of mercury-containing instruments and chemicals. Notify suppliers/vendors of NO MERCURY policy. Send mercury-containing products for reclamation (retorting).
	Lead-containing equipment	Identify lead-containing supplies and equipment, particularly in radiology areas, and designate for reuse, recycling or hazardous waste disposal. Note: Much lead-shielding material, when no longer suitable for use in intended purpose, can be adapted for other uses within the radiology department.

Table V-1: Pollution Prevention and Waste Management Strategies by Waste Category (Continued)

Waste Category	Specific Wastes/Emissions Found in this Category	Waste Management Strategy
Hazardous Waste (cont.)	Hazardous chemicals	Implement chemical purchasing, inventory and management systems in laboratory settings, plant operations, boiler areas, paint, electric and plumbing shops, and other areas. Label and store waste in accordance with RCRA regulations. Use secondary containment measures for storage of hazardous chemicals and storage of hazardous chemical wastes. Develop appropriate facilities to store hazardous chemical wastes. Have spill preparedness systems in place, secondary containment, neutralizing agents, and other resources to minimize problems associated with managing hazardous materials and wastes. Seek less harmful alternatives through environmentally preferable products from such places as the Sustainable Hospital Project (*www.sustainablehospitals.org*).
Radioactive Wastes	Radioactive materials and residues in drains and piping	Work with radiation safety officer to establish protocols for radioactive waste decay, strategies to minimize the amounts of radioactive wastes generated, etc.
Pressurized Containers	Gas cylinders, gas cartridges, aerosol cans, oxygen farms	Eliminate any gas cylinders on site that are not currently in use or that do not have a specific purpose. Return to vendor for recycling where possible.

Table V-1: Pollution Prevention and Waste Management Strategies by Waste Category (Continued)

Waste Category	Specific Wastes/Emissions Found in this Category	Waste Management Strategy
Universal Wastes	Mercury-containing thermostats, and spent fluorescent lamps and other hazardous lamps. Hazardous waste batteries, hazardous waste pesticides - recalled or sent to collection program. States may have additional universal wastes such as electronics.	Collect and recycle mercury-containing bulbs and thermostats. Develop a separate storage area for universal wastes; use proper labeling and storage methods. Contact the vendor or service representative to determine if mercury-free alternatives exist. Discontinue use, where feasible, of mercury-containing switches, thermostats, etc. Clearly label the device as one containing mercury and requiring special care and handling. Maintain a list of where mercury-containing devices are located in the facility. Train and advise maintenance staff to routinely monitor for leakage and to respond appropriately if a leak occurs. Develop a maintenance protocol for when the article needs to be recalibrated, handled, or replaced. Have mercury spill cleanup materials available in areas where mercury cannot be phased out in the near term (e.g., boiler switches in boiler room areas). When the device needs replacement due to age or efficiency, replace it with a nonmercury alternative.
Construction and Demolition Debris containing asbestos or other hazardous material	Asbestos Mercury Lead PCBs from old fluorescent lights and transformers	Conduct thorough walk-throughs prior to renovations to identify possible sources of asbestos, mercury, or lead materials. Conduct drain trap cleanouts prior to renovations in areas that once used mercury-containing products or materials. Work with a certified vendor to manage lead or PCB waste materials as they are encountered during renovations.

Table V-1: Pollution Prevention and Waste Management Strategies by Waste Category (Continued)

Waste Category	Specific Wastes/Emissions Found in this Category	Waste Management Strategy
Wastewater	Potentially, any hazardous substance in any clinical area Oils Hydraulic fluid Chemical spills Recycle and heat recovery from boilers, cooling towers, and laundry facilities wastewater	Identify all direct discharge drains within the facility. Examine materials used and stored in proximity to the drains. If materials are potentially problematic (e.g., oils, hydraulic fluids, formaldehyde, or other hazardous chemicals), ensure that drain mat covers, spill cleanup materials, and training for spills are part of the operations plan for the area. Examine decontamination areas in emergency departments (areas where victims of chemical or biological exposures are cleansed prior to receiving medical treatment) to ensure that systems are in place to capture contaminated fluids resulting from decontamination activities.
Stormwater	Runoff from building, lawns, parking areas, underground storage tank areas, aboveground storage tank areas, disturbed soils during construction	Identify storm drains outside the facility, and explore what substances might be inadvertently discharged into them. For example, if the on-site solid waste compactor is uphill from the nearest storm drain, ensure that spill cleanup materials are nearby in the event of a hydraulic fluid leak in the compactor. If the loading dock (shipping and receiving) is near a storm drain, ensure that spill cleanup materials are nearby in the event of a chemical spill (e.g., from a large barrel of floor stripper or other potentially toxic substance). Minimize use of fertilizers and pesticides. Clean oil spills from vehicles. Cover storage tanks areas. Have spill cleanup materials readily available in relevant locations. Ensure staff have adequate training to respond to spills to minimize resulting damage. For construction project, use stormwater best practices to keep sediment and other contaminants out of run-off.

Table V-1: Pollution Prevention and Waste Management Strategies by Waste Category (Continued)

Waste Category	Specific Wastes/Emissions Found in this Category	Waste Management Strategy
Air Emissions	Air conditioning and refrigeration units	CFC/Freon management systems.
	Boilers	Use steam generated from incinerators to partially replace boilers. Purchase ENERGY STAR qualified boilers, which use about 10% less energy than a *standard boiler.*
	Medical waste incinerators	Minimize biohazardous waste quantities to reduce frequency of needing to run incinerator. Establish definitive waste segregation programs to minimize inappropriate segregation of hazardous wastes (e.g., mercury spill cleanup materials) in biohazardous waste stream. Minimize the use of PVC (polyvinyl plastic) products and packaging materials to reduce the likelihood of creating dioxin emissions (2,3,7,8 dioxin).
	Asbestos removal	Work with a certified vendor to conduct this process safely.
	Paint booths	Install a filtering ventilation system to collect paint fumes.
	EtO sterilizers	Minimize use of EtO where feasible. Use EtO scavenging units on external stacks. Use air monitoring systems within the facility to monitor for EtO leaks.
	Anesthesia services	Employ scavenger systems.

VI. SUMMARY OF FEDERAL STATUTES AND REGULATIONS

This section discusses the federal regulations that may apply to the healthcare sector. The purpose of this section is to highlight and briefly describe the applicable federal requirements, and to provide citations for more detailed information. The four following subsections are included:

- Section VI.A contains a list of regulations specific to this industry;
- Section VI.B contains a list of regulations by waste category;
- Section VI.C contains a list of pending and proposed regulatory requirements; and
- Section VI.D contains a list of additional applicable non-EPA regulations.

The descriptions within Section VI are intended solely for general information. While EPA has made every effort to ensure the accuracy of this information, depending upon the nature or scope of the activities at a particular facility, these summaries may or may not necessarily describe all applicable environmental requirements. Moreover, they do not constitute formal interpretations or clarifications of the statutes and regulations. States and local regulating bodies may impose more stringent requirements than those established by EPA and other federal agencies. It is beyond the scope of this compliance chapter to list the requirements of all federal, state and local regulatory bodies. For further information, consult the Code of Federal Regulations (CFR) and other state, tribal, or local regulatory agencies.

To search the CFR, go to the Electronic Code of Federal Regulations (e-CFR) at *http://www.gpoaccess.gov/ecfr/*. The e-CFR consists of two linked databases: the "current Code" and "amendment files." The Office of Federal Register updates the current Code database according to the effective dates of amendments published in the *Federal Register*. The *Federal Register* is the official daily publication for rules, proposed rules, and notices of federal agencies and organizations, as well as executive orders and other presidential documents. The *Federal Register* can be searched at *http://www.gpoaccess.gov/fr/index.html*.

VI.A. Industry-Specific Requirements

The healthcare industry is affected by multiple federal environmental statutes. In addition, the industry is subject to numerous laws and regulations from state, tribal, and local governments designed to protect and improve the nation's health, safety, and environment. Table VI-1 summarizes the major federal regulations affecting air, water, and waste outputs from the healthcare industry.

Table VI-1: Summary of Potentially Applicable EPA Regulations

Water Programs (CWA and SWDA)	
40 CFR Part 112	Oil Pollution Prevention
40 CFR Part 122	EPA-Administered Permit Programs: The National Pollutant Discharge Elimination System
40 CFR Part 141	National Primary Drinking Water Regulations
40 CFR Part 142	National Primary Drinking Water Regulations Implementation
40 CFR Part 143	National Secondary Drinking Water Regulations
40 CFR Part 144	Underground Injection Control ("UIC") Program
40 CFR Part 145	State UIC Program Requirements
40 CFR Part 146	UIC Program: Criteria and Standards
40 CFR Part 147	State UIC Programs
40 CFR Part 148	Hazardous Waste Injection Restrictions
40 CFR Part 403	General Pretreatment Regulations for Existing and New Sources of Pollution
40 CFR Part 430	Effluent Guidelines for Direct Dischargers
40 CFR Part 460	Effluent Guidelines for the Hospital Point Source Category
Solid and Hazardous Wastes (RCRA)	
40 CFR Part 260	Hazardous Waste Management System
40 CFR Part 261	Identification and Listing of Hazardous Waste
40 CFR Part 262	Standards Applicable to Generators of Hazardous Waste
40 CFR Part 263	Standards Applicable to Transporters of Hazardous Waste
40 CFR Part 264	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR Part 265	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
40 CFR Part 266	Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
40 CFR Part 268	Land Disposal Restrictions
40 CFR Part 273	Standards for Universal Waste Management
40 CFR Part 279	Standards for the Management of Used Oil
40 CFR Part 280	Technical Standards and Corrective Requirements for Owners and Operators of Underground Storage Tanks ("USTs")
Hazardous Substances and Chemicals, Environmental Response, Emergency Planning, and Community Right-to-Know Programs (CERCLA and EPCRA)	
40 CFR Part 302	Designation, Reportable Quantities, and Notification
40 CFR Part 355	Emergency Planning and Notification
40 CFR Part 370	Hazardous Chemical Reporting: Community Right-to-Know
40 CFR Part 372	Toxic Chemical Release Reporting: Community Right-to-Know

Table VI-1: Summary of Applicable EPA Regulations (Continued)

Air Programs (CAA)	
40 CFR Section 52.21	Prevention of Significant Deterioration of Air Quality
40 CFR Part 60	Standards of Performance for New Stationary Sources
40 CFR Part 61	National Emission Standards for Hazardous Air Pollutants, Subpart M, National Emission Standard for Asbestos
40 CFR Part 62 Subpart HHH	Federal Plan Requirements for Hospital/Medical/Infectious Waste Incinerators
40 CFR Part 63	National Emission Standards for Hazardous Air Pollutants for Source Categories (all applicable provisions)
40 CFR Part 68	Chemical Accident Prevention Provisions
40 CFR Part 70	State Operating Permit Programs
40 CFR Part 82	Protection of Stratospheric Ozone
All applicable provisions of State Implementation Plan Regulations (promulgated pursuant to Section 110 of the Clean Air Act) including the New Source Review regulations	
Toxic Substances (TSCA)	
40 CFR Part 745	Lead-Based Paint Poisoning Prevention in Certain Residential Structures
40 CFR Part 761	Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
40 CFR Part 763	Asbestos
Pesticide Programs (FIFRA)	
40 CFR Part 160	Good Laboratory Practice Standards
40 CFR Part 162	State Registration of Pesticide Products
40 CFR Part 170	Worker Protection Standard
40 CFR Part 171	Certification of Pesticide Applicators
40 CFR Part 172	Experimental Use Permits

Note that, in the healthcare industry, compliance with environmental regulations may be handled in many different ways. Though ideally all employees should help comply, official responsibility could lie at the corporate level, it could lie within the healthcare facility as either a centrally or non-centrally organized activity, or it could be part of a function for vendored-out services. EPA observes that the organizations that successfully achieve compliance engage all or many employees in the various facility operations.

Clean Water Act

The primary objective of the Federal Water Pollution Control Act, commonly referred to as the Clean Water Act (CWA), is to restore and maintain the chemical, physical, and biological integrity of the nation's surface waters. Pollutants regulated under the CWA are classified as either "toxic" pollutants (priority pollutants); "conventional" pollutants, such as biochemical oxygen demand (BOD), total suspended solids (TSS), fecal coliform, oil and grease,

and pH; or "nonconventional" pollutants, including any pollutant not identified as either conventional or priority.

The CWA regulates both direct (those that discharge directly to waters of the United States) and indirect dischargers (those who discharge to POTWs). The National Pollutant Discharge Elimination System (NPDES) permitting program (CWA Section 402) controls direct discharges into navigable waters. NPDES permits, issued by either EPA or an authorized state (EPA has authorized 45 states, one territory, and no tribes to administer the NPDES program), contain industry-specific, technology-based and water-quality-based limits and establish pollutant monitoring and reporting requirements. A facility that proposes to discharge into the nation's waters must obtain a permit prior to initiating a discharge. A permit applicant must provide quantitative analytical data identifying the types of pollutants present in the facility's effluent. The permit will then set forth the conditions and effluent limitations under which the facility may discharge.

EPA has established technology-based discharge standards for hospitals that are direct dischargers. These standards limit 5-day biochemical oxygen demand (BOD_5) and total suspended solids as a mass value calibrated per 1,000 occupied beds. pH is also limited. In contrast, water-quality-based discharge limits are based on federal or EPA-approved state or tribal water quality criteria or standards that were designed to protect designated uses of surface waters, such as supporting aquatic life or recreation. These standards, unlike the technology-based standards, generally do not take into account technological feasibility or costs. Water quality criteria and standards vary from state to state and site to site, depending on the use classification of the receiving body of water. Most states and territories follow EPA effluent guidelines, which propose aquatic life and human health criteria for many of the 126 priority pollutants. The permitting agency (EPA or the authorized state) is obligated to impose the more stringent of these two types of limits in the permit issued to the applicable hospital.

As stated in Section III.B.4 of this document, healthcare facilities wastewater sources include sinks, drains, showers, toilets, and tubs; photographic development drains from radiology (X-rays), other imaging, and dentists; and stormwater. The healthcare industry is subject to various provisions of the CWA including:

- Wastewater Discharges - NPDES Effluent Limitations and Guidelines for Direct Dischargers (guidelines for direct discharging hospitals with more than 1,000 occupied beds) and General Pretreatment Standards.

- Stormwater Permits: Municipal separate storm sewer systems (MS4), such as those from hospitals, and construction activities are subject to stormwater permitting requirements.

- Oil Pollution Prevention Requirements: Hospitals that have a total aboveground oil storage capacity exceeding 1,320 gallons or an underground storage capacity exceeding 42,000 gallons are subject to spill prevention control and countermeasure (SPCC) plan requirements.

Wastewater Discharges

As stated above, the water regulations establish different permitting programs for direct and indirect wastewater discharges. EPA's NPDES web site *http://cfpub.epa.gov/npdes* provides technical and regulatory information about the NPDES permit program that controls water pollution by regulating point sources (e.g., pipe, ditch) that discharge pollutants into waters of the United States. Most hospitals are indirect dischargers.

- Indirect Dischargers: Hospitals that are indirect dischargers are subject to regulations by the local sewer authority. At present, about 1,500 of the nation's largest municipalities are required to implement industrial pretreatment programs that include issuing industrial user permits to significant industrial users. Some municipalities have determined hospitals to be significant industrial users.

  Most municipalities have established local prohibitions that apply specifically to medical waste discharges. For example, some municipalities have set a prohibition on "all medical waste." Other prohibitions include, for example, no discharge of discernible body parts, no human remains greater than 0.5 inches in diameter, and or no radioactive wastes. The ability of municipalities to establish prohibitions to meet their specific needs/interests is very flexible.

  Federal Pretreatment Regulations prohibit discharges of fire or explosion hazards; corrosive discharges (pH < 5.0); solid or viscous pollutants; heat (in amounts that cause the treatment plant influent to exceed 104 degrees F); pollutants that cause toxic gases, fumes, or vapors; and any other pollutant (including oil and grease) that will interfere with or pass through the treatment plant.

- Direct Dischargers: There are very few direct discharging hospitals as reported to PCS in 2004 (e.g., 11 with non-major NPDES permits and 1 with major NPDES permit using SIC Code 806). Hospitals that are direct dischargers of process and sewer wastes must be permitted (i.e., obtain a permit) for any point source discharge of pollutants to waters of the United States. These permits are issued either by EPA or the state, where the state has been authorized to implement the NPDES Permit Program. The federal regulations establish the permit application and permit requirements. Specific numeric limitations that apply to a medical facility depend on the more stringent limits determined by the applicable technology-based discharge standards (40 CFR 460) and water quality standards for the receiving stream of the discharge. For detailed information on numeric limitations, contact your EPA Regional pretreatment coordinator. Contact information can be found at the following web site.
  http://cfpub.epa.gov/npdes/contacts.cfm?program_id=0&type=NPDES

Stormwater Discharges

The stormwater program is part of the NPDES program and is designed to prevent the discharge of contaminated stormwater into navigable waters. See the web site at: *http://cfpub.epa.gov/npdes/home.cfm?program_id=6*

Phase I of the stormwater program was promulgated in 1990 and applied to medium and large municipal separate storm sewer systems (MS4), certain industrial facilities (not hospitals), and any construction activity disturbing greater than 5 acres (large construction sites).

Phase II of the stormwater program was promulgated in 1999 and applies to small municipal separate storm sewer systems (MS4) and construction activity greater than 1 acre and less than 5 acres (small construction sites). Hospitals located in urbanized areas are regulated under this new rule. Any hospital located in urbanized or rural areas that are planning construction activities should look into obtaining a stormwater NPDES permit for construction.

