

July 2011

# HAZARDOUS WASTE

## Early Goals Have Been Met in EPA's Corrective Action Program, but Resource and Technical Challenges Will Constrain Future Progress

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Highlights of [GAO-11-514](#), a report to the Honorable Edward J. Markey, House of Representatives

## Why GAO Did This Study

Years of industrial development generated hazardous waste that, when improperly disposed of, poses risks to human health and the environment. To mitigate these risks, Congress passed the Resource Conservation and Recovery Act of 1976 (RCRA). Subtitle C of RCRA, as amended, requires owners or operators to take corrective actions to clean up contamination at facilities that treat, store, or dispose of hazardous waste. The corrective action program is administered by the Environmental Protection Agency (EPA) or states authorized by EPA.

GAO was asked by Representative Markey, in his former capacity as Chairman of the House Subcommittee on Energy and Environment, to assess this program. This report discusses (1) actions EPA has taken to establish goals for the program and expedite cleanup; (2) the progress EPA, states, and facilities have made in meeting these goals; and (3) the challenges EPA, states, and facilities face, if any, in meeting future cleanup goals. GAO reviewed and analyzed EPA documents and data and interviewed EPA and state agency officials and stakeholder groups.

## What GAO Recommends

GAO recommends that EPA assess the remaining corrective action workload, determine the extent to which the program has resources needed to meet 2020 goals, and take steps to either reallocate its resources or revise its goals. EPA agreed with the recommendation.

View [GAO-11-514](#) or key components. For more information, contact David Trimble at (202) 512-3841 or [trimbled@gao.gov](mailto:trimbled@gao.gov).

July 2011

## HAZARDOUS WASTE

### Early Goals Have Been Met in EPA's Corrective Action Program, but Resource and Technical Challenges Will Constrain Future Progress

## What GAO Found

To focus and streamline the RCRA corrective action program, EPA has over the past decade set a series of progressively more ambitious performance goals and identified which facilities must meet them. Its first set of performance goals, for example—to be achieved in fiscal year 2005—were to control human exposures to contamination and migration of contaminated groundwater at 95 percent of 1,714 “high-risk” facilities. EPA also established a long-range vision for the program, going beyond controlling contamination to cleaning it up. Hence, it targeted 2020 as the year by which 95 percent of 3,747 facilities (expanded from 1,714 to include low- and medium-risk facilities) would have completed construction of all cleanup remedies. EPA also (1) established a process for its regions and authorized states to follow in determining whether facilities undergoing cleanup have met major milestones toward controlling human exposure and preventing the spread of contaminated groundwater and (2) issued guidance to assist in streamlining the corrective action process, maximize program flexibility, and expedite cleanup.

EPA, states, and facilities have made considerable progress in meeting corrective action performance goals to control and contain contamination at high-risk facilities. Each of the five EPA regional offices GAO visited cited efforts to improve information on state program status, better estimate remaining work, and identify actions taken to meet the 2020 goals. Several also directly assisted states in assessing whether facilities had controlled contamination. Regional and state offices also reported streamlining reporting requirements and compliance procedures. EPA data show that by the end of fiscal year 2005, the vast majority of high-risk facilities had controlled human exposure to hazards and the migration of contaminated groundwater. Importantly, the EPA data also highlight the challenge facing EPA, states, and facilities in meeting the 2020 goal of constructing final cleanup remedies for 95 percent of the expanded universe of 3,747 facilities. For example, almost three-quarters of these facilities have yet to construct final cleanup remedies. Most EPA and state officials interviewed agreed that the 2020 goal was unlikely to be met.

EPA, states, and facilities identified fiscal and human resource constraints and groundwater cleanup as key challenges for achieving the 2020 goals on time. Program cuts resulting from states' fiscal problems and facilities' funding difficulties resulting from the economic downturn have exacerbated resource constraints. Technical complexity associated with groundwater remediation may also impede progress, and disagreements between industry and regulators over groundwater cleanup standards may perpetuate delays. To date, however, EPA has not performed a rigorous analysis of its remaining corrective action workload, including the resources it needs to meet its 2020 goals and the complexity and cost of what remains to be done. Without such an assessment, EPA cannot determine the extent to which the program has the resources it needs to meet these goals.

