

Industry Surveys

Environmental & Waste Management

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Weak economy slows spending and disposal

Although recent signs of a pickup in economic growth should translate into a gradual recovery in waste management industry volume during 2004, the outlook for growth is still tentative. Consumer confidence was recently near its lowest level in 10 years, the jobless rate remains high, and capital spending is still weak. Furthermore, geopolitical turmoil, especially in the Middle East, has had an unsettling effect on global markets and continues to darken economic prospects in the United States. Higher energy prices, resulting from production cutbacks in foreign countries and low oil and natural gas inventories in the United States, could drain even more purchasing power from U.S. businesses and consumers.

Although many view the waste management industry as recession resistant, it certainly has not been recession proof. For most companies, volume was flat or little changed in 2002 and continued flat in 2003, year to date. Pricing remains competitive, leading us to forecast flat to minimally higher industry revenues for full-year 2003. However, cost cutting and productivity improvements should allow most companies to post modest profit growth for full-year 2003.

Buoyed by record low mortgage rates, the housing market has been strong for the past few years. However, interest rates have begun to rise from their 40-year lows, and Standard & Poor's projects only a modest gain in housing starts for 2003, followed by a decline in 2004, which would lower the amount of construction and demolition debris. Nonresidential construction remains soft, reflecting the doubling of the office vacancy rate since mid-2001. With plenty of excess space, there is no reason to build.

In addition, because of ongoing excess manufacturing capacity — the U.S. capacity utilization rate was near 74% as of August

2003 — corporate spending is improving at only a snail's pace. Most capital spending is being directed at replacement rather than capacity expansion, which is common in the early stages of an economic recovery.

Federal support for environmental programs and water treatment services remains strong, but ballooning federal budget deficits and increased spending on military and national security programs may limit funding in the future. Meanwhile, state and municipal budgets have come under severe pressure from lingering economic woes. Government officials at these levels are slashing budgets and revising programs for solid waste collection and recycling programs, while deferring capital spending on upgrades to public water systems.

Federal budget supports environmental programs

Among government actions that will affect the water, waste, and environmental sectors, the Bush administration has requested a \$7.6 billion budget for the U.S. Environmental Protection Agency (EPA) in the 2004 fiscal year (which began October 1, 2003), up \$10 million from fiscal 2003. Included in the proposal is \$470 million to fund core water programs, which should help to support needed upgrades in municipal water systems.

The budget also proposes a tax credit for energy produced from landfill gas in facilities put into service between January 1, 2003, and January 1, 2011, according to *Waste News*. This would encourage further development of energy projects by waste management companies. The President also requested \$23.4 billion for the Department of Energy (DOE), which oversees many environmental programs, including more than \$7.2 billion to accelerate the environmental cleanup program at 18 DOE non-Superfund sites.

President Bush budgeted \$4.5 billion in fiscal 2003 for activities related to global climate change, up by \$700 million from fiscal 2002. To reduce greenhouse gas emissions that have been linked to global warming, the President's proposed Clear Skies Act would set caps on emissions of sulfur dioxide, nitrogen oxide, and mercury. Other programs are designed to spur development of waste-related and renewable energy sources. (These initiatives are described in more detail later in this section.)

Dividend tax cuts spur payouts

President Bush's tax reduction plan provides incentive for companies to initiate or increase their cash dividend payments. Two major waste haulers have already cited the dividend tax cut that became effective in May 2003 as a reason for implementing cash dividends. Republic Services Inc. initiated a \$0.06 a share quarterly cash dividend in September 2003, and Waste Management Inc. dramatically raised its dividend to a \$0.75 annual rate (to be paid quarterly at \$0.1875), well above the \$0.01 annual dividend that it had paid for the preceding three years.

In addition, many water utilities continue to increase their dividends annually. For example, Philadelphia Suburban Corp. announced it will raise its quarterly dividend by 7% and split its shares five-for-four effective November 2003.

Solid waste management slows with economy

Weak economic conditions have led to flat to declining volume levels for solid waste companies, while excess landfill capacity has restricted pricing (as discussed in the "Industry Trends" section). Based on weighted averages, nationwide landfill disposal fees declined by nearly 7% in 2002, according to *Solid Waste Digest*. However, for the five months through May 2003, tipping fees edged up 0.4%, year to year, led by a 1% gain in the western region of the United States. Commodity recycling prices have also remained extremely weak, though they have stabilized since late 2002. Discretionary consumer spending remains soft, which is affecting waste volume levels and limiting sustained price increases.

The sector's equity performance has improved as the stock market has strengthened. Standard & Poor's Environmental Services Stock Index rose 15.2% through September 19, 2003, while the S&P 500 was up 17.8%. The group had suffered a 23.6% decline for full-year 2002, in line with the 23.4% drop in the S&P 500.

Solid waste companies are now focusing on improving their return on assets and cash flow generation, rather than seeking growth through acquisitions, which was the sector's strategy of the 1990s. For 2003, we expect internal revenue growth to be flat to up 3%, with essentially flat volume growth and some firming in prices. Standard & Poor's projects slightly faster revenue growth for 2004, as the economy strengthens.

The two largest publicly traded waste haulers, Waste Management Inc. and Allied Waste Industries Inc., have taken steps to improve operating efficiencies and cut costs. These major players have implemented restructuring programs — divesting underperforming assets and reducing their work forces — and are using the proceeds from asset sales to pay down debt. In mid-2003, Allied Waste refinanced its debt, issuing notes and redeeming preferred stock.

Such measures have enabled these companies to strengthen their balance sheets and operate profitably in this slow-growth business, an improvement from previous years. Waste Management reported losses in 1999 and 2000, following integration issues related to its 1998 merger with USA Waste, as well as problems with accounting irregularities and a management stock trading scandal. Integration difficulties at Allied Waste, which merged with Browning Ferris Industries in 1999, also led to a loss for that firm in 1999.

At present, the two firms are on somewhat different tacks. Although Waste Management will not pursue major mergers, the company intends to spend up to \$375 million in 2003 on strategic tuck-in acquisitions. In the second half of 2003, Waste Management acquired assets from Allied Waste Industries for over \$100 million, including \$40 million for Allied's South Florida operations that have annual revenues of nearly \$80 million. Waste Management acquired more than \$100 million in total annualized revenues from Allied. However, the U.S. Department of Justice has ordered

Waste Management to divest certain hauling and disposal assets in parts of Colorado, Florida, Georgia, New Jersey, and South Carolina, and a waste collection asset and landfill in Oklahoma, in order to maintain an adequate level of competition in those regions. Allied Waste, on the other hand, plans to raise \$300 million in net proceeds from asset sales this year, in order to reduce its debt load.

Although cost-cutting efforts will aid overall margins, one trend that may continue to pressure earnings of public services companies in 2003 and 2004 will be rising insurance costs. In August 2003, Republic Services Inc. lowered its 2003 earnings guidance, mainly because higher insurance costs have led to an increase in its self-insurance reserve. Previously, this company had been doing exceedingly well, outperforming its peers.

Municipal budget cuts hurt collection

In the face of soft economic conditions, some municipalities have suspended recycling and special waste collection in order to maintain their regular waste collection services. Others have locked in long-term disposal and recycling contracts or have charged user fees to customers as a way to offset the economic impact.

According to the February 2003 issue of *Waste Age*, small and mid-sized cities have done better than larger cities, since it's easier for them to manage their waste. In ad-

dition, larger cities like New York tend to export a large percentage of trash, which adds to the complexity of garbage management issues and makes them more subject to economic swings.

One result of budget pressures has been reduced recycling rates. With excess landfill capacity, it's often cheaper for cities to dump waste than to recycle it. (See the "Industry Trends" section of this report for more on this topic.) In June 2002, New York City Mayor Michael Bloomberg suspended glass recycling for two years and plastic recycling for one year in an effort to save an estimated \$40 million. The city's recycling rate grew steadily in the 1980s and 1990s, but has since slipped from a peak of 29% in 2001. In July 2003, Mayor Bloomberg agreed on a \$44 billion fiscal 2004 budget that includes reinstating plastic and glass recycling on July 1, 2003, and April 1, 2004, respectively. According to a spokesperson for the Natural Resources Defense Council in New York, the savings from suspending the recycling program amounted to closer to \$11 million than the targeted \$40 million. Other cities have considered scaling back their recycling programs due to budget shortfalls and are reviewing their targeted recycling goals.

Seattle, however, is going in the opposite direction. In July 2003, it proposed banning paper, cardboard, bottles, and cans from residential trash beginning in January 2005. The move would reduce waste volumes by an estimated 92,000 tons over three years, saving the city \$1.7 million, according to *Waste News*. In early 2003, Seattle added a food waste collection program and banned the disposal of paper in an effort to improve recycling rates. Seattle, which has established a 60% recycling goal by 2008, saw its recycling rate slip to 38% in 2001 from 44% in 1995.

Some smaller cities have drop-off centers for marketable commodities such as newspapers, cardboard, and yard waste; this saves local governments the labor costs of separating the recyclables. However, neither cities nor small rural towns have been immune to the economic downturn. In the area near Sacramento, California, the mandatory diversion goal was reduced for certain towns that suffered from high unemployment and budget constraints, and were a long distance from major markets. In

U.S. MUNICIPAL SOLID WASTE TONNAGES AND RECYCLING, INCINERATION, & LANDFILL RATES

YEAR	TOTAL MSW GENERATED (THOUS. TONS/YR)	MSW DISPOSAL METHOD (%)		
		RECYCLED	INCINERATED	LANDFILLED
2001*	409,029	32.0	7.0	61.0
2000	382,594	33.0	7.0	60.0
1999	374,631	31.5	7.5	61.0
1998	340,466	30.0	9.0	61.0
1997	327,460	28.0	10.0	62.0
1996	326,709	27.0	10.0	63.0
1995	322,879	23.0	10.0	67.0
1994	306,866	19.0	10.0	71.0
1993	291,742	17.0	11.0	72.0
1992	280,675	14.0	10.0	76.0
1991	293,600	11.5	11.5	77.0
1990	269,000	8.0	8.0	84.0

*Latest available.
Source: *BioCycle*.

Atlanta, Georgia, budget cuts led the city to enlist businesses and volunteers to assist in the city's cleanup efforts.

Interstate waste exports rising

As the amount of waste exported from one state to another has more than doubled since 1994, and nearly tripled since 1989, the number of interstate conflicts has risen as well. More than 35 million tons of waste was imported or exported during 2002, up modestly from a year earlier. Some state governments have tried to regulate these shipments, but federal courts have declared those restrictions unconstitutional. Now lawmakers are addressing the issue, and many states are considering landfill taxes as a means to raise revenues and discourage the importation of waste.

In early 2003, Representative John Dingell (D., Michigan) asked for legislation to allow state governments to control waste imports. In July 2003, three bills intended to allow states to prohibit trash imports (*H.R. 382*, *H.R. 411*, and *H.R. 1730*) were debated before a House subcommittee. *H.R. 382* would allow states to enact laws that could set limits on disposal of foreign municipal trash, according to *Solid Waste Report*. *H.R. 411* focuses on an existing agreement signed in 1986 on the transboundary movement of hazardous waste, with municipal solid waste added to the agreement in 1992. Meanwhile, *H.R. 1730* would give local communities the power to regulate trash imports, contingent on the state's promotion of recycling.

Virginia's waste imports increased 12.5% in 2002, with the state importing 5.4 million tons of waste (4.5 million tons from household garbage), according to a report from the state Department of Environmental Quality (DEQ), placing it second in the nation. With Waste Management expected to begin barging trash to Charles City County later in 2003, the state's waste imports are likely to continue to increase. Virginia is considering regulating trash barge containers moving along its rivers, while imposing fees on waste companies. The report estimates the available landfill capacity in Virginia for municipal solid waste at 19.7 years.

According to the Congressional Research Service, Pennsylvania imported the most trash in the United States during 2002, with imports of more than 11 million tons, or nearly half of the total waste disposed of in Pennsylvania landfills. Nine states and Washington, D.C., export more than 15% of their solid waste, and every state except Hawaii imports or exports trash. New York exported more than 8.0 million tons in 2002, the most of any state, while New Jersey exported more than 5.0 million tons.

During 2002, New York City unveiled a plan to phase out the use of land transfer stations for its residential trash, relying instead on marine transfer stations. The plan would build nine stations within the city's five boroughs. The city, which collects 11,000 tons of residential trash each day, plans to ship the waste in sealed containers

LANDFILL DISPOSAL: BIG THREE VS. TOTAL INDUSTRY — 2001*

	WASTE MANAGEMENT	ALLIED WASTE INDUSTRIES	REPUBLIC SERVICES	PUBLIC ENTITIES	TOTAL U.S. PRIVATE COMPANIES	TOTAL
Number of active landfills	297	167	54	2,063	955	3,018
Total volume disposed in landfills (mil. tons)	101	53	26	129	190	319
Market share by volume (%)	32	16	8	40	60	100
Volume per landfill (tons)	339,853	314,573	478,442	62,385	199,239	105,691
Disposed tons per day	323,514	168,377	82,807	412,503	609,850	1,022,353
Average tons per day per landfill	1,089	1,008	1,533	200	639	339
Remaining capacity (mil. tons)	2,202	1,005	692	2,514	4,165	6,678
Years of remaining capacity at current disposal rates	22	19	27	20	22	21
Remaining capacity per landfill (mil. tons)	7.41	6.02	12.81	1.22	4.36	2.21
Market share by capacity (%)	33	15	10	38	62	100

*Latest available.

Source: *Solid Waste Digest*.

by barge to disposal and transfer facilities outside of its borders.

Water supply and treatment rate hikes ahead

The highly regulated and fragmented water supply and treatment industry continues to focus on geographic diversification through acquisitions to offset adverse regional weather conditions (including both droughts and excessive rainfall), and on rate hikes to recapture capital costs. Since the September 2001 terrorist attacks, water utilities have beefed up security at plants and reservoirs in an effort to protect drinking water from chemical or biological contamination. Following slower water sales during 2002 due to conservation in drought-stricken regions, especially in the Northeast and Southwest, reservoirs have returned to normal in the East.

With standards for water service becoming more stringent and infrastructure replacement needs growing, capital investment has escalated at a rapid pace. In the 20 years through 2002, annual capital spending per customer more than tripled, while customer use remained virtually unchanged. The price of service has risen faster than inflation over this 20-year period, with a 4% to 6% average annual increase in the unit costs paid by customers.

New arsenic standards advanced

In October 2001, then-EPA Administrator Christine Todd Whitman announced the establishment of new standards for arsenic levels in drinking water: 10 parts per billion (ppb), down from 50 ppb, effective in 2006. Ms. Whitman said that the new standards would better protect the public from the risk of cancer. First proposed by the agency under the Clinton administration, the standards had been postponed since early 2001, when the Bush administration put on hold all pending regulations while further studies were conducted.

Compliance with the new arsenic standard will place a significant financial burden on some municipalities. A Congressional report suggested that the EPA recommend ways for small communities to receive an extension if they can prove that meeting the deadline would create economic hardship. Some 97% of the 3,850 water systems affected by the

rule serve fewer than 10,000 people, according to *Clean Water Report*, an industry publication. The EPA plans to provide \$20 million over the two years through 2004 for research and development of cost-effective technologies to comply with the new standard.

Funds needed for water systems

Over the next 20 years, U.S. communities may encounter annual shortfalls aggregating up to \$20 billion or more for needed waste water and drinking water system improvements, according to a government official quoted in *Clean Water Report*. Congressional representatives continue to debate issues regarding federal versus state jurisdiction over water quality.

In early 2003, a new bill was introduced in Congress to authorize \$25 billion over five years for the Clean Water State Revolving Fund (SFR), which would boost infrastructure spending. Although water groups and city officials have pushed Congress for large increases in direct financial assistance, Congress seems set on providing the funding through the SRF, according to *Clean Water Report*.

Air pollution: the global warming threat

In August 2003, the Bush Administration adopted a new antipollution exemption rule, establishing an equipment replacement provision as part of a plan to reform the New Source Review (NSR). The provision will allow utilities and industrial plants to upgrade their facilities with equivalent components without installing pollution control devices. In contrast, the NSR program, which Congress established as part of the 1977 Clean Air Act to help control emissions from major new stationary sources of pollution, had required older plants to install modern pollution control equipment when upgrading their facilities.

Changes to the definition of equipment replacement under NSR were proposed in December 2002, according to the EPA. The new provision stipulates that upgrade costs must not exceed 20% of the replacement value of the entire processing unit, and that the replacements must not cause the unit to exceed any emission limits set by the EPA. The EPA believes the new rule will provide industrial facilities and power plants with regula-

tory certainty, which will result in more efficient and reliable operations that are environmentally sound and provide more affordable energy.

Utilities noted that this rule would allow them to improve the reliability of their power supplies, which has been a major concern since the August 2003 power outage that affected eight states and 50 million people in the northeast United States. The Natural Resources Defense Council estimates that the rule will affect more than 17,000 facilities, and possibly as many as 22,000, including refineries, chemical plants, power plants, and other industrial operations. Bush administration officials said this revision would lead to greater plant efficiencies and possibly lower consumer costs.

In response to environmental concerns, the Bush administration said that other rules, notably the Acid Rain Amendments of 1990, were in place to control emissions and had already led to reduced emissions of pollutants over the past few years. The Acid Rain program was effective in 1995, and SO₂ emissions from power plants have been reduced by more than 40% from 1980 levels, according to EPA statistics. However, some politicians and regulators believe the new rule would allow increased emissions, and they plan to contest it, according to the *New York Times*.

Thomas R. Kuhn, president of the Edison Electric Institute, a utilities trade group, noted that the rule would encourage plants to improve efficiencies, because it removes hurdles that would require them to install new pollution controls. The upgrades would al-

low generators to produce electricity using less fuel, thereby resulting in lower emissions, the spokesperson said.