The term MS4 does not solely refer to municipally owned storm sewer systems, but rather is a term with a much broader application that can include, in addition to local jurisdictions, state departments of transportation, universities, local sewer districts, hospitals, military bases, and prisons. A MS4 also is not always just a system of underground pipes - it can include roads with drainage systems, gutters, and ditches. Hospitals in urbanized areas should consult with their state NPDES authority to evaluate whether a permit authorization is required.

The regulatory definition of an MS4 is provided in 40 CFR 122.26(b)(8). General stormwater information can be found at *http://cfpub.epa.gov/npdes/home.cfm?program_id=6* and the Stormwater Phase II Compliance Assistance Guide, at *http://www.epa.gov/npdes/pubs/comguide.pdf.*

Aboveground or Underground Oil Storage Containers

EPA's oil spill program web site, *http://www.epa.gov/oilspill/*, provides information about EPA's program for preventing, preparing for, and responding to oil spills that occur in and around inland waters of the United States. If a hospital uses or stores oil it may be subject to the Spill Prevention Control Countermeasure (SPCC) rule. Hospitals with an above ground oil storage capacity of greater than 1,320 gallons, or total completely buried oil storage capacity greater than 42,000 gallons must prepare and implement a SPCC plan to prevent any discharge of oil into or upon navigable waters of the United States or adjoining shorelines.

On July 16, 2002, EPA promulgated a revised final SPCC Regulation which became effective August 17, 2002. EPA subsequently extended the regulatory compliance schedule included in the new SPCC rule.

The current compliance dates for the new rule are:

- February 17, 2006: Facilities must prepare and a Professional Engineer (P.E.) certify an SPCC Plan in accordance with the new SPCC rule by this date.

- August 18, 2006: The revised SPCC Plan must be implemented.

In the interim, facilities are required to maintain their existing SPCC Plan and amend it in accordance with 40 CFR §112.5.

CWA Common Areas for Inspections

While an EPA inspector is authorized to examine a wide range of documents and operations, he/she will probably be interested in three areas of a hospital: wastewater discharges, stormwater discharges, and any aboveground or underground oil storage containers.

Typical Records an EPA Inspector May Ask to Review under the CWA

- Industrial User permit (IU permit) for discharges to the local municipality (indirect discharge). Most hospitals are indirect dischargers.

- Spill Prevention, Control, and Countermeasure (SPCC) Plan. The plan is to prevent any discharge of oil into or upon navigable waters of the United States or adjoining shorelines.

- Phase II stormwater permits under the NPDES program for public hospitals located in an urbanized area.

- NPDES construction stormwater permits (Phase I and Phase II) are also required for any construction activity greater than 1 acre for any hospital located in urban or rural areas.

- NPDES general permit for discharging directly to a water body (direct discharge).

EPA's Office of Water operates a Water Resource Center with a 24-hour voice mail system for publication orders or reference questions at (202) 566-1729 (e-mail address: center.water-resource@epa.gov). Long-distance callers in the United States may also use the Wetlands Helpline ((800) 832-7828), operating weekdays from 8:30 a.m. to 4:30 p.m., EST, excluding federal holidays. Visit the Office of Water web site (http://www.epa.gov/water/) and the NPDES web site (http://cfpub.epa.gov/npdes/) for additional material.

Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) mandates that EPA establish regulations to protect human health from contaminants in drinking water. The law authorizes EPA to develop national drinking water standards and to create a joint federal-state (or federal-tribal) system to ensure compliance with these standards. The SDWA also directs EPA to protect underground sources of drinking water by controlling underground injection of fluid wastes.

EPA has developed primary and secondary drinking water standards under its SDWA authority. EPA and authorized states and territories enforce the primary drinking water standards, which are contaminant-specific concentration limits that apply to certain public drinking water supplies. Primary drinking water standards consist of maximum contaminant level goals (MCLGs), which are nonenforceable health-based goals, and maximum contaminant levels (MCLs), which are enforceable limits set generally as close to MCLGs as possible, considering cost and feasibility of attainment.

A hospital would be considered a nontransient, noncommunity water system (i.e., a public water system) if it regularly serves at least 25 of the same persons 6 months per year from its own water source. The hospital would thus be required to comply with SDWA monitoring and reporting requirements. Healthcare facilities that have their own drinking water treatment to comply with MCLs should be aware that they could generate hazardous or radioactive waste (e.g., some areas have elevated arsenic levels in groundwater.)

Part C of the SDWA mandates EPA to protect underground sources of drinking water from inadequate injection practices. EPA has published regulations codified in 40 CFR Parts 144 to 148 to comply with this mandate. The Underground Injection Control (UIC) regulations break down injection wells into five different types, depending on the fluid injected and the formation that receives it. The regulations also include construction, monitoring, testing, and operating requirements for injection well operators. All injection wells have to be authorized by permit or by rule depending on their potential to threaten Underground Sources of Drinking Water (USDW). RCRA also regulates hazardous waste injection wells and a UIC permit is considered to meet the requirements of a RCRA permit. EPA has authorized delegation of the UIC for all well classes in 34 states, implements the program directly in 10 states and all Indian country areas, and shares responsibility with 6 states. For a hospital, an injection well can constitute any bored, drilled or driven shaft or a dug hole, where the depth is greater than the largest surface dimension that is used to discharge fluids underground as well as any on-site drainage systems, such as septic systems, cesspools, and stormwater wells, that discharge fluids only a few feet underground. Hospitals and doctors' offices must make sure that what they pour down a drain goes to a sewer, and not to a drywell or septic system.

The SDWA also provides for a federally implemented Sole Source Aquifer program, which prohibits federal funds from being expended on projects that may contaminate the sole or principal source of drinking water for a given area, and for a state-implemented Wellhead Protection program, designed to protect drinking water wells and drinking water recharge areas.

EPA's Safe Drinking Water Hotline, at (800) 426-4791 (or (703) 412-3330 for local and international calls), answers questions and distributes guidance pertaining to SDWA standards (e-mail: hotline-sdwa@epa.gov). The Hotline operates from 9:00 a.m. through 5:00 p.m., EST, excluding federal holidays. Visit the web site at www.epa.gov/ogwdw for additional material.

Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) aims to manage the disposal of waste from municipalities and industries. It regulates facilities that generate, transport, treat, store, or dispose of hazardous waste. Under RCRA, most healthcare facilities are hazardous waste generators. RCRA hazardous waste regulations are in the Code of Federal Regulations (CFR), Title 40, Parts 260 to 280. A series of hazardous waste evaluation flowcharts are available on EPA Region 2's web site at *http://www.epa.gov/region02/healthcare/*. The flowcharts are based on the federal requirements. Most states are authorized the hazardous waste program and may have more stringent requirements. Healthcare facilities should check with their states for additional requirements.

Although RCRA is a federal statute, most states are authorized to administer the RCRA hazardous waste program under their own authority. Currently, EPA has authorized 48 of the 50 states and two United States territories to administer various provisions of RCRA Subtitle C. States must have regulations consistent with and at least as stringent as the federal program; some states have additional reporting requirements. Healthcare facilities should contact their state or tribal authority to determine which state or tribal requirements apply to their business. RCRA does not enable EPA to authorize tribal hazardous waste programs in lieu of the federal program; therefore, EPA directly implements RCRA hazardous waste programs in Indian country, but tribes may have their own, independent hazardous waste programs.

RCRA defines hazardous waste as a subset of solid waste. Solid waste is defined as garbage, refuse, sludge, or other discarded material (including solids, semisolids, liquids, and contained gaseous materials). Once a waste is considered solid waste, determine if it is hazardous waste. EPA defined hazardous wastes as either listed or characteristic. If a waste is specifically named on one of four lists of hazardous wastes, it is a listed waste. If a waste exhibits one of four characteristics, it is a characteristic waste. Section III.B.3 describes the listed and characteristic hazardous wastes commonly found in the healthcare field.

Under RCRA, a facility must determine its generator status. Reporting and other regulatory requirements are different for each generator type. Hazardous waste generators are divided into three categories, according to how much hazardous waste they generate in a calendar month:

- **Large Quantity Generators** (LQGs) generate greater than or equal to 1,000 kg (about 2,200 lbs) of hazardous waste per month, or greater than 1 kg (about 2.2 lbs) of acutely hazardous waste per month. EPA considers acute hazardous wastes the P-listed wastes. If facilities generate more than 1 kg (about 1 quart) of acutely hazardous waste, then they are LQGs

and must comply with all LQG reporting requirements. See Table III-1 for a list of some common acute and toxic healthcare hazardous wastes.

- **Small Quantity Generators** (SQGs) generate greater than 100 kg (about 220 lbs) but less than 1,000 kg of hazardous waste per month and or less than 1 kg (about 2.2 lbs) of acutely hazardous waste per month.

- **Conditionally Exempt Small Quantity Generators** (CESQGs) generate less than or equal to 100 kg of hazardous waste per month, and less than or equal to 1 kg of acutely hazardous waste per month. Not all states recognize the CESQG classification.

- **Large Quantity Handler of Universal Waste** (LQHUW) store greater than 5,000 kg of universal waste on site.

- **Small Quantity Handler of Universal Waste** (SQHUW) store less than 5,000 kg or about 11,000 lbs of universal waste (all types combined) on any given day during the calendar year.

Entities that generate hazardous waste are subject to Federal standards applicable to generators of hazardous waste (e.g., hazardous waste manifest, pre-transportation, recordkeeping and reporting, etc). Storage of hazardous waste generally requires a permit under RCRA hazardous waste regulations, but provisions under RCRA do allow generators to "accumulate" hazardous waste on site without a permit or interim status as long as they comply, among other things, with the technical standards for the containment unit(s). The length of time a generator is allowed to accumulate hazardous waste on site without a permit or interim status depends on the generator's classification. For instance, Large Quantity Generators may accumulate any quantity on-site for 90 days or less without a permit or interim status. Small Quantity Generators may accumulate no more than 6,000 kg of hazardous waste without a permit or interim status for 180 days or less (or for 270 days or less depending on transport distance). CESQGs may accumulate 1,000 kg of waste, 1kg acute waste, or 100 kg residue or contaminated soil from a cleanup of an acute hazardous waste spill. Generators also may treat hazardous waste in accumulation tanks or containers (in accordance with the requirements of 40 CFR Part 262.34) without a permit or interim status. Facilities that treat, store, or dispose of hazardous waste generally are required to obtain a RCRA permit.

Generator status is determined by calendar month; therefore, one month a facility may be a CESQG, and the rest of the year it may be an SQG. In this case, it might be easier to comply with SQG reporting requirements for consistency. On the other hand, if the facility is usually an SQG, a store room or laboratory cleanout might push it into being an LQG. In exceptional cases like this when it is a one time occurrence, some states have made exceptions so that the cleanout does not trigger LQG status.

Generators "count" the amount of waste generated, by adding up the total weight of all quantities of characteristic and listed waste generated at a particular facility. Certain wastes, such as those that are reclaimed or recycled continuously on site, are not counted under

the federal regulations but might be counted under some state regulations. Facilities should also determine if their state has adopted the universal waste rule, which would cover mercury-containing thermostats, certain batteries, and fluorescent light bulbs. Universal wastes do not count toward determining generator status.

Most RCRA requirements are not industry-specific but apply to any company that generates, transports, treats, stores, or disposes of hazardous waste. Below are some important RCRA regulatory requirements that apply to healthcare facilities:

Identification of Solid and Hazardous Wastes (40 CFR Part 261) establishes the standard to determine whether the material in question is considered a solid waste and, if so, whether it is a hazardous waste or is exempted from regulation.

Standards for Generators of Hazardous Waste (40 CFR Part 262) establishes the responsibilities of hazardous waste generators including obtaining an EPA identification number, preparing a manifest, ensuring proper packaging and labeling, meeting standards for waste accumulation units, and recordkeeping and reporting requirements. Generators can accumulate hazardous waste on site for up to 90 days (or 180 days depending on the amount of waste generated) without obtaining a permit. If the waste must be transported more than 200 miles away for recovery, treatment, or disposal, the generator may accumulate the waste for up to 270 days.

Standards for Transporters of Hazardous Waste (40 CFR Part 263) apply to persons transporting manifested shipments of hazardous waste within the United States. Transport requires an EPA identification number, a hazardous waste manifest, compliance with Department of Transportation (DOT) requirements, and proper recordkeeping.

Land Disposal Restrictions (LDRs) (40 CFR Part 268) are regulations prohibiting the disposal of hazardous waste on land without prior treatment. Under the LDRs program, materials must meet treatment standards prior to placement in a RCRA land disposal unit (landfill, land treatment unit, waste pile, or surface impoundment). Generators of waste subject to the LDRs must provide notification of such to the designated TSD facility to ensure proper treatment prior to disposal.

Used Oil Management Standards (40 CFR Part 279) impose management requirements affecting the storage, transportation, burning, processing, and re-refining of used oil. For parties that merely generate used oil, regulations establish storage standards. A party considered a used oil processor, re-refiner, burner, or marketer (one who generates and sells off-specification used oil directly to a used oil burner), must meet additional tracking and paperwork requirements.

RCRA contains unit-specific standards for all units used to store, treat, or dispose of hazardous waste, including Tanks and Containers. Tanks and containers used to store hazardous waste with a high volatile organic concentration must meet emission standards under RCRA. Regulations (40 CFR Part 264-265, Subpart CC) require generators to test the waste to determine the concentration of the waste, to satisfy tank and container emissions standards, and

to inspect and monitor regulated units. These regulations apply to all facilities that store such waste, including large quantity generators accumulating waste prior to shipment off site.

Underground Storage Tanks (USTs) containing petroleum and hazardous substances are regulated under Subtitle I of RCRA. Subtitle I regulations (40 CFR Part 280) contain tank design and release detection requirements, as well as financial responsibility and corrective action standards for USTs. The UST program also includes upgrade requirements for existing tanks that were to be met by December 22, 1998.

Boilers and Industrial Furnaces (BIFs) that use or burn fuel containing hazardous waste must comply with design and operating standards. BIF regulations (40 CFR Part 266, Subpart H) address unit design, provide performance standards, require emissions monitoring, and, in some cases, restrict the type of waste that may be burned.

Imminent Hazard RCRA Section 7003 gives EPA a broad and powerful enforcement tool to use in abating imminent hazards caused by hazardous or solid wastes. Section 7003 states that upon receipt of evidence that the past or present handling, storage, treatment, transportation, or disposal of any solid waste or hazardous waste may present imminent and substantial endangerment to human health or the environment, EPA may bring suit against any person who has contributed or who is contributing to the handling of the waste to restrain the person, order the person to take any action that may be necessary, or both. This authority is used only in extreme circumstances.

Some wastes have special exclusions for practices that are not considered to be hazardous, as determined by federal policy. Several exclusions and exemptions pertain specifically to healthcare facilities. Keep in mind that some states do not recognize the federal exclusions. Some federal exclusions, exemptions, and other special circumstances that are relevant to healthcare facilities are listed below:

- **Domestic Sewage Exclusion**. Mixtures of domestic sewage and other wastes that discharge to a sewer system to a POTW for treatment are excluded from the definition of solid waste. For example, employees may generate a hazardous waste by washing hands with a soap containing a listed hazardous waste. The mixture will be going through a POTW; therefore, it is excluded from the facility's hazardous waste "count." Generators need to contact their local POTW for prior approval. Note that wastes must actually reach the POTW to be covered by this exclusion. Waste that volatilizes in the drain or corrodes the pipes does not reach the POTW.

- **Point Source Exclusions**. Point source discharges of industrial waste waters that are subject to regulation under Section 402 of the CWA are excluded from the definition of solid waste.

- **De Minimis Exclusion**. Small quantities of some solvents and other chemicals are exempt from the regulations when they are mixed with

wastewater in a wastewater treatment system discharging, according to the Clean Water Act.

- **Elementary Neutralization Unit**. Tanks used for neutralizing waste that is hazardous solely because of its corrosive characteristic are excluded from the permitting requirements.

- **Nitroglycerine Formulation**. As of August 14, 2001, federal regulations of nitroglycerine formulations are exempt from hazardous waste regulation as long as they do not exhibit the characteristic of reactivity. Medicinal nitroglycerine are typically not reactive and therefore would not be regulated. This interpretation is based on the revised mixture and derived-from rules [40 CFR 261.3(g)(1)]. Healthcare facilities should check with their state environmental regulatory agency to see if this rule applies in the state in which they operate.

- **Wastewater Treatment Unit**. Any hazardous waste tank system used to store or treat the wastewater that is managed at an on-site wastewater treatment facility with an NPDES permit or that discharges to a POTW is exempt from the RCRA regulations. Most healthcare facilities do not perform this type of wastewater treatment but instead perform elementary neutralization, discussed below.

- **Mixed Wastes**. In May 2001, EPA issued a rule offering a conditional exemption from RCRA requirements for mixed waste as long as it is managed in accordance with NRC or Agreement State licenses (40 CFR Part 266, Subpart N). This exemption covers on-site storage and means that facilities no longer have to obtain RCRA storage permits for mixed waste stored beyond 90 days. The rule has been adopted by 20 states, but is authorized in only two.

- **Reverse Distribution of Pharmaceuticals**. Unused pharmaceutical products shipped to reverse distributors are not considered discarded and are therefore not classified as hazardous waste. The materials must be shipped as product and not identified as waste. Check with state regulatory authorities to understand specific restrictions or requirements in each state.

- **Epinephrine Syringes**. Epinephrine residue in syringes is not considered P042 under federal RCRA hazardous waste rules. Some states may not have adopted this policy. See also *http://www.epa.gov/epaoswer/hotline/94report/12_94.txt*. Note that this federal interpretation does not apply to epinephrine in other formulations (such as vials), and note that the syringe may still be hazardous waste by characteristic.