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## Abbreviations

EPA	Environmental Protection Agency
GPRA	Government Performance and Results Act
RCRA	Resource Conservation and Recovery Act

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United States Government Accountability Office  
Washington, DC 20548

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July 22, 2011

The Honorable Edward J. Markey  
House of Representatives

Dear Mr. Markey:

During more than a century of American industrial development, huge volumes of hazardous waste were generated and disposed of in an environmentally unsound manner. Recognizing that waste disposal without careful planning and management endangered human health and the environment, Congress passed the Resource Conservation and Recovery Act of 1976, or RCRA, to manage hazardous waste from generation to disposal, among other aims.<sup>1</sup> RCRA requires companies that treat, store, or dispose of hazardous waste to obtain a permit specifying how their facilities will safely manage that waste, but the law initially required cleanup, known as corrective action, only in limited circumstances.<sup>2</sup> In 1984, Congress amended RCRA to include expanded provisions for cleaning up contamination at facilities having permits, as well as those required to have permits, to treat, store, and dispose of hazardous waste.

Under RCRA, as amended, the owners or operators of facilities located on sites where hazardous waste was or is treated, stored, or disposed of must clean up present and past contamination within the boundaries of their sites, as well as contamination that may have spread beyond those boundaries. The facilities include, for example, chemical manufacturers, wood preservers, and commercial landfill operations; the sites range in size from small hazardous waste storage areas where contaminants leaked into the ground to sites of more than 1,000 acres in area with extensive contamination. While conducting corrective actions, facility owners typically incur capital and equipment costs, operations and

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<sup>1</sup>Codified as amended at 42 U.S.C. §§6901-6992k (2006). Subtitle C of the law governs hazardous waste management. The act also contains provisions governing solid nonhazardous waste and the regulation of underground storage tanks.

<sup>2</sup>Throughout this report, we use the terms “companies” and “facilities” to refer to the owners or operators of facilities for the treatment, storage, or disposal of hazardous waste. The terms “owner” or “operator” are broadly defined to include individuals, trusts, corporations, federal agencies, states, municipalities, interstate bodies, and other entities.

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maintenance expenses, and planning and compliance costs. A 2002 study by the Environmental Protection Agency (EPA) found that the costs of cleanup at facilities can vary widely, noting at the time that facilities' cleanup estimates ranged from less than \$1 million to more than \$50 million.<sup>3</sup> More recently, an internal analysis conducted by an EPA contractor in 2007 estimated that in 2006 nationwide private-sector costs associated with corrective action program cleanups ranged from about \$400 million to \$500 million.<sup>4</sup>

EPA may authorize states to administer their own permitting programs for hazardous waste in lieu of the federal program, as long as these state programs are equivalent to and consistent with the federal program and provide for adequate enforcement. EPA may also authorize states to implement the corrective action program. To date, 42 states and Guam<sup>5</sup> are authorized to manage their own corrective action programs (see app. I). EPA distributes grant funds to these states, not to pay for the cost of cleanup, but rather to assist in the administration of their programs. States are required to supplement these grants with at least \$1 for every \$3 in federal money. In fiscal year 2010, EPA grants to the states to administer the program totaled \$31 million. States typically work closely with EPA's 10 regional offices to implement their programs, and the pertinent EPA regional office retains lead responsibility for a portion of facilities undertaking corrective action. EPA's Offices of Solid Waste and Emergency Response, and of Enforcement and Compliance Assurance, oversee the RCRA corrective action program as a whole. The Office of Solid Waste and Emergency Response is responsible for developing and implementing policy for the federal corrective action program, and the Office of Enforcement and Compliance Assurance is responsible for enforcement and compliance assurance at regulated facilities. Although RCRA, as amended, set no deadlines for completing cleanups under the corrective action program, EPA set performance goals for the program in response to planning requirements established for all federal agencies under the Government Performance and Results Act (GPRA) of 1993.

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<sup>3</sup>Environmental Protection Agency, *A Study of the Implementation of the RCRA Corrective Action Program* (Washington, D.C., Apr. 9, 2002).

<sup>4</sup>Industrial Economics, Inc., "Private Sector RCRA Corrective Action Cost," prepared for EPA's Office of Solid Waste, September 28, 2007.

<sup>5</sup>RCRA defines "state" to include the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands.

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Over the years, nationwide progress on the cleanup of hazardous waste has been slow. Moreover, in October 1997 and August 2000, we reported that a number of management factors limited cleanup progress under the corrective action program during the 1990s, including a burdensome cleanup process and resource shortfalls.<sup>6</sup> Against a backdrop of continuing congressional concern, you asked us to assess the status of EPA's RCRA corrective action program in your former capacity as Chairman of the House Subcommittee on Energy and Environment. Accordingly, this report examines (1) the actions EPA has taken to establish goals for the program and expedite cleanup; (2) the progress EPA, the states, and facilities have made in meeting these goals; and (3) the challenges, if any, that EPA, the states, and facilities face in meeting future cleanup goals.