Pollution controls were previously mandated as part of the routine maintenance, repair, and equipment replacement exclusion under the New Source Review (NSR) permitting program. However, according to a report in the *New York Times*, the Justice Department contends that 51 power plants are in violation of the Clean Air Act because they made major upgrades and increased pollution levels without installing pollution controls.

The proposed Clear Skies Act

President Bush's proposed Clear Skies Act for controlling greenhouse gas emissions is an alternative to the international Kyoto Protocol treaty that he rejected in 2001. The treaty calls for all nations to cut carbon dioxide and other harmful emissions in an attempt to reduce the threat of global warming.

President Bush's plan, which would establish a mandatory multi-pollutant approach to reducing air pollution, is receiving bipartisan support from state and local officials, according to the EPA. The Southern Governors Association has recognized the need for national mandatory legislation for reducing emissions of sulfur dioxide, nitrogen oxides, and mercury from electric utility plants. In July 2003, the EPA released updated air quality data indicating that Clear Skies would bring almost all U.S. counties into compliance with the fine particle standards. In addition, the EPA stated that it would provide billions of dollars in benefits to human health and the environment, in-

EMISSIONS LEGISLATION — 2003

(Legislation being considered that would place caps on the tonnages of emissions allowed)

	SULFUR DIOXIDE	NITROGEN OXIDE	CARBON DIOXIDE	MERCURY
Clean Power Act				
Tonnage cap in 2009*	275,000 in West 1.98 million in East	1.51 million	2.05 billion	5 (2008)
Clean Air Planning Act				
Tonnage cap in 2009	4.5 million	1.87 million	2.6 billion	24
Tonnage cap in 2013	3.5 million	1.70 million	2.3 billion	10
Tonnage cap in 2016	2.25 million			
Clear Skies Act				
Tonnage cap in 2010*	4.5 million	2.1 million (2008)	No mandated reduction	26
Tonnage cap in 2018	3 million	1.7 million		15

*Year except as noted.
Source: *Waste News*.

cluding avoiding over 14,000 premature deaths, 30,000 fewer hospital visits, and 12.5 million fewer days with respiratory illnesses and symptoms.

The Clear Skies plan would reduce annual emissions of sulfur dioxide from power plants from over 11.0 million tons in 2000 (latest available) to 4.5 million tons by 2010 and 3.0 million tons by 2018 (for a decline of about 73% over the 17-year period). Nitrogen oxide emissions would decline from 5.0 million tons to 2.1 million tons by 2008, and to 1.7 million tons by 2018 (for a total decrease of 66%). Mercury emissions would fall from 48 tons to 26 tons by 2010, and to 15 tons by 2018 (down 69%). President Bush's plan does not address other emissions — including carbon dioxide, methane, and other industrial gases — that scientists believe trap heat in the atmosphere.

Power plants are responsible for 63% of the sulfur dioxide, 22% of nitrogen oxide, 37% of mercury emissions, and 40% of carbon dioxide emitted from industry and transportation sources, according to the EPA. Electric power plants built before 1972 still produce 42% of the electricity made from burning fossil fuels, mainly coal, according to the U.S. General Accounting Office. The older plants, primarily in the Southwest, Midwest, and mid-Atlantic states, produce 59% of the sulfur dioxide and 47% of nitrogen oxides emitted by utilities.

The Clear Skies initiative includes cap-and-trade systems, under which the EPA would assign a company a declining cap in the form of quotas for reduced emissions. Companies that lower emissions below the quota receive tradable rights to pollute, which can be sold to other companies that exceed quotas. It is believed that emission trading will help cleaner companies finance pollution-scrubbing equipment, while allowing other companies to meet their quotas until older power plants are closed.

Targeting carbon dioxide

Carbon dioxide from energy-related sources such as heating, industrial fuel, and electricity generation accounts for 81% of the greenhouse gases released in the United States, according to the DOE. A group comprised of eight electric power companies and nine investment funds recommend a manda-

tory national market-based climate change program to limit greenhouse gases, mainly carbon dioxide, according to a report the group issued in June 2003 and reported in *Waste News*. The group said it believes the government will regulate carbon dioxide and other greenhouse gas emissions, but is unsure when it will act.

Of the three multi-pollutant bills proposed during 2003, two include carbon dioxide reductions: The Clean Power Act proposed by Senator James Jeffords (I., Vermont) sets an annual cap of 2.05 billion tons beginning in 2009, while the Clean Air Planning Act, co-sponsored by Senators Tom Carper (D., Delaware), Lincoln Chafee (R., Rhode Island), and Judd Gregg (R., New Hampshire), phases in carbon dioxide caps in two steps, setting limits of 2.6 billion tons by 2009 and 2.3 billion tons by 2013.

As of 2000 (latest available), about 2.4 billion tons of carbon dioxide was generated in the United States annually. Although the Clear Skies Act does not set carbon dioxide limits, the federal government launched a voluntary program during 2003 called Climate Vision, which aims to reduce the intensity of carbon dioxide emissions generated by all industrial sectors by 18% over the next decade.

Driving changes in transportation

Regulations also address emissions from transportation sources. In May 2002, a federal appeals court upheld new air pollution rules that will require heavy-duty diesel trucks and buses (including waste-hauling trucks) to cut emissions by 95% starting with the 2007 model year. The rules also require that sulfur in highway diesel fuel be reduced by 97%, to 15 parts per million (ppm), from 500 ppm, by 2007. When fully implemented, the rules are expected to reduce smog-causing nitrogen oxide emissions by 2.6 million tons each year, while soot or particulate matter should decline by 110,000 tons annually, according to the EPA. After-treatment technology, similar to catalytic converters in cars, will have to be installed to achieve the cleaner emission standards.

New rules to reduce tailpipe pollution and to tighten standards for gasoline will reduce cars' allowable emissions of nitrogen oxide to 0.07 grams per mile by 2004, a cut of more than 50% versus 2001. Certain

light trucks will have to comply by 2009. However, some larger light trucks, including sport-utility vehicles, would be required to reduce their particulate emissions levels beginning in 2004. New diesel engine manufacturing requirements will be phased in between 2007 and 2010, to 0.2 grams of nitrogen oxide per horsepower hour.

Foreign carmakers are already successfully marketing hybrid gasoline/electric cars in the United States, and DaimlerChrysler AG plans to sell vehicles powered by fuel cells, an alternative to the internal-combustion engine, by 2004. Fuel cells mix hydrogen with oxygen from the air to produce electricity that powers the cars; the exhaust is primarily water. Hybrids save gas by supplementing internal combustion with electricity, with mileage depending on climate and driving patterns; cars save the most gas in warmer climates and in urban areas.

Japan-based Toyota Motor Corp. redesigned its 2004 Prius hybrid. This hatchback is the first midsize hybrid and gets 55 miles a gallon, according to regulatory tests, as reported in the *New York Times*. Toyota is targeting sales of 36,000 Prius vehicles in the United States during 2004, up from less than 11,000 year to date through August 2003. Thus far, more than 30% of sales have come from California, which has the authority to set its own air quality standards, according to the *Times*.

In June 2003, the U.S. Senate added amendments to the energy bill that would require oil companies to double their use of ethanol to five billion gallons by 2012, while phasing out the use of MTBE (methyl tertiary-butyl ether), a fuel additive that pollutes groundwater. Ethanol and MTBE are blended together to produce a cleaner-burning fuel.

In early 2003, the Bush administration introduced the Freedom Fuel initiative, calling for the federal government to spend \$1.2 billion on research to develop hydrogen fuel cells mainly for the manufacture of nonpolluting cars and trucks. The plan includes \$720 million in new funding over the next five years to develop the technologies and infrastructure needed to produce, store, and distribute hydrogen fuel. An earlier initiative, called Freedom Car, is aimed at shifting the push for clean-car technology from hybrid vehicles, which run on both an internal-combustion engine and an electric motor, to fuel

cells, which are considered the most efficient form of this technology. President Bush's goal is for hydrogen fuel cell vehicles to be common by 2020, as reported in *Waste News*.

Change at the EPA

On June 27, 2003, Christine Todd Whitman stepped down as head of the Environmental Protection Agency, citing personal reasons and the need to spend more time with her husband. Among the accomplishments Whitman cited during her two-and-a-half year tenure were new emission standards for nonroad diesel engines and brownfield legislation that provides additional money for cleaning up former industrial properties.

However, some believe that disagreement with administration policies — such as the rejection of the Kyoto treaty on global warming and the decision to alter power plant emission regulations — were contributing factors. Additionally, the “Draft Report on the Environment,” an environmental status report released on June 23, 2003, just days before Whitman's departure, had a section on global warming that apparently was whittled to a few noncommittal paragraphs after demands to edit the section were made by the White House Council on Environmental Quality, according to a report in the *New York Times*. *Waste News* reported that an internal EPA document stated that the effect of climate change on human health and the environment was deleted from the report.

In August 2003, President Bush nominated Mike Leavitt, the Republican governor of Utah, to run the EPA. Although Leavitt noted that he planned to improve air, water, and land pollution and “plant seeds for future generations,” several environmental and conservation groups criticize Leavitt's ties to the mining, timber, and oil and gas industries, to name a few. In addition, during his term as governor, Leavitt apparently eliminated protection for large areas of wilderness, allowing for commercial development. Supporters, however, cite his environmental credentials: Leavitt co-chairs the Western Regional Air Partnership (three federal agencies, 13 states, and 13 tribal nations), which is committed to reducing sulfur dioxide levels by 50% to 70% by 2040. He also reportedly cleaned up a copper mine in Utah and

sought to improve air quality near the Grand Canyon. According to a report in *Waste News*, a spokesperson for the National Association of Manufacturers said that Leavitt's support of states' rights will continue the EPA's trend of returning more power to the states

Superfund boost expected

Despite some concern that the resignation of Whitman would jeopardize the 23-year-old federal Superfund program, EPA officials have tried to reassure the public that the program will be financially sound, according to *Solid Waste Digest*. The Superfund program received nearly \$1.3 billion from Congress in fiscal 2003 (including \$277 million for cleanup work); the EPA is seeking an additional \$150 million in the fiscal 2004 budget. Although Congress has not reinstated corporate taxes that had funded the Superfund program before expiring in 1995, appropriations have remained steady. And, according to EPA officials, companies now pay directly for 70% of the cleanup work.

Some environmental interest groups believe that a corporate tax, such as the tax on oil and chemicals that was in effect from 1980 through 1995, would prevent the public from having to pay via the Superfund for polluters' cleanup projects. The U.S. Public Interest Research Group (USPIRG) noted that in 1995, taxpayers paid for 18% of the Superfund's budget, with a trust fund providing the balance; by 2004, however, at least 79% of the program will be financed by taxpayers.

USPIRG also noted that the pace of cleanups has slowed by some 50% over the past two years. However, the EPA contends that the remaining sites are more challenging and could take decades to complete. The EPA reports that, as of mid-2003, 854 sites had been cleaned up. There are 1,200 remaining entries on the Superfund's National Priorities List, while the federal government is responsible for an additional 8,000 to 9,000 sites under other environmental programs, according to the EPA. Possibly 700,000 more sites may have to be managed by state or local governments, or through voluntary cleanup initiatives. The EPA said in July 2003 that it plans to begin cleaning up 10 new Superfund sites in nine states, but lacks funding for an additional 10 sites with less serious environmental risks.

Other recent news

In early September 2003, a federal court ordered W.R. Grace & Co. to pay more than \$54 million, the largest fine ever assessed in a Superfund lawsuit, to clean up asbestos at a mining site in Montana. EPA officials said Grace's cost could eventually reach \$110 million: the company will also have to pay the EPA's future costs to clean up hundreds of properties contaminated by Grace's operations and to screen the health of residents.

Brownfields are also in the news. According to the federal government, possibly 600,000 brownfield sites may exist in the United States. A report released in June 2003 by the U.S. Conference of Mayors stated that redeveloping these sites could create new jobs and generate billions of dollars in tax revenue for financially strapped cities. The mayors are asking Congress to provide the EPA with \$250 million in annual funding for brownfield assessment and cleanup, funding that President Bush had authorized in early 2002. In early 2003, President Bush requested a \$10 million increase for the brownfield grant program, which restores former industrial sites. ■



INDUSTRY PROFILE

Managing the essentials of life

The U.S. environmental services industry generates more than \$200 billion in annual revenues. The sector includes everything from solid, hazardous, and nuclear waste management, to air pollution controls and water quality systems, including both drinking water and wastewater treatment. This industry also encompasses environmental and infrastructure engineering, with engineering firms participating as prime contractors on design-build projects and operational services.

The main sectors are water supply and treatment, solid waste management and hazardous waste management, air pollution con-

trol, and environmental remediation, as outlined below.

Water supply and treatment

The U.S. water supply and treatment market totaled about \$110 billion in 2002 (including new data compiled by the U.S. Department of Commerce for sewer pipe and equipment and for construction revenues). This sum, which excludes \$3 billion from water consulting, represented about 35% of the estimated \$300 billion worldwide market, according to Farkas Berkowitz & Co.,

ENVIRONMENTAL SECTORS

	MAJOR COMPANIES
WATER SUPPLY AND TREATMENT	
Municipal waste-water treatment	American Water Works (a unit of RWE AG), U.S. Liquids
Water supply	American Water Works (a unit of RWE AG), Philadelphia Suburban, United Water Resources (unit of Suez), American States Water.
Water infrastructure	Insituform Technologies
Consumer bottled water, residential/commercial water filter products	Perrier Group, Culligan Water Technologies (unit of Veolia Environment's U.S. Filter), Groupe Danone (France), Pepsico Inc., Coca-Cola Co.
Water treatment equipment	Ionics, Osmonics (a unit of General Electric), Veolia Environment's U.S. Filter, Waterlink Inc.
Water treatment chemicals	Nalco Chemical (unit of Suez), Calgon Carbon
Water-related consulting	Roy F. Weston
Contract operations of water supply and waste-water treatment facilities	Professional Services Group Inc. (division of Veolia Environment's Aqua Alliance), JMM Operational Services (unit of Suez's Waste Resources), Veolia Environment's U.S. Filter
SOLID-WASTE MANAGEMENT	
Municipal solid waste (MSW)	Waste Management, Allied Waste Industries, Republic Services, Casella Waste Systems, Waste Connections, Waste Industries USA
Hazardous solid waste	Clean Harbors, Philip Services, Onyx Environmental Services, eris Corp., Heritage Environment Services, Waste Management, Safety Kleen
AIR POLLUTION CONTROL	
Vehicle emissions control equipment	Allied Signal, Corning Inc., De Gussa-Huls Corp., Engelhard Corp., Johnson Matthey plc, NGK-Locke Inc.
Industrial emissions control equipment	Air-Cure Inc., Comfort Systems, Research Cottrell (division of Veolia Environment's Aqua Alliance)
Indoor air control	Air-Cure Inc., Comfort Systems
Consulting and monitoring	CH2M Hill, Environmental Resources Management, Roy F. Weston
ENVIRONMENTAL REMEDIATION	
	IT Group (a unit of Shaw Group), Fluor Corp., Tetra Tech, CH2M Hill, CET Environmental Services Inc., Severson Environmental Services Inc., Roy F. Weston, Bechtel Corp., URS Corp., Earth Tech

Sources: Farkas Berkowitz & Co.; company reports.

LEADING U.S. WATER UTILITIES — 2002
(Ranked by revenues)

COMPANY	REVENUES (MIL. \$)
1. American Water Works*	1,670
2. Philadelphia Suburban	322
3. California Water Service Group	263
4. American States Water	209
5. SJW Corp.	146
6. Southwest Water Co.	131
7. Middlesex Water	62
8. Connecticut Water Services	46
9. Artesian Resources	35
10. Pennichuck	23

*Acquired by RWE AG in early 2003; annual data estimated based on nine-month sales (\$1.23 billion).
Source: Company reports.

an environmental consulting and research firm based in Washington, D.C.

Municipalities and investor-owned water utilities accounted for nearly 60% of the U.S. market, while nonregulated companies in various water-related segments (infrastructure construction, consulting, chemicals, equipment, bottled water, water treatment, and operations and maintenance) accounted for the balance. The water industry remains the most fragmented of the major utility industries, with more than 50,000 community water systems in the United States, nearly 85% of which serve fewer than 3,300 customers.

Solid waste

Standard & Poor's divides the solid waste segment into four lines of business, the largest of which is waste collection, accounting for more than 55% of municipal solid waste (MSW) revenues in 2002. Landfill, recycling, and waste-to-energy in-

**LARGEST PUBLICLY TRADED
U.S. MUNICIPAL SOLID WASTE COMPANIES**

	2002 REVENUES (MIL. \$)
1. Waste Management Inc.	11,142
2. Allied Waste Industries	5,517
3. Republic Services	2,365
4. Casella Waste Systems	421
5. Waste Connections	378
6. Waste Industries USA*	252
7. Capital Environmental Resource	93

*Formerly Waste Holdings.
Source: Company reports.

cineration make up 35%, 5%, and 5% of revenues, respectively. The MSW business primarily involves the collection, disposal (through landfills and incineration), and recycling of nonhazardous solid waste.

Although the MSW industry has been consolidating over the past several years, it remains fragmented and highly competitive. Recently, almost 20% of the \$36 billion collection and landfill market was managed by municipalities; nearly 60% was managed by seven investor-owned, publicly held waste hauling and disposal companies; and more than 20% was owned by privately held, investor-owned waste hauling and disposal companies. (The top companies are listed in the table entitled "Largest publicly traded U.S. municipal solid waste companies.") Close to 4,000 small private firms (with annual revenues of \$2 million or less) remain as potential acquisition candidates. The four largest privately held firms generate annual collection and disposal revenues of more than \$100 million each, according to *Waste News*.