Typical Physical Features to Inspect under RCRA

- Universal waste storage area;
- Used oil storage areas;
- Vehicle maintenance facilities;
- Battery storage areas;
- Building maintenance and repair shops;
- Laboratories;
- Bulk storage tank farms;
- Transfer terminals;
- Secondary containment structures;
- Tank peripheral piping, manifolds, filling and dispensing areas;
- Dispenser pumps and check valves;
- Tank sumps, manway areas;
- Leak detection equipment;
- Overflow alarms or other audible and visual alarms, sight gauges;
- Fill ports, catchment basins;
- Oil/water separators;
- Cleanup equipment (e.g. absorbent materials, fuel recovery pumps, personal protective gear);
- Hazardous waste generation sites (x-ray, chemotherapy, morgue, pathology);
- Waste storage areas;
- Satellite accumulation points;
- Vehicles used for transport;
- Container storage areas; and
- Shop activities.

Typical Records an Inspector May Ask to Review under RCRA

- Notification of Hazardous Waste Activity (EPA ID No.);
- Hazardous waste manifests;
- Manifest exception reports;
- Biennial reports;
- Inspection logs;
- Land disposal restriction certifications;
- Employee training documentation;
- Hazardous substance spill control and contingency plan;
- Material Safety Data Sheets (MSDSs);
- Inventory records;
- Spill records - Spill Prevention Control and Countermeasure (SPCC) Plans;
- Emergency plan documents;
- Placarding of hazardous waste and hazardous materials;
- Permits, if issued;
- Waste analysis plan(s);

- Operating record;
- Universal waste transportation/shipping records;
- Used oil analysis records;
- Used oil transportation related documentation; and
- Underground Storage Tanks (UST) leak detection performance and maintenance including the following:

  — Monitoring results over the last 12 months,
  — Most recent tank tightness test(s),
  — Manual tank gauging records,
  — Copies of performance claims provided by leak detection equipment manufacturers,
  — Records of recent maintenance, repair and calibration of on-site leak detection equipment,
  — Records of required inspections and test of corrosion protection systems,
  — Records of repairs or upgrades of UST systems,
  — Site assessment results of closed USTs,
  — Results of AST integrity assessments, sampling, monitoring, inspection and repair work,
  — Notification forms and registration records for all in-service, temporarily out-of service, and permanently closed tanks, and
  — Waste determinations.

RCRA information is available to the public on the web at www.epa.gov/osw. The Office of Solid Waste (OSW) has also compiled a list of phone numbers and waste program web sites maintained by EPA Regional offices and state environmental agencies to help users locate site-specific information on RCRA facilities within their states. This compilation is found at www.epa.gov/epaoswer/osw/comments.htm. This site also provides links to the RCRA OnLine database (www.epa.gov/rcraonline), to a searchable database of Frequently Asked Questions (FAQs) about RCRA, and to an on-line order form for RCRA publications (www.epa.gov/epaoswer/osw/publicat.htm). More information on RCRA Subtitle C can be found at www.epa.gov/epaoswer/osw/hazwaste.htm. State specific information related to RCRA can be found at www.herc.org.

See Section VI.C of this document for information pertaining to pending regulations under RCRA.

Universal Waste Rule

EPA created the Universal Waste Rule to encourage and streamline recycling efforts. It allows facilities to count wastes as universal instead of hazardous, which does not count toward generator status. Segregating universal wastes from the rest of the hazardous waste streams can save hospitals money on disposal costs, as well as on recordkeeping. Federal universal wastes include hazardous waste batteries, mercury-containing thermostats, certain pesticides, and fluorescent light bulbs. Facilities should make sure that their state or territory has

adopted these universal wastes. Some states may have additional types of waste such as electronics on their list of universal wastes. Section III.B.3 also discusses this rule.

Medical Waste Tracking Act

In 1988, Congress enacted the Medical Waste Tracking Act under RCRA Subtitle J, which directed EPA to begin a two-year demonstration program for medical waste tracking. The demonstration program operated from June 1989 to June 1991. The program is expired and no federal tracking requirements are in place; however, many states have developed similar tracking and management programs.

Emergency Planning And Community Right-To-Know Act

This act, also known as Superfund Amendments and Reauthorization Act (SARA) Title III, was designed to promote emergency planning and preparedness at both the state and local level. It provides citizens, local governments, and local response authorities with information regarding the potential hazards in their community. EPCRA requires the use of emergency planning and designates state and local governments as recipients of information regarding certain chemicals used in the community. SARA Title III, better known as EPCRA, originated from the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, or better known as the Superfund law). Like EPCRA Section 304, CERCLA also has hazardous substance release reporting regulations under CERCLA Section 103; 40 CFR Part 302. Under CERCLA, the person in charge of a facility is required to report to the National Response Center ((800) 424-8802 or www.nrc.uscg.mil) "immediately upon knowledge of a reportable release" any environmental release of a listed hazardous substance that equals or exceeds a reportable quantity.

EPCRA establishes the following types of reporting obligations for facilities that store or manage specified chemicals:

Emergency Planning (Sections 302 and 303)

Any healthcare facility that has any chemical listed on the extremely hazardous substances list at or above its planning threshold quantity must perform the following:

- Notify the State Emergency Response Commission (SERC) and Local Emergency Planning Committee (LEPC) within 60 days of receiving the shipment (or producing the substance) on site;
- Provide the LEPC with a facility representative who will participate in the emergency planning process; and
- Provide requested information for the LEPC necessary for development and implementation of the emergency plan.

Emergency Release Notification (Section 304)

If there is a reportable release into the environment of a hazardous substance, healthcare facilities must provide an emergency notification and a written follow-up notice to the LEPC and SERC (for any area likely affected). A release is reportable under EPCRA Section 304 if the amount of hazardous substance releases meets or exceeds the minimum reportable quantity set in the regulations. Two types of chemicals fall under this regulation: 1) extremely hazardous substances; and 2) CERCLA hazardous substances.

Annual Inventory (Sections 311 and 312)

Under EPCRA Section 311 requirements, healthcare facilities must submit copies of hazardous chemical material safety data sheets (MSDS) or a list of MSDS chemicals to the LEPC, SERC, and local fire department. Under Occupational Safety and Health Administration (OSHA) regulations, employers must maintain a MSDS for any hazardous chemical stored or used in the work place.

Under EPCRA Section 312, healthcare facilities that meet Section 311 requirements for a hazardous chemical must submit an annual inventory report for that chemical. The inventory report (called a Tier II report) must be submitted to the LEPC, SERC, and local fire department by March 1 of each year.

Certain chemicals are exempt from the EPCRA Section 311 and 312 definition of a hazardous chemical. One exemption that applies to the healthcare industry is the exemption of medical and research lab materials (i.e., any substance, to the extent it is used in a research laboratory or a hospital or other medical facility under the direct supervision of a technically qualified individual). A technically qualified individual meets the following definition:

- Capable of understanding the health and environmental risks associated with the chemical substance that is used under his or her supervision because of education, training, or experience, or a combination of these factors;
- Responsible for enforcing appropriate methods of conducting scientific experimentation, analysis, or chemical research to minimize such risks; and
- Responsible for the safety assessments and clearances related to the procurement, storage, use, and disposal of the chemical substance as may be appropriate or required within the scope of conducting a research and development activity.

In addition, EPCRA requirements do not apply to the transportation, including storage, of any substance, with the exception of Section 304 reporting. Therefore, materials being distributed or stored incident to transportation (i.e., under active shipping papers) would not be included in a facility threshold determination under Sections 311 and 312.

EPCRA Section 313 (Toxic Release Inventory, TRI)

The healthcare industry primarily falls under SIC codes 0741 and 0742 (veterinary services), 4119 (land ambulances), 4522 (air ambulances), 80 (hospitals and doctors' offices/clinics), 83 (social services), and 8734 (veterinary testing laboratories). These SIC codes are not required to report to TRI (i.e., submit annual reports of toxic chemical releases) under EPCRA Section 313. Federal facilities however, are subject to EPCRA Section 313. These include federal hospitals such as veterans hospitals, military hospitals, or clinics in federal prisons.

Healthcare facilities that are defined as auxiliary facilities (i.e., supports another establishments's activities) can assume the SIC code of the covered establishment that it supports. For the purposes of TRI, auxiliary facilities are defined as one primarily engaged in performing support services for another establishment(s) of a facility (in a covered SIC code) and is in a different physical location than the primary facility. If the healthcare facility meets this definition, the facility meets the SIC code criterion.

Typical Records an EPA Inspector May Ask to Review under the EPCRA

- Proof of notification for all environmental releases of a listed hazardous substance. "Failure to notify" violation will be sited if the National Response Center, State Hotline, and LEPC is not notified in a timely fashion.
- Emergency Response Plans.
- MSDS.
- Tier I or Tier II inventory reporting forms. This inspection is done together with the MSDS. The inspector will look at what materials are stored and in what quantity and if they are subject to reporting requirements. The federal government prefers the more detailed Tier II inventory form.
- EPA Toxic Release Inventory Form R for federal healthcare facilities report on every chemical manufactured, processed, or used. Form R contains facility identification information and chemical specific information (toxic chemical identity; mixture component; activity and uses; maximum amount of chemical on site during calendar year; quantity; transfers; discharges; on-site waste treatment; on-site energy recovery; on-site recycling; source reduction/recycling).

Visit these web sites for more information: http://yosemite.epa.gov/oswer/ceppoweb.nsf/content/EPCRA.htm and http://www.epa.gov/ceppo/pubs/hotline/hazchem.html. Visit the TRI web site (http://www.epa.gov/tri/) for more details. ***"List of Lists"*** *is a consolidated list of chemicals subject to EPCRA and CAA Section 112(r) used to help facilities*

handling chemicals determine whether they need to submit reports under Sections 302, 304, 311, 312, or 313 of EPCRA and, for a specific chemical, what reports may need to be submitted. It will also help facilities determine whether they will be subject to accident prevention regulations under CAA Section 112(r) and lists "unlisted hazardous wastes" under RCRA. It is available at http://www.epa.gov/ceppo/pubs/title3.pdf

Clean Air Act

The CAA and its amendments are designed to "protect and enhance the nation's air resources so as to promote the public health and welfare and the productive capacity of the population." The CAA consists of six sections, known as Titles, which direct EPA to establish national standards for ambient air quality and for EPA, states, and tribes to implement, maintain, and enforce these standards through a variety of mechanisms. Under the CAA, many facilities are required to obtain operating permits that consolidate their air emission requirements. State, tribal, and local governments oversee, manage, and enforce many of the requirements of the CAA. CAA regulations appear at 40 CFR Parts 50-99.

As discussed in Section III.B.4 of this document, healthcare air emissions come from air conditioning and refrigeration, boilers, medical waste incinerators (if on site), asbestos, paint booths, ethylene oxide sterilization units, emergency generators, anesthesia, laboratory chemicals, and laboratory fume hoods.

Pursuant to Title I of the CAA, EPA has established national ambient air quality standards (NAAQSs) to limit levels of "criteria pollutants," including carbon monoxide, lead, nitrogen dioxide, particulate matter, ozone, and sulfur dioxide. Geographic areas that meet NAAQSs for a given pollutant are designated as attainment areas; those that do not meet NAAQSs are designated as nonattainment areas. Under Section 110 and other provisions of the CAA, each state must develop a State Implementation Plan (SIP) to identify sources of air pollution and to determine what reductions are required to meet federal air quality standards. Tribes may, but are not required, to develop Tribal Implementation Plans (TIP), which play the same role as SIPs, but apply within Indian country. Revised NAAQS for particulates and ozone became effective in 2004.

Title I also authorizes EPA to establish New Source Performance Standards (NSPS), which are nationally uniform emission standards for new and modified stationary sources falling within particular industrial categories. NSPSs are based on the pollution control technology available to that category of industrial source (see 40 CFR Part 60).

New Source Performance Standards

NSPS at 40 CFR 60 include process-specific operational standards. Individual states may impose stricter requirements. The following NSPS are particularly relevant to the healthcare industry:

- **Boilers** - Most hospital boilers are subject to the NSPS regulations. The applicable regulations can be found at 40 CFR Part 60, Subparts Db and

Dc. Subpart Db applies to the larger boilers (greater than 100 million BTU/hr) that were constructed after June 19, 1984. Subpart Dc applies to the smaller boilers (between 10 and 100 million BTU/hr) that were built after June 8, 1989. Depending on the type of fuel combusted, the regulations have emission standards for sulfur dioxide, nitrogen oxides, and particulate matter. The NSPS also have requirements for monitoring and recordkeeping. *http://www.epa.gov/ttn/atw/boiler/boilerpg.html*.

- **Medical Waste Incinerators** - Under the CAA, EPA regulates air emissions from hospital and or medical/infectious wastes incinerators (HMIWI). The applicable regulations can be found at 40 CFR Part 60, Subparts Ec and Ce. Subpart Ec applies to HMIWI that were constructed after June 20, 1996. Subpart Ce applies to HMIWI that were constructed before June 20, 1996. When burned, medical waste may emit air pollutants, including hydrochloric acid (Hal), dioxins and furans, and metals, such as lead (Pb), cadmium (Cd), and mercury (Hg). Therefore, EPA has developed emission standards that apply to incinerators used by hospitals and healthcare facilities as well as those used by commercial waste treatment and disposal companies to treat medical waste. The emission guidelines are intended to meet the requirements of the CAA, and states must establish standards that are at least as protective. These standards will result in reductions in the air emissions of concern from HMIWI. For additional information visit: *http://www.epa.gov/ttn/atw/129/hmiwi/rihmiwi.html*.

Hazardous Air Pollutants

Under Title I, EPA establishes and enforces National Emission Standards for Hazardous Air Pollutants (NESHAPs), nationally uniform standards oriented toward controlling specific hazardous air pollutants (HAPs). Section 112(c) of the CAA further directs EPA to develop a list of source categories that emit any of 188 HAPs, and to develop regulations for these categories of sources. To date, EPA has listed 185 source categories and developed a schedule for establishing emission standards. The emission standards are being developed for both new and existing sources based on "maximum achievable control technology" (MACT). The MACT is defined as the control technology achieving the maximum degree of reduction in the emission of the HAPs, taking into account cost and other factors. Air toxics regulations apply to several operations at healthcare facilities. The NESHAPs that apply to the industry are:

- **Asbestos** (40 CFR 61 Subpart M) - A hospital that performs demolition and renovation operations will be subject to the CAA NESHAP for asbestos. Asbestos must be removed prior to demolition or renovation and proper precautions must be made such as wetting down the material to keep in intact. No asbestos is to be stripped, removed, or otherwise handled or disturbed unless at least one authorized representative trained in NESHAP asbestos regulations is present. A written notice of intention

to demolish or renovate must be submitted to EPA at least 10 working days prior to the start of construction.

- **Industrial, Commercial and Institutional Boilers and Process Heaters** (40 CFR 63 Subpart DDDDD) - This NESHAP may apply at hospitals that are major hazardous air pollutant emitters under the CAA. A major emitter is defined as emitting 10 tons/year of a single HAP or 25 tons/year of combined HAPS. For additional information visit: *www.epa.gov/ttn/atw/boiler/boilerpg/html*.

Chemical Accident Prevention Provisions

The CAA sets forth a list of regulated substances and thresholds, a petition process for adding or deleting substances to the list of regulated substances, requirements for owners or operators of stationary sources concerning the prevention of accidental releases, and state accidental release prevention programs.

Title V Permits

Title V of the CAA requires that all "major sources" (and certain minor sources) obtain an operating permit. Healthcare facilities that qualify as a major source are required to have a Title V permit, and may be required to submit information about emissions, control devices, and the general process at the facility in the permit application. Permits may limit pollutant emissions and impose monitoring, recordkeeping, and reporting requirements.

Monitoring requirements for many facilities with Title V permits are specified in the Compliance Assurance Monitoring (CAM) regulations. For facilities that meet emissions requirements on their permits by using pollution control equipment, CAM may require that the facilities monitor the control equipment to assure that it is operated and maintained as prescribed in their permits.

Refrigerant Recycling Rule

The purpose of Section 608 of the CAA is to maximize the recovery and recycling of refrigerants during the servicing and disposal of stationary air conditioning and refrigeration equipment. Requirements include prohibition of venting, service requirements, equipment certification, leak repair, proper disposal, and recordkeeping. More information can be found at *http://www.epa.gov/region02/cfc/*.

EPA's Clean Air Technology Center, at (919) 541-0800 (in Spanish: (919) 541-1800) or http://www.epa.gov/ttn/catc, provides general assistance and information on CAA standards (e-mail: catcmail@epamail.epa.gov). The Stratospheric Ozone Information Hotline, at (800) 296-1996, or the Ozone Depletion web site (www.epa.gov/ozone), provides general information about regulations promulgated under Title VI of the CAA. RCRA information pertaining to questions about accidental release prevention under CAA Section112(r), is available in the RCRA OnLine database (www.epa.gov/rcraonline), a searchable database of

Frequently Asked Questions (FAQs) about RCRA, and through an on-line order form for RCRA publications (www.epa.gov/epaoswer/osw/publicat.htm). Information on air toxics can be accessed through the Unified Air Toxics web site at http://www.epa.gov/ttn/atw/. In addition, the Clean Air Technology Center's web site includes recent CAA rules, EPA guidance documents, and updates of EPA activities. Visit the Office of Air and Radiation (OAR) homepage for more information: (http://www.epa.gov/air/).

See Section VI.C of this document for information pertaining to pending regulations under CAA.