To accomplish our work, we reviewed relevant EPA strategic plans and guidance, along with the procedures the agency has adopted to establish goals, identify which facilities it monitors for progress toward meeting those goals, measure progress, and expedite cleanup. We analyzed EPA's data on cleanup status, including information from EPA's RCRAInfo database.<sup>7</sup> We assessed the reliability of the RCRAInfo data elements necessary to our engagement by reviewing system documentation, performing electronic testing, and interviewing officials knowledgeable about them; we found the data to be sufficiently reliable for the purposes of this report.

To better understand the progress made and what work remains, we examined a nongeneralizable random sample of 32 facilities (located in Georgia, Louisiana, Michigan, and Pennsylvania) selected from 1,658 facilities that met criteria set by EPA for facilities deemed to pose a high risk to human health and the environment. Further, we interviewed officials responsible for the corrective action program in EPA

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<sup>6</sup>GAO, *Hazardous Waste: Progress under the Corrective Action Program Is Limited, but New Initiatives May Accelerate Cleanups*, [GAO/RCED-98-3](#) (Washington, D.C.: Oct. 21, 1997), and GAO, *Hazardous Waste: EPA Has Removed Some Barriers to Cleanups*, [GAO/RCED-00-224](#) (Washington, D.C.: Aug. 31, 2000).

<sup>7</sup>RCRAInfo is a national program management and inventory system of hazardous waste handlers, which includes a range of information on treatment, storage, and disposal facilities, such as whether they have active operating permits or have been closed, whether they are in compliance with federal and state regulations, and whether they are undertaking cleanup activities.

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headquarters and in a nonprobability sample of 4 of EPA's 10 regional offices. We selected this nonprobability sample of regions on the basis of their having the largest caseloads (as determined by the number of facilities under their jurisdictions that are subject to the program).<sup>8</sup> Taken together, the four regions account for approximately 65 percent of facilities EPA has identified that must meet its goals for the corrective action program.<sup>9</sup> To gain a perspective from a region with a relatively smaller caseload, we also interviewed EPA officials in Region 10 in Seattle. Within the five regions, we visited or spoke with officials from nine states: Alabama, Georgia, Louisiana, Michigan, New Mexico, Ohio, Oregon, Pennsylvania, and Virginia. In addition, we discussed cleanup challenges with stakeholder groups, including a group of Fortune 50 companies with facilities in the RCRA corrective action program, the Association of State and Territorial Solid Waste Management Officials, and the Environmental Council of States. Appendix II presents a more detailed description of our scope and methodology.

We conducted this performance audit from December 2009 through July 2011, in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

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## Background

The Hazardous and Solid Waste Amendments of 1984 revised RCRA to include new provisions requiring certain facilities to take corrective action to clean up their sites. EPA data show that as of the end of fiscal year 2010, about 6,000 facilities were subject to corrective action; that is, they were required to undertake corrective action in response to a release of

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<sup>8</sup>The information we obtained from the interviews from this nonprobability sample of regions cannot be generalized to other regions.

<sup>9</sup>The four regional offices were Region 3 in Philadelphia, Region 4 in Atlanta, Region 5 in Chicago, and Region 6 in Dallas.

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hazardous waste or constituents.<sup>10</sup> Facilities that may be required to undertake corrective action include, among others, operating or closed treatment, storage, or disposal facilities that are permitted or have interim status—during which the owner or operator of a treatment, storage, or disposal facility is considered to have been issued a RCRA permit even though a final determination on the permit has not yet been made by the regulator. Permitted and interim-status facilities generally incur an obligation for continued corrective action even after closure.

Facilities generally come into the corrective action program when (1) EPA or an authorized state is considering a facility's RCRA permit application, (2) a release of hazardous waste or constituent has been identified, or (3) a facility volunteers to perform corrective action by entering into an agreement with EPA or an authorized state. First, when a facility is seeking a permit or when a permit is already in place, EPA or an authorized state can incorporate corrective action into the permit's requirements. EPA or the state may use this process to address both on-site releases and releases that have migrated beyond a facility's boundary. Second, EPA or the state may issue a corrective action order that is not contingent on a facility's permit status, for example, when immediate action is necessary to address a release or threat of release of a solid or hazardous waste that may present an imminent and substantial endangerment to human health or the environment, including at an interim-status facility. Third, facilities may volunteer to take corrective action before they are required to do so by the terms of the permit or corrective action order.

There are no comprehensive cleanup regulations under RCRA. Instead, EPA and authorized states primarily use guidance to implement corrective action and impose requirements at individual facilities through their permits or orders. The agency emphasizes the flexible nature of the program, but several elements are common to most, although not all, corrective action cleanups:

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<sup>10</sup>Hazardous wastes are those listed at 40 C.F.R. pt. 261, subpt. D, or that display characteristics listed at 40 C.F.R. pt. 261, subpt. C. Waste may also be determined to be hazardous waste if it contains certain toxic constituents listed at 40 C.F.R. pt. 261, app. VIII. According to an EPA document, these constituents include toxic pollutants under the Clean Water Act, hazardous air pollutants under the Clean Air Act, certain contaminants regulated under the Safe Drinking Water Act.