Hazardous waste

Classification of hazardous wastes has changed since the early 1980s. Most of the waste previously labeled "hazardous" is now referred to as "special" waste, the treatment of which includes on-site services at industrial plants, processing of nonhazardous industrial wastes, oil collection and recovery, parts washers, and other waste-related services. About 165 firms handle related waste in this segment, according to Farkas Berkowitz, with six companies (revenues ranging from \$200 million to \$500 million) accounting for 45% of the \$2.9 billion market in North America. Eight other companies (\$30 million to \$100 million in revenues) account for 18% of the business, while some 150 firms handle 14% of the market. Clean Harbors became the market leader in 2002 when it acquired Safety-Kleen's Chemical Services Division (CSD), accounting for 23% of the hazardous waste market (including CSD as of January 1, 2002), bringing its total revenues to \$667 million for the year (excluding CSD, Clean Harbors had 2002 revenues of \$350 million, up from \$252 million in 2001).

Air pollution control

The \$12 billion to \$15 billion air pollution control industry provides equipment and services to the automotive industry and various smokestack industries. It comprises four main sectors. The two largest — vehicle pollution control equipment (mobile source control) and industrial plant pollution control equipment and chemicals (end-of-pipe stationary source control) — account for 90% of the total market. The other two sectors are indoor air pollution control, and consulting and monitoring equipment.

Environmental remediation

The environmental clean up (or remediation services) industry had global revenues of about \$12 billion in 2002, including about \$7.0 billion in the U.S. market. Farkas Berkowitz divides the industry into five segments: remediation consulting (which includes hazardous waste consulting, \$3.5 billion), remediation construction (\$4.0 billion), wastewater treatment (\$1.9 billion), water supply (\$1.6 billion), and air and solid waste (\$1 billion). Estimates of the size of these sectors vary, however. For example, according to the top 500 design firm survey in *Engineering News-Record*, the U.S. remediation consulting and engineering market slipped 2.3% to \$3.76 billion in 2002, from \$3.85 billion in 2001.

The remediation industry is fragmented and very competitive, but consolidation has been on the rise. According to Farkas Berkowitz, the top five firms control some 33% of the gross U.S. revenues for remediation consulting and engineering work, with the next 10 firms accounting for 31%, and hundreds of smaller concerns claiming the remaining 36%.

INDUSTRY TRENDS

Soft economic conditions continue to affect waste volume generation and pricing levels, while capital spending cutbacks are delaying air and water projects. With the economy beginning to gain some momentum, Standard & Poor's expects real (inflation-adjusted) GDP to increase 2.4% in 2003, and 4.1% in 2004. However, state and

local budgets remain under pressure, and the federal government faces growing deficits.

Looking longer term, the U.S. population is expected to reach 299.9 million by 2010, up from 282.8 million in 2003, based on the U.S. Bureau of the Census's projection of a compound annual growth rate of 0.84%. As a result, the volume of waste collection is expected to increase gradually, while new and updated water systems will be needed, particularly in high-growth regions.

Water supply and treatment

In this highly regulated monopoly business, there's been a trend among public operators toward privatization. Faced with stringent regulations, deteriorating water systems, increasing public demand for improved water quality, and financially strapped budgets, many municipalities are looking to private firms either to acquire their water businesses or to run them cost-effectively as outside contractors. Industry experts believe that long-term operating contracts will become the most popular way of privatizing water utilities, and expect the cumulative value of such contracts to grow at annual rates of 25% to 30% over the next few years.

The sector remains highly fragmented, with more than 40,000 municipally owned water systems and 16,000 municipally owned wastewater treatment facilities in the United States. Although rapid changes are leading to a more competitive marketplace, Standard & Poor's does not expect the water industry to deregulate in the manner of the electric utilities sector. Given the difficulty in transporting water long distances, it is more cost-effective to develop water supplies locally.

Trends in providing water service will be driven by growing regulatory and infrastructure demands. We believe water companies will pursue markets that increase their asset and customer base and expand their geographic regions in an effort to mitigate the impact of adverse weather, such as the droughts during 2002 and the excessive rain and cool temperatures in 2003, and high regulatory costs. The larger, more financially secure operators will enjoy a lower cost of capital and be able to spread expenses over a larger customer base. Since much of the cost of providing water service does not change

with the amount of water delivered, consolidation can improve efficiencies and lower unit costs for companies that acquire others.

Major upgrades needed

Municipal water companies will need to spend over \$150 billion on water delivery systems through 2020, and \$100 billion to meet environmental standards in wastewater, according to the Environmental Protection Agency (EPA). However, projections vary widely, as the National Association of Water Companies (NAWC) projects the total cost for both drinking water and wastewater infrastructure upgrades could reach \$1 trillion through 2020.

Major federal funding for wastewater systems has not been available since Congress passed the Water Quality Act of 1987, which replaced the federal Construction Grants program with the State Revolving Fund (SRF) program. With funding shortages and increased expenses to repair and replace deteriorating sewer pipes, city officials have been seeking federal aid. One bill (*H.R. 20*) introduced in early 2003 calls for \$25 billion over five years for the Clean Water State Revolving Fund. Current spending is only \$1.35 billion per year, according to *Clean Water Report*.

In late 2002, the EPA estimated that between the years 2000 and 2019, there could be a gap of \$534 billion between available funds and the cost of improvements, assuming no revenue growth for water systems. Under a 3% annual revenue growth assumption, the gap narrows to \$76 billion, with wastewater systems accounting for \$31 billion and drinking water systems accounting for \$45 billion.

Municipalities' bidding processes for water utility infrastructure projects may be changing. Most local laws require that design firms be separate from construction companies to reduce the appearance of conflicts of interest. However, proposed rule revisions would allow municipalities to use the same firm to design and build water utility projects, which could alter the dynamics of the infrastructure construction market.

Demand drivers

Standard & Poor's believes that the demand drivers for the water supply and treatment segment — population growth,

industrial growth, deteriorating systems, and new environmental regulations — will see a gradual pickup during the first part of the present decade, with more rapid growth between 2005 and 2010. New regulations will drive demand for assessing pollutant containment levels, developing analytical methods, and upgrading water and wastewater treatment infrastructure.

Population growth in the South and West continues to be a significant demand driver as communities in those regions seek new sources of water. Three quarters of the 11% population growth in the United States during the 1990s occurred in the South and West, according to U.S. census figures.

With quality concerns heightened by possible terrorist attempts to contaminate reservoirs, demand for bottled water has been growing. In European and other markets, demand growth has been about 30% a year in recent years, compared with 10% in the United States, according to Farkas Berkowitz & Co. The firm noted that more than 50% of the U.S. population drinks bottled water on a regular basis.

In the present decade, the National Association of Water Companies, an industry trade group, expects the United States to place a premium on the installation of advanced systems to combat radon, arsenic, and other toxins that can compromise the quality of groundwater.

Additionally, President Bush's dividend tax cut should drive investment in this industry. Water utilities tend to increase their cash dividend payments frequently, and their dividend yields tend to exceed the average yields for companies in other sectors, making the stocks attractive for investors seeking total return.

Industrial outsourcing may boost revenues

With budget-strapped municipal governments lacking sufficient funding to improve water systems, outsourcing has become a growing trend. Regulated water utilities can either buy or operate the water system, and recoup their capital investment via rate hikes, which they request from state commissions. As costs per customer rise while water use declines, government partnerships with private companies and industrial outsourcing will likely play a larger role in the growth of the water supply and treatment sectors.

New markets may be emerging for investor-owned companies that can build, own, or operate wastewater treatment operations on behalf of industrial companies, which are seeking to outsource their noncore wastewater treatment operations to third-party water equipment companies. This trend is expected to prove significant over the next decade, as more public- and private-sector owners attempt to shift risk to their engineers and contractors.

Long-term prospects for the water and wastewater engineering sector remain favorable. The segment grew 9% in 2002 to \$4.1 billion, with 55% of that total related to wastewater, according to Farkas Berkowitz. This market segment has demonstrated consistent growth over the past few years in the 9% to 10% range. Deteriorating infrastructure, regional population growth for the municipal segment, and capacity expansions in the industrial sector are likely to continue to provide momentum for the wastewater engineering market, although municipal budget cuts may pressure the industry. In addition, new regulations are expected to provide a boost to this segment. The EPA projects that a new standard for the reduction of arsenic levels in water will require \$6 billion in capital improvements.

In the wake of the September 2001 terrorist attacks, the House and Senate passed a bioterrorism bill (*H.R. 3448*) in May 2002, under which medium to small water systems are required to assess their vulnerability to attack. This component of the segment already has led to hundreds of vulnerability assessments at \$50,000 to \$150,000 per facility. Under a new bill introduced in early 2003, called the Comprehensive Homeland Security Act of 2002 (*S. 6*), the EPA will review wastewater treatment plants' emergency response plans, provide grants to complete assessments, pay for security enhancements, and consider alternative treatment processes should an attack occur.

Technological advances are also playing a role in the water supply market. Notably, experts believe that desalination (conversion of sea water into drinking water), will double over the next 15 years, which could offset the impact of water shortages. The need for new sources of water and better water systems should benefit the filtration and separation group, which continues to

invest in new product development. Membrane technology, which continues to improve, can remove parasites from drinking water. When membrane technology is taken to the next level, salt can be removed from water through reverse osmosis.

Farkas Berkowitz estimates that industrial outsourcing (both on-site and off-site) could be a \$10 billion market by 2010, up from approximately \$675 million in 2000. Outsourcing of wastewater treatment operations, which is still in its embryonic stage, is beginning to gain acceptance, as manufacturing plants (mainly in the electronics, pharmaceuticals, and electric utilities industries) upgrade or expand their facilities. In addition, a shift towards design-build in procurement is gaining momentum among municipalities, with the average design-build project size growing to \$26 million in 2002, from \$5 million in the mid-1990s. The consulting firm noted that design-build could reach 50% of the construction value of this market over the next five to 10 years, up from an estimated 15% in 2002.

Globalization

With private water companies serving only 7% of the world's population, overseas markets are becoming the focus for water treatment projects. Demand for water services is outpacing the growth in supply, which should enhance the opportunities for private companies to improve efficiencies and develop new sources of water supply. State-owned water companies in Europe are seeking to upgrade their deteriorating water infrastructure systems through privatization, while a trend towards desalination projects in the Middle East continues to pick up steam, in efforts to provide drinking water to desert regions.

Industry experts estimate the worldwide market for water projects at \$500 billion over the next 10 to 15 years. Clients are beginning to select full-service providers that can offer design, engineering, and construction services as well as financing. In August 2002, the *New York Times* reported that the United Nations expects five billion people (63% of the world's projected population) to suffer from an inadequate supply of water by 2025, up from two billion in 2002. During 2002, two French water utilities — Suez S.A. (formerly Suez Lyonnaise

des Eaux) and Veolia Environnement S.A. (formerly Vivendi Environnement S.A.) — signed long-term deals to manage municipal water systems in China and in parts of South America.

For water treatment businesses, Latin America has been a disappointment thus far, due to a lack of funding and the priority given to non-water-related projects for which demand is stronger. Nonetheless, regional results are expected to improve over the next few years as emerging markets need to meet the water quality demands of a growing population. The consolidation trend continues to have an impact on this industry, both domestically and abroad. Although foreign companies continue to pursue acquisitions and operations and management (O&M) contracts in the U.S. water market, the pace has slowed recently as the major European players try to reduce their heavy debt burden by selling off assets and cutting back capital spending. Buyers continue to seek to expand market share, internalize sources of supply, and diversify into new markets, while sellers seek to expand their services, gain access to new customers, and increase access to capital markets. German utility RWE AG acquired the largest U.S.-based, publicly traded investor-owned water utility, American Water Works Inc., in early 2003. RWE also continues to focus on expanding into China, which has enormous potential due to its urban population growth but may also present challenges in regard to political support for foreign companies during economic downturns.

Solid waste management sees gradual demand growth

Although volume levels are expected to remain weak during the balance of 2003, and pricing should remain competitive in most regions, selective price hikes may stick in areas where a hauler controls market share. Allied Waste Industries began initiating price hikes in the spring of 2003 for both existing collection customers and at some landfills. However, it has been a difficult process and is still too early to tell whether Allied's price hikes will be successful and whether other major haulers will be able to follow suit. Results should gradually improve as economic conditions recover. This mature sector tends to lag an economic recovery by

about six months and, although it has generally been recession-resistant over the past few years, it hasn't been recession-proof.

We expect industrial and commercial waste volumes to increase as the economy recovers. However, following 6.9% growth for new housing starts in 2002, Standard & Poor's projects only a 0.6% gain for 2003, and foresees a 3.2% decline for 2004, which would reduce the amount of construction and demolition debris available for collection.

Based on the latest EPA projections, daily municipal solid waste (MSW) generated per person may grow from about 4.55 pounds in 2002 to 4.8 pounds in 2010 — an average annualized growth rate of 0.7%. Historically, nearly one percentage point of the industry's internal growth (revenue growth not driven by acquisitions) has come from population increases, while the rest has been derived from rising prices.

Efficiencies replace acquisitions

We expect most solid waste companies to focus more on internal growth and niche "tuck-in" acquisitions, rather than the megadeals of the 1990s, as they attempt to maintain solid operating margin levels via cost-cutting initiatives. A focus on free cash flow generation should continue to be a major trend in the industry, as waste companies use excess cash to pay down debt, repurchase stock, acquire assets, and to increase or initiate cash dividends in response to President Bush's dividend tax cuts.

With still uncertain market conditions, waste companies are taking a more conservative approach, budgeting their expenses with the assumption that economic conditions will remain relatively soft near term. In addition, healthcare and property and casualty insurance costs are expected to remain stubbornly high. Cost-saving measures included cutting staff, reducing overtime and professional fees, and realigning regional sales markets so that they cover more territory.

Looking forward, the aim would be to increase internalization rates and route density. Haulers may also continue to seek vertical integration. For the near term, solid waste companies' growth strategies are likely to downplay the need for major acquisitions. The 1990s were an active period for merger and acquisition (M&A) activity, including two major mergers in the late

1990s: In 1998, USA Waste Services acquired Waste Management for \$13.5 billion in stock, and adopted the Waste Management name. And in 1999, Allied Waste Industries acquired Browning Ferris Industries for \$7.3 billion in cash and \$1.8 billion in debt.

Excess landfill capacity

Landfill capacity grew substantially during the 1990s. The number of private and public landfills in the United States dropped from 6,186 in 1991, to 3,018 in 2001 (latest available), according to Chartwell Information Publishers, an MSW research firm based in San Diego. During that time, however, the average size of a U.S. landfill (measured by disposal volume) increased dramatically, to 3.5 million tons of capacity, from one million tons. Waste volume entering the average landfill increased to 106,000 tons in 2001 from 36,000 tons in 1991. Privately owned landfills have expanded significantly more than those of the public sector. As a result, landfill capacity increased from 12 years in 1991 to more than 20 years as of 2001, indicating that much more waste can be disposed of in landfills before they reach full capacity. From this point forward, the number of landfills should remain roughly the same, unless major regulatory changes are adopted.

We believe that landfill overcapacity, which is holding down fees, will persist in the foreseeable future. Causes include weak MSW demand drivers, an increase in composting (the recycling of organic yard waste), and an abundance of available space created by larger landfills built after Subtitle D went into effect in October 1991 (as described in

the “How the Industry Operates” section of this *Industry Survey*).

Despite the long time period to get a new landfill permit (more than five years, in some cases), which is monitored by the EPA and local municipalities, with nearly 20 years of landfill capacity remaining there is a little need to expand or develop new landfills. However, some haulers are seeking to develop landfills closer to their primary routes in an effort to reduce the high cost of shipping waste long distances and/or paying third-party landfill owners tipping fees for the use of their space.

With increasing amounts of waste being transported across state boundaries for disposal, more states may attempt to implement landfill taxes to dissuade imports from out of state. For example, Pennsylvania passed a landfill tax in July 2002 after Waste Management raised landfill prices in the state. We don't think, however, that this taxation trend is much of a threat to industry results since exporting waste benefits both parties and an exporter can always seek another state that would gladly accept its trash in exchange for the economic rewards. Furthermore, certain states that import a lot of waste, such as Virginia, cannot easily impose a landfill tax, because much of the waste is created in Virginia, and the tax would affect local businesses. We believe that the three largest U.S. haulers — Waste Management, Allied Waste Industries, and Republic Services — which control the majority of domestic disposal space, will continue to expand their existing landfills, while maintaining a balance between shipping waste to out-of-state landfills and to local facilities.

VOLUME DISPOSED IN LANDFILLS, BY REGION AND OWNERSHIP

REGION	THOUSANDS OF TONS						SHARE (%)			
	PRIVATE		PUBLIC		TOTAL		PRIVATE		PUBLIC	
	1991	2001*	1991	2001*	1991	2001*	1991	2001*	1991	2001*
Northeast	16,004	26,728	19,147	13,557	35,151	40,285	46	66	54	34
Southeast	14,857	40,872	35,927	41,429	50,784	82,301	29	50	71	50
Midwest	36,864	63,377	17,241	18,297	54,105	81,674	68	78	32	22
West	20,052	34,480	19,551	26,418	39,603	60,898	51	57	49	43
Pacific	15,560	24,815	28,086	28,999	43,646	53,814	36	46	64	54
Total	103,337	190,272	119,952	128,700	223,289	318,972	46	60	54	40

*Latest Available.

Source: *Solid Waste Digest*.

Another factor in waste management is the development of bioreactor technology, which rapidly breaks down organic waste by adding liquid and air to the entombed waste. By using these techniques, airspace in a typical landfill can be increased by at least 10% to 15%, lowering the need for new landfills. By increasing landfill life and reducing the length (currently 50 to 100 years) and cost of postclosure care, bioreactors are an important advance in landfill technology.

BioCycle, a magazine for the recycling business, points out that transfer stations have surpassed landfills in number. This, in turn, has increased the distance from waste generation to disposal, such that *BioCycle* predicts that transfer stations will become the preferred method for handling MSW on a local basis. As they take on waste diversion functions, including materials segregation, recovery, and composting, transfer stations extend landfill life and enable communities to control waste disposal without incurring a large financial risk.