Toxic Substances Control Act

The Toxic Substances Control Act (TSCA) granted EPA authority to create a regulatory framework to collect data on chemicals in order to evaluate, assess, mitigate, and control risks that may be posed by their manufacture, processing, and use. TSCA provides a variety of control methods to prevent chemicals from posing unreasonable risk. It is important to note that pesticides as defined in the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) are not included in the definition of a "chemical substance" when manufactured, processed, or distributed in commerce for use as a pesticide. Healthcare facilities may be subject to TSCA through:

- Lead hazard reduction regulations;
- Hexavalent chromium regulations under 40 CFR 749.68, replace hexavalent chromium compounds with phosphate based chemicals for water treatment in industrial cooling towers;
- Polychlorinated Biphenyls (PCB) hazard reduction regulations; and
- Asbestos hazard reduction regulations.

TSCA Regulations for Lead

- **National Lead Laboratory Accreditation Program** (TSCA Section 405(b)) establishes protocols, criteria, and minimum performance standards for laboratory analysis of lead in paint, dust, and soil.
- **Hazard Standards for Lead in Paint, Dust, and Soil** (TSCA Section 403) establishes standards for lead-based paint hazards and lead dust cleanup levels in most pre-1978 housing and child-occupied facilities.
- **Training & Certification Program for Lead-Based Paint Activities** (TSCA Section 402/404) ensures that individuals conducting lead-based paint abatement, risk assessment, or inspection are properly trained and certified, that training programs are accredited, and that these activities are

EPA ORDERS CLOSURE OF MEDICAL WASTE INCINERATORS AT GUAM MEMORIAL HOSPITAL

FOR RELEASE: June 2004

HONOLULU -- In response to an order from the U.S. Environmental Protection Agency, the Guam Memorial Hospital Authority has shut down one of its medical waste incinerators and will soon shut down a second in order to meet federal Clean Air Act standards.

Guam Memorial Hospital Authority has agreed to comply with the EPA's order by ceasing to operate its incinerators and putting an alternative medical waste treatment method into place.

The first of two incinerators was shut down on May 18. The second incinerator was switched to emergency back-up status on June 11 and will be permanently shut down by Nov. 30. The EPA determined that both incinerators were violating the emissions standards set by the Clean Air Act.

"It is critical that medical waste incinerators meet all of the required emission standards to protect the public's health," said Deborah Jordan, the EPA's air division director for the Pacific Southwest region. "Developing alternative medical waste treatment will further ensure clean air and proper disposal of medical waste for Guam's residents."

During the initial source tests, one of the incinerators violated the particulate matter, dioxins and furans, hydrogen chloride and lead emissions limits, while the second incinerator violated the particulate matter and hydrogen chloride emission limits. At that time, Guam Memorial Hospital Authority also failed to submit to the EPA the required waste management plan and necessary incinerator operating parameters and other required data for both incinerators.

In response to the order, Guam Memorial Hospital Authority has given the EPA a plan to transport all hospital, medical and infectious waste to a commercial medical waste treatment and disposal facility while the hospital develops an alternative waste treatment system.

The EPA's order also requires the Guam Memorial Hospital Authority to:

- Provide to the EPA a copy of its waste management plan which will include plans to separate solid waste from medical waste and other waste minimization opportunities; and

- Complete the shut down of both incinerators by Nov. 30 and complete final removal and proper disposal of the two incinerators by Dec. 30.

Frequently Asked Questions (FAQs) about RCRA, and through an on-line order form for RCRA publications (www.epa.gov/epaoswer/osw/publicat.htm). Information on air toxics can be accessed through the Unified Air Toxics web site at http://www.epa.gov/ttn/atw/. In addition, the Clean Air Technology Center's web site includes recent CAA rules, EPA guidance documents, and updates of EPA activities. Visit the Office of Air and Radiation (OAR) homepage for more information: (http://www.epa.gov/air/).

See Section VI.C of this document for information pertaining to pending regulations under CAA.

Toxic Substances Control Act

The Toxic Substances Control Act (TSCA) granted EPA authority to create a regulatory framework to collect data on chemicals in order to evaluate, assess, mitigate, and control risks that may be posed by their manufacture, processing, and use. TSCA provides a variety of control methods to prevent chemicals from posing unreasonable risk. It is important to note that pesticides as defined in the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) are not included in the definition of a "chemical substance" when manufactured, processed, or distributed in commerce for use as a pesticide. Healthcare facilities may be subject to TSCA through:

- Lead hazard reduction regulations;
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- **Hazard Standards for Lead in Paint, Dust, and Soil** (TSCA Section 403) establishes standards for lead-based paint hazards and lead dust cleanup levels in most pre-1978 housing and child-occupied facilities.
- **Training & Certification Program for Lead-Based Paint Activities** (TSCA Section 402/404) ensures that individuals conducting lead-based paint abatement, risk assessment, or inspection are properly trained and certified, that training programs are accredited, and that these activities are

conducted according to reliable, effective, and safe work practice standards.

- **Pre-Renovation Education Rule** (TSCA Section 406(b)) ensures that owners and occupants of most pre-1978 housing are provided information concerning potential hazards of lead-based paint exposure before beginning certain renovations on that housing.

- **Lead-Based Paint Disclosure Rule** (TSCA Section 1018) requires disclosure of known lead-based paint and or lead-based paint hazards by persons selling or leasing housing constructed before the phase-out of residential lead-based paint use in 1978.

TSCA Regulations for PCBs

The PCB regulations and requirements apply to both PCB waste materials and PCBs still in use. Because of potential harmful effects on human health and the environment, federal law banned U.S. production of PCBs as of July 2, 1979. However, PCB-containing materials may be present at facilities and PCB-laden wastes may be generated during renovations.

Items with a PCB concentration of 50 ppm or greater are regulated for disposal under 40 CFR Part 761. Some potential sources of PCBs include:

- Mineral-oil filled electrical equipment such as motors or pumps manufactured prior to July 2, 1979;

- Capacitors or transformers manufactured prior to July 2, 1979;

- Plastics, molded rubber parts, applied dried paints, coatings or sealants, caulking, adhesives, paper, Galbestos, sound-deadening materials, insulation, or felt or fabric products such as gaskets manufactured prior to July 2, 1979;

- Fluorescent light ballasts manufactured prior to July 2, 1979;

- Waste or debris from the demolition of buildings and equipment manufactured, serviced, or coated with PCBs; and

- Waste containing PCBs from spills, such as floors or walls contaminated by a leaking transformer.

The general requirements for handling PCB materials and equipment include: identifying and labeling the material, notifying EPA, properly storing the material, and properly disposing of the material.

TSCA Regulations for Asbestos

EPA and the OSHA have promulgated rules regulating asbestos production, use, and disposal. OSHA regulates private sector and some public sector employees' exposure to asbestos and specifies work practices and engineering controls for removing and handling asbestos. Along with EPA and OSHA, some states also have established asbestos requirements that extend the federal requirements. Asbestos programs implemented under TSCA include the following:

- Asbestos Hazard Emergency Response Act (AHERA), which regulates asbestos contained in schools and all public and commercial buildings including hospitals; requires the development of management plans; specifies work practices and engineering controls for removing and handling asbestos; and sets emissions limitations in schools after an abatement activity is completed. EPA Region 6 provides a list of suspected asbestos-containing materials at: *http://www.epa.gov/Region06/6pd/asbestos/asbmatl.htm*.

Typical Physical Features to Inspect for Lead-based Paint, PCBs, and Asbestos under TSCA

- PCB storage areas;
- Equipment, fluids, and other items used or stored at the facility containing PCBs. PCBs are most likely to be found in electrical equipment such as transformers, capacitors, and possibly fluorescent light ballasts (in older fixtures);
- Pipe, spray-on, duct, and troweled cementitious insulation and boiler lagging; and
- Ceiling and floor tiles.

EPA's TSCA Assistance Information Service, at (202) 554-1404 (e-mail: tsca-hotline@epa.gov), answers questions and distributes guidance pertaining to TSCA standards. The Service operates from 8:30 a.m. through 5:00 p.m., EST, excluding federal holidays. For more information on TSCA programs for lead, visit the web site www.epa.gov/lead/regulation.htm. EPA's PCB Homepage includes links to the regulatory text (40 CFR Part 761) as well as lists of approved PCB waste handlers: http://www.epa.gov/pcb/. EPA operates the Asbestos Ombudsman Clearinghouse/Hotline ((800) 368-5888, or (202) 260-0490) to provide general asbestos information. Also visit the EPA Asbestos Management & Regulatory Requirements web site (http://www.epa.gov/asbestos/help.html) for additional material.

Federal Insecticide, Fungicide and Rodenticide Act

FIFRA was first passed in 1947 and amended numerous times, most recently by the Food Quality Protection Act (FQPA) of 1996. FIFRA provides EPA with the authority to oversee, among other things, the registration, distribution, sale and use of pesticides. The Act applies to all types of pesticides, including insecticides, herbicides, fungicides, rodenticides and antimicrobials. FIFRA covers both intrastate and interstate commerce.

Product Registration

Under Section 3 of FIFRA, all pesticides (with few exceptions) sold or distributed in the United States must be registered by EPA. Pesticide registration is very specific and generally allows use of the product only as specified on the label. Each registration specifies the use site (i.e., where the product may be used) and the amount that may be applied. The person who seeks to register the pesticide must file an application for registration. The application process often requires either the citation or submission of extensive environmental, health, and safety data.

Use Restrictions

As a part of the pesticide registration, EPA classifies the product as unclassified, general use, or restricted use (40 CFR Section 152.160(a)). The Administrator may prescribe restrictions relating to the product's composition, labeling, or packaging. For pesticides that may cause unreasonable adverse effects on the environment, including injury to the applicator, EPA may require that the pesticide be applied either by, or under the direct supervision of, a certified applicator.

Good Laboratory Practices

EPA prescribes good laboratory practices under 40 CFR Part 160 for conducting studies that support research or marketing permits for pesticide products regulated by EPA. These practices are intended to assure the quality and integrity of the submitted research data.

Typical Physical Features to Inspect for under FIFRA

- Personnel protection equipment;
- Pesticide application equipment;
- Pesticide storage areas, including storage containers; and
- Cleaning disinfectants and labels.

Typical Records a EPA Inspector May Ask to Review under the FIFRA

- Records of pesticides purchased (purchase orders, inventory);
- Pesticide application records;
- Description of the pest control program;
- Certification status of pesticide applicators;

- *Pesticide disposal manifests;*
- Contract files; and
- Recent ventilation rating for pesticide fume hood and pesticide mixing/storage areas.

Antimicrobials

In healthcare settings, EPA regulates disinfectants that are used on environmental surfaces (housekeeping and clinical contact surfaces). Disinfectants intended for use on clinical contact surfaces (e.g., light handles, radiographic-ray heads, or drawer knobs) or housekeeping surfaces (e.g., floors, walls, or sinks) are regulated by EPA, under the authority of FIFRA. Under FIFRA, any substance or mixture of substances intended to prevent, destroy, repel, or mitigate any pest, including microorganisms but excluding those in or on living man or animals, must be registered before sale or distribution. To obtain a registration, a manufacturer must submit specific data regarding the safety and the effectiveness of each product.

FIFRA requires users of products to follow the labeling directions on each product explicitly. The following statement appears on all EPA-registered product labels under the Directions for Use heading: "**It is a violation of federal law to use this product inconsistent with its labeling.**" This means that users, including the healthcare industry, must follow the safety precautions and use directions on the labeling of each registered product. Not following the specified dilution, contact time, method of application, or any other condition of use is considered misuse of the product.

The Centers for Disease Control (CDC) recommends disinfecting environmental surfaces or sterilizing or disinfecting medical equipment, and medical facilities should use products approved by EPA unless no such products are available for use against certain microorganisms or sites. However, if no registered or approved products are available for a specific pathogen or use situation, medical facilities are advised to follow the specific guidance regarding unregistered or unapproved (e.g., off-label) uses for various chemical germicides. For example, no antimicrobial products are registered for use specifically against certain emerging pathogens (e.g., Norwalk virus), potential terrorism agents (e.g., variola major or *Yersinia pestis*), or Creutzfeldt-Jakob disease agents.

Microorganisms vary in their resistance to disinfection and sterilization, enabling CDC's designation of disinfectants as high-, intermediate-, and low-level, when compared with EPA's designated organism spectrum. However, exceptions to this general guide exist, and manufacturers' label claims and instructions should always be followed.

For more information on the use of hospital disinfectants, refer to: MMWR Recommendation and Report on Dental Infection Control Guidelines, (*http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5217a1.htm*) and Guidelines for Environmental Infection Control in Health-Care Facilities, (*http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5210a1.htm*).

Additional information on FIFRA and the regulation of pesticides can be obtained from a variety of sources, including EPA's Pesticide Program at

http://www.epa.gov/pesticides , EPA's Office of Compliance, Pesticide Compliance Assistance at http://www.epa.gov/compliance/assistance/pesticides/index.html, EPA's Office of Compliance Agriculture and Ecosystem Division at http://www.epa.gov/compliance/assistance/sectors/agriculture.html, or The National Agriculture Compliance Assistance Center, (888) 663-2155 or http://www.epa.gov/agriculture/ (e-mail: agcenter@epa.gov). Other sources include the National Pesticide Information Center, (800) 858-7378 or http://npic.orst.edu/, and EPA's Antimicrobial hotline , (703) 308-0127, operating weekdays from 9:00 a.m. to 4:00 p.m., EST, excluding federal holidays (e-mail: info_antimicrobial@epa.gov) or web site, http://www.epa.gov/oppad001/.

VI.B. Regulations by Waste Category

Table VI-2 lists the applicable regulations for each waste category.

Table VI-2: EPA Regulations by Waste Category

Waste Category	Specific Wastes Found in this Category[1]	Applicable Statute
Municipal Solid Waste	Cardboard, paper, boxboard, magazines, newspaper, metals (steel and aluminum), glass, plastics, food waste, leaf and yard waste, mixed materials, mattresses, furniture, pallets, carpet, packaging materials	RCRA, EPCRA, FIFRA
Biohazardous Waste, Regulated Medical Waste (RMW)	Sharps waste, blood and blood products, pathological waste, selected isolation wastes, cultures and stocks from laboratories, non-regulated chemotherapy waste, blood-soaked bandages, etc.	RCRA, CAA
Hazardous Waste	Solvents, selected pharmaceuticals, ethylene oxide (EtO), mercury-containing equipment or compounds, lead-containing equipment, hazardous chemicals	RCRA
Pressurized Containers	Gas cylinders, gas cartridges, aerosol cans, oxygen farms	RCRA
Universal Wastes	Mercury-containing thermostats, and spent fluorescent lamps and other hazardous lamps. Hazardous waste batteries, hazardous waste pesticides - recalled or sent to collection program	RCRA
Construction and Demolition Debris	Asbestos, mercury, lead, C&D debris	RCRA, CWA, CAA, TSCA
Wastewater	Potentially, any hazardous substance in any clinical area, oils, hydraulic fluid, chemical spills	CWA
Stormwater	Contaminated runoff from building, lawns, parking areas, underground storage tank areas, aboveground storage tank areas, and disturbed soils from construction sites	CWA, FIFRA

Table VI-2: EPA Regulations by Waste Category (Continued)

Waste Category	Specific Wastes Found in this Category[1]	Applicable Statute
Air Emissions	Air conditioning and refrigeration, boilers, medical waste incinerators, asbestos, paint booths, sterilization using ethylene oxide, emergency generators, anesthesia	CAA, EPCRA

[1]See Section III for more examples.

VI.C. Pending and Proposed Regulatory Requirements

The following pending and proposed regulations affect the healthcare industry:

Clean Water Act

EPA is working with dental offices to begin collecting dental amalgam before it enters the waste stream. As part of its pretreatment standards review process, EPA is reviewing industrial sources of mercury, including dental facilities, for potential technology-based options for controlling mercury discharges to wastewater treatment plants. In addition, the Agency is working with wastewater treatment plants to begin implementing best management practices for collecting mercury from other industrial sources, as well as modifying surface water discharge permits to reflect stricter requirements in mercury discharges. See EPA's Effluent Guidelines Program web site (*http://www.epa.gov/guide/*) for more information.

Clean Air Act

Ethylene Oxide (EtO)

Some hospitals use ethylene oxide as a sterilant for certain types of healthcare supplies and devices, primarily due to manufacturers' recommended practice to ensure the sterility of a product. Hospital sterilizers are one of 55 area source categories may be subject to Area Source Category NESHAP regulations. Go to: *http://www.epa.gov/ttn/atw/urban/arearules.html* for more information.

Resource Conservation and Recovery Act

Universal Waste Regulations

In June 2002, EPA proposed to add mercury-containing equipment to the universal waste list. The Universal Waste Rule allows facilities to streamline the waste management of certain widely generated hazardous wastes. The waste management requirements of universal wastes are less strict than those for other RCRA listed hazardous wastes. Visit the web site *www.epa.gov/epaoswer/hazwaste/id/univwast/regs.htm* for more information.

VI.D. Additional Applicable Regulations (Non-EPA Administered)

The following non-EPA administered environmental or wastes related regulations affect the healthcare industry:

Mercury Ordinances/Resolutions

Many states have passed ordinance and resolutions banning the manufacture or sale of mercury-containing items, such as thermometers, thermostats, and switches containing mercury.