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- *Initial facility assessment.* EPA or an authorized state first assesses a facility to characterize the risk posed and determine the need for immediate action.
  - *Facility investigation.* If it is determined that information beyond initial facility assessment is needed, EPA or the authorized state requires the company owning or operating the facility to conduct a more detailed investigation to establish the nature and extent of contamination released to groundwater, surface water, air, and soil. Depending on a facility's particular circumstances, this phase may be complex and take years to complete. The process is monitored by the agency overseeing the correction action, and the outcome is subject to that authority's approval. While facility investigation is under way, interim measures may be needed to control or abate ongoing risks to human health and the environment. According to EPA, interim measures may take place any time during the corrective action process. In some cases, such actions may be enough to complete the corrective action process.
  - *Remedy study and selection.* If further corrective action is deemed necessary, facility owners and operators analyze a range of cleanup options. A company may complete a study of corrective measures describing the advantages, disadvantages, and costs of various options. The scope of the effort required for such a study depends on the risks posed at the facility: a study can be relatively restricted in scope if the risks and cleanup option are readily identifiable. EPA or the authorized state solicits public comments on the selected option and approves a final cleanup method.
  - *Remedy construction and implementation.* Facility owners and operators design and construct and, as necessary, operate, maintain, and monitor the selected remedy.

EPA has undertaken a number of initiatives over the years to manage the corrective action program by making decisions on the basis of the level of the risk to public health and the environment and to improve the cleanup process. In 1991, EPA decided to focus its resources on facilities it ranked as high priority for corrective action because of the relatively high

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risk they posed.<sup>11</sup> It also decided to first control or abate immediate threats to human health and the environment at these facilities, instead of diverting resources to push for final cleanup actions. In 1994, EPA established two environmental indicators: controlling exposures to humans and controlling the migration of contaminated groundwater. In 1998, EPA took steps to remove some barriers to cleanups, such as providing for more flexible treatment of contaminated soil that may temporarily accumulate during cleanups. In 1999 and 2001, EPA implemented a set of administrative reforms to promote faster and more flexible cleanup. These reforms called for new results-oriented cleanup guidance, promoting program flexibility through training and outreach, and enhancing community involvement.

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## During the Past Decade, EPA Established Goals and Issued Guidance to Expedite Cleanup under the Corrective Action Program

As part of its effort to focus and streamline the RCRA corrective action program, EPA has since 1997 set a series of progressively more ambitious performance goals and identified which facilities must meet them. The agency also issued guidance to expedite cleanup.

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## EPA Has Set a Series of Progressively More Ambitious Performance Goals and Identified Which Facilities Must Meet Them

Goals set by EPA for the corrective action program have encompassed progressively more facilities and longer time frames. In response to GPRA, the agency first set performance goals to be achieved by fiscal year 2005, which focused on high-risk facilities deemed to have potentially unacceptable levels of contaminants. EPA then began focusing on longer-term concerns by setting goals to be achieved by fiscal year 2008. EPA also began to establish a long-range vision for the program, which included a larger universe of facilities and goals for fiscal

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<sup>11</sup>In the early 1990s, EPA created the National Corrective Action Prioritization System, a computer-based ranking system that sets priorities for the cleanup of hazardous wastes at treatment, storage, and disposal facilities regulated under RCRA. The system established national criteria for ranking facilities as high, medium, or low priority, as determined by an evaluation of four pathways of actual or potential contamination (groundwater, surface water, air, or soil).

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## EPA First Set Goals for High-Priority Facilities

year 2020. In addition, the agency has also issued guidance to expedite cleanup.

In 1997, in response to GPRA, EPA established its first set of performance goals for the corrective action program. The goals were to be achieved by the end of fiscal year 2005 and targeted 1,714 facilities at high risk of causing potentially unacceptable public exposure to pollutants, having high levels of groundwater contamination, or both. The performance goals to be met by fiscal 2005 were as follows:

- controlling human exposures to contaminants at 95 percent of these high-priority facilities and
- controlling the migration of contaminated groundwater at 70 percent of the 1,714 facilities.<sup>12</sup>

Importantly, these goals did not explicitly address final cleanup of sites but rather sought to control contamination at high-risk sites first. Previously, we and others reported that EPA had not established long-term goals for final cleanup.<sup>13</sup> In our August 2000 report, we noted that focusing only on controlling contamination and not on implementing final cleanup actions could postpone cleanups well into the future, and we recommended that EPA establish long-term and annual goals delineating the number or portion of facilities that are to implement final cleanup actions. In response to our recommendation, EPA agreed that implementing final remedies was important but decided at the time to use its limited resources to focus on controlling contamination at the worst sites. EPA also stated that the corrective action program did not have the resources to focus concurrently on containing contamination and implementing final cleanup actions.