Another trend that has grown in popularity is the hauling of waste by rail to rural landfills. Transport by rail, which can carry heavy volumes of waste long distances, is faster and more economical than transport by truck, according to *Waste News*. New York City plans to adopt a waste export system by 2005 that will focus on rail and barge shipments.

Additionally, waste-to-energy (WTE) projects are gaining support. President Bush's Department of Energy (DOE) is recommending expanded tax credits for new landfill methane and waste-to-energy projects. With electricity deregulation, many WTE facilities have amortized their capital investments and thus can provide electricity at competitive prices, especially in regions where landfill costs are high or energy supply is limited.

Meanwhile, recent legislation aimed at encouraging the recycling of electronic waste, which includes computers and monitors that contain hazardous materials, could limit the amount of trash dumped in landfills. A new bill would require the EPA to award grants to organizations and state and local governments that recycle computers in an environmentally responsible manner. Some industry projections target 250 million computers becoming obsolete over the next five years in the United States, accord-

ing to the November 2002 issue of *Solid Waste Digest*. A 2001 National Safety Council report estimated that 85% of more than 63 million tons of computer equipment removed from service in 2002 would be dumped in landfills.

Privatization trend continues

The solid waste industry continues to experience a growing trend toward privatization. In 2002, the private sector provided 75% of U.S. solid waste service revenues, and managed more than 60% of disposal volumes, according to Chartwell Information.

Although some communities are concerned that private companies will fail to focus on their best interests, many municipalities facing soft economic conditions are privatizing waste services as a way to cut costs. Additionally, as public facilities close, communities may rely on private facilities rather than build new public plants. In our view, one factor that could hurt privatization would be regulation changing the way waste flows within and across states, by affecting the size and location of landfills. Government-imposed restrictions would limit the ability for private companies to recoup their investment.

Recycling gains slow

Recycling markets continue to remain sluggish despite efforts by some states to mandate programs. Following rapid growth in the early 1990s, municipal recycling has slowed considerably as recycling costs continue to exceed disposal costs. According to a 2003 survey conducted by *Waste News*, the recycling rate of the 30 largest U.S. cities rose modestly to 23.5% from 23.4% a year ago, although the residential recycling rate fell to 17.2% from 17.5%. In response to budget constraints, a number of cities have scaled back targets, reduced frequency of collection, or suspended their recycling programs (see the "Current Environment" section for more details). New York City, however, restored its curbside recycling program for plastics in July 2003.

One factor that has led to reduced recycling is its high cost — \$100 per ton, according to Waste Policy Center, a consulting firm in Leesburg, Virginia. In comparison, tipping fees for landfilling are about \$35 per ton. Although sales of recycled materials

STATE DIVERSION GOALS AND RECYCLING RATES

STATE	RECYCLING/ WASTE REDUCTION GOAL (%)	RECYCLING RATE (%)	DEADLINE	IS GOAL MANDATORY?
Alabama	25	23	None	No
California	50	42	2000	Yes
Connecticut	40	23	2000	Yes
Delaware	30	59	None	No
District of Columbia	45	16	2000	Yes
Florida	30	28	1994	Yes
Hawaii	50	24	2000	No
Indiana	50	35	2001	No
Iowa	50	35	2000	No
Kentucky	30	30	2010	No
Louisiana	25	17	1992	No
Maine	55	40	2003	No
Maryland	40	37	2005	No
Massachusetts	70	38	2010	No
Michigan	25	18	2005	No
Minnesota	50/35*	42	1996	No
Mississippi	25	16	1996	No
Missouri	40	38	1998	No
Nebraska	50	23	2002	No
Nevada	25	14	None	No
New Hampshire	40	21	2000	No
New Jersey	65	38	2000	Yes
New Mexico	50	9	2000	No
New York	50	42	1997	No
North Carolina	40	26	2001	No
North Dakota	40	11	2000	No
Ohio	50	21	2005	No
Oregon	50	39	2009	Yes
Pennsylvania	35	33	2003	No
Rhode Island	70	24	None	Yes
South Carolina	35	31	2005	Yes
South Dakota	50	NA	2001	No
Tennessee	25	34	2003	Yes
Texas	40	35	1994	No
Vermont	50	33	2005	No
Virginia	25	29	Annual	Yes
Washington	50	35	1995	No
West Virginia	50	25	2010	No

NA-Not available. *50% for metro-area counties, 35% for other counties.
Source: *BioCycle*.

generate more than 5% of the solid waste market, that is not enough to eliminate the cost difference.

A new trend that could further hamper recycling efforts is the emergence of blue bottles and other nontraditional colors for beverages, which increase the difficulty of sorting the bottles. *Waste News* reports that other problems include barriers within the bottle (made of nylon and other materials) to increase shelf life and different types of labels.

Glass recycling continues to remain weak, as more glass is being used for nonrecoverable applications such as road filler and landfill cover, while paper is experiencing flat growth, as newsprint recovery facilities were operating at 89% of capacity in 2002, well below their target rate of at least 96%, according to *Waste News*.

Other challenges to recycling include improving collection methods for MSW service providers and reaching the EPA's recycling goal of 35% by 2005, according to the National Recycling Coalition, a nonprofit advocacy organization. Getting people to buy new products made with recovered material is another matter. According to *Waste Age*, consumers do buy recycled products when they are price-competitive and easy to find, but in many cases, high prices, low quality, or lack of availability have dampened consumer enthusiasm.

Diversion of construction and demolition (C&D) materials is a key strategy for reaching recycling goals. These materials, which can range from 15% to 30% of the waste stream, are highly recyclable, are generally less expensive to process for recycling than to ship to landfill, and have good end uses and markets, according to *Waste Age*. While the industry generally breaks down waste volumes with and without C&D debris, how governments classify C&D varies. For example, Jacksonville, Florida's recycling rate dropped from 43% to 33% during 2002, primarily because the state excluded construction and demolition debris from its calculation. Although excluding C&D provides a more accurate measure of consumers' participation in recycling everyday goods, it also lowers measured recycling rates.

Recycling programs tend to be more numerous in crowded regions where disposal costs are higher and incentives to recycle greater. One growing trend is the single-stream recycling system, which puts the burden of sorting the material on the recovery facility rather than the resident, according to *Waste News*. Workers separate the recyclables in an environment that's more controlled than are individual homes. Although these programs are labor-intensive, thus requiring high initial costs for salaries and benefits, the system reduces operating costs as fewer trucks and drivers are needed to run recycling collection routes.

Chartwell projects that growth in the number of recycling programs will be in the single digits over the next few years. Markets for the most prominent recycled materials — paper, metals, and glass, which account for almost 65% of total recycling tonnage — continue to be impacted by slower growth.

Hazardous waste business remains soft

The North American market for disposing of and treating hazardous waste continues to lack growth drivers in a soft economy. This competitive and capital intensive business has been weak for several years, and revenues declined 6% in 2002 to \$2.9 billion, according to Farkas Berkowitz. We expect the market to continue to feel the impact of a still sluggish economy near term. Longer-term growth will continue to be restricted by an increase in the number of firms outsourcing their manufacturing operations, some to foreign companies.

With high fixed costs, hazardous waste companies are having a tough time implementing price hikes. Additionally, new regulations, such as the New Maximum Achievable Control Technology (MACT) standards, are boosting operating costs for the combustion segment (35% of the industry), while virtually no additional wastes are facing new controls under Subtitle C of the Resource Conservation and Recovery Act (RCRA), according to a report issued by the consulting firm. In fact, the EPA is liberalizing its RCRA exemptions, which will remove some waste from the system.

As part of an ongoing transformation, many industry participants are rationalizing

their traditional hazardous waste operations by divesting assets or changing the make-up of their sites. They are also redefining their businesses to include a wider range of industrial wastes, including low-level radioactive wastes, nonhazardous liquid wastes (industrial wastewater), and management of manufacturing wastes. During 2002, 19% of the waste received by incinerators and 32% of the waste disposed of in landfills was non-hazardous. Some firms have diversified into the on-site industrial operation and maintenance services market, a highly fragmented and low-margin market valued at more than \$30 billion. It consists of many engineering and construction firms that remain on site after construction to provide maintenance services.

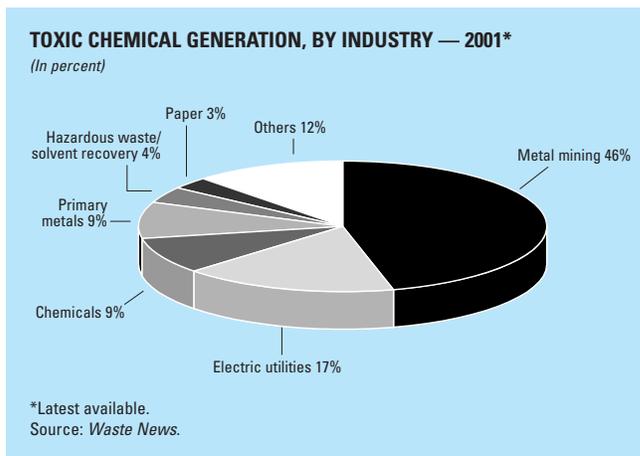
With the hazardous waste industry evolving into more of a general industrial services market, the outsourcing of noncore activities and a reduction in the number of vendors utilized may be the main drivers toward a return to growth. For example, industrial cleaning and maintenance firms generally arrange for a third party to collect the wastes for treatment and disposal at another location.

Supply and demand may come into balance within the next few years as some companies exit the hazardous waste industry and others consolidate. Only seven companies are publicly traded, including Clean Harbors Inc., Perma-Fix Inc., and American Ecology Inc.

According to changes enacted in 1999 with the EPA's federal Hazardous Waste Identification Rules (HWIR) — the set of regulations that serves as the industry's primary market driver — hazardous waste can be classified as nonhazardous if its toxic characteristics can be contained or eliminated. This delisted waste may create more business for the MSW industry at the expense of hazardous-waste companies. And as designated hazardous wastes decline as a percentage of total waste, the main driver of industry demand may shift from regulatory factors to economic, transaction-oriented ones.

Regulation and air pollution control

The two largest subsegments of the air pollution control business are vehicle emissions control and industrial emissions control. Overall, national air quality levels have improved for smog, carbon monoxide, sulfur



dioxide, lead, nitrogen dioxide, and particulate matter (soot) since the 1970 Clean Air Act became law. During the final decade of the twentieth century, carbon monoxide concentrations declined 36%; lead, 60%; nitrogen dioxide, 10%; smog, 4%; soot, 18%; and sulfur dioxide, 36%.

Vehicle emissions control

Under new regulations aimed at reducing air pollutants emitted by diesel-powered vehicles, fuel producers would be required to reduce sulfur levels in diesel to only 15 parts per million (ppm) by 2007, from more than 500 ppm currently. In August 2000, the EPA finalized a rule that sets emission standards for diesel engines, to take effect in 2005. According to this rule, engines for vehicles weighing 8,500 to 10,000 pounds may not emit more than 0.28 gram per mile of hydrocarbons and 0.90 grams per mile of nitrogen oxide. For vehicles weighing 10,000 to 14,000 pounds, emissions will be limited to 0.33 grams per mile of hydrocarbons and 0.90 grams per mile of nitrogen oxide.

The diesel rule will add \$1,200 to \$1,900 to the cost of a new truck or bus, while diesel costs could increase by four to five cents per gallon. It is expected to prevent emissions of 2.6 million tons of nitrogen oxide annually, and 110,000 tons of particulates, according to the EPA.

We expect these new regulations to lead to growth in alternative-fuel vehicles, such as hybrid and fuel-cell vehicles, which run much like conventional autos and can be refueled at the gas station. In early 2002, the Bush administration said that it would subsidize U.S. automakers' efforts to develop fuel-cell powered vehicles, which are considered to be the most efficient in clean-car technology. Bush has proposed a federally funded, five-year \$1.7 billion plan to develop hydrogen-powered fuel cells. Hybrid vehicle sales have already been growing rapidly, with more than 35,000 vehicles sold in the United States in 2002, up from fewer than 10,000 in the year 2000.

Industrial emissions control

This segment's primary market driver consists of proposed amendments to the federal Clean Air Act. Tough new standards include tightening controls on small-particle industrial air pollutants as well as ozone levels.

In February 2003, the Bush Administration reintroduced the Clear Skies Act, which intends to reduce power plant emissions by about 70% by 2018. The plan would establish emission limits for nitrogen oxide, sulfur dioxide, and mercury for fossil-fuel fired electric generators greater than 25 megawatts that sell electricity. The EPA asserts that the proposed rules would save lives and billions of dollars in health costs by reducing air pollution.

However, the Bush administration has relaxed pollution controls on coal-fired power plants by changing a section of the Clean Air Act that requires owners of coal-fired plants to install state-of-the-art pollution control equipment when plant upgrades increase emissions. Thus, electric utilities would be allowed to upgrade old and dirty coal-fired plants without installing new devices. Power plants are responsible for 67% of all sulfur dioxide emissions, 40% of man-made emissions of carbon dioxide, 34% of mercury emissions, and 25% of nitrogen oxide emissions, according to the EPA.

According to an air pollution market report published in mid-1999 by Illinois-based McIlvane Co., global equipment sales may reach \$255 billion by 2008, with U.S. firms spending \$66 billion. Equipment that removes sulfur oxides is projected to generate \$7.8 billion in global sales by 2008. During the next decade, China is expected to be the largest buyer of particulate control equipment and the second-largest purchaser of all air pollution equipment.

Meanwhile, some vendors of end-of-pipe pollution control systems are studying new ways to adapt their technologies for upstream uses and finding new applications for their core areas. Electric utilities remain the major purchasers of air pollution control systems, but other industries are likely to become customers as Title V permit applications submitted for approval over the past few years take effect. (A Title V permit is an operating permit awarded under the Clean Air Act Amendments of 1990 to new plants that meet air quality regulations.)

Environmental remediation demand shifts to private market

We expect the remediation market to rebound gradually in some sectors as economic conditions recover, while remaining weak in

others, as relaxed federal and state enforcement, a shift in priorities, and reduced budgets have led to project delays. For example, while the oil industry has shown signs of picking up, cleanup projects for power companies remain extremely weak.

Companies in this segment of the industry receive business from two sources: the federal government and private industry. Although remediation contracts for the Department of Defense (DOD) and the Department of Energy (DOE) should remain strong over the next few years, the Bush Administration has instructed both the DOD and DOE to increase their percentage of prime contracting to small businesses, which should force large contractors to compete for projects.

The federal remediation market is stable, with funding remaining at a rather high level of \$10 billion for the DOD, DOE, and Superfund in President Bush's fiscal 2004 budget proposal, with another round of military base closures targeted for 2005, according to a Farkas Berkowitz report. The DOE has accelerated its cleanup activity, while the DOD has had a strong flow of task orders with major procurements underway at all branches, none of which have been interrupted by costs related to the war in Iraq or for homeland security. However, long-term prospects may weaken with growing federal budget deficits.

Among industrial customers, the demand drivers for the clean-up market may be shifting from government regulation to private industry, driven by internal cost-saving incentives. Farkas Berkowitz predicts that remediation construction for the industrial market will be fueled by internally motivated site clean-ups, but will decline once progress is made. Total industrial remediation expenditures are projected to drop by some 30% by 2007.

Municipal design-build growth

Trends toward design-build, design-build-operate, and privatized operations have the potential to change the market for providers of engineering services. These trends favor engineering firms that vertically integrate to offer both construction and operating services. Municipalities tend to buy the full range of environmental consulting and remediation services, contributing 67% of the total U.S. water and wastewater engineering

market, and 33% of the solid waste consulting market.

Additionally, many engineering firms are integrating information technology to improve or expand their services. In the water market, engineering firms are developing systems to assess the condition of water and wastewater plants and to recommend cost-effective rehabilitation.

HOW THE INDUSTRY OPERATES

The highly fragmented U.S. environmental industry provides a wide range of products and services that control, reduce, or monitor a variety of wastes and pollutants. This large and complex industry, consisting of both investor-owned and government entities, provides everything from small-scale consulting services to the operation of large-scale water utilities. Customers range from individual consumers to regulated local water utility monopolies and major U.S. corporations.

The four primary industry segments are water supply and treatment, solid waste management, air pollution control, and environmental remediation and consulting. Companies within the industry are generally vertically integrated, focusing on acquisitions within their core businesses and areas of specialization.

Water supply and treatment

The U.S. water supply and treatment market comprises numerous segments, with wastewater treatment, water supply systems, and water infrastructure construction accounting for the majority of the market. Municipalities and investor-owned water utilities account for nearly 60% of the U.S. market. Nonregulated companies in various water-related segments (infrastructure construction, consulting, chemicals, equipment, bottled water, water treatment, and operations and maintenance) account for the balance.

Market segments

The water supply and treatment market is composed of the segments described below.

◆ **Municipally owned and operated public wastewater treatment.** Representing approximately 30% of market share, or some \$32.1 billion, municipal sewage treatment utilities

operate as regulated local monopolies. As of mid-2003, about 21,000 wastewater collection (pipe) systems and 16,000 public wastewater treatment plants in the United States were owned and operated by municipalities.

Discharge of the treated sewage-to-surface water is regulated by a national pollution discharge elimination system (NPDES) permit, which may be issued by the federal Environmental Protection Agency (EPA) or by a state agency. Each system is the exclusive provider for a designated local area.

Wastewater treatment utilities are often categorized by volume: how many millions of gallons of wastewater are treated daily. Based on EPA statistics, 50 U.S. facilities treated more than 100 million gallons per day (mgd) in 2001 (latest available); 450 treated between 10 mgd and 100 mgd; 2,600 treated between 1.0 mgd and 10 mgd; 6,500 treated between 0.1 mgd and 1.0 mgd; and 6,400 treated less than 0.1 mgd.