"One Plan"/Integrated Contingency Plan

The "One Plan" (EPA HQ), also known as Integrated Contingency Plan (ICP), allows a facility to comply with multiple federal planning requirements by consolidating them into one functional emergency response plan. A number of statutes and regulations, administered by several federal agencies, include requirements for emergency response planning. A particular facility may be subject to one or more of the following federal regulations:

- EPA's Oil Pollution Prevention Regulation (SPCC and Facility Response Plan Requirements) - 40 CFR Part 112.7(d) and 112.20-.21;
- MMS's Facility Response Plan Regulation - 30 CFR Part 254;
- RSPA's Pipeline Response Plan Regulation - 49 CFR Part 194;
- USCG's Facility Response Plan Regulation - 33 CFR Part 154, Subpart F;
- EPA's Risk Management Programs Regulation - 40 CFR Part 68;
- OSHA's Emergency Action Plan Regulation - 29 CFR 1910.38(a);
- OSHA's Process Safety Standard - 29 CFR 1910.119;
- OSHA's HAZWOPER Regulation - 29 CFR 1910.120; and
- EPA's RCRA Contingency Planning Requirements - 40 CFR Part 264, Subpart D, 40 CFR Part 265, Subpart D, and 40 CFR 279.52.

In addition, facilities may also be subject to state emergency response planning requirements that this guidance does not specifically address. Facilities are encouraged to coordinate development of their ICP with relevant state and local agencies to ensure compliance with any additional regulatory requirements.

Visit the National Response Team's Integrated Contingency Plan Guidance (One Plan) web site for more information:
http://yosemite.epa.gov/oswer/ceppoweb.nsf/content/sta-loc.htm

Federal Hazardous Materials Transportation Law (HAZMAT)

The Department of Transportation (DOT), along with other agencies, regulates the transportation of hazardous materials (including certain medical wastes) under 49 CFR Parts 171-180. The regulations cover five areas: (1) hazardous materials definition/classification; (2) hazard communication; (3) packaging requirements; (4) operational rules; and (5) training. Biohazardous wastes are classified as a Class 6 DOT hazard.

The Hazardous Materials Information Center can be contacted at (800) HMR-4922 ((800) 467-4922) or (202) 366-4488, Monday through Friday from 9:00 am to 5:00 pm EST. Visit the HAZMAT web site at http://hazmat.dot.gov/hazhome.htm for additional material.

Nuclear Regulatory Commission (NRC)

The NRC, under authority of the Atomic Energy Act, regulates the use of nuclear by-product material in the fields of nuclear medicine, radiation therapy, and research. The nuclear by-product material is regulated by either the NRC or the state (currently 33 states have agreements with NRC to regulate the by-product material). The NRC issues licenses to authorized users and provides regulations and guidance for the use of nuclear by-product material. Note that radium, a radioactive material that has historically been used in brachytherapy and may be present in healthcare facilities, is not regulated by NRC. It is only regulated by states (although legislation is pending that would bring it under NRC authority).

Visit the NRC web site (http://www.nrc.gov) for more information.

Occupational Safety and Health Administration (OSHA)

OSHA provides regulatory standards to protect workers from injury. OSHA requirements that apply to healthcare facilities include the Bloodborne Pathogens Standard (1910.1030), Hazardous Waste Operations and Emergency Response (HAZWOPER) Standard (1910.120), and Asbestos Standards (1910.1001) for any renovation work.

Visit the OSHA web site (http://www.osha.gov/) for more information. OSHA also has a Hospital eTool (http://www.osha.gov/SLTC/etools/hospital/mainpage.html) that addresses the following areas: administration, central supply, clinical services, dietary, emergency, engineering, heliport, housekeeping, ICU, laboratories, laundry, pharmacy, surgical suite, healthcare wide hazards, and other healthcare wide hazards.

U.S. Postal Service (USPS)

The Domestic Mail Manual, C023, as well as D.O.T. have certain requirements and restrictions for mailing or shipping hazardous pharmaceuticals to patients (i.e. consumer commodities that are hazardous). USPS also has regulations pertaining to mailing sharps, biological specimens, and other healthcare related materials.

Visit the USPS web site and reference the Domestic Mail Manual at (http://pe.usps.gov/) for more information.

National Institutes of Health, Centers for Disease Control (CDC)

The CDC publishes guidelines and recommendations for the healthcare industry on many areas including infection control, sterilization, hand hygiene, and immunizations.

Visit the CDC web site (www.cdc.gov) for more information. The CDC web site also has access to the National Institution of Safety and Health (NIOSH) publication, Preventing Occupational Exposure to Antineoplastic and Other Hazardous Drugs in Health Care Settings (http://www.cdc.gov/niosh/docs/2004-165/)

U.S. Department of Health and Human Services (HHS)

The HHS provides information on laws and regulations pertaining to healthcare from a variety of organizations including the Food and Drug Administration, Centers for Medicare and Medicaid Services, Health Resources and Services Administration, Substance Abuse and Mental Health Services Administration, and Indian Health Services.

Visit the HHS web site (www.hhs.gov) for more information.

VII. COMPLIANCE AND ENFORCEMENT HISTORY

VII.A. Background

Until recently, EPA focused much of its attention on ensuring compliance with specific environmental statutes. This approach allows the Agency to track compliance with the Clean Air Act, the Resource Conservation and Recovery Act, the Clean Water Act, and other environmental statutes. Within the last several years, the Agency has begun to supplement single-media compliance indicators with facility-specific, multimedia indicators of compliance. In doing so, EPA is in a better position to track compliance with all statutes at the facility level, and within specific industrial sectors.

A major step in building the capacity to compile multimedia data for industrial sectors was the creation of EPA's Integrated Data for Enforcement Analysis (IDEA) system. IDEA has the capacity to "read into" the Agency's single-medium databases, extract compliance records, and match the records to individual facilities. IDEA uses the Facility Registry System (FRS) maintained Master Source ID identification number to "glue together" separate data records from EPA's databases. This is done to create a "master list" of data records for any given facility. Some of the data systems accessible through IDEA are: AIRS (Air Facility Indexing and Retrieval System, Office of Air and Radiation), PCS (Permit Compliance System, Office of Water), RCRAInfo (Resource Conservation and Recovery Information System, Office of Solid Waste), NCDB (National Compliance Data Base, Office of Prevention, Pesticides, and Toxic Substances), CERCLIS (Comprehensive Environmental and Liability Information System, Superfund), and TRIS (Toxic Release Inventory System). IDEA also contains information from outside sources such as Dun and Bradstreet and OSHA.

The IDEA system can match Air, Water, Waste, Toxics/Pesticides/EPCRA, TRI, and Enforcement Docket records for a given facility, and generate a list of historical permit, inspection, and enforcement activity. IDEA also has the capability to analyze data by geographic area and corporate holder. As the capacity to generate multimedia compliance data improves, EPA will make available more in-depth compliance and enforcement information. Additionally, sector-specific measures of success for compliance assistance efforts are under development.

EPA has also developed Enforcement and Compliance History Online (ECHO). This database was developed in partnership with the Environmental Council of the States (ECOS), a national association representing state and territorial environmental commissioners. ECHO provides users detailed facility reports, which include:

- Federal and state compliance inspections;
- Environmental violations;
- Recent formal enforcement actions taken; and
- Demographic profile of surrounding area.

The data in ECHO covers a two-year period of information and includes information drawn from the following EPA databases:

- AIRS;
- PCS;
- RCRAInfo;
- Integrated Compliance Information System (ICIS);
- Facility Registry System (FRS); and
- U.S. Census Data.

The ECHO database can be found at *http://www.epa.gov/echo/index.html*.

VII.B. Compliance and Enforcement Description

This section discusses how EPA collects data on the historical compliance and enforcement activity of each sector. The Agency compiles compliance and enforcement records from its data systems to the facility level using the Facility Registry System's (FRS) Master Source ID, which links records from virtually any of EPA's data systems to a facility record. For each facility (i.e., Master Source ID), EPA uses the facility-level SIC code that is designated by IDEA, as follows:

1. If the facility reports to TRI, then the designated SIC code is the primary SIC reported in the most recent TRI reporting year.

2. If the facility does not report to TRI, the first SIC codes from all linked AFS, PCS, RCRAInfo, BRS ID/permits are assembled. If more than one permit/ID exists for a particular program, then only one record from that data system is used. The SIC code that occurs most often, if there is one, becomes the designated SIC code.

3. If the facility does not report to TRI and no SIC code occurs more often than others, the designated SIC code is chosen from the linked programs. If more than one permit/ID exists for a particular program, then only one record from that data system is used.

Note that EPA does not attempt to define the actual number of facilities that fall within each sector. Instead, the information presented in this section reflects the records of a subset of facilities within the sector that are well defined in EPA databases.

To compare the number of reported facilities in EPA's database to the total sector universe, most Sector Notebooks contain an estimated number of facilities within the sector according to the Bureau of Census (See Section II). With sectors dominated by small businesses, such as metal finishers and printers, the reporting universe in the EPA databases may be small in comparison to Census data. However, the group selected for inclusion in this data analysis section should be consistent with this sector's general make-up.

This subsection contains four tables that summarize enforcement and compliance activities for the healthcare industry. Tables VII-1 and VII-2 look exclusively at the healthcare industry for the past five years. Tables VII-3 and VII-4 provide a general overview of

compliance and enforcement activities across each of the sectors discussed in a Sector Notebook, for the past five years. Following this introduction is a list defining each column in the tables presented in this section. The data in these tables solely reflect EPA, state, and local compliance assurance activity data that have been entered into EPA databases. EPA ran data queries, for the past five calendar years (February 19, 1998 to February 19, 2004). For up-to-date compliance data, visit the Sector Notebook data refresh web page at: *http://epa.gov/compliance/resources/publications/assistance/sectors/notebooks/data_refresh.html.*

Because most inspections focus on single-media requirements, the data presented in this section result from queries of single-medium databases. These databases do not provide data on whether inspections are state/local- or EPA-led. However, the table presenting the universe of violations generally measures EPA's and states' efforts within each media program. The presented data illustrate the variations across Regions for certain sectors[10]. This variation may result from state/local data entry variations, specific geographic concentrations, proximity to population centers, sensitive ecosystems, highly toxic chemicals used in production, or historical noncompliance. Therefore, the data do not rank regional performance or necessarily reflect which regions may have the most compliance problems.

VII.C. Compliance and Enforcement Data Definitions

Facilities in Search (Tables VII-1, 2, 3, and 4) -- the number of the FRS-maintained Master Source IDs that were designated to the listed SIC code range.

Facilities Inspected (Tables VII-1, 2, 3, and 4) -- the number of EPA and state agency inspections for the facilities in this data search. These values show what percentage of the facility universe is inspected in a 24- or 60-month period.

Number of Inspections (Tables VII-1, 2, 3, and 4) -- the total number of inspections conducted in this sector. An inspection is counted each time it is entered into a single-medium database.

Average Months Between Inspections (Tables VII-1 and 3) -- the average length of time, expressed in months, between compliance inspections at a facility within the defined universe.

Facilities with One or More Enforcement Actions (Tables VII-1 and 3) -- the number of facilities that were party to at least one enforcement action within the defined time period. This category is broken down further into federal and state actions in subsequent columns. EPA obtained these data for administrative, civil/judicial, and criminal enforcement actions. Administrative actions include Notices of Violation (NOVs). A facility with multiple

[10] EPA Regions include the following states: 1 (CT, MA, ME, RI, NH, VT); 2 (NJ, NY, PR, VI); 3 (DC, DE, MD, PA, VA, WV); 4 (AL, FL, GA, KY, MS, NC, SC, TN); 5 (IL, IN, MI, MN, OH, WI); 6 (AR, LA, NM, OK, TX); 7 (IA, KS, MO, NE); 8 (CO, MT, ND, SD, UT, WY); 9 (AZ, CA, HI, NV, Pacific Trust Territories); 10 (AK, ID, OR, WA).

enforcement actions is counted only once in this column. All percentages that appear are referenced to the number of facilities inspected.

Total Enforcement Actions (Tables VII-1, 2, 3, and 4) -- the total number of enforcement actions identified for an industrial sector across all environmental statutes. In this column, a facility with multiple enforcement actions is counted multiple times (e.g., a facility with three enforcement actions counts as three).

State-Led Actions (Tables VII-1 and 3) -- the percentage of the total enforcement actions taken by state and local environmental agencies. Note that this number may not reflect the total number of state enforcement actions; some states extensively report enforcement activities to EPA to include in its data systems, while other states may use their own data systems.

Federal-Led Actions (Tables VII-1 and 3) -- the percentage of the total enforcement actions taken by EPA. This number includes cases that were referred to EPA from state agencies. Many of these actions result from coordinated or joint state/federal efforts.

Enforcement-to-Inspection Ratio (Tables VII-1 and 3) -- shows how often enforcement actions result from inspections; this number is presented for comparative purposes only. This number simply indicates historically how many enforcement actions can be attributed to inspection activity. This ratio includes and enforcement actions under the CWA (PCS), CAA (AFS) and RCRA. Inspections and enforcement actions from the TSCA/FIFRA/EPCRA databases are not factored into this ratio because most of the actions taken under these programs are not the result of facility inspections. This ratio also does not account for enforcement actions arising from noninspection compliance monitoring activities (e.g., self-reported water discharges) under the CAA, CWA and RCRA.

Media Breakdown of Enforcement Actions and Inspections (Tables VII-2 and 4) -- four columns identify the proportion of total inspections and enforcement actions within EPA's Air, Water, Waste, and TSCA/FIFRA/EPCRA databases.

VII.D. Healthcare Industry Compliance History

Table VII-1 provides an overview of the reported compliance and enforcement data for the healthcare industry over the past five years (February 19, 1998 to February 19, 2004). These data are broken out by EPA Region, thereby permitting geographical comparisons. Observations from the data are listed below:

- Regions 2, 3, and 4 contain the most healthcare facilities and conducted the most inspections;
- Region 3 conducted, by far, the most inspections of healthcare facilities and had the lowest average time between inspections; and

- Region 2 had both the most enforcement actions, and the most enforcement actions per inspection.

Table VII-2 provides a more in-depth comparison between the healthcare industry and other sectors by breaking out the compliance and enforcement data by environmental statute for the same five-year period (February 19, 1998 to February 19, 2004). These data are also broken out by EPA Region, thereby permitting geographical comparisons. Observations from the data are listed below:

- The majority of inspections and actions are conducted under the CAA, followed by RCRA; and

- Regions 7 and 8 have only conducted enforcement actions under the CAA.

EPA's Region 2 office identified the following most common healthcare facility violations based on the inspections performed in their region, listed below.

Most Common CAA Healthcare Facility Violations

- Failure to use properly trained and accredited asbestos personnel;

- Failure to notify EPA of asbestos removal projects and to keep required documentation/records;

- Failure to properly dispose of asbestos debris;

- Failure to have CFC leak rate records for chillers and air conditioning units more than 50 pounds of charge;

- Failure to have EPA certified technicians for CFC-containing air conditioning and refrigeration systems;

- Failure to get boilers permitted with the state agency;

- Failure to apply for Title V operating permit;

- Failure to close parts washer lids when not in use; and

- Failure to include spray paint booths and parts degreasers in air permit.

Table VII-1: 5-Year Enforcement and Compliance Summary for the Healthcare Industry (SIC 8000), By Region

Region	Facilities in Search	Facilities Inspected	Number of Inspections	Average Months Between Inspections	Facilities with 1 or More Enforcement Actions	Total Enforcement Actions	Percentage of State Actions	Percentage of Federal Actions	Enforcement-to-Inspection Ratio
National	1,798	1,187	3,953	27	195	343	96%	4%	0.09
1	205	126	265	46	21	31	100%	0%	0.12
2	277	136	391	43	66	130	93%	7%	0.33
3	314	256	1,413	13	20	51	98%	2%	0.04
4	321	235	854	23	24	37	95%	5%	0.04
5	218	120	296	44	25	35	97%	3%	0.12
6	111	75	131	51	9	14	100%	0%	0.11
7	142	105	268	32	6	11	100%	0%	0.04
8	53	40	127	25	1	1	100%	0%	0.01
9	96	55	138	42	18	28	96%	4%	0.2
10	59	37	67	53	5	5	100%	0%	

Table VII-2: 5-Year Enforcement and Compliance Summary for the Healthcare Industry (SIC 8000), by Region and Statute

Region	Facilities In Search	Facilities Inspected	Number of Inspections	Total Enforcement Actions	Clean Air Act		Clean Water Act		RCRA		FIFRA/TSCA/EPCRA	
					% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions	% of Total Inspections	% of Total Actions
National	1,798	1,187	3,953	343	78%	82%	0%	2%	21%	16%	1%	1%
1	205	126	265	31	81%	74%	0%	0%	19%	26%	0%	0%
2	277	136	391	130	71%	85%	2%	2%	24%	12%	3%	1%
3	314	256	1,413	51	88%	90%	0%	0%	12%	10%	0%	0%
4	321	235	854	37	73%	60%	0%	0%	27%	41%	0%	0%
5	218	120	296	35	83%	80%	2%	6%	15%	11%	0%	3%
6	111	75	131	14	45%	79%	0%	0%	55%	21%	0%	0%
7	142	105	268	11	80%	100%	0%	0%	20%	0%	0%	0%
8	53	40	127	1	67%	100%	0%	0%	33%	0%	0%	0%
9	96	55	138	28	70%	86%	0%	0%	29%	14%	1%	0%
10	59	37	67	5	43%	80%	0%	0%	52%	20%	4%	0%

Most Common RCRA Healthcare Facility Violations

- Failure to comply with hazardous waste generator regulations and lack of documentation;
- Failure to comply with Underground Storage Tank regulations and lack of documentation;
- Improper or lack of hazardous waste labeling;
- Failure to have waste batteries/fluorescent lamps stored in proper universal waste containers and labeled;
- No or infrequent weekly inspections of hazardous wastes storage/satellite areas;
- Open containers of hazardous wastes;
- Failure to have hazardous waste determinations on file for all wastes (i.e., some pharmaceutical wastes are classified as RCRA hazardous wastes);
- Failure to have procedures in place to ensure spent aerosol containers are empty before disposal as solid waste;
- Malfunctioning leak detection systems on underground storage tanks;
- Labeling of hazardous waste not done or incorrect;
- Improper disposal of chemotherapy drugs;
- Hazardous waste determination not done or incorrect;
- No or inadequate hazardous waste manifest;
- Disposal of hazardous waste down the drain;
- Improper management of expired pharmaceutical, paints, etc.;
- Lack of contingency plan;
- Lack of or inadequate training for employees in hazardous waste management;
- Failure to ensure that hazardous waste meets Land Disposal Restrictions;
- Failure to upgrade or close USTs by December 22, 1998; and

- Improper consolidation of wastes from nearby facilities.