## Goals for 2008 Began to Focus on Longer-Term Concerns

EPA's next set of performance goals, for 2008, began to address longer-term concerns. EPA continued the goals to control human exposures to contaminants and contain the spread of groundwater contamination, but it

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<sup>12</sup>EPA defined groundwater as under control if contaminated groundwater remained in place and the contaminants it contained no longer rose above specified levels of concern. In addition, contaminated groundwater was not to significantly affect surface water in streams or other water bodies.

<sup>13</sup>[GAO/RCED-00-224](#) and Environmental Protection Agency, Office of Inspector General, *RCRA Corrective Action: RCRA Corrective Action Focuses on Interim Priorities—Better Integration with Final Goals Needed*, 2000-P-0028 (Washington, D.C., September 2000).

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added two new goals. These two longer-term goals directed that a portion of high-priority facilities were to decide upon and construct a final cleanup remedy. EPA defined the completion of final remedy construction as the time when the physical components of a final corrective action remedy for a facility were in place and functioning correctly. EPA also increased the total number of high-priority facilities that must address the goals from 1,714 to 1,968.<sup>14</sup> The performance goals to be met by fiscal year 2008 were as follows:

- controlling human exposures to contaminants at 95 percent of 1,968 high-priority facilities,
- controlling the migration of contaminated groundwater at 80 percent of these high-priority facilities,
- selecting final remedies at 30 percent of these facilities, and
- completing final remedy construction at 20 percent of these facilities.

#### EPA Expanded the Universe for Goals Set after 2008

While directing attention to high-priority facilities, EPA was also working to establish what it considered a long-range vision for the corrective action program—that by the year 2020, cleanup of contamination at an expanded universe of RCRA facilities would be largely complete.<sup>15</sup> In developing this vision, EPA issued a memorandum asking the regions and authorized states to include in this universe facilities that, as of October 1997, had RCRA permits for actively managing waste, as well as treatment and storage facilities that had been closed and had postclosure obligations. The regions and states had discretion to add facilities they agreed were important to address through the program. According to an EPA official, this group of facilities includes the majority of facilities ultimately expected to need corrective action, including those that had previously been considered as medium or low priority.

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<sup>14</sup>According to agency officials, EPA added new facilities judged as high risk to the list and deleted facilities from the list that were deferred to other cleanup programs.

<sup>15</sup>In stating that cleanup of existing contamination problems at RCRA facilities would be “largely complete,” EPA’s vision statement maintains that in some cases, long-term remediation work may continue and some mechanism for addressing releases occurring in the future may be needed.

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Beginning in fiscal year 2009, EPA shifted its focus from the 1,968 high-priority facilities to tracking and reporting progress among the expanded universe of 3,747 facilities targeted in the 2020 goals. In September 2010, EPA issued new fiscal year 2015 performance goals for this expanded universe. These goals were as follows:

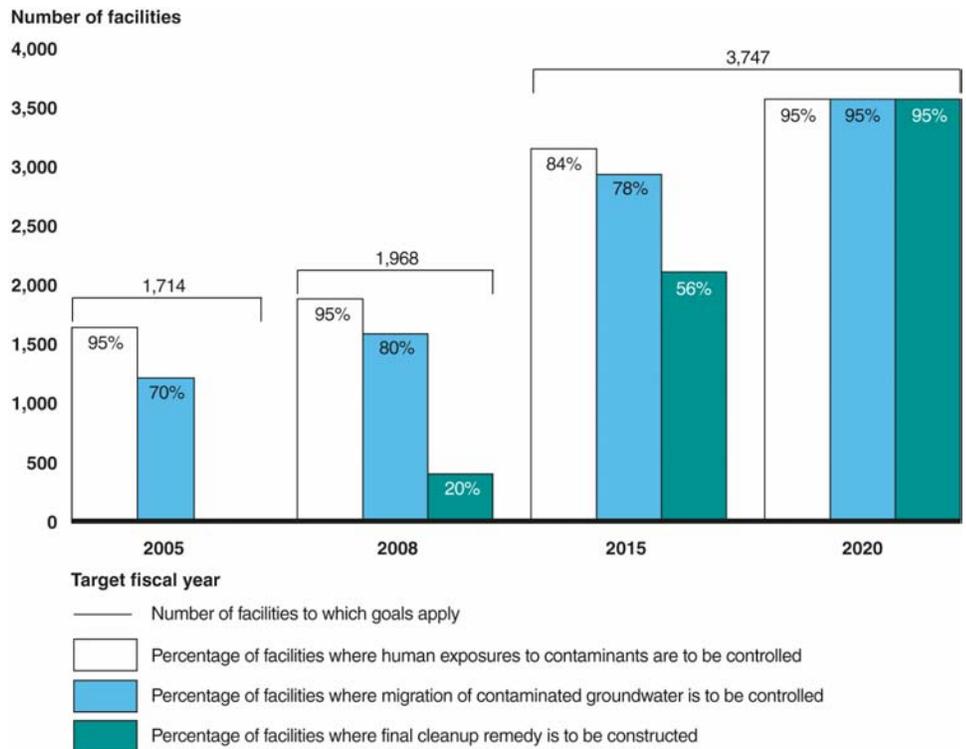
- controlling human exposures to contaminants at 84 percent of the 3,747 facilities,
- containing migration of contaminated groundwater at 78 percent of these facilities, and
- completing final remedy construction at 56 percent of these facilities.