◆ **Water supply systems.** Water supply systems involve extraction from surface water or groundwater sources, transport to a water treatment plant, and distribution of water to end users — municipalities and private industry — via pipelines. They accounted for 28% of water segment revenues in 2001 (latest available), or \$30.0 billion. Municipalities are responsible for about 85% of segment revenues, while investor-owned utilities account for the remaining 15%. State public utility commissions regulate water quality and the rates that private investor-owned water utilities may charge. According to the EPA, there are approximately 168,000 public drinking water systems in the United States, with 93% of the population getting its water from a community water system (over 54,000 systems), which supplies water to the same population year round. Although nearly 80% of these community systems have groundwater as a source, close to 70% of the people drink from a surface water system.

In terms of population served, about 350 U.S. community water supply utilities are considered “very large” (serving more than 100,000 people), over 3,400 “large” (10,000 to 100,000), nearly 4,500 “medium” (3,301 to 10,000), about 14,150 “small” (501 to 3,300), and almost 31,700 “very small” (25 to 500 people). Generally, 85% of the water

systems serve fewer than 3,300 people, while only 2% serve more than 50,000 people.

Although large and very large water supply utilities constitute only 7% of all such utilities in the United States, they distribute over 80% of the nation’s municipal water supply by volume. Medium firms comprise 8% of water supply utilities and serve 10% of the market; small firms comprise 26% of such utilities and serve 8% of the market; and very small firms account for 59% of water supply utilities and serve 2% of the market.

Water supply utilities operate as regulated local monopolies, with about 40% of the municipally owned and operated systems serving 85% of the population. The balance were owned and operated by seven publicly traded, investor-owned water utilities; more than 16,500 privately held, investor-owned companies; and 12,000 ancillary systems serving less than 1% of the population.

◆ **Water infrastructure construction.** This segment (18% of the 2001 market; or \$19.3 billion, according to the latest available data) consists of companies that provide consulting services for water pollution clean-up projects. Water infrastructure construction primarily involves the installation of sewer pipes and the building of water facilities. Some 3,000 consulting and design engineering firms cater to the water supply and treatment market. These firms tend to be small, and the market fragmented.

◆ **Water treatment equipment.** Companies in this sector (about 8%; \$8.6 billion) design, manufacture, and sell equipment to the water supply and municipal wastewater treatment segments — including purification and filtration devices and desalination systems, and pumps and filters. The sector is highly fragmented, consisting of 10,000 small water equipment makers. Following the acquisition of U.S. Filter by France’s Vivendi in 1999, only four large publicly traded concerns now exist.

◆ **Bottled water.** The bottled water industry (5%; \$5.4 billion) has been growing at an annualized rate of about 8% since 1995. Sales of water in eight- to 20-ounce plastic bottles account for more than 30% of this rapidly growing market. The balance of the market consists of water sold in five-gallon

bottles. Major participants include Nestle's Perrier Group (whose 14 brands include Poland Springs, Deer Park, and Perrier), Danone Inc. (Evian), Coca-Cola Bottling Co., and PepsiCo Inc.

Residential/commercial water filter products are devices that use carbon filters to purify tap water. Calgon Carbon Corp. is the world's largest maker of residential/commercial water filter products.

According to the International Bottled Water Association, bottled water is sold under 700 brand names in the United States alone. (For more coverage of the bottled water industry, see the *Foods & Nonalcoholic Beverages* issue of *Industry Surveys*.)

◆ **Water treatment chemicals.** This sector (3%; \$3.2 billion) comprises companies that make water treatment chemicals for water suppliers and wastewater treatment facilities.

◆ **Point-of-use/point-of-entry residential products.** The point-of-use residential products market consists of pitchers and other dispensers that purify water by use of an activated carbon filter. Point-of-entry systems treat all the water entering a household and may include a combination of coarse sediment filters, activated carbon filters, and reverse osmosis membranes. Both sectors combined represent 3% (\$3.2 billion) of water segment revenues.

◆ **Contract operations and maintenance (O&M).** The contract O&M industry (2%; \$2.1 billion) consists of third-party, investor-owned companies that operate municipal water supply and wastewater treatment facilities, as well as industrial water treatment facilities. Municipal privatization accounts for about two-thirds of the market, while industrial outsourcing accounts for the balance.

◆ **Water-related consulting.** This overlapping segment consists of companies that provide consulting services for water pollution clean-up projects. We believe that these services (about 3% of segment revenues, or \$3.2 billion) are included in the water infrastructure construction and contract O&M segments.

Operations overview

Public wastewater (sewage) treatment utilities provide two related services: collection

(through pipe systems into which sewage drains) and treatment (performed at special facilities). Primary treatment uses large basins to physically separate solid wastes from wastewater. Secondary treatment typically uses a biological process to remove organic waste from the water. Sometimes a third step is taken, to remove salts and certain metals. Once wastewater is treated to regulatory standards, it is released into lakes, streams, or groundwater sources.

Municipally owned water supply and wastewater treatment facilities are typically funded by taxes or the issuance of tax-exempt private-activity bonds. Traditionally, most tax-exempt bonds limit third-party operations contracts to five years, and thus preclude widespread privatization of plants and operations.

Privatization does occur, however, and agreements can take several forms. A private company may purchase a municipal system outright. A municipality may make a single-purpose investment, in which it contracts with a private company to build, own, and service a plant. Yet another way is to form a public-private partnership, such as municipal financing of a private water system's improvement project or contracts for operation, maintenance, billing, and other services. Privatization can benefit municipalities by creating a new source of funding to support municipal services. In addition, with a private company investing, the municipality can earn a return on investment while expanding its rate base.

When municipalities decide to build or upgrade their water supply or treatment infrastructure, they hire third-party engineering design firms to plan the projects and construction companies to build them. Although most municipalities are required by local law to use separate firms for each function to minimize conflicts of interest, there is a growing trend in hiring a single firm to do both jobs.

Municipal water supply and wastewater treatment utilities generate revenues from user fees that are established by public commissions through a rate-setting process. When a rate change is requested — typically by a water utility — the commission will conduct public hearings to consider several factors before issuing a ruling. Those factors include the size of current investments in fa-

ilities, current operating costs, estimated capital costs needed to finance future facility expansions, and equitable rate increase allocations across the customer base.

Operations and maintenance contracts

O&M contracts for water supply and wastewater treatment facilities are described below. This emerging subsegment consists of independent firms that operate a water treatment facility for a municipality or industrial company.

◆ **Short-term operating contract.** Under a short-term contract, an O&M firm operates a facility for up to five years. The municipality issuing the contract is typically responsible for long-term capital improvements as well as for customer billing and collection. Until early 1997, when the Internal Revenue Service private-activity bond tax ruling was issued, one- to five-year operating contracts were the most common form of third-party operations of water utilities.

◆ **Long-term operating contract.** An O&M firm operates a water facility for up to 20 years under a long-term operating contract. Currently, 20-year contracts are commonplace. The municipality retains ownership of the wastewater facility, while the operator is generally responsible for long-term capital improvements, short-term operating expenses, and customer billing and payment collection. Long-term contracts give investor-owned O&M firms the time needed to recoup costs of large up-front capital investments.

◆ **Own-operate-transfer contract.** An own-operate-transfer contract includes the sale of a water utility to an O&M company — and a provision allowing the municipality to repurchase the facility from the O&M firm.

◆ **Own-leaseback-operate contract.** An own-leaseback-operate contract entails the initial sale of a utility to an O&M firm, the subsequent leaseback of the utility to the municipality, and a long-term O&M operating contract.

◆ **Design-build-operate contract.** A design-build-operate contract is made when a

construction company designs, builds, and operates a water utility.

Elements of revenue growth

Demand for water supply and wastewater treatment services is driven mostly by population and by industrial development, both of which are growing slowly in the United States. Of course, growth in water supply and wastewater treatment revenues is also driven by increases in water use charges.

Demand for water infrastructure construction and equipment is driven by the availability of funding for municipal projects, and by population and industrial growth. Demand for operations and maintenance work is driven by privatization of publicly owned municipal water facilities and by industrial companies that outsource water treatment operations.

◆ **Demographics.** U.S. population growth has been slowing over the past several decades, which has not helped these industry segments. The Bureau of the Census projects that the domestic population will grow from 282.8 million in 2003 to 299.9 million in 2010, a compound annual growth rate (CAGR) of less than 1%.

◆ **Economic growth.** A rebound in economic conditions can increase state and municipal budgets, expanding the number of projects, while a rise in industrial production also enhances the need for infrastructure. Economic slowdowns can hurt revenues, as capital spending budgets may be reduced, delaying infrastructure projects.

◆ **Water-use charges.** Water supply charges continue to rise in the high single digits, as customers are willing to pay more for improved drinking water quality. Water utilities have been able to receive approval from state commissions for at least 75% of their rate hike requests, as capital spending for new water systems has increased.

◆ **Privatization.** The EPA has estimated that expenditures for municipal water and wastewater plant upgrades will total \$136 billion through 2012. A large portion of these expenditures should involve the replacement of aging water supply and wastewater pipe systems, many of which are over 100 years

old. In view of these needs, many municipalities are studying the possibility of privatizing their water supply and treatment functions, primarily through long-term operating contracts with investor-owned O&M firms.

◆ **Outsourcing.** For corporations with capital-intensive, noncore water treatment operations, the need to boost profitability is driving demand for outsourcing to independent O&M firms.

Solid waste management

Standard & Poor's divides the solid waste collection and disposal segment into four lines of business, the largest of which is waste collection — the collection, disposal (through landfills and incineration), and recycling of nonhazardous solid waste — followed by landfills, recycling, and waste-to-energy incineration. Hazardous waste is a subsegment of the solid waste industry.

The MSW operating cycle: garbage in...

Commercial MSW collection services are generally performed under one- to three-year contracts. With residential services, contracts are typically one to five years in length, and are usually granted by municipalities or regional authorities. Municipal contracts are generally awarded to the lowest bidder.

Residential contracts grant the waste hauler the exclusive right to service all or part of the municipality's jurisdictions. Waste collection fees are usually determined by collection frequency; type of collection equipment used; type, volume, or weight of the waste collected; and the distance from the collection sites to the disposal facility.

...garbage out

Once waste has been collected, it may be hauled directly to landfills or incinerators for disposal, or it may be transported to transfer stations. After leaving the transfer station it may be deposited in a landfill, recycled, or incinerated.

◆ **Landfills.** Landfills are either owned by full-service waste collection firms or operated as stand-alone companies. Landfill operations generate revenues from tipping fees. These are charged to waste haulers or transfer stations based on industry supply and de-

mand; type, volume, or weight of the MSW; and the type and size of waste trucks.

Although the number of U.S. landfills has declined dramatically since 1990, landfill capacity on a national basis has increased, as larger new facilities replace older, smaller landfills. According to Chartwell Information, western states possess the greatest amount of remaining capacity, more than 20 years worth, while northeastern states have the least, about 12 years worth.

New capacity has been added in the mid-western and western regions, where population density is the lowest, land is cheap, local governments need economic incentives, and permitting receives little opposition from environmental groups. Montana has the most available capacity, with 40 years remaining, while Oklahoma has the least, with 10 years. Chartwell notes that the public sector accounts for 18 years of remaining landfill disposal capacity, while the private sector has about 19 years left, as more communities leave the landfilling business and capacity is either owned or managed by the private sector.

◆ **Transfer stations.** Transfer stations collect waste from the smaller garbage trucks, separate recyclable material, and compact nonrecyclable waste, which is placed in trailers or on barges for transport to disposal facilities. The stations are located near residential and commercial collection routes. Waste haulers generally use them when the main disposal facilities are located too far from original MSW collection sites.

Transfer stations are either owned by full-service waste haulers or operated as stand-alone companies. Stand-alone transfer stations generate revenues through disposal charges, or tipping fees, which they charge waste haulers based on the type and volume of waste compacted, the distance to disposal sites, and disposal costs. (Full-service waste haulers also charge tipping fees to other companies that use their transfer stations.)

◆ **Incineration.** Waste incineration is conducted primarily through waste-to-energy plants, which generate and sell the energy produced. According to the Integrated Waste Services Association, a waste-to-energy industry trade association, there are about 115 such plants in the United States.

◆ **Recycling.** Recycling involves the collection, separation, and recovery of reusable MSW. Recyclables are collected for the most part through curbside recycling programs sponsored by municipalities, and to a lesser extent, at drop-off sites, transfer stations, and landfill sites. Curbside programs serve more than 50% of the U.S. population.

Ultimately, recyclables find their way to recovery centers, which BioCycle defines as facilities that sort, bale, and market recyclables. The largest single category of recyclables is paper of various types, followed by scrap metal and yard trimmings.

MSW versus hazardous waste

Both the MSW and hazardous waste businesses offer undifferentiated services. While both are struggling with price competition, the hazardous waste industry is suffering the most.

Both industries are capital intensive. In MSW, large amounts of capital are needed to develop new landfills and/or incineration plants and to maintain existing facilities, to build and operate transfer stations, to purchase and maintain collection trucks and related equipment, and to comply with government regulations. Capital requirements are especially intensive for companies that operate hazardous waste incinerators.

In the United States, both industries are heavily regulated as well. The MSW industry is regulated primarily by the Solid Waste Disposal Act (SWDA). As amended by the Resource Conservation and Recovery Act of 1976 (RCRA), the SWDA regulates the handling, transportation, treatment, and disposal of municipal and hazardous wastes.

Subtitle D of the RCRA, adopted in 1991, established a framework for federal, state, and local government cooperation in controlling municipal solid waste management. Although the EPA provides overall regulatory direction, actual planning and implementation of Subtitle D programs fall under the auspices of state and local governments. One effect of Subtitle D provisions, related to regulations requiring the installation of new equipment to control leachate gas emissions, was that the average capacity per U.S. landfill more than tripled during the 1990s. Small landfill owners that could not finance the projects needed to bring their landfills into compliance with the new leachate regulations

were forced out of business, while the large financially sound companies built new, larger landfills that met the regulations. The result was fewer but larger landfills, thus increasing capacity despite the drastic decline in the number of landfills.

The hazardous waste industry is primarily regulated under Subtitle C of the RCRA. Whereas municipal solid waste companies tend to grow through acquisitions, hazardous waste firms grow through diversification or the pursuit of niche markets. Total hazardous waste shipments to commercial landfills have remained flat at around four million tons per year since 1995, when new landfill disposal regulations took effect, Farkas Berkowitz has noted. During the six years through 2002, the volume of hazardous waste burned annually in commercial incinerators in the United States averaged 660,000 tons, while that of hazardous waste burned in cement kilns averaged one million tons.

What drives the market?

Demand for municipal solid waste services is driven primarily by gross U.S. economic output and population growth. For hazardous waste services, government regulation is the market's main driver.

Reflecting low single-digit growth in the nation's GDP and population, the municipal solid waste industry is basically mature. In recent years, waste generation has expanded less rapidly than the economy as a whole, suggesting that the United States is generating less trash per unit of total economic output. This trend may be the result of the nation's growing reliance on services as opposed to manufacturing, and of its pollution prevention and waste minimization efforts. Although the industry remains highly competitive, municipalities are concerned that further consolidation will lead to collection and disposal price increases. However, in recent years soft markets have limited price hikes to selective regions where a waste hauler dominates market share.

The hazardous waste industry, meanwhile, is shrinking. The production of industrial waste byproducts, which make up the bulk of hazardous waste, is declining, as are the number of contracts for treating such waste. Today, capacity is more in line with demand than it was between 1995 and 1997, years

FEDERAL ENVIRONMENTAL STATUTES

STATUTE	INDUSTRY SECTOR CONCERNED
Clean Air Act (CAA)	Air quality systems
Clean Water Act (CWA)	Water quality systems: waste water
Safe Drinking Water Act (SDWA)	Water quality systems: water supply
Solid Waste Disposal Act (SWDA)	Solid waste
Resource Conservation and Recovery Act (RCRA); and Toxic Substances Control Act (TSCA)	Hazardous waste management
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or "Superfund")	Remediation (toxic clean-up)
Asbestos Hazardous Emergency Response Act (AHERA)	Asbestos abatement (toxic clean-up)
All the above	Consulting engineering
CWA and CERCLA	Analytical services
All the above	Other supporting products and services — e.g., environmental drilling, environmental information systems, landfill liners

Source: Farkas Berkowitz & Co.

characterized by pricing pressures. But the industry still suffers from landfill overcapacity, particularly in solvent recovery and fuel blending. These factors have affected the industry's profit margins, which have narrowed substantially. In addition, possible modifications to Subtitle C of the RCRA may soon delist many items formerly classified as hazardous waste.

Some waste companies have hedging programs in place in order to offset the impact of fluctuating fuel prices. In anticipation of rising fuel prices, haulers lock in fixed rate contracts for a year or more. With disposal trucks using a large amount of fuel, this practice can substantially reduce operating expenses.

Air pollution control

The air pollution control industry provides equipment and services to the automotive industry and various smokestack industries. It comprises four main sectors: vehicle pollution control equipment, industrial plant pollution control equipment and chemicals (together, these two account for 90% of the total market), indoor air pollution control, and consulting and monitoring equipment.

Demand for vehicle emissions control devices is driven by the automotive industry as well as by government regulations. The markets for smokestack emissions-control equipment and chemicals and for consulting and

monitoring services are both driven by federal and state regulations.

The primary federal legislation addressing air pollution control is the Clean Air Act Amendments of 1990. Enforcement of federal regulations, which ultimately fall to state environmental agencies (whose efforts are overseen by the U.S. Environmental Protection Agency), have softened in recent years, due primarily to budget cuts. However, stricter vehicle emissions standards for sport-utility vehicles and other light trucks will be imposed starting in 2004. In addition, the government is debating various proposals to limit greenhouse gas emissions by utility and industrial plants, as described in the "Current Environment" section of this *Industry Survey*.

Vehicle pollution control equipment

The vehicle emissions control (or mobile source control) industry primarily makes catalytic converters — devices that reduce the toxicity of vehicle exhaust fumes. The catalytic converter business includes substrate producers, catalyst applicators, and "canners."