Most Common CWA Healthcare Facility Violations

- No permit for noncompliance with wastewater discharges;
- Failure to know about local treatment plant sewer use regulations and possible prohibited discharges for indirect dischargers;
- No or inadequate secondary containment for storage tanks;
- Improper disposal down floor drains; and
- No Spill Prevention, Control and Countermeasure Plan.

Most Common EPCRA Healthcare Facility Violations

- Failure to report certain accidental chemical releases to the local authorities along with emissions data; and
- Storage of chemicals (i.e., heating oil and gasoline) on site above threshold amounts (hazardous chemicals above 10,000 lbs and or extremely hazardous substances present at 500 lbs or the threshold planning quantity, whichever is lower).

Most Common FIFRA Healthcare Facility Violations

- Misuse of a registered pesticide product;
- Use of an unregistered product;
- Lack of proper records concerning pest control application within the hospital and or on the hospital grounds; and
- Failure to report pesticide poisonings either occurring within the hospital or of admitted patients.

Common Violations and Problems Found at Hospitals for TSCA Issues

TSCA inspectors are primarily interested in any PCBs and lead-based paint at hospitals. Typical staff residential area lead paint violations/issues are:

- Failure to notify residents of lead paint in building or lack of knowledge of any lead hazard; and

- Failure to provide EPA's pamphlet, "Protect Your Family from Lead in Your Home" as required under 40 CFR Part 745.107(a)(1) (see *http://www.epa.gov/opptintr/lead/leadpdfe.pdf*).

Visit the Healthcare Environmental Resource Center at *http://www.herc.org* for plain language explanations on how to comply with environmental regulations and to learn about pollution prevention opportunities. The Center web site also links to state rules and permitting contacts. Its resource sections contain selected compliance assistance and pollution prevention tools. If you don't have access to the Internet, refer to Section VI and to the Bibliography in Section IX.B for additional resources.

VII.E. Comparison of Enforcement Activity Among Selected Industries

Table VII-3 compares the compliance history of the healthcare sector to the other industries covered by the industry Sector Notebooks. Observations from these five years of data are listed below:

- Sixty-six percent of healthcare facilities have been inspected over the past five years, which is about equal to the average (62 percent) for all other sectors listed;
- The inspected healthcare facilities have been inspected an average of three times each; and
- The healthcare, ground transportation, and oil and gas extraction industries have the highest percentage of state-led enforcement actions (96 percent).

Tables VII-4 provides a more in-depth comparison between the healthcare industry and other sectors by breaking out the compliance and enforcement data by environmental statute. As in Table VII-3, the data cover the last five years. Observations from the data are listed below:

- The majority of inspections and actions are conducted under the CAA, followed by RCRA;
- The healthcare industry has a higher percentage of CAA inspections (78 percent) than the average of the other sectors (60 percent); and
- The healthcare industry has one of the lowest percentages of CWA inspections and actions of any of the sectors listed in these tables.

Table VII-3: 5-Year Enforcement and Compliance Summary for Selected Industries

Sector	Facilities In Search	Facilities Inspected	Number of Inspections	Average Months Between Inspections	Facilities with 1 or More Enforcement Actions	Total Enforcement Actions	Percentage of State-Led Actions	Percentage of Federal-Led Actions	Enforcement-to-Inspection Ratio
Healthcare (SIC Code 8000)	**1,798**	**1,187**	**3,953**	**27**	**195**	**343**	**96%**	**4%**	**0.09**
Acrospace	764	526	2,704	17	246	238	65%	35%	0.09
Ag Chem Pesticide & Fertilizer	585	345	2,123	17	138	107	57%	43%	0.05
Ag Crop Production	131	69	165	48	12	7	86%	14%	0.04
Ag Livestock Production	53	17	58	55	14	28	11%	89%	0.48
Air Transportation	428	211	619	41	80	62	71%	29%	0.1
Dry Cleaning	3,345	1,620	2,944	68	232	178	92%	8%	0.06
Electronics & Computer	1,852	906	2,486	45	286	196	75%	25%	0.08
Fossil Fuel Elec Power Gen	3,520	2,543	18,758	11	1,170	1,582	78%	22%	0.08
Ground Transportation	4,970	3,338	13,612	22	1,084	880	96%	4%	0.06
Inorganic Chemical	1,007	629	5,291	11	352	414	79%	21%	0.08
Iron and Steel	683	480	6,060	7	312	536	78%	22%	0.09
Lumber & Wood Products	3,038	2,045	10,728	17	872	814	85%	16%	0.08
Metal Casting	1,346	797	3,549	23	348	340	79%	21%	0.1
Metal Fabrication	8,279	5,092	16,568	30	2,138	1,716	76%	24%	0.1
Metal Mining	281	183	980	17	70	71	85%	16%	0.07
Motor Vehicle Assembly	1,886	1,211	5,531	20	500	448	77%	23%	0.08
Non-Fuel, Non-Metal Mining	3,778	2,005	9,291	24	522	524	95%	6%	0.06
Nonferrous Metals	531	327	2,968	11	242	395	88%	12%	0.13
Oil & Gas Extraction	2,783	1,681	6,371	26	1,120	949	96%	4%	0.15
Organic Chemical	1,050	787	8,483	7	558	846	73%	27%	0.1
Petroleum Refining	438	297	5,405	5	352	1,335	69%	31%	0.25
Pharmaceutical	572	414	2,108	16	174	199	84%	16%	0.09
Plastic Resins & Fibers	709	502	4,637	9	344	444	85%	15%	0.1
Printing	2,384	1,460	4,913	29	476	435	90%	10%	0.09
Pulp and Paper	566	467	5,830	6	336	498	90%	10%	0.09

Table VII-3: 5-Year Enforcement and Compliance Summary for Selected Industries (Continued)

Sector	Facilities In Search	Facilities Inspected	Number of Inspections	Average Months Between Inspections	Facilities with 1 or More Enforcement Actions	Total Enforcement Actions	Percentage of State-Led Actions	Percentage of Federal-Led Actions	Enforcement-to-Inspection Ratio
Rubber and Plastic	3,823	2,294	9,239	25	962	787	90%	10%	0.09
Shipbuilding & Repair	235	168	870	16	96	83	81%	19%	0.1
Stone Clay Glass&Concrete	3,388	2,013	12,190	17	876	930	89%	11%	0.08
Textiles	1,226	814	3,859	19	304	310	87%	13%	0.08
Water Transportation	269	158	384	42	40	36	89%	11%	0.09
Wood Furniture & Fixtures	1,652	1,047	5,515	18	440	382	89%	12%	0.07

Table VII-4: 5-Year Enforcement and Compliance Summary by Statute for Selected Industries

Sector	Facilities In Search	Facilities Inspected	Number of Total Inspections	Total Enforcement Actions	Clean Air Act		Clean Water Act		RCRA		FIFRA/TSCA/ EPCRA/Other	
					% of Total Inspections	% of Total Enforcement Actions	% of Total Inspections	% of Total Enforcement Actions	% of Total Inspections	% of Total Enforcement Actions	% of Total Inspections	% of Total Enforcement Actions
Healthcare (SIC Code 8000)	**1,798**	**1,187**	**3,953**	**343**	**78%**	**82%**	**0%**	**2%**	**21%**	**16%**	**1%**	**1%**
Aerospace	764	526	2,704	238	52%	43%	3%	3%	44%	51%	0%	3%
Ag Chem Pesticide & Fertilizer	585	345	2,123	107	55%	34%	12%	8%	27%	31%	6%	27%
Ag Crop Production	131	69	165	7	50%	71%	0%	0%	46%	29%	4%	0%
Ag Livestock Production	53	17	58	28	53%	89%	0%	7%	47%	0%	0%	4%
Air Transportation	428	211	619	62	38%	23%	1%	2%	61%	74%	0%	2%
Dry Cleaning	3,345	1,620	2,944	178	26%	35%	0%	0%	74%	65%	0%	0%
Electronics & Computer	1,852	906	2,486	196	31%	14%	4%	5%	64%	67%	1%	15%
Fossil Fuel Elec Power Gen	3,520	2,543	18,758	1,582	75%	88%	18%	8%	6%	3%	0%	1%
Ground Transportation	4,970	3,338	13,612	880	78%	76%	0%	1%	21%	23%	0%	1%
Inorganic Chemical	1,007	629	5,291	414	48%	54%	13%	10%	37%	31%	1%	6%
Iron and Steel	683	480	6,060	536	61%	67%	13%	10%	26%	20%	0%	3%
Lumber & Wood Products	3,038	2,045	10,728	814	75%	76%	1%	0%	24%	23%	1%	1%
Metal Casting	1,346	797	3,549	340	60%	59%	3%	2%	36%	33%	1%	6%
Metal Fabrication	8,279	5,092	16,568	1,716	45%	46%	2%	1%	52%	46%	1%	7%
Metal Mining	281	183	980	71	56%	52%	28%	39%	15%	7%	1%	1%
Motor Vehicle Assembly	1,886	1,211	5,531	448	60%	56%	1%	1%	38%	40%	0%	3%
Non-Fuel, Non-Metal Mining	3,778	2,005	9,291	524	97%	99%	1%	0%	2%	1%	0%	0%
Nonferrous Metals	531	327	2,968	395	64%	70%	9%	5%	27%	22%	0%	2%
Oil & Gas Extraction	2,783	1,681	6,371	949	97%	98%	0%	1%	3%	2%	0%	0%
Organic Chemical	1,050	787	8,483	846	47%	55%	12%	13%	39%	28%	2%	5%
Petroleum Refining	438	297	5,405	1,335	57%	83%	15%	6%	27%	10%	1%	1%
Pharmaceutical	572	414	2,108	199	40%	49%	7%	8%	52%	37%	1%	6%
Plastic Resins & Fibers	709	502	4,637	444	51%	59%	19%	17%	29%	22%	1%	3%
Printing	2,384	1,460	4,913	435	65%	66%	0%	0%	34%	33%	1%	1%
Pulp and Paper	566	467	5,830	498	67%	75%	26%	18%	7%	4%	0%	3%
Rubber and Plastic	3,823	2,294	9,239	787	71%	73%	1%	0%	27%	23%	1%	5%
Shipbuilding & Repair	235	168	870	83	59%	34%	6%	8%	35%	57%	1%	1%
Stone Clay Glass&Concrete	3,388	2,013	12,190	930	85%	87%	1%	1%	13%	10%	1%	2%

Table VII-4: 5-Year Enforcement and Compliance Summary by Statute for Selected Industries (Continued)

Sector	Facilities In Search	Facilities Inspected	Number of Total Inspections	Total Enforcement Actions	Clean Air Act		Clean Water Act		RCRA		*FIFRA/TSCA/ EPCRA/Other*	
					% of Total Inspections	% of Total Enforcement Actions	% of Total Inspections	% of Total Enforcement Actions	% of Total Inspections	% of Total Enforcement Actions	% of Total Inspections	% of Total Enforcement Actions
Textiles	1,226	814	3,859	310	76%	59%	12%	23%	12%	14%	1%	3%
Water Transportation	269	158	384	36	42%	50%	1%	0%	56%	50%	1%	0%
Wood Furniture & Fixtures	1,652	1,047	5,515	382	76%	75%	0%	1%	23%	23%	0%	2%

VII.F. Review of Major Legal Actions

This subsection discusses major legal cases and pending litigation within the healthcare industry. Following are several press releases that discuss recent major cases regarding healthcare facilities:

DEPARTMENT OF VETERANS AFFAIRS AGREES TO $133,000 SETTLEMENT FOR LEAD PAINT DISCLOSURE VIOLATIONS IN MAINE AND MASSACHUSETTS

EXCERPTS FROM: EPA Region 1 Press Release, April 6, 2004, Release # 04-04-04

BOSTON - The U.S. Department of Veterans Affairs has agreed to pay a $10,068 penalty and perform environmental projects worth $123,050 to settle claims by the U.S. Environmental Protection Agency that it failed to properly inform tenants about potential lead hazards at employee housing provided by the department.

The three EPA complaints allege violations of the federal Lead Disclosure Rule for employee housing at VA Medical Centers in Northampton and Bedford, Mass. and Togus, Maine. The three medical centers include a total of about 41 on-site housing units, which the VA leases to employees and their families. Settlement of this case represents the first time a federal facility has paid a penalty for violations of the Lead Disclosure Rule.

In addition to paying the fine, the VA agreed to assign a person to be responsible for environmental compliance at each facility, and to implement a lead-based paint abatement project in employee housing at a total cost of $123,050. Of the case penalty, the Bedford facility will pay $3,080; the Togus facility will pay $3,908; and the Northampton facility will pay $3,080. This case abates health risks posed by lead paint in 16 units of employee housing divided between the three locations and addresses the facilities' underlying barriers to compliance.

The case is among numerous lead-related civil and criminal cases EPA New England has taken to make sure landlords and property owners and managers are complying with the federal Lead Disclosure Rule. EPA New England's work to implement the Residential Lead-Based Paint Hazard Reduction Act has included more than 150 inspections around New England, as well as numerous compliance assistance workshops.

Low-level lead poisoning is widespread among American children, affecting as many as three million children under the age of six, with lead paint the primary cause. Elevated lead levels can trigger learning disabilities, decreased growth, hyperactivity, impaired hearing and even brain damage. Lead is also harmful to adults. Adults can suffer from difficulties during pregnancy, other reproductive problems, high blood pressure, digestive problems, nerve disorders, memory and concentration problems, and muscle and joint pain.

EPA ORDERS CLOSURE OF MEDICAL WASTE INCINERATORS AT GUAM MEMORIAL HOSPITAL

FOR RELEASE: June 2004

HONOLULU -- In response to an order from the U.S. Environmental Protection Agency, the Guam Memorial Hospital Authority has shut down one of its medical waste incinerators and will soon shut down a second in order to meet federal Clean Air Act standards.

Guam Memorial Hospital Authority has agreed to comply with the EPA's order by ceasing to operate its incinerators and putting an alternative medical waste treatment method into place.

The first of two incinerators was shut down on May 18. The second incinerator was switched to emergency back-up status on June 11 and will be permanently shut down by Nov. 30. The EPA determined that both incinerators were violating the emissions standards set by the Clean Air Act.

"It is critical that medical waste incinerators meet all of the required emission standards to protect the public's health," said Deborah Jordan, the EPA's air division director for the Pacific Southwest region. "Developing alternative medical waste treatment will further ensure clean air and proper disposal of medical waste for Guam's residents."

During the initial source tests, one of the incinerators violated the particulate matter, dioxins and furans, hydrogen chloride and lead emissions limits, while the second incinerator violated the particulate matter and hydrogen chloride emission limits. At that time, Guam Memorial Hospital Authority also failed to submit to the EPA the required waste management plan and necessary incinerator operating parameters and other required data for both incinerators.

In response to the order, Guam Memorial Hospital Authority has given the EPA a plan to transport all hospital, medical and infectious waste to a commercial medical waste treatment and disposal facility while the hospital develops an alternative waste treatment system.

The EPA's order also requires the Guam Memorial Hospital Authority to:

- Provide to the EPA a copy of its waste management plan which will include plans to separate solid waste from medical waste and other waste minimization opportunities; and

- Complete the shut down of both incinerators by Nov. 30 and complete final removal and proper disposal of the two incinerators by Dec. 30.

All medical waste incinerators need to be permitted and have the necessary air pollution controls to meet all Clean Air Act standards. Medical waste can be a source of

pollution from the pathological and biological waste, along with any chemicals produced during incineration from plastics and other medical waste materials.

SLOAN-KETTERING FINED FOR FAILURE TO PROPERLY MANAGE HAZARDOUS WASTE

FOR RELEASE: Tuesday, January 27, 2004

New York, N.Y. – The U.S. Environmental Protection Agency (EPA) announced today that it has cited Memorial Sloan-Kettering Cancer Center in New York City for violating numerous hazardous waste management requirements. The Agency is seeking full compliance and $214,420 in penalties for the violations.

"Hospitals and healthcare facilities must consider the proper handling of hazardous waste an integral part of their mandates to protect people's health," said Jane M. Kenny, EPA Regional Administrator. "Chemotherapy waste is an especially toxic waste produced by many medical facilities. Hazardous waste regulations are in place to help to ensure that facilities like Sloan-Kettering do not release these or other toxic chemicals into the environment.

EPA discovered violations of the Resource Conservation and Recovery Act (RCRA) at Sloan- Kettering during a March 2003 inspection. They included improper storage and disposal of chemotherapy and dental solid wastes, as well as a general failure to determine whether they were hazardous wastes. Sloan-Kettering has 30 days to respond to the complaint.

In 2002, EPA started the Hospital and Healthcare Initiative to help hospitals and healthcare facilities comply with environmental regulations as part of a larger EPA voluntary audit policy. The Agency established the policy to encourage prompt disclosure and correction of environmental violations, safeguarding people's health and the environment. Many hospitals and healthcare facilities were not aware of their responsibilities under various environmental laws or had failed to implement effective compliance strategies. As part of the initiative, EPA sent letters to 480 facilities in New Jersey, New York, Puerto Rico and the U.S. Virgin Islands and held free workshops to help hospitals comply. In addition, the Agency established a web site that provides information about their duties under the law, and warned hospitals that EPA inspections of their facilities - with risk of financial penalties - were imminent.