The agency also set long-range goals for 2020:

- controlling human exposures to contaminants at 95 percent of 3,747 facilities,
- controlling the migration of contaminated groundwater at 95 percent of these facilities, and
- completing final remedy construction at 95 percent of these facilities.

Figure 1 depicts the goals set for the corrective action program for fiscal years 2005, 2008, 2015, and 2020. (App. III contains a map illustrating the number of facilities covered by the fiscal year 2020 goals in each EPA region and each state.)

**Figure 1: EPA's Goals for the Corrective Action Program**



Source: EPA.

Note: EPA's goals for 2005 did not include final remedy construction.

Notably, EPA's fiscal year 2020 goals are for the final construction of remedies, which is something short of the ultimate goal of final completion of corrective action. According to EPA guidance, for corrective action to be complete, a facility must have constructed all required remedies and met the relevant specific cleanup objectives.<sup>16</sup> For some facilities, such as those working to clean up contaminated groundwater, it can take years—perhaps decades—of operation before a site meets final cleanup

<sup>16</sup>Facilities may be designated as “corrective action complete without controls,” meaning that the areas subject to the determination do not require any additional action or measures to ensure that the remedy remains protective of human health and the environment, or “corrective action complete with controls,” meaning that all that remains is required operation, maintenance, and monitoring actions; compliance with and maintenance of any institutional controls; or both.

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EPA Established a Process to Determine When Facilities Meet Performance Goals

standards. To date, EPA has not explicitly articulated such an ultimate cleanup goal. EPA headquarters officials told us that they may consider adding an explicit completion goal as the program progresses.

EPA has established a formal process for its regions and authorized states to follow to determine whether facilities undergoing cleanup have controlled human exposures to contaminants and the migration of contaminated groundwater. An EPA document outlining the process calls for a facility's lead regulator (an EPA or state official) to evaluate the site, using a standard assessment tool, to determine if these goals have been met. Both the individual completing the evaluation and that person's supervisor must sign off on the evaluation and provide supporting documentation for their determination. The resulting determination represents the status of the facility. If conditions change for a facility deemed to have achieved its performance goals (for example, if contamination is no longer under control), the decision can be reversed in EPA's records. The major aim of this process is to measure the progress facilities have made and determine whether a facility poses an unacceptable risk of human exposures to contaminants or migration of contaminated groundwater.

Regarding the risk of human exposures, EPA documents direct regulators to evaluate various pathways, such as air or migrating groundwater, by which humans could be exposed to contamination and determine whether controls are in place to prevent unacceptable exposures given present uses of the land and groundwater. To meet the goal of controlling unacceptable human exposures, a facility may have to institute controls such as posting signs, constructing fences, or providing residents with alternative drinking water sources. In addition, according to EPA documents, to meet the goal of controlling the migration of contaminated groundwater, contaminants within groundwater must be contained, and monitoring must be done to confirm that contaminated groundwater remains in place. In addition, the groundwater contamination must not significantly affect the quality of streams, rivers, and other surface waters. To accomplish this goal, typical actions a facility might have to take include installing groundwater systems to treat or hydraulically contain contaminated groundwater, removing contaminated soil, or capping contaminated areas. Cleanup is not necessarily complete after meeting the goal of controlling groundwater migration, however. More-permanent remedies (or more detailed site investigation) are often needed to ensure the site is safe for reasonably anticipated future uses. As part of longer-term site cleanup, EPA would put these remedies in place.