Substrate producers make a ceramic device called a substrate — a catalytic converter component with a large surface area. A catalyst application producer applies a catalyst — a platinum-based paste — to the substrate. The catalyst is used to convert exhaust gases into less harmful exhaust fumes. The canner encloses the treated substrate in a cylinder. Completed catalytic converters are sold to car and truck manufacturers as well as to automotive repair shops.

The substrate production segment operates as an oligopoly, with two companies — Corning Inc. and NGK-Locke Inc. — dominating the market. The catalyst application market is also an oligopoly, with four principal firms. The canner market is fragmented, consisting of many independent canners as well as auto manufacturers that encase the treated substrates.

Industrial plant pollution control

Also known as end-of-pipe stationary source control, this industry makes emissions-control equipment and chemicals for electric utilities and industrial companies. Primary types of equipment include scrubbers for electric utilities and organic compounds control equipment for a broad range of industrial companies.

Electric utilities use scrubbers to remove sulfur dioxide from coal- or oil-burning generators. Scrubber systems, which are installed in new and existing power plants, can cost hundreds of millions of dollars. Other key industry groups include pulp and paper, cement, metals smelting and refining, and petrochemicals.

The smokestack emissions-control market is fragmented. According to Farkas Berkowitz, it comprises large firms that have long-standing relationships with the electric utility industry, suppliers that offer a broad line of air pollution control equipment for a variety of industries, replacement market service providers, engineering firms that install air pollution control systems in new plants, and a host of relatively small firms.

Air pollution consulting and monitoring

This industry serves both the vehicle emissions and smokestack pollution control markets. The vehicle emissions control monitoring market is made up primarily of motor vehicle inspection stations, which check automotive exhausts for emissions that exceed required levels. Smokestack pollution covers a broad range of industries, with power plants and manufacturing facilities producing the bulk of emissions.

Environmental remediation

The environmental clean up (or remediation services) industry is divided into five segments: remediation consulting (includes hazardous waste consulting), remediation construction, wastewater treatment, water supply, and air and solid waste.

Remediation consulting primarily involves investigations and feasibility studies. Remediation construction involves actual site clean up. Both segments serve the U.S. government (including the defense and energy departments) and private industry. Remediation construction includes companies responsible for Superfund sites, non-Superfund sites, and the redevelopment of brownfield sites, which are other contaminated sites being cleaned up for industrial and commercial redevelopment.

The process of cleaning toxic sites can be long and costly. Generally, it begins with consulting firms that conduct initial clean-up investigations and feasibility studies. Large construction companies with environmental

operations then perform the actual site clean-up work, which may consist of either digging up contaminated soil and hauling it away, or mixing toxic waste with concrete and fly ash and burying it under rock and clay.

The two basic types of toxic clean-up sites are Department of Defense or Department of Energy (DOE) military sites and industrial areas. Although federal funding has declined, the U.S. Air Force and Navy have been active in the remediation market, and have been outsourcing or privatizing clean-up projects. The DOE has turned to medium-size as well as large firms as subcontractors.

The industrial clean-up category includes Superfund sites, industrial non-Superfund sites, and other sites known as brownfield redevelopment areas. According to the EPA, the United States possesses 150,000 or more contaminated sites (whose hazardous corrosive or ignitable properties can't be treated to remove toxic characteristics) and about 1,500 Superfund sites on the EPA's National Priority List (NPL).

The Superfund segment consists of non-government toxic clean-up sites on the NPL; these sites are considered highly toxic, posing health risks to surrounding communities. The industrial non-Superfund segment primarily involves voluntary and transaction-driven clean-ups, certain regulatory-mandated jobs, and underground storage tank clean-ups. Brownfield redevelopment involves cleaning up contaminated sites to render them suitable for industrial and commercial purposes. Five hundred brownfield sites are on the NPL.

Federal and state regulations are the main demand drivers for remediation consulting and construction services. The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) was the primary force behind the creation of Superfund and the remediation industry. This law created a tax on the chemical and petroleum industries that generated \$1.6 billion over five years for a trust fund for cleaning up abandoned or uncontrolled hazardous waste sites. In October 1986, CERCLA was amended by the Superfund Amendments and Reauthorization Act (SARA).

The Superfund program, however, has been problematic, in that few sites have been cleaned to the EPA's satisfaction. In the early 1990s, Congress began re-examining the

Superfund statute, but funding for the program was not given priority. Although the Superfund had not been reauthorized, in January 2002, President George W. Bush signed the Small Business Liability Relief and Brownfields Revitalization Act. The bill (*H.R. 2869*) authorizes the federal government to grant as much as \$250 million per year for five years to state and local governments to assess and clean up brownfield sites. The legislation also provides relief from Superfund liability for many small business owners, property purchasers, and owners of properties who previously could be held liable for part of the clean-up costs.

Industrial cleaning

An increasing number of environmental firms are subcontracting their industrial cleaning and maintenance, according to Farkas Berkowitz, which calls the outsourced work “in-plant systems” since the customers may be either industrial or government entities. Services performed include equipment repair, cleaning and replacement of parts, spill containment and clean-up, and general facility and fleet maintenance. While industrial cleaning is not generally considered part of the environmental remediation sector, some engineering and construction firms also do this sort of work.

The industrial cleaning industry generates revenues of about \$15 billion (excluding specialty and mechanical contractors). The 10 largest firms (with revenues of over \$100 million each) control 15% of the market; 50 firms (\$20 million to \$100 million in revenues) account for 20%; and 9,000 firms (under \$20 million in revenues) claim 65% of the market.

KEY INDUSTRY RATIOS AND STATISTICS

► Gross domestic product (GDP).

Compiled quarterly by the U.S. Department of Commerce, GDP measures the total value of goods and services produced in the United States. GDP is an important indicator used to gauge the health of the U.S. economy, which in turn is important in driving demand for municipal solid waste services.

Standard & Poor’s currently projects real (inflation-adjusted) GDP growth of 2.7% for

2003 and 4.7% for 2004, compared with 2.4% in 2002. Many industry observers believe that GDP will expand at moderate rates for the next few years. Because GDP growth is a primary driver of the municipal solid waste (MSW) market, we believe the overall MSW industry will also grow at moderate rates.

► **Housing starts.** Released monthly by the U.S. Department of Commerce and reported as a seasonally adjusted annualized rate, housing starts indicate the number of residences on which construction has begun in a given period. This data is a key indicator of solid waste generation.

Standard & Poor’s expects housing starts to rise 1.7% in 2003, but to decrease 5.1% in 2004, following a 6.9% gain in 2002. A decline in housing starts limits solid waste generation, as construction and demolition waste can make up 15% to 30% of total volume.

► **U.S. population growth.** A primary demand driver for the municipal water supply and treatment industry, as well as for the MSW industry, is U.S. population growth.

Based on estimates by the U.S. Census Bureau, the U.S. population was about 282.8 million in 2003. Under the bureau’s most recent projection of a compound annual growth rate (CAGR) of 0.84%, the population will reach 299.9 million in 2010.

► **Daily municipal solid waste generated per capita.** Daily MSW generated per capita drives demand for the MSW industry. Statistics on this category are published annually by the federal Environmental Protection Agency (EPA).



Based on the latest EPA projections, daily MSW generated per person will grow from about 4.5 pounds in 2002 to 4.8 pounds in 2010, for an average annualized growth rate of 0.6%. The very moderate expansion of per-capita MSW generation is contributing to the low MSW industry growth rates.

► **Landfill and incinerator capacity.**

Reported by several private waste industry publications, this statistic is important in gauging the MSW industry's ability to increase landfill charges, or tipping fees. In general, the less capacity that is available, the higher the fees that can be charged.

According to Chartwell Information/EBI Inc., there were more than 19 years of unused U.S. landfill capacity in 2002. Landfill and incinerator capacity utilization was approximately 5% and 83%, respectively, for 2002. (For 2003 projections, see the table titled "U.S. disposal demand, capacity, and tipping fees.")

► **Landfill disposal charges.** Also reported by several private waste industry publications, landfill disposal charges are important in gauging the MSW industry's profitability.

According to Chartwell, national tipping fees, calculated on a weighted-average basis, edged up 0.4%, year to year, to \$36.38 per ton in May 2003 (latest available). Regional tipping fees, also calculated on a weighted-average basis, were as follows: rates in the Northeast, including the New England and Mid-Atlantic regions, rose 0.5% to \$57.24 per ton; the South fell 0.7% to \$32.46; Midwest fees rose 0.9% to \$32.52; fees in the West advanced more than 1.0%, to \$21.86; and Pacific rates were up 0.8%, to \$39.19.

HOW TO ANALYZE AN ENVIRONMENTAL COMPANY

Some useful factors to consider when analyzing an environmental company include financial statement ratios and statistics, internalization rates (for waste management companies), and business life cycles.

Looking at the numbers

Analyzing an environmental company's primary financial statements — balance

sheet, income statement, and statement of cash flows — provides an important basis for assessing the firm's overall performance.

Measures of financial condition

◆ **Current ratio.** This commonly used ratio helps in assessing a company's ability to service its short-term financial obligations. To derive the current ratio, divide current assets by current liabilities. Current assets are those that can be readily converted to cash or used up in the course of a firm's operating cycle, typically one year. Current liabilities generally encompass short-term debt, accounts payable, and other short-term obligations. In 2002, the environmental services industry posted a current ratio of 0.82, according to Standard & Poor's, versus 0.84 in 2001 and 0.82 in 2000.

◆ **Debt-to-capital ratio.** A company's financial strength and flexibility can be assessed according to the level of debt it holds relative to its total invested capital. The debt-to-capital ratio is calculated by dividing long-term debt (including lease obligations) by the sum of long-term debt and equity.

As of year-end 2002, the environmental services industry recorded a debt-to-capital ratio of 71.4%. While this was an improvement from nearly 72% in 2001 and 74% in 2000, environmental services companies are still highly leveraged.

◆ **Interest coverage ratio.** This measure is calculated by dividing EBITDA (earnings before interest, taxes, depreciation and amortization) by interest expense. In times of low interest rates, as in recent years, interest coverage can improve, as interest expense tends to be lower. In 2002, interest coverage for the group was 9.9 times, versus only 3.6 times in 2001 and 3.1 times in 2001.

Measures of profitability

◆ **Return on equity (ROE).** A common measure of a company's performance, ROE is calculated by dividing net income (less preferred stock dividends) by average common shareholders' equity.

ROE for the environmental services industry was 14% in 2002, up from 8.4% in 2001, and versus a deficit in 2000.

◆ **Depreciation expense.** When analyzing an environmental company's profit performance, depreciation expense is particularly important, especially for capital-intensive waste management firms. Waste companies generally own varying numbers of collection trucks, transfer stations, and landfills. Financial statement depreciation of trucks and transfer stations is straightforward; companies typically use a "straight-line" method to depreciate trucks and transfer stations, presuming an eight- to 10-year life for trucks and related equipment and a 30-year life for transfer stations.

Regarding landfill depreciation, however, waste companies have wide discretion. The choice of depreciation methods and useful life calculations can materially affect the amount of depreciation expense and thus reported income. Which method a company chooses depends on the total landfill capacity and the projected life of the landfill. Companies can depreciate less expense in the early years, thus boosting net income early on. From a tax standpoint, a more aggressive stance would entail depreciating a larger amount initially, which would result in lower reported earnings (and thus taxes) during the first few years.

There are four basic landfill depreciation methods. From most conservative to most aggressive, they are: life cycle/permitted-only capacity; life cycle/permitted and potential capacity; non-life cycle/existing capacity; and non-life cycle/existing and potential capacity.

◆ **Waste internalization rate.** This figure is a measure of the profitability of waste hauling and disposal firms. The waste internalization rate is defined as the percentage of refuse a waste company deposits in its own disposal facilities, rather than in third-party disposal facilities.

In general, paying a third party to dispose of waste costs more than depositing the waste in a company's own landfill. However, some companies decide whether to internalize their waste based on the economic benefits in each marketplace.

Overall, solid waste companies have focused on improving their internalization rates. For year-end 2003, Waste Management has targeted an average rate of about 70%, versus its actual rate of 65% as of mid-2003. According to the company, for every 100 basis points that it gains in its internalization

rate, it adds about two cents a share to earnings. Allied Waste Industries expects its internalization rate to exceed 70% by late 2003; it was 68.5% at June 30, 2003. Waste Connections Inc. also projects a rate of close to 70% by the end of 2003, versus 65% at mid-year 2003. Republic Services Inc. aims to increase its internalization rate to between 55% and 60% by 2003 year-end, from 54% at June 30, 2003.

Analysis of free cash flow

A company's true intrinsic value can be measured by estimating the present value of future free cash flows. Free cash flow consists of after-tax net income plus depreciation and amortization, less capital expenditures, increases in working capital, and preferred dividends. These figures are available from a company's balance sheets and cash flow statements, which are found in its annual report, 10K filing, or quarterly 10Q reports filed with the U.S. Securities and Exchange Commission (SEC).

Free cash flow is important to calculate because it paints a relatively accurate picture of a company's true profit performance, or earnings allocated to shareholders after capital costs are expended to maintain the company's operations. It is especially important in evaluating an MSW company's intrinsic value, as waste haulers are currently focusing on free cash flow generation for debt paydowns.

For example, MSW firms engaged in capital-intensive businesses — such as disposal operations like landfill and incinerator services — may generate lower free cash flows than MSW firms whose operations are more focused on collection. However, for the latter, capital expenditures may be needed to upgrade an aging truck fleet. In recent years, several large waste haulers (including Waste Management and Allied Waste Industries) have boosted their free cash flow via disposal proceeds from asset sales and reduced acquisition budgets.

Capital costs, however, aren't reflected on the income statement; in essence, they are deducted from retained earnings and thus from equity attributable to shareholders. Capitalized expenses can be found on the company's balance sheet.

Standard & Poor's Core Earnings

During 2002, Standard & Poor's began reporting Core Earnings™, using a uniform

methodology for calculating operating earnings that focuses on a company's after-tax earnings generated from its principal businesses. Included in the Standard & Poor's definition are employee stock option grant expenses, pension costs, restructuring charges from ongoing operations, writedowns of depreciable or amortizable operating assets, purchased research and development expenses, M&A-related expenses, and unrealized gains/losses from hedging activities. Excluded from the definition are pension gains, impairment of goodwill charges, gains or losses from asset sales, reversal of prior-year charges and provisions, and litigation or insurance settlements and proceeds. In August 2002, the Financial Accounting Standards Board (FASB) announced plans to require U.S. companies to disclose an estimate of stock-option costs in footnotes to quarterly income statements beginning in 2003.

Including pension and stock option expense provides investors with a clearer picture of the company's operating results and a more accurate assessment of earnings. The result of this analysis varies from company to company; in general, however, it reduces earnings. For example, Waste Management had reported EPS of \$1.33 in 2002, but Standard & Poor's Core EPS of \$1.17. Allied Waste recorded EPS of \$0.76 in 2002 versus Core EPS of \$0.53.

Acquisitions versus internal growth

With consolidation of the water treatment and municipal solid waste industries, several large, fast-growing, publicly traded water conglomerates and waste management companies have acquired smaller water treatment and municipal solid waste (MSW) companies. Some companies have financed their acquisitions by exchanging stock, with the acquirers' shares generally valued at higher price/earnings (P/E) multiples than those of the acquirees' stock.

In the past, this stock-for-stock financing strategy produced strong increases in per-share operating earnings for the acquirer. As long as an acquirer pursues a high-P/E-for-low-P/E stock swap method, these transactions are usually accretive to earnings. However, integration problems and high debt levels in the solid waste industry following large mergers in 1998 and 1999 have led to a decrease in major stock deals and a focus

more on internal growth, asset swaps, and niche "tuck-in" acquisitions.

Once the acquisition pace slows, as it has in the solid waste business, acquirers have to focus more on growth through internal expansion. Many water and MSW firms will have difficulty maintaining their per-share earnings growth because they operate in mature industries. (Air pollution and environmental clean-up firms have not followed the same acquisition strategy.)

Retained earnings

Analysts can see if a company is generating earnings growth through internal operations by disaggregating retained earnings growth from book-value growth. Retained earnings consist of accumulated net income kept by the company as cash, investments, securities, and so on. Book value, or total equity, primarily includes common stock, paid-in capital and retained earnings.

In general, when an acquiring company exchanges its higher-P/E stock for the lower-P/E stock of its target, its total equity increases. However, if its retained earnings growth doesn't keep pace with total equity growth, then most of its earnings gains are the result of financial transactions, not internal operations. If a company depends on acquisitions for growth, then its growth rate, and the price of its stock, may become vulnerable once the pace of acquisitions slows.

Pooling of interest, goodwill amortization eliminated

Both stock-for-stock (or pooling of interest) and cash acquisitions have figured in environmental firms' growth strategies during past years. The Financial Accounting Standards Board (FASB) decided to eliminate pooling of interest accounting methods as of July 1, 2001. (The pooling method was still required for certain business combinations initiated before the final statement was issued in June 2001.) The FASB believes that the purchase method reflects the underlying economics of business combinations by requiring that the current values of assets and liabilities exchanged be reported to investors.

In the past, an increase in cash transactions would also boost the amount of overall industry goodwill (reflecting premiums paid above the acquirees' book value), which ordinarily would lead to lower reported earn-

ings. However, the FASB also eliminated goodwill amortization, which has boosted profits for many companies. Under the new rule, goodwill is not steadily amortized against earnings, but is reviewed for impairment, and thus is written down and expensed against earnings only in the periods in which the recorded value of goodwill exceeds its fair value.

Acquisition multiples have been averaging five to seven times earnings before interest, taxes, depreciation, and amortization (EBITDA) in the solid waste sector in recent years. For the water sector, acquisition multiples have averaged four to five times EBITDA in recent years.