Hospitals that wish to take advantage of the Agency's voluntary self-audit program can investigate and disclose environmental violations to EPA and, if certain conditions are met, receive a partial or complete reduction in financial penalties. To date, fourteen healthcare organizations have entered into voluntary self-audit disclosure agreements with EPA. The Agency is continuing to conduct inspections. More information about the healthcare initiative can be found on EPA's web site at: *www.epa.gov/Region2/healthcare/index.html* and about hazardous waste regulation in general at: *www.epa.gov/epaoswer/osw/index.htm*.

EPA FINES NASSAU HEALTH CARE CORPORATION FOR VIOLATING HAZARDOUS WASTE REGULATIONS

FOR RELEASE: Monday, October 20, 2003

New York, N.Y. – The U.S. Environmental Protection Agency (EPA) announced today that it will seek $279,900 in penalties from the Nassau Health Care Corporation Nassau University Medical Center in East Meadow, New York for violating numerous requirements of the federal and New York State hazardous waste regulations. The medical research, diagnostic and treatment facility must comply with all hazardous waste management requirements under the Resource Conservation and Recovery Act (RCRA).

"Hazardous waste regulations help to ensure that facilities like Nassau Health do not release toxic chemicals into the environment and protect workers, patients and visitors at the hospital," said EPA Regional Administrator Jane M. Kenny. "Many toxic compounds easily contaminate air, ground or water and exposure can cause or aggravate many illnesses. Though there were no releases in this case, it is essential that companies with hazardous chemicals in their waste follow EPA and state regulations very carefully to ensure that they don't endanger people or the environment."

The discovery of violations at Nassau Health grew out of EPA inspections of the facility this past winter. These violations included storage or abandonment of several types of solid waste and chemicals, and failure to determine whether or not they were hazardous wastes. In addition, the hospital did not have a permit to store hazardous waste, and did not meet the protective management requirements needed to be exempt from a permit. Hazardous waste containers were not identified with the required markings or inspected regularly; emergency response agencies were not notified of hazardous waste being stored; and the hospital did not minimize the possibility of fire, explosion or unplanned release of hazardous substances into the environment. Finally, a number of hospital personnel responsible for hazardous waste management were not trained in how to handle it, and no hazardous waste emergency response plan was in place. Since the inspection, Nassau Health has been correcting the violations. The company has 30 days to respond to the complaint.

Nassau Health could have avoided this enforcement action by taking advantage of EPA's Hospitals and Healthcare Initiative. EPA Region 2 started the Hospital and Healthcare Initiative in the fall of 2002 to help hospitals and healthcare facilities comply with environmental regulations as part of a larger EPA Voluntary Audit Policy. The Agency established the policy to encourage prompt disclosure and correction of environmental violations, safeguarding human health and the environment. Many hospitals and healthcare facilities were not aware of their responsibilities under various environmental laws or failed to implement effective compliance strategies. As part of the initiative, EPA sent letters to 480 facilities in New Jersey, New York, Puerto Rico and the U.S. Virgin Islands and held free workshops to help hospitals comply. In addition, the Agency established a web site that provides information about their duties under the law, and warned hospitals that EPA inspections of their facilities - with risk of financial penalties - were imminent.

Hospitals can take advantage of the Agency's Voluntary Audit Policy, through which they can investigate and disclose environmental violations to EPA and, as a compliance incentive, receive a partial or complete reduction in financial penalties. To date, eleven hospitals have entered into voluntary self-audit disclosure agreements with EPA.

More information about hazardous waste regulations can be found on EPA's web site at: *http://www.epa.gov/epaoswer/osw/index.htm*.

NORTH SHORE PAYS FINES FOR VIOLATING FEDERAL HAZARDOUS WASTE HANDLING RULES

FOR RELEASE: Thursday, June 12, 2003

NEW YORK, N.Y. – North Shore University Hospital on Community Drive in Manhasset has agreed to pay $40,000 in penalties to the federal government for violations of the Resource Conservation and Recovery Act (RCRA) hazardous waste regulations, the U.S. Environmental Protection Agency (EPA) announced today.

EPA Regional Administrator Jane M. Kenny explained. "The only way hospitals and other healthcare facilities can ensure that wastes that have the potential to harm people and the environment are properly handled is to strictly adhere to federal hazardous waste rules."

As part of a region-wide initiative to bring hospitals into compliance with federal rules, EPA is inspecting healthcare facilities in New York, New Jersey, Puerto Rico and the U.S. Virgin Islands. The discovery of the violations at North Shore Hospital grew out of EPA inspections of the facility in April and May of 2002.

EPA issued a complaint last year against North Shore hospital alleging it failed to determine if spent fluorescent bulbs and chemotherapy waste were hazardous prior to disposal, and had improperly documented the transport of hazardous waste. The Agency also cited North Shore for failing to properly label storage drums containing hazardous waste and to minimize the risk of explosion, fire and release that could have affected people's health and the environment. As part of the settlement between the facility and EPA, the facility agreed to take corrective actions that would prevent any recurrence of the violations in the future.

EPA operates a Voluntary Audit Policy, through which the Agency can substantially reduce civil penalties for those that voluntarily disclose and promptly correct violations that are identified through self-policing and meet certain other specified conditions, except in cases involving serious harm to public health or the environment. In most cases, the punitive component of the penalty may be fully eliminated, but EPA would still be able to collect any economic benefit as a result of non-compliance.

EPA PROPOSES TO FINE PONCE HOSPITAL FOR ILLEGAL DISCHARGE

FOR RELEASE: Wednesday, November 19, 2003

New York, N.Y. – The U.S. Environmental Protection Agency (EPA) has proposed a $137,500 penalty against Quality Health Services of Puerto Rico, Inc. (Hospital San Cristobal) for discharging wastewater to a small creek, a tributary to the Rio Inabon, in violation of the federal Clean Water Act. The EPA issued a complaint based on the hospital's continuing failure to comply with the requirements of its wastewater discharge permit.

"Wastewater discharge permits protect public health and the environment," said EPA Regional Administrator Jane M. Kenny. "The hospital has been out of compliance since February 2000. As a healthcare facility, Hospital San Cristobal should understand the importance of properly managing its waste."

The September 30, 2003 complaint charges that Quality Health Services violated the requirements of its National Pollutant Discharge Elimination System (NPDES) permit, issued under the Clean Water Act. In March 2003, EPA inspected the hospital and ordered Quality Health Services to comply with the requirements of its NPDES permit. However, Quality Health Services allegedly continued to violate the Clean Water Act (for a total of 226 times from February 2000 through May 2003) with its discharge of sanitary wastewaters from the hospital's wastewater treatment plant. Specifically, the discharge exceeded permit limitations for ammonia, biochemical oxygen demand, color, fecal coliform, flow, fluoride, nitrate-nitrite, phenolics, phosphorus, silver, sulfide, surfactants and zinc. Under federal regulations, Quality Health Services has the right to request a hearing on the proposed penalty.

NEW YORK PRESBYTERIAN HOSPITAL

BASED ON NOVEMBER 2004 PRESS RELEASE

New York Presbyterian Hospital was charged with failing to provide tenants, including pregnant women and families with young children, with the required lead paint hazard information (i.e., failing to provide a lead warning statement, statement disclosing any knowledge of lead-based paint, and list of any existing records or reports pertaining to lead-based paint, nor obtaining a statement by the lessee of receipt of a lead hazard information pamphlet.) These failures are violations of 42 U.S.C. Section 4852d(b)(5) and § 409 of TSCA, 15 U.S.C. § 2689.

Lead poisoning presents an environmental health hazard for young children living in apartments constructed before 1978, due to the potential chipping or peeling of lead paint, or lead-contaminated dust. New York Presbyterian Hospital owned and leased at least twenty-nine housing units to families of physicians at their facility in White Plains, New York. Region 2 suggested possible activities that could be undertaken as Supplemental Environmental Projects, and New York Presbyterian Hospital submitted a proposal for a SEP that involved exterior maintenance and repair, but the parties were unable to reach agreement on an appropriate SEP. New York Presbyterian Hospital entered into a cash settlement with EPA for $248,000, which is

the largest monetary settlement in the history of the Lead-based Paint Disclosure Program. On July 10, 2003, the Regional Administrator signed the Final Order memorializing the settlement in the Consent Agreement and Final Order. (T. Bourbon/L. Livingston)

EPA FINES ATLANTIC HEALTH SYSTEMS INC. FOR FAILURE TO PROPERLY MANAGE HAZARDOUS WASTE

FOR RELEASE: Tuesday, November 25, 2003

New York, N.Y. -- The U.S. Environmental Protection Agency (EPA) announced today that it will seek $64,349 in penalties from Atlantic Health System Inc., owner and operator of Mountainside Hospital in Montclair, New Jersey. The Agency cited the company for violating numerous hazardous waste management requirements under the Resource Conservation and Recovery Act (RCRA).

"Hospitals and healthcare facilities should consider the proper handling of hazardous waste as an integral part of their mandates to protect people's health," said Jane M. Kenny, EPA Regional Administrator."We are pleased that Mountainside Hospital has recognized its responsibility to its patients, employees and neighbors, and is taking action to correct the violations."

EPA discovered the violations at Mountainside Hospital during an April 2003 inspection. The violations included improper storage or disposal of several types of solid waste, and failure to determine whether they were hazardous wastes. In addition, the hospital did not have a permit to store hazardous waste and did not meet the protective management requirements needed to be exempt from a permit. Hazardous waste containers were not clearly identified with the required markings or inspected regularly, and emergency response information was not posted. Mountainside is working to correct the violations. Its parent company, Atlantic Health, has 30 days to respond to the complaint.

In 2002, EPA started the Hospital and Healthcare Initiative to help hospitals and healthcare facilities comply with environmental regulations as part of a larger EPA voluntary audit policy. The Agency established the policy to encourage prompt disclosure and correction of environmental violations, safeguarding people's health and the environment. Many hospitals and healthcare facilities were not aware of their responsibilities under various environmental laws or had failed to implement effective compliance strategies. As part of the initiative, EPA sent letters to 480 facilities in New Jersey, New York, Puerto Rico and the U.S. Virgin Islands and held free workshops to help hospitals comply. In addition, the Agency established a web site that provides information about their duties under the law, and warned hospitals that EPA inspections of their facilities - with risk of financial penalties - were imminent.

Hospitals that wish to take advantage of the Agency's voluntary self-audit program can investigate and disclose environmental violations to EPA and, if certain conditions are met, receive a partial or complete reduction in financial penalties. To date, eleven hospitals have entered into voluntary self-audit disclosure agreements with EPA. The Agency is continuing to conduct inspections.

YALE-NEW HAVEN HOSPITAL ACCEPTS EPA PLAN FOR ENVIRONMENTAL AUDIT

Yale-New Haven Hospital and EPA say they have reached an agreement under which the hospital will voluntarily carry out a comprehensive environmental audit. The agreement between EPA Region I and the hospital in New Haven, Conn., is the first of its kind to be signed in New England and is part of an agency effort to improve hospital compliance with environmental laws. EPA Region I launched its hospital initiative earlier this year, citing the experience of EPA's New York/New Jersey regional office, which took enforcement actions against several hospitals after significant noncompliance was found during inspections of hospital facilities.

Source: *http://pubs.bna.com/ip/BNA/den.nsf/is/a0b0d4k1d7*

VIII. COMPLIANCE ACTIVITIES AND INITIATIVES

This section highlights organizations, resources, and the voluntary activities being undertaken by the healthcare sector, public agencies, and nongovernmental organizations to improve the sector's environmental performance. These activities include those independently initiated by industrial trade associations.

VIII.A. Healthcare Related Programs and Activities

Healthcare Environmental Resource Center (Compliance Assistance Center)

Using an EPA grant the National Center for Manufacturing Sciences with the cooperation of the American Hospital Association, the American Nurses Association, and EPA, via the Hospitals for a Health Environment (H2E) program and other stakeholders, is creating an on-line compliance assistance center (or Healthcare Environmental Resource Center - HERC) serving the healthcare industry. The HERC will address issues relevant to hospitals, ambulatory clinics, and other specialized medical facilities. It will serve as a first stop for environmental compliance and pollution prevention information for the healthcare industry. Among its many compliance assistance and pollution prevention features, the HERC will include plain language explanations of applicable regulations and feature links to state and local permitting agencies where users can find information on local regulations and contacts. Look for the Healthcare Environmental Resource Center at *www.HERCenter.org*.

Hospitals for a Healthy Environment (H2E)

Hospitals for a Healthy Environment (H2E) is a voluntary program jointly sponsored by the EPA, the American Hospital Association, the American Nurses Association, and Health Care Without Harm. The primary goal of the H2E effort is to educate healthcare professionals about pollution prevention opportunities in hospitals and healthcare systems and make significant reductions in mercury-containing healthcare waste, and waste volume overall. Through activities such as the development of best practices, model plans for total waste management, resource directories, and case studies, the project hopes to provide hospitals and healthcare systems with enhanced tools for minimizing the volumes of waste generated and the use of persistent, bioaccumulative, and toxic chemicals. Such reductions are beneficial to the environment and health of our communities. Furthermore, improved waste management practices will reduce the waste disposal costs incurred by the healthcare industry. For more information, see the web site at *http://www.h2e-online.org/*.

Resource Conservation Challenge (RCC)

EPA's Resource Conservation Challenge (www.epa.gov/rcc) is a voluntary, joint effort between EPA, businesses, and communities. RCC aims to find flexible, yet more protective ways of improving waste reduction, public health, and the environment. As part of the Resource Conservation Challenge, EPA is asking the hospital industry to develop projects for the

reuse and recycling of hospital items and the reduction of waste. For more information, see the web site at *http://www.epa.gov/epaoswer/osw/conserve/clusters/hospital.htm*.

Lead needed to protect healthcare workers from CatScan radiation, mercury in ultraviolet lamps, and residual or expired pharmaceuticals are just a few examples of the hospital waste that can harm the environment if disposed of improperly. EPA's RCC is committed to supporting projects that:

- Reduce the volume of nonhazardous solid waste, including paper, packaging, yard waste, food waste, and electronic equipment, from the healthcare industry and promote its recycling and safe reuse;
- Virtually eliminate all mercury waste from the healthcare industry waste stream;
- Reduce the volume of other toxic chemicals; and
- Improve the management of pharmaceutical waste by reducing the amount of expired/unused pharmaceuticals that are disposed of in landfills.

Performance Track

Performance Track is a public/private partnership recognizing top environmental performance among participating U.S. facilities of all types, sizes, and complexity, public and private. Program partners are providing leadership in many areas, including preventing pollution at its source and implementing environmental management systems. Currently, the program has about 300 members and welcomes all qualifying facilities. Applications are accepted twice a year: February 1-April 30 and August 1-October 31. For more information, contact the Performance Track hotline at (888) 339-PTRK or visit the web site at *www.epa.gov/performancetrack*.

EPA Audit Policy

EPA encourages companies with multiple facilities to take advantage of the Agency's Audit Policy (Incentives for Self-Policing: Discovery, Disclosure, Correction and Prevention of Violations, 65 Fed. Reg. 19618 (April 11, 2000)) to conduct audits and develop environmental compliance systems. The Audit Policy eliminates gravity-based penalties for companies that voluntarily discover, promptly disclose, and expeditiously correct violations of federal environmental law. More information on EPA's Audit Policy can be obtained from the web site at *http://www.epa.gov/compliance/resources/policies/incentives/auditing/index.html*. EPA Region 2 (NY, NJ, PR, VI) has been actively promoting use of the policy; see voluntary audit policy at *http://www.epa.gov/region02/healthcare/*.

Office of Solid Waste and Emergency Response (OSWER) Innovations Pilot

The Office of Solid Waste and Emergency Response (OSWER) initiated a series of innovative pilots to test new ideas and strategies for environmental and public health protection to find creative approaches to waste minimization. For additional information on OSWER Innovations Pilots, visit the EPA OSWER Innovations web site at *www.epa.gov/oswer/iwg*.

Expanding Pharmaceutical Waste Management in Hospitals

Hospitals for a Healthy Environment is partnering with EPA Region 1, Dartmouth-Hitchcock Medical Center, New Hampshire Department of Environmental Services, New Hampshire Hospital Association, and H2E Champion, PharmEcology Associates, to pioneer pharmaceutical management techniques that ensure regulatory compliance, implement best management practices, and identify and implement waste minimization opportunities. Baseline data on costs and quantities of end-of-life pharmaceuticals will be compiled and evaluated. This information will be used to assess where pharmaceuticals are being discarded, how much is being wasted, and how wasting can be minimized. Based on the results of the baseline assessment, the pilot will develop best management practices incorporating waste reduction activities. A blueprint will be developed providing a step-by-step approach to program implementation and lessons learned. For more detailed information on the pharmaceutical pilot, visit H2E's web site at *www.h2e-online.org*.

Collaborative Partnership to Improve Environmental Performance in the Healthcare Sector

The overall goal of this project is to institutionalize regulatory compliance and pollution prevention practices in the healthcare sector. To achieve this the project seeks to establish a formal lasting partnership with multiple healthcare and regulatory organizations and JCAHO to maximize EPA compliance assistance and pollution prevention resources, improve the environmental performance of the healthcare sector, and create incentives for continuous improvement. The final product will be a set of matrices for JCAHO surveyors and hospital personnel that align environmental regulations and environmental improvement with the JCAHO standards. The matrices will be available electronically on EPA's forthcoming Healthcare Environmental Resource Center's web site at *www.HERCenter.org*. For more detailed information on the JCAHO project, visit H2E's web site at: *www.h2e-online.org*.