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EPA's documented process for determining whether a facility has achieved the performance goal of remedy construction is less formal. According to this process, EPA and the states must affirm this achievement in a letter to the facility or in a memorandum to the file, acknowledging that all physical construction of the last corrective remedy has been completed and that all the remedies are fully functional. In some instances, EPA considers facilities to have completed remedy construction even if no remedy has been constructed. According to its documented process, EPA may make such a determination in cases where (1) an investigation of the facility was conducted and no remedy was needed or (2) no additional construction was needed beyond the interim measures the facility implemented to control contamination. EPA has also established criteria for determining when cleanup is to be documented as complete. For example, if a facility has completed construction and the facility cleanup objectives have been met, the lead regulator can make a determination that the facility has achieved protection of human health and the environment. EPA guidance recommends that such a determination be reflected in a permit modification and include procedures for public involvement.

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## EPA Guidance to Support Cleanup

In addition to clarifying when facilities may be deemed to have met performance goals, EPA has also issued a number of guidance documents to help streamline the corrective action process, maximize program flexibility, and expedite cleanup. Key documents include guidance on results-based cleanup approaches and tailored oversight, groundwater remediation, and enforcement strategies and financial responsibilities. Specifically:

- *January 2001 guidance on enforcement strategies to encourage timely cleanup.* This enforcement guidance describes several actions regulators could consider during corrective action permitting and negotiation, including using flexible rather than fixed compliance schedules to determine when or if facilities should be penalized for missing deadlines.<sup>17</sup> The guidance also describes more collaborative approaches, with reduced agency oversight, for facilities with good

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<sup>17</sup>Environmental Protection Agency, "Transmittal of Guidance on Enforcement Approaches for Expediting RCRA Corrective Action," January 2001.

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compliance histories and the capacity to complete necessary corrective actions.

- *September 2003 guidance outlining ways that regulators can change their processes to emphasize results and outcomes.*<sup>18</sup> This guidance outlines several core approaches for consideration at all corrective action facilities to move oversight and cleanup activities away from a one-size-fits-all approach to one that is site-specific, based on actual site risk, and procedurally flexible. For example, the lead regulator responsible for a site would develop an oversight plan for the corrective action process based on facility-specific conditions, such as site complexity, compliance history, and the facility's financial and technical capability. In addition, the guidance encourages facilities to use innovative technologies and to focus first on areas representing the greatest short-term threats to human health or the environment. To increase cleanup efficiency at a site with multiple contamination sources, facility owners or operators would first address immediate risks to human health and the environment posed by the site as a whole and then address other short- and long-term cleanup objectives. The guidance recommends that regulators and facilities focus on achieving environmental results, rather than follow a predetermined set of cleanup steps that may not reflect site-specific circumstances. The guidance states that such results-based approaches to corrective action can achieve environmental results faster and potentially save resources for both the facility and regulatory agencies.
- *April 2004 guidance for remediating groundwater contamination.*<sup>19</sup> In its own words, the guidance serves as a "plain language" consolidation of previous EPA policies on groundwater cleanup, aiming to provide regulators, facilities, and the public with greater clarity, certainty, and understanding of EPA's policies and expectations regarding the cleanup of contaminated groundwater. The

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<sup>18</sup>Environmental Protection Agency, *Results-Based Approaches and Tailored Oversight Guidance for Facilities Subject to Corrective Action under Subtitle C of the Resource Conservation and Recovery Act*, EPA 530-R-03-012 (Washington, D.C., September 2003).

<sup>19</sup>Environmental Protection Agency, *Handbook of Groundwater Protection and Cleanup Policies for RCRA Corrective Action for Facilities Subject to Corrective Action under Subtitle C of the Resource Conservation and Recovery Act*, EPA530-R-04-030 (Washington, D.C., issued September 2001 and updated April 2004).

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guidance promotes a results-based approach, recommending that facilities address immediate threats before moving on to intermediate and longer-term issues. It outlines EPA's expectation that, where practicable, final cleanups will return usable groundwater to its "maximum beneficial use" (e.g., for drinking water, industrial use, or agriculture) within a time frame that is reasonable. This maximum beneficial use determines the levels to which a site's groundwater should be cleaned up, whether to drinking water standards or potentially less stringent levels, which may be appropriate for industrial use. The guidance also notes that EPA's policy recognizes that it may in some cases be technically impracticable to achieve certain groundwater cleanup levels. Importantly, the guidance notes that EPA policy also recognizes that states are the primary implementers of the program and that facilities may therefore need to follow the states' groundwater requirements, which may be stricter.