Business life cycles and profitability

As an environmental product or service progresses along the business life cycle, it becomes increasingly price sensitive, according to the environmental industry marketing research firm BTI Consulting Group. And as it becomes more price sensitive, its profit margins are likely to be reduced.

BTI's business life-cycle analysis describes each stage of the cycle for environmental companies. It sees each service progressing from new, developing, and growth phases, to maturity and stagnation. The analysis identifies the stage that each principal environmental offering has attained.

The new stage is typically the domain of venture capitalists and entrepreneurs. This stage requires capital for investment in research and development and start-up costs for new business operations and products. Companies seek financing and managers experienced in the respective fields.

In the development stage and the early part of the growth stage, the environmental company works with customers to develop a product or service that meets their needs. Customers usually don't ask for a specific service if it doesn't exist yet, or if they don't know it exists; all they know is that they have needs. Innovative companies can tap into these needs by providing services to satisfy them.

During the growth stage, the market begins to expand as it becomes easier for environmental companies to develop a product or service offering. Supply reaches equilibrium with demand as a large amount of supply

enters the market. Once customers gain experience buying the product or service and competitors enter the market, they begin to dictate prices.

The maturity and stagnation stages see too much supply chasing too little demand. At these times, an environmental company has little to differentiate itself from other suppliers, and so must compete on price. Profit margins typically decline in these stages.

According to BTI, most environmental management and information services are currently in the development stage of the service life cycle. The outsourcing of service functions — such as industrial treatment operations — lies between the development and growth stages. Both toxic clean-up consulting and third-party industrial water-quality contract operations are in the growth stage.

Remediation consulting services are more price-sensitive than industrial water quality services. Remediation construction services, which involve actual clean up, and air pollution-control consulting services may be moving toward the mature stage. Finally, both hazardous and nonhazardous solid waste disposal and treatment services are in the middle of the mature stage of the business life cycle. ■

GLOSSARY

Bioreactors — Landfills that add liquids and oxygen to speed the degradation of wastes.

Brownfield — A tract of land that was developed for industrial purposes, polluted, and then abandoned.

Brownfields development — The cleanup of a contaminated site to render it suitable for industrial and commercial development.

Composting — The recycling of organic yard waste (such as leaves, grass, and tree branches) into a product that can be used as fertilizer.

Emissions — Airborne pollutants emitted by utilities, industrial plants, transportation vehicles, etc.

Environmental remediation — The process of cleaning up a toxic waste site.

Greenhouse effect — The phenomenon whereby the Earth's atmosphere traps solar radiation. Certain gases, particularly carbon dioxide, allow incoming sunlight to pass through, but absorb heat radiated back from the Earth's surface.

Hazardous waste — Waste that may be considered toxic and must be treated or disposed of in a special landfill to avoid exposing people to health risks.

Incinerator — A facility that burns nonhazardous or hazardous waste. Most incinerators possess the ability to convert incinerated waste into energy.

Internalization rate — The percentage of rubbish discarded in a waste company's own disposal facilities, rather than in third-party disposal facilities.

Landfill capacity utilization — The annual amount of municipal solid waste (excluding commercial construction and demolition debris) disposed of in landfills as a percentage of total landfill capacity.

Landfill liner — A coating, typically made of layers of clay and special plastic, that is placed around the bottom and sides of a landfill. Landfill liners are used to prevent leachate from seeping into the soil and contaminating groundwater sources.

Leachate — Rainwater that percolates through a landfill, dissolving and picking up pollutants as it goes.

Municipal solid waste (MSW) — Nonhazardous consumer, household, commercial, and industrial waste.

Outsourcing — Contracting a company's noncore operations (such as a beverage company's water purification functions) to a third-party concern.

Ozone — The triatomic form of oxygen that is found in the Earth's atmosphere. Ozone is an important part of the stratosphere because it absorbs solar ultraviolet radiation not screened by other atmospheric components. At ground level, however, ozone is the primary ingredient of smog.

Privatization — The act of selling government-owned operations or assets to investor-owned companies.

Route density — The amount of trash collected along a given hauling route in a localized area. Solid waste companies can reduce operating costs by acquiring routes in highly populated communities, as more trash is collected within shorter distances.

The Superfund Program — A program set up by the U.S. government to fund Environmental Protection Agency (EPA) clean-ups of high-priority toxic industrial sites. Formally known as the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

Tipping fees — Fees charged by operators of transfer stations and landfills to solid waste collectors for the disposal of nonhazardous and/or hazardous waste.

Transfer station — A facility that compacts collected municipal solid waste. The compacted waste is then transported to a disposal site (either a landfill or an incinerator). Transfer stations are increasingly being used to sort recyclable materials.

Tuck-in acquisitions — Waste-hauling acquisitions that increase the acquirer's waste collection operations without its having to build additional capital-intensive waste-disposal capacity.

Waste-to-energy plant — A facility that converts incinerated waste into electric power.

Wastewater treatment plant — A facility that treats and purifies municipal and industrial sewage.

INDUSTRY REFERENCES

PUBLICATIONS

BioCycle

The JG Press Inc.
419 State Ave., Emmaus, PA 18049
(610) 967-4135
Web site: <http://www.jgpress.com>
Monthly; primarily covers the recycling industry.

Chemical & Engineering News

American Chemical Society
1155 16th St. NW, Washington, DC 20036
(202) 872-4600
Web site: <http://www.pubs.acs.org/cen>
Weekly; covers the chemical processing industries. Includes news on remediation, and toxic substances; presents industrial, commercial, and government viewpoints.

Clean Water Report

Business Publishers Inc.
8737 Colesville Rd., Silver Spring, MD 20910
(800) 274-6737
Web site:
<http://www.bpinews.com/enviro/pages/cwr.cfm>
Bi-weekly; developments in beneficial use, waste water residuals, industrial sludge, incineration, special wastes, permitting, and landfilling.

Engineering News-Record

The McGraw-Hill Cos.
2 Penn Plaza, 9th Fl., New York, NY 10121
(877) 876-8208
Web site: <http://www.enr.com>
Weekly; covers engineering and construction news.

Environmental Business Journal

Environmental Business International Inc.
4452 Park Blvd., Ste. 306, San Diego, CA 92116
(619) 295-7685
Web site: <http://environmental-industry.com/ebj/ebj.html>
Monthly; marketing research information and statistics for all segments of the environmental industry.

EnvironmentNOW News Service

Environmental Data Resources
3530 Post Rd., Southport, CT 06890
(800) 352-0050
Web site: <http://www.edrnet.com>
A comprehensive online environmental business news service that offers daily news and market analysis.

HUD Environmental Maps

U.S. Department of Housing and Urban Development
451 7th St. SW, Washington, DC 20410
(202) 708-1112
Web site: <http://www.hud.gov/emaps>
Free Internet service that combines information on HUD's community development and housing programs with EPA's environmental data.

Solid Waste Digest

Chartwell Information
4452 Park Blvd., Ste. 306, San Diego, CA 92116
(619) 295-7685
Web site: <http://www.wasteinfo.com/products/swd.htm>
Monthly; primarily covers regional capacity and pricing trends, and internalization strategies of solid waste companies.

Solid Waste Report

Business Publishers Inc.
8737 Colesville Rd., Silver Spring, MD 20910
(800) 274-6737
Web site: <http://www.bpinews.com>
Weekly; covers the nonhazardous and hazardous waste industries.

The U.S. Environmental Industry

Technology Administration
U.S. Department of Commerce
14th & Constitution Ave. NW, Washington, DC 20230
(202) 482-1575
Web site: <http://www.ta.doc.gov/Reports.htm>
A report released in September 1998 (latest available) detailing conditions and trends in the U.S. environmental industry.

Waste Age

Primedia Business Magazines & Media
6151 Powers Ferry Rd., Atlanta, GA 30339
(770) 955-2500
Web site: <http://www.wasteage.com>
Monthly; covers the nonhazardous and hazardous waste industries.

Waste News

Crain Communications Inc.
1725 Merriman Rd., Akron, OH 44313
(330) 836-9180
Web site: <http://www.wastenews.com>
Weekly; covers the solid waste industry.

INDUSTRY ASSOCIATIONS**Air & Waste Management Association**

420 Fort Duquesne Blvd., One Gateway Center, 3rd Fl.
Pittsburgh, PA 15222
(412) 232-3444

Web site: <http://www.awma.org>

Serves the air quality and solid waste industries.

American Water Works Association

6666 W. Quincy Ave., Denver, CO 80235
(303) 794-7711

Web site: <http://www.awwa.org>

Serves the water utility and sewage treatment industries.

Institute of Clean Air Companies

1660 L St. NW, Ste. 1100, Washington, DC 20036
(202) 457-0911

Web site: <http://www.icac.com>

Serves the air quality industry.

Integrated Waste Services Association

1401 H St. NW, Ste. 220, Washington, DC 20005
(202) 467-6240

Web site: <http://www.wte.org>

Serves the waste-to-energy incinerator industry.

Manufacturers of Emission Controls Association

1660 L St., Ste. 1100, Washington, DC 20036
(202) 296-4797

Web site: <http://www.meca.org>

Serves air quality equipment makers.

Municipal Waste Management Association

1620 Eye St. NW, Washington, DC 20006
(202) 861-6774

Web site: <http://usmayors.org/uscm/mwma>

Serves the municipal solid waste industry; affiliated with the U.S. Conference of Mayors.

National Association of Water Companies

1725 K St. NW, Ste. 1212, Washington, DC 20006
(202) 833-8383

Web site: <http://www.nawc.org>

Serves the water utilities industry.

National Recycling Coalition Inc.

1325 G St. NW, Washington, DC 20005
(202) 347-0450

Web site: <http://www.nrc-recycle.org>

Nonprofit representing interests committed to maximizing recycling as a means to conserve resources and energy, reduce solid waste, protect the environment, and promote social and economic development.

National Solid Waste Management Association

c/o Environmental Industry Associations
4301 Connecticut Ave. NW, Washington, DC 20008
(800) 424-2869

Web site: <http://www.envasns.org>

Serves the solid waste industry.

Solid Waste Association of North America

1100 Wayne Ave., Silver Spring, MD 20910
(800) 467-9262

Web site: <http://www.swana.org>

Serves the solid waste industry.

Waste Equipment & Technology Association

c/o Environmental Industry Associations
4301 Connecticut Ave. NW, Washington, DC 20008
(800) 424-2869

Web site: <http://www.envasns.org>

Provides services to solid waste equipment makers.

RESEARCH FIRMS**BTI Consulting Group**

167 Milk St., Ste. 340, Boston, MA 02109
(617) 439-0333

Web site: <http://www.bticonsulting.com>

Market research and management consulting for the air, water, and environmental clean-up industries.

Chartwell Information

4452 Park Blvd., Ste. 306, San Diego, CA 92116
(619) 295-7685

Web site: <http://www.wasteinfo.com>

A division of Environmental Business International Inc.; provides strategic economic market analysis and data to the waste management industry.

Environmental Business International Inc.

4452 Park Blvd., Ste. 306, San Diego, CA 92116
(619) 295-7685

Web site: <http://www.ebiusa.com>

A research, publishing, and consulting company serving the environmental industry and government agencies worldwide

Environmental Information Ltd.

5775 Wayzata Blvd., Ste. 820, St. Louis Park, MN 55416
(952) 831-2473

Web site: <http://www.envirobiz.com>

Business policy and technology-related environmental research services for the hazardous waste management and environmental clean-up industries.

Farkas Berkowitz & Co.

1220 19th St. NW, Ste. 300, Washington, DC 20036
(202) 833-7530

Web site: <http://www.farkasberkowitz.com>

Market research and management consulting services for all segments of the environmental industry.

GrassRoots Recycling Network

2203 Regent St., Ste. B, Madison, WI 53726

(608) 232-1830

Web site: <http://www.grrn.org>

Community-based recycling activists advocating zero waste.

The Waste Policy Center

211 Loudoun St. SW, Leesburg, VA 20175

(703) 777-9800

Web site: <http://www.winporter.com>

Environmental consulting and communications.

GOVERNMENT AGENCIES**Environmental Protection Agency (EPA)**

1200 Pennsylvania Ave. NW, Washington, DC 20460

(202) 272-0167

Web site: <http://www.epa.gov>

Federal agency that oversees the nation's environmental safety; enacts and enforces environmental laws. Many states also maintain environmental agencies.

DEFINITIONS FOR COMPARATIVE COMPANY ANALYSIS TABLES

Operating revenues

Net sales and other operating revenues. Excludes interest income if such income is "nonoperating." Includes franchised/leased department income for retailers and royalties for publishers and oil and mining companies. Excludes excise taxes for tobacco, liquor, and oil companies.

Net income

Profits derived from all sources, after deductions of expenses, taxes, and fixed charges, but before any discontinued operations, extraordinary items, and dividend payments (preferred and common).

Return on revenues

Net income divided by operating revenues.

Return on assets

Net income divided by average total assets. Used in industry analysis and as a measure of asset-use efficiency.

Return on equity

Net income, less preferred dividend requirements, divided by average common shareholder's equity. Generally used to measure performance and to make industry comparisons.

Current ratio

Current assets divided by current liabilities. It is a measure of liquidity. Current assets are those assets expected to be realized in cash or used up in the production of revenue within one year. Current liabilities generally include all debts/obligations falling due within one year.

Debt/capital ratio

Long-term debt (excluding current portion) divided by total invested capital. It indicates how highly "leveraged" a company might be. Long-term debt are those debts/obligations due after one year, including bonds, notes payable, mortgages, lease obligations, and industrial revenue bonds. Other long-term debt, when reported as a separate account, is excluded; this account generally includes pension and retirement benefits. Total invested capital is the sum of stockholders' equity, long-term debt, capital lease obligations, deferred income taxes, investment credits, and minority interest.

Debt as a percent of net working capital

Long-term debt (excluding current portion) divided by the difference between current assets and current liabilities. It is an indicator of a company's liquidity.

Price/earnings ratio

The ratio of market price to earnings, obtained by dividing the stock's high and low market price for the year by earnings per share (before extraordinary items). It essentially indicates the value investors place on a company's earnings.

Dividend payout ratio

This is the percentage of earnings paid out in dividends. It is calculated by dividing the annual dividend by the earnings. Dividends are generally total cash payments per share over a 12-month period. Although payments are usually calculated from the ex-dividend dates, they may also be reported on a declared basis where this has been established to be a company's payout policy.

Dividend yield

The total cash dividend payments divided by the year's high and low market prices for the stock.

Earnings per share

The amount a company reports as having been earned for the year (based on generally accepted accounting standards), divided by the number of shares outstanding. Amounts reported in *Industry Surveys* exclude extraordinary items.

Tangible book value per share

This measure indicates the theoretical dollar amount per common share one might expect to receive should liquidation take place. Generally, book value is determined by adding the stated (or par) value of the common stock, paid-in capital, and retained earnings, then subtracting intangible assets, preferred stock at liquidating value, and unamortized debt discount. This amount is divided by the number of outstanding shares to get book value per common share.

Share price

This shows the calendar-year high and low of a stock's market price.

In addition to the footnotes that appear at the bottom of each page, you will notice some or all of the following:

NA—Not available.

NM—Not meaningful.

NR—Not reported.

AF—Annual figure. Data are presented on an annual basis.

CF—Combined figure. In this case, data are not available because one or more components are combined with other items.

COMPARATIVE COMPANY ANALYSIS — ENVIRONMENTAL & WASTE MANAGEMENT

Operating Revenues

Ticker	Company	Yr. End	Million \$							Compound Growth Rate (%)			Index Basis (1992 = 100)				
			2002	2001	2000	1999	1998	1997	1992	10-Yr.	5-Yr.	1-Yr.	2002	2001	2000	1999	1998
ENVIRONMENTAL SERVICES†																	
AW	* ALLIED WASTE INDS INC	DEC	5,517.3	5,565.3A	5,707.5A	3,341.1A,C	1,575.6A	875.0A	35.0A	NM	44.5	-0.9	15,747	15,883	16,289	9,536	4,497
ION	§ IONICS INC	DEC	335.4	466.7	474.6	358.2	351.3	352.5	155.2	8.0	-1.0	-28.1	216	301	306	231	226
RSG	† REPUBLIC SERVICES INC	DEC	2,365.1A	2,257.5A	2,103.3A	1,838.5A	1,369.1A	1,127.7A	NA	NA	16.0	4.8	**	**	**	**	NA
SRCL	† STERICYCLE INC	DEC	401.5	359.0	323.7	132.8A	66.7A	46.2	NA	NA	54.1	11.8	**	**	**	**	NA
WCN	§ WASTE CONNECTIONS INC	DEC	498.7A	377.5A	304.4A	182.6A	54.0A	24.4A	NA	NA	82.9	32.1	**	**	**	**	NA
WMI	* WASTE MANAGEMENT INC	DEC	11,142.0A	11,322.0	12,492.0	13,126.9	12,703.5A	2,613.8A	52.2A	NM	33.6	-1.6	21,330	21,675	23,915	25,130	24,319
WATER UTILITIES‡																	
AWR	§ AMERICAN STATES WATER CO	DEC	209.2	197.5	184.0	173.4	148.1	153.8	100.7	7.6	6.4	5.9	208	196	183	172	147
PSC	† PHILADELPHIA SUBURBAN CORP	DEC	322.0	307.3A	275.5	257.3A	151.0	136.2	93.3	13.2	18.8	4.8	345	329	295	276	162
OTHER COMPANIES WITH SIGNIFICANT WASTE MANAGEMENT OPERATIONS																	
CWST	CASELLA WASTE SYS INC -CL A	# APR	420.9A,C	420.8A,C	479.8A,C	337.3A,C	173.4A	118.1A	NA	NA	28.9	0.0	**	**	**	**	NA
WWIN	WASTE INDUSTRIES USA INC	DEC	251.8A	249.3	242.4A	214.7A	171.3A	116.3	NA	NA	16.7	1.0	**	**	**	**	NA
OTHER COMPANIES WITH SIGNIFICANT ENVIRONMENTAL SERVICES OPERATIONS																	
CCC	CALGON CARBON CORP	DEC	258.1C	270.6	269.0	296.2	301.0	327.5C	298.4	-1.4	-4.7	-4.6	87	91	90	99	101
TTI	§ TETRA TECHNOLOGIES INC/DE	DEC	242.6A	303.4	224.5D	215.3	238.5	219.4A,C	57.2	15.5	2.0	-20.0	424	530	392	376	417

Note: Data as originally reported. ‡ S&P 1500 Index group. * Company included in the S&P 500. † Company included in the S&P MidCap. § Company included in the S&P SmallCap. # Of the following calendar year. ** Not calculated; data for base year or end year not available. A - This year's data reflect an acquisition or merger. B - This year's data reflect a major merger resulting in the formation of a new company. C - This year's data reflect an accounting change. D - Data exclude discontinued operations. E - Includes excise taxes. F - Includes other (nonoperating) income. G - Includes sale of leased depts. H - Some or all data are not available, due to a fiscal year change.