National Strategies for Healthcare Providers: Pesticide Initiative

The Pesticide Initiative is an initiative created by EPA and the National Environmental Education & Training Foundation (NEETF) in collaboration with the U.S. Departments of Health and Human Services, Agriculture, and Labor. It is aimed at incorporating pesticide information into the education and practice of healthcare providers. The goal is to

improve the recognition, diagnosis, management, and prevention of adverse health effects from pesticide exposures. This initiative also serves as a model for broader efforts to educate healthcare providers about the spectrum of environmental health issues. Seven federal agencies and 16 professional associations of healthcare providers were involved in launching this initiative. For additional information, visit the EPA Pesticide Initiative web site at *http://www.epa.gov/oppfead1/safety/healthcare/healthcare.htm*

EPA and Veterans Health Administration (VHA) Cooperative Environmental Partnership

Stemming from EPA inspections of VA medical centers in 2002 that revealed repeated violations of environmental regulations, particularly those involving federal hazardous waste management regulations, EPA and VHA are conducting environmental management reviews (EMRs) at select VA medical centers. EMRs evaluate the current status of the management system and identify steps to establish a comprehensive management system for environmental compliance as well as continual improvement beyond compliance. The partnership has fostered environmental training through both EPA Headquarters and the Regions, and assisted in the development of the VA's Green Environmental Management Systems (GEMS). These efforts and others are underway to improve environmental compliance and performance at VA medical centers. For additional information visit *http://www.epa.gov/compliance/assistance/sectors/federal/epavha.html*.

The Green Suppliers Network (GSN)

The Green Suppliers Network (GSN) is a collaborative venture between industry, EPA, and 360vu, the national accounts organization of the Department of Commerce's National Institute of Standards and Technology Manufacturing Extension Partnership (NIST MEP). GSN provides expert technical assistance to small and medium-sized suppliers, through 360vu's national network of technical assistance centers. This assistance provided in a GSN Review enables suppliers to optimize processes and products, eliminate waste, reduce their environmental impacts, identify cost-saving opportunities, and remain competitive. GSN engages both original equipment manufacturers and their suppliers to achieve environmental and economic benefits throughout the supply chain. GSN has launched a pharmaceutical/healthcare initiative piloted in Puerto Rico. For additional information on the program, contact Kristin Pierre at *pierre.kristin@epa.gov* or (202) 564-8837.

WasteWi$e Program

The WasteWi$e Program was started in 1994 by EPA's Office of Solid Waste and Emergency Response. The program is aimed at reducing municipal solid wastes by promoting waste minimization, recycling collection, and the manufacturing and purchase of recycled products. As of February 17, 2004, WasteWise has 1,377 partners (including alumni) spanning more than 54 industry sectors. Members agree to identify and implement actions to reduce their

solid wastes and must provide EPA with their waste reduction goals along with yearly progress reports. EPA in turn provides technical assistance to member companies and allows the use of the WasteWi$e logo for promotional purposes. Sixty-one medical services companies are partners. For more information, contact the Hotline at (800) EPA-WISE (372-9473) or the web site at www.epa.gov/wastewise.

Energy Star®

In 1991, EPA introduced Green Lights®, a program designed for businesses and organizations to proactively combat pollution by installing energy efficient lighting technologies in their commercial and industrial buildings. In April 1995, Green Lights® expanded into Energy Star® Buildings — a strategy that optimizes whole-building energy-efficiency opportunities. The energy needed to run commercial and industrial buildings in the United States produces 19 percent of U.S. carbon dioxide emissions, 12 percent of nitrogen oxides, and 25 percent of sulfur dioxide, at a cost of $110 billion a year. If implemented in every U.S. commercial and industrial building, the Energy Star® Buildings upgrade approach could prevent up to 35 percent of the emissions associated with these buildings and cut the nation's energy bill by up to $25 billion annually.

The more than 7,000 participants include corporations, small businesses, universities, healthcare facilities, nonprofit organizations, school districts, and federal and local governments. Energy Star® has successfully delivered energy and cost savings across the country, saving businesses, organizations, and consumers more than $7 billion a year. Over the past decade, Energy Star® has been a driving force behind the more widespread use of such technological innovations as LED traffic lights, efficient fluorescent lighting, power management systems for office equipment, and low standby energy use. For more information, contact the Energy Star Hotline, (888) STAR-YES ((888) 782-7937) or the web site at http://www.energystar.gov/healthcare.

Small Business Compliance Policy

The Small Business Compliance Policy promotes environmental compliance among small businesses (those with 100 or fewer employees) by providing incentives to discover and correct environmental problems. EPA will eliminate or significantly reduce penalties for small businesses that voluntarily discover violations of environmental law and promptly disclose and correct them. A wide range of resources are available to help small businesses learn about environmental compliance and take advantage of the Small Business Compliance Policy. These resources include training, checklists, compliance guides, mentoring programs, and other activities. Businesses can find more information through links on the web site at http://www.epa.gov/smallbusiness/.

Healthy Building Network (HBN)

Healthcare institutions are increasingly embracing green building goals driven by several important factors: public health, market competitiveness, operation costs, and social responsibility. HBN is a national network of green building professionals, environmental and health activists, socially responsible investment advocates, and others who are interested in promoting healthier building materials as a means of improving public health and preserving the global environment. For more information, contact HBN at (202) 898-1610 or the web site at *http://www.healthybuilding.net/healthcare/index.html*.

Health Care Without Harm (HCWH)

HCWH is an international coalition of hospitals and healthcare systems, medical professionals, community groups, health-affected constituencies, labor unions, environmental and environmental health organizations, and religious groups.

In 1994, EPA's draft Dioxin Reassessment identified medical waste incineration as the single largest source of dioxin air pollution. The HCWH campaign was formed in 1996 to respond to this serious problem. Since then, the campaign has grown from an initial 28 founding organizations into a broad-based international coalition. The mission of HCWH is to transform the healthcare industry worldwide, without compromising patient safety or care, so that it is ecologically sustainable and no longer a source of harm to public health and the environment. For more information, contact the HCWH web site at *http://www.noharm.org/*.

The Sustainable Hospitals Project (SHP)

SHP's mission is to provide technical support to the healthcare industry for selecting products and work practices that reduce occupational and environmental hazards. The SHP is based at the University of Massachusetts Lowell Center for Sustainable Production (LCSP). The project includes in-hospital research on implementing new products and practices, using SHP's Pollution Prevention and Occupational Safety and Health (P2OSH) model. Additionally the SHP web site, *http://www.sustainablehospitals.org*, provides a list of alternative products to help hospitals identify and evaluate more benign alternatives to existing products. SHP also provides technical support by email (*shp@uml.edu*) or phone ((978) 934-3386). For more information, contact the web site at *http://www.sustainablehospitals.org*.

Nightingale Institute for Health and the Environment (NIHE)

NIHE assists healthcare professionals recognize the inextricable link between human and environmental health and their role in changing practices to improve the health of humans and the environment. There are three initiatives associated with this program: the Trustees Initiative, the Clinicians Initiative, and the Environmental Procurement Initiative. Each initiative is designed to educate the target audience on the environmental impact of the

healthcare industry, and to offer resources that enable them to improve the environmental performance of their organizations or processes and minimize the adverse ecological impact in the communities they serve. Inherent in this project is an emphasis on sustainability, resource conservation, and life cycle thinking. For more information, contact the web site at *http://www.nihe.org/*.

Canadian Centre for Pollution Prevention (Healthcare EnviroNet)

Healthcare EnviroNet provides the healthcare community with access to environmental information, products, and services that support a commitment to quality healthcare, protection of the environment, and sustainability. Healthcare EnviroNet delivers a unique collection of Canadian-based information including:

- Green alternatives for healthcare facilities;
- Regulatory updates and government initiatives; and
- Canadian case studies.

Healthcare EnviroNet was established with funding from Environment Canada and is developed and maintained by the Canadian Centre for Pollution Prevention in consultation and partnership with healthcare and nongovernment organizations. For more information, go to the web site at *http://www.c2p2online.com/main.php3?section=83&doc_id=169*.

Recovered Medical Equipment for the Developing World (REMEDY)

Founded in 1991 at Yale University School of Medicine, REMEDY is a group of healthcare professionals and others promoting the nationwide practice of recovery of open-but-unused surgical supplies with the goal of providing international medical relief while reducing solid medical waste from U.S. hospitals. For more information, go to the web site at *http://www.remedyinc.org/about_us.cfm*.

Public Entity Environmental Resource (PEER) Center

The PEER Center is the Public Entity Environmental Management System Resource Center. A virtual clearinghouse, it is specifically designed to aid local, county, and state governments that are considering implementing or have implemented an environmental management system (EMS) and want to access the knowledge and field experience of other public entities that have done so. For more information, go to the web site at *http://www.peercenter.net/*.

ISO 14000

ISO 14000 is a series of internationally accepted standards for environmental management. The series includes standards for EMS, guidelines on conducting EMS audits, standards for auditor qualifications, and standards and guidance for conducting product lifecycle analysis. Standards for auditing and EMS were adopted in September 1996, while other elements of the ISO 14000 series are currently in draft form. While regulations and levels of environmental control vary from country to country, ISO 14000 attempts to provide a common standard for environmental management. The governing body for ISO 14000 is the International Organization for Standardization (ISO), a worldwide federation of over 110 country members based in Geneva, Switzerland. The American National Standards Institute (ANSI) is the United States representative to ISO. Information on ISO is available at the following Internet site: *http://www.iso.ch/iso/en/ISOOnline.openerpage*.

VIII.B. Summary of Trade Organizations and Industry Organizations

There are dozens of trade organizations associated with the healthcare industry. The following list is meant to act as a representative sample, not a comprehensive list.

Joint Commission on Accreditation of Healthcare Organizations (JCAHO)

JCAHO is an independent nonprofit organization whose mission is to improve the safety and quality of care through its accreditation process. JCAHO standards promote patient safety and care and good operational practices in all aspects of healthcare organizations. Nearly 17,000 healthcare organizations worldwide are accredited by JCAHO. Extensive on-site reviews are conducted at least once every three years. The reviews currently only cover environmental issues in a limited manner. See Collaborative Partnership to Improve Environmental Performance in the Healthcare Sector in Section VIII.A of this Notebook to see how H2E is working with JCAHO to help healthcare facilities improve their environmental performance. Contact Information: One Renaissance Blvd, Oakbrook Terrace, IL 60181, Phone: (630) 792-5000, Fax: (630) 792-5005, web site: *http://www.jcaho.org/*.

American Hospital Association (AHA)

The AHA provides education for healthcare leaders and is a source of information on healthcare issues and trends. Through its representation and advocacy activities, AHA ensures that members' perspectives and needs are heard and addressed in national health policy development, legislative and regulatory debates, and judicial matters. AHA advocacy efforts include the legislative and executive branches and the legislative and regulatory arenas. Contact Information: One North Franklin, Chicago, IL 60606-3421, Phone: (312) 422-3000, web site: *http://www.aha.org/*.

American Medical Association (AMA)

The AMA serves as the steward of medicine and leader of the medical profession. The AMA is the national professional organization for all physicians and the leading advocate for physicians and their patients. The AMA's envisioned future is to be an essential part of the professional life of every physician and an essential force for progress in improving the nation's health. Contact Information: 515 N. State Street, Chicago, IL 60610, Phone: (800) 621-8335, web site: *http://www.ama-assn.org/*.

American Dental Association (ADA)

The ADA is the professional association of dentists committed to the public's oral health, ethics, science and professional advancement and leading a unified profession through initiatives in advocacy, education, research and the development of standards. Contact Information: 211 East Chicago Ave., Chicago, IL 60611-2678, Phone: (312) 440-2500, web site: *http://www.ada.org/*.

American Nurses Association (ANA)

ANA focuses its work on core issues of vital concern to the nation's registered nurses - nursing shortage, appropriate staffing, health and safety, workplace rights, and patient safety/advocacy - in addition to its cornerstone work, ethics and standards.

The ANA, composed of professional nurses dedicated to the promotion of health and the care of the sick, has served as the forum in which the nation's critical health issues have been discussed throughout the last century.

Functioning as a democracy, the ANA provided the structure in which views were expressed, ideas were debated and evaluated, and positions and goals were formulated. Because it represented the views of administrators, clinical practitioners in institutions and community agencies, educators, and researchers, it has served for 100 years as the public voice for the diversity of America's professional nurses. Contact Information: 600 Maryland Ave. SW., Suite 100W, Washington D.C. 20024, Phone: (202) 651-7000, Fax: (202) 651-7001, web site: *http://www.ana.org/*.

American Veterinary Medical Association (AVMA)

The AVMA, established in 1863, is a not-for-profit association representing more than 69,000 veterinarians working in private and corporate practice, government, industry, academia, and uniformed services. Structured to work for its members, the AVMA acts as a collective voice for its membership and for the profession.

The AVMA provides a number of tangible benefits to its members, including information resources, continuing education opportunities, quality publications, and discounts on personal and professional products, programs and services. Contact Information: 1931 North Meacham Road - Suite 100, Schaumburg, IL 60173, Phone: (847) 925-8070, Fax: (847) 925-1329, web site: *http://www.avma.org/*.

American Health Care Association (AHCA)

The AHCA is a nonprofit federation of affiliated state health organizations, together representing nearly 12,000 nonprofit and for-profit assisted living, nursing facility, developmentally disabled, and subacute care providers that care for more than 1.5 million elderly and disabled individuals nationally.

AHCA represents the long-term care community to the nation at large – to government, business leaders, and the general public. It also serves as a force for change within the long-term care field, providing information, education, and administrative tools that enhance quality at every level.

At its Washington, D.C. headquarters, the association maintains legislative, regulatory and public affairs, as well as member services staffs that work both internally and externally to assist the interests of government and the general public, as well as member providers. In that respect, AHCA represents its membership to all publics, and national leadership to its members. Contact Information: 1201 L Street, N.W., Washington, D.C. 20005, Phone: (202) 842-4444, Fax: (202) 842-3860, web site: *http://www.ahca.org/*.

American Society for Healthcare Environmental Services (ASHES)

Setting the standard for environmental excellence, ASHES advances healthcare environmental services, textile care professions and related disciplines. ASHES leads, represents and serves our members by promoting excellence, best practices, innovation, and leadership through advocacy, education and certification. Web site: *http://www.ashes.org/*.

American Society for Healthcare Engineers (ASHE)

ASHE is the advocate and resource for continuous improvement in the healthcare engineering and facilities management professions. Web site: *http://www.ashe.org/*.

College of American Pathologists (CAP)

The CAP, the principal organization of board-certified pathologists, serves and represents the interest of patients, pathologists, and the public by fostering excellence in the practice of pathology and laboratory medicine.

The CAP's Strategic Plan is intended to help ensure that the College fulfills its mission in a thoughtful and effective manner. The plan contains 13 specific directions that the College will follow in carrying out its commitment to members, their patients, and the public. CAP members can download a copy of the Strategic Plan; log in to access the file. Contact Information: 325 Waukegan Road, Northfield, IL 60093-2750, Phone: (847) 832-7000, Fax: (847) 832-8000, web site: *http://www.cap.org/*.

National Indian Health Board (NIHB)

The NIHB represents Tribal Governments operating their own healthcare delivery systems through contracting and compacting, as well as those receiving healthcare directly from the Indian Health Service (IHS). Contact Information: 101 Constitution Ave. N.W., Suite 8-B02, Washington, D.C. 20001, Phone: (202) 742-4262, Fax: (202) 742-4285, web site: *www.nihb.org*.

IX. CONTACTS/ACKNOWLEDGMENTS/RESOURCE MATERIALS/ BIBLIOGRAPHY

For further information on selected topics within the healthcare industry, a list of publications and contacts is provided below:

IX.A. Contacts/Document Reviewers[11]

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Charlotte A. Smith, R. Ph., M.S., HEM	President, PharmEcology Associates, LLC	(262) 814-2635 / info@pharmecology.com	Activity Descriptions
Laura Brannen	Hospitals for a Healthy Environment	(603) 643-6700 / laura.brannen@h2e-online.org	Hospital Wastes
Jeffrey Keohane	Karshmer & Associates (P.C.)	(510) 841-5056 / keohane@karshmerindianlaw.com	Environmental Regulations on Indian Country
Eydie Pines	Hospitals for a Healthy Environment	(603) 643-6710 / eydie.pines@h2e-online.org	Pharmaceutical Waste
Fawzi M. Awad, M.S., E.H.S. II	Saint Paul-Ramsey County Department of Public Health, Environmental Health Section	(651) 773-4459 / fawzi.awad@co.ramsey.mn.us	Minnesota Pollution Control Agency Fact Sheets
Catherine Galligan	Sustainable Hospitals Project Clearinghouse Manager	(978) 934-3386 / shp@uml.edu	Healthcare Wastes and Sustainable Hospitals Project Fact Sheets
Kathleen Malone	EPA, Region 2	(212) 637-4083 / malone.kathleen@epa.gov	Federal Statutes and Regulations

[11] Many of the contacts listed in this section have provided valuable background information and comments during the development of this document. EPA appreciates this support and acknowledges that the individuals listed do not necessarily endorse all statements made within this Notebook.

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Kristina Meson	EPA, Office of Solid Waste	(703) 308-8488 / *meson.kristina@epa.gov*	Hazardous Waste

IX.B. Bibliography

Below is a list of references used in compiling this Sector Notebook, by section. The Healthcare Environmental Resource Center contains additional details on most of the subjects touched on in this Notebook and is an excellent follow-up reference for locating information on state and local requirements. For your convenience, the Center maintains current URLs for all of the sites mentioned in this document at *www.HERCenter.org/links*.

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