Net Income

Ticker	Company	Yr. End	Million \$							Compound Growth Rate (%)			Index Basis (1992 = 100)				
			2002	2001	2000	1999	1998	1997	1992	10-Yr.	5-Yr.	1-Yr.	2002	2001	2000	1999	1998
ENVIRONMENTAL SERVICES†																	
AW	* ALLIED WASTE INDS INC	DEC	225.2	75.5	137.7	-221.3	-98.3	53.6	1.0	NM	33.2	198.4	NM	NM	NM	NM	NM
ION	§ IONICS INC	DEC	4.8	44.7	-1.9	19.4	21.4	28.3	12.8	-9.4	-29.9	-89.3	37	349	-15	151	167
RSG	† REPUBLIC SERVICES INC	DEC	239.6	125.5	221.0	200.8	153.7	116.2	NA	NA	15.6	90.9	**	**	**	**	NA
SRCL	† STERICYCLE INC	DEC	45.7	22.0	14.5	14.0	5.7	1.4	NA	NA	100.0	107.7	**	**	**	**	NA
WCN	§ WASTE CONNECTIONS INC	DEC	55.5	30.7	28.2	9.2	2.8	-6.2	NA	NA	NM	80.6	**	**	**	**	NA
WMI	* WASTE MANAGEMENT INC	DEC	823.0	503.0	-97.0	-395.1	-766.8	273.3	7.3	NM	24.7	63.6	NM	NM	-1,321	NM	NM
WATER UTILITIES‡																	
AWR	§ AMERICAN STATES WATER CO	DEC	20.3	20.4	18.1	16.1	14.6	14.1	12.1	5.3	7.7	-0.5	168	168	149	133	120
PSC	† PHILADELPHIA SUBURBAN CORP	DEC	67.2	60.1	52.9	36.4	28.8	23.2	10.6	20.3	23.7	11.8	632	566	498	342	271
OTHER COMPANIES WITH SIGNIFICANT WASTE MANAGEMENT OPERATIONS																	
CWST	CASELLA WASTE SYS INC -CL A	# APR	6.2	11.8	-82.2	13.3	9.1	2.7	NA	NA	18.6	-47.3	**	**	**	**	NA
WWIN	WASTE INDUSTRIES USA INC	DEC	11.0	7.4	7.7	12.0	10.3	2.7	NA	NA	32.3	48.5	**	**	**	**	NA
OTHER COMPANIES WITH SIGNIFICANT ENVIRONMENTAL SERVICES OPERATIONS																	
CCC	CALGON CARBON CORP	DEC	4.2	8.0	9.9	-13.7	8.3	21.6	28.6	-17.4	-27.8	-47.1	15	28	34	-48	29
TTI	§ TETRA TECHNOLOGIES INC/DE	DEC	8.9	23.9	7.7	16.0	8.9	13.9	-3.9	NM	-8.6	-62.7	NM	NM	NM	NM	NM

Note: Data as originally reported. ‡ S&P 1500 Index group. * Company included in the S&P 500. † Company included in the S&P MidCap. § Company included in the S&P SmallCap. # Of the following calendar year. ** Not calculated; data for base year or end year not available.

Ticker	Company	Yr. End	Return on Revenues (%)					Return on Assets (%)					Return on Equity (%)				
			2002	2001	2000	1999	1998	2002	2001	2000	1999	1998	2002	2001	2000	1999	1998
ENVIRONMENTAL SERVICES†																	
AW	* ALLIED WASTE INDS INC	DEC	4.1	1.4	2.4	NM	NM	1.0	0.0	0.5	NM	NM	23.1	0.4	10.4	NM	NM
ION	§ IONICS INC	DEC	1.4	9.6	NM	5.4	6.1	0.8	7.4	NM	4.1	5.0	1.1	11.5	NM	5.5	6.4
RSG	† REPUBLIC SERVICES INC	DEC	10.1	5.6	10.5	10.9	11.2	5.9	3.4	6.5	6.6	7.4	13.2	7.3	13.9	14.3	15.0
SRCL	† STERICYCLE INC	DEC	11.4	6.1	4.5	10.5	8.6	7.0	3.2	2.0	3.9	7.2	16.1	10.6	9.5	15.9	11.6
WCN	§ WASTE CONNECTIONS INC	DEC	11.1	8.1	9.3	5.0	5.1	4.9	3.4	3.9	2.4	2.2	13.3	8.6	10.2	6.6	6.1
WMI	* WASTE MANAGEMENT INC	DEC	7.4	4.4	NM	NM	NM	4.2	2.6	NM	NM	NM	15.4	9.9	NM	NM	NM
WATER UTILITIES‡																	
AWR	§ AMERICAN STATES WATER CO	DEC	9.7	10.4	9.8	9.3	9.9	2.9	3.1	3.1	3.1	3.1	9.8	10.4	10.2	10.2	9.5
PSC	† PHILADELPHIA SUBURBAN CORP	DEC	20.9	19.6	19.2	14.1	19.1	4.1	4.0	3.9	3.7	4.3	13.9	13.3	13.3	12.2	13.5
OTHER COMPANIES WITH SIGNIFICANT WASTE MANAGEMENT OPERATIONS																	
CWST	CASELLA WASTE SYS INC -CL A	# APR	1.5	2.8	NM	4.0	5.2	0.5	1.3	NM	2.3	4.0	2.1	5.0	NM	6.3	7.8
WWIN	WASTE INDUSTRIES USA INC	DEC	4.4	3.0	3.2	5.6	6.0	3.6	2.4	2.8	5.7	7.2	11.9	9.6	11.2	17.8	19.7
OTHER COMPANIES WITH SIGNIFICANT ENVIRONMENTAL SERVICES OPERATIONS																	
CCC	CALGON CARBON CORP	DEC	1.6	2.9	3.7	NM	2.7	1.4	2.4	2.8	NM	2.0	2.5	4.3	5.4	NM	3.8
TTI	§ TETRA TECHNOLOGIES INC/DE	DEC	3.7	7.9	3.4	7.4	3.7	2.9	8.1	2.7	5.3	3.1	5.1	15.3	5.3	11.1	6.6

Note: Data as originally reported. ‡ S&P 1500 Index group. * Company included in the S&P 500. † Company included in the S&P MidCap. § Company included in the S&P SmallCap. # Of the following calendar year.

Ticker	Company	Yr. End	Current Ratio					Debt / Capital Ratio (%)					Debt as a % of Net Working Capital				
			2002	2001	2000	1999	1998	2002	2001	2000	1999	1998	2002	2001	2000	1999	1998
ENVIRONMENTAL SERVICES†																	
AW	* ALLIED WASTE INDS INC	DEC	0.7	0.8	0.8	0.9	1.1	78.1	79.7	81.9	83.4	69.5	NM	NM	NM	NM	NM
ION	§ IONICS INC	DEC	2.9	2.4	1.5	1.9	2.2	2.0	2.2	2.7	2.1	0.4	4.5	4.6	12.8	8.9	1.5
RSG	† REPUBLIC SERVICES INC	DEC	1.2	0.8	1.1	0.9	1.0	40.9	41.6	40.0	41.9	28.9	NM	NM	NM	NM	NM
SRCL	† STERICYCLE INC	DEC	1.8	1.5	2.1	1.5	1.1	36.8	49.1	62.6	65.5	30.4	552.0	772.4	720.5	NM	NM
WCN	§ WASTE CONNECTIONS INC	DEC	0.8	0.9	0.8	0.8	0.6	50.4	46.5	44.9	48.4	48.9	NM	NM	NM	NM	NM
WMI	* WASTE MANAGEMENT INC	DEC	0.9	0.8	0.8	0.8	0.9	54.0	54.1	59.5	62.0	69.2	NM	NM	NM	NM	NM
WATER UTILITIES‡																	
AWR	§ AMERICAN STATES WATER CO	DEC	0.7	1.4	0.7	0.8	0.6	52.7	55.0	41.5	44.1	36.9	NM	NM	NM	NM	NM
PSC	† PHILADELPHIA SUBURBAN CORP	DEC	0.3	0.3	0.4	0.3	0.7	46.1	44.6	44.5	45.0	44.5	NM	NM	NM	NM	NM
OTHER COMPANIES WITH SIGNIFICANT WASTE MANAGEMENT OPERATIONS																	
CWST	CASELLA WASTE SYS INC -CL A	# APR	1.1	1.1	1.8	2.0	1.3	61.8	54.1	60.6	58.0	33.9	NM	NM	645.0	527.3	NM
WWIN	WASTE INDUSTRIES USA INC	DEC	1.1	1.2	1.5	1.3	1.4	54.9	61.0	70.4	63.5	54.4	NM	NM	NM	NM	NM
OTHER COMPANIES WITH SIGNIFICANT ENVIRONMENTAL SERVICES OPERATIONS																	
CCC	CALGON CARBON CORP	DEC	3.0	2.2	1.6	1.8	1.8	25.3	20.1	18.2	26.6	21.9	74.4	95.7	118.1	148.9	122.5
TTI	§ TETRA TECHNOLOGIES INC/DE	DEC	2.8	2.0	2.2	2.6	3.1	15.1	17.9	23.5	30.8	41.3	51.8	59.7	77.2	100.4	124.9

Note: Data as originally reported. ‡ S&P 1500 Index group. * Company included in the S&P 500. † Company included in the S&P MidCap. § Company included in the S&P SmallCap. # Of the following calendar year.

Price / Earnings Ratio (High-Low)

Dividend Payout Ratio (%)

Dividend Yield (High-Low, %)

Ticker	Company	Yr. End	2002	2001	2000	1999	1998	2002	2001	2000	1999	1998	2002	2001	2000	1999	1998
ENVIRONMENTAL SERVICES†																	
AW	* ALLIED WASTE INDS INC	DEC	19-7	NM-NM	40-14	NM-NM	NM-NM	0	0	0	NM	NM	0.0-0.0	0.0-0.0	0.0-0.0	0.0-0.0	0.0-0.0
ION	§ IONICS INC	DEC	NM-65	12-7	NM-NM	31-21	34-17	0	0	NM	0	0	0.0-0.0	0.0-0.0	0.0-0.0	0.0-0.0	0.0-0.0
RSG	† REPUBLIC SERVICES INC	DEC	15-11	29-19	14-8	22-8	24-12	0	0	0	0	0	0.0-0.0	0.0-0.0	0.0-0.0	0.0-0.0	0.0-0.0
SRCL	† STERICYCLE INC	DEC	34-21	52-21	53-19	21-10	40-20	0	0	0	0	0	0.0-0.0	0.0-0.0	0.0-0.0	0.0-0.0	0.0-0.0
WCN	§ WASTE CONNECTIONS INC	DEC	20-12	33-19	29-8	64-21	81-47	0	0	0	0	0	0.0-0.0	0.0-0.0	0.0-0.0	0.0-0.0	0.0-0.0
WMI	* WASTE MANAGEMENT INC	DEC	23-15	41-28	NM-NM	NM-NM	NM-NM	1	1	NM	NM	NM	0.0-0.0	0.0-0.0	0.1-0.0	0.1-0.0	0.1-0.0
WATER UTILITIES‡																	
AWR	§ AMERICAN STATES WATER CO	DEC	22-15	20-14	20-13	22-12	18-13	65	64	67	72	78	4.3-3.0	4.6-3.3	5.1-3.4	5.8-3.2	6.0-4.3
PSC	† PHILADELPHIA SUBURBAN CORP	DEC	26-16	28-18	24-13	33-22	29-18	55	57	58	79	64	3.4-2.2	3.2-2.0	4.4-2.4	3.5-2.4	3.5-2.2
OTHER COMPANIES WITH SIGNIFICANT WASTE MANAGEMENT OPERATIONS																	
CWST	CASELLA WASTE SYS INC -CL A	# APR	NM-37	39-15	NM-NM	51-18	63-38	0	0	NM	0	0	0.0-0.0	0.0-0.0	0.0-0.0	0.0-0.0	0.0-0.0
WWIN	WASTE INDUSTRIES USA INC	DEC	10-7	17-8	23-8	22-12	32-19	0	0	0	0	0	0.0-0.0	0.0-0.0	0.0-0.0	0.0-0.0	0.0-0.0
OTHER COMPANIES WITH SIGNIFICANT ENVIRONMENTAL SERVICES OPERATIONS																	
CCC	CALGON CARBON CORP	DEC	90-36	45-27	38-19	NM-NM	66-28	109	95	60	NM	152	3.0-1.2	3.6-2.1	3.2-1.6	5.7-3.7	5.5-2.3
TTI	§ TETRA TECHNOLOGIES INC/DE	DEC	48-27	17-8	30-12	10-5	39-12	0	0	0	0	0	0.0-0.0	0.0-0.0	0.0-0.0	0.0-0.0	0.0-0.0

Note: Data as originally reported. ‡ S&P 1500 Index group. * Company included in the S&P 500. † Company included in the S&P MidCap. § Company included in the S&P SmallCap. # Of the following calendar year.

Earnings per Share (\$)

Tangible Book Value per Share (\$)

Share Price (High-Low, \$)

Ticker	Company	Yr. End	2002	2001	2000	1999	1998	2002	2001	2000	1999	1998	2002	2001	2000	1999	1998
ENVIRONMENTAL SERVICES†																	
AW	* ALLIED WASTE INDS INC	DEC	0.77	0.01	0.37	-1.33	-0.54	-39.96	-40.62	-40.89	-40.32	-2.19	14.55-5.54	19.90-8.90	14.75-5.31	24.06-6.50	31.63-16.13
ION	§ IONICS INC	DEC	0.27	2.61	-0.12	1.20	1.33	23.81	23.12	18.61	19.03	18.56	33.90-17.64	31.85-19.27	37.69-18.19	36.94-24.88	45.88-22.50
RSG	† REPUBLIC SERVICES INC	DEC	1.44	0.73	1.26	1.14	1.13	1.90	1.20	1.39	1.17	2.09	22.26-16.26	20.90-13.75	17.50-9.63	25.50-8.88	27.44-13.38
SRCL	† STERICYCLE INC	DEC	1.19	0.61	0.40	0.48	0.27	-3.48	-5.13	-9.34	-10.33	0.21	40.54-25.00	31.42-13.00	21.13-7.59	9.88-4.75	10.75-5.44
WCN	§ WASTE CONNECTIONS INC	DEC	2.00	1.14	1.21	0.50	0.29	-4.66	-1.75	-1.11	-0.89	-4.00	39.56-23.49	37.31-22.20	35.25-9.25	32.13-10.50	23.38-13.75
WMI	* WASTE MANAGEMENT INC	DEC	1.34	0.80	-0.16	-0.64	-1.31	0.21	0.43	-0.63	-1.54	-3.13	31.25-20.20	32.50-22.51	28.31-13.00	60.00-14.00	58.19-34.44
WATER UTILITIES‡																	
AWR	§ AMERICAN STATES WATER CO	DEC	1.34	1.35	1.28	1.19	1.08	13.24	12.41	11.87	11.82	11.48	29.01-20.25	26.40-19.00	25.29-16.67	26.50-14.79	19.50-14.08
PSC	† PHILADELPHIA SUBURBAN CORP	DEC	0.98	0.88	0.82	0.57	0.67	7.25	6.90	6.38	5.69	5.34	25.00-16.02	24.64-15.65	19.95-10.56	19.04-12.64	19.24-12.08
OTHER COMPANIES WITH SIGNIFICANT WASTE MANAGEMENT OPERATIONS																	
CWST	CASELLA WASTE SYS INC -CL A	# APR	0.13	0.38	-3.63	0.71	0.62	-1.83	7.47J	7.46J	11.84J	9.71J	15.27-4.86	14.95-5.63	19.25-3.25	35.88-12.75	39.00-23.75
WWIN	WASTE INDUSTRIES USA INC	DEC	0.82	0.56	0.56	0.88	0.80	2.15	1.61	0.03	-0.33	0.12	8.02-5.40	9.55-4.45	12.88-4.38	19.50-10.25	25.63-15.25
OTHER COMPANIES WITH SIGNIFICANT ENVIRONMENTAL SERVICES OPERATIONS																	
CCC	CALGON CARBON CORP	DEC	0.11	0.21	0.25	-0.35	0.21	3.41	2.84	2.85	2.69	3.40	9.89-4.00	9.50-5.63	9.44-4.75	7.75-5.06	13.88-5.81
TTI	§ TETRA TECHNOLOGIES INC/DE	DEC	0.42	1.14	0.38	0.79	0.44	7.11	7.09	6.00	5.72	5.58	20.00-11.15	19.50-9.13	11.29-4.67	7.88-4.04	17.00-5.08

Note: Data as originally reported. ‡ S&P 1500 Index group. * Company included in the S&P 500. † Company included in the S&P MidCap. § Company included in the S&P SmallCap. # Of the following calendar year. J-This amount includes intangibles that cannot be identified.

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