- *April 2010 memorandum on enforcement strategy.* This memorandum outlines a national enforcement strategy to assist the regions and states in achieving the 2020 goals.<sup>20</sup> This strategy provides direction for identifying and ranking facilities that warrant enforcement and clarifies a number of enforcement issues that regions and states should consider during the various steps of the correction action process.
- In addition to enforcement-related guidance, EPA also implemented an initiative to improve compliance with financial assurance requirements to ensure that funds are available for cleanup. According to EPA officials, to increase EPA and state officials' knowledge and skills on financial assurance matters, EPA held training sessions, developed fact sheets and cost estimation software, held monthly conference calls, and took other education actions. These officials also stated that the agency hired a contractor to assess financial assurances obtained from numerous facilities, which helped to identify violations, as well as areas where more training was needed.<sup>21</sup>

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<sup>20</sup>Environmental Protection Agency, "Transmittal of National Enforcement Strategy for RCRA Corrective Action," April 27, 2010.

<sup>21</sup>Environmental Protection Agency, "Transmittal of Interim Guidance on Financial Responsibility for Facilities Subject to RCRA Corrective Action," September 30, 2003.

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## EPA, States, and Facilities Have Made Considerable Progress in Meeting Corrective Action Performance Goals, but Meeting Long-Term Cleanup Goals May Be Difficult

EPA, states, and facilities have taken a variety of actions to streamline the cleanup process, and the vast majority of high-priority facilities have made considerable progress in meeting EPA's performance goals to control contamination. But EPA's longer-term 2020 goal of actually constructing final remedies to clean up contamination—a goal that applies to a much larger universe of high-, medium-, and low-priority facilities—may be difficult for the agency, states, and facilities to meet.

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## EPA Regions and States Have Taken a Variety of Actions to Hasten Cleanup

According to the EPA and state officials we spoke with, EPA's 2020 corrective action goals have helped motivate regulators and facilities to address cleanups. Each of the five EPA regional offices we visited has developed a strategy for achieving cleanup goals at the facilities within its jurisdiction that are subject to the 2020 goals. The strategies generally include clarifying the status of the region's program, projecting remaining workloads, and identifying actions the region plans to take to meet the 2020 goals. In addition to articulating these long-term strategies, regional officials also told us that, through the agency's annual planning process, they develop annual targets for the states to achieve each year. The regions build these targets into states' work plans accompanying their grant agreements. These work plans specify activities that states are to perform in their corrective action programs and form the basis of midyear and end-of-year regional reviews. Regional officials also told us that they routinely discuss with responsible state regulators facilities' progress and projections, and they hold training classes and other meetings to promote best practices.

EPA officials in several regions also reported assisting states with facilities. In some cases, the regions have taken over the oversight of sites with unusually complex circumstances at the state's request. Regional officials also told us of taking direct responsibility for completing assessments of the extent to which particular facilities have controlled human exposures to contaminants and the migration of contaminated groundwater. For example, EPA's Dallas regional office reported reviewing technical documents and conducting site inspections at 47 facilities in Texas to verify that corrective action goals were met, and the Chicago office reported a number of assessments in Michigan.

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Regional and state officials also cited examples of regional technical assistance, such as regional support in sampling and analysis and groundwater surveys or modeling at distressed or bankrupt facilities.

Officials from the regions and states we visited also reported taking steps to streamline corrective action procedures to help expedite cleanup. For example, in lieu of the conventional sequence of procedural steps, the EPA Dallas regional office developed a strategy that involved the development and use of performance standards and facility-specific risk management plans for a more results-based approach, which was adopted by several of its states. Officials in several regional and state offices told us they had eliminated the “corrective measures study,” which requires an evaluation of different cleanup alternatives. Officials in one region explained that this study often took too long and had neither a focus nor a remedy envisioned and that with the maturing of the corrective action program, federal and state regulators and the facilities with more knowledge about successful remedies can better target their efforts toward these remedies. In the same vein, a Georgia official explained that instead of studying every option for cleanup, facilities may now submit a proposal. The state may ask a facility to consider other alternatives if the proposal does not look appropriate or is not likely to be implemented within a reasonable time frame.

Several of EPA’s Chicago regional officials told us they have successfully used streamlined enforcement orders for a number of facilities. According to the officials, the orders allow facility owners to investigate their sites and perform cleanup activities with fewer prescriptive instructions from the regulators. Reporting requirements during the investigation phase have also been streamlined to reduce the time needed to produce and review paperwork. The officials maintained that this more flexible approach has in some cases allowed them to cut substantial time off what would otherwise be needed to clean up some sites. Along similar lines, Philadelphia regional officials cited more than 50 “facility-lead agreements” with lower-risk facilities. Under these agreements, instead of relying on a more time-consuming enforcement order, the regional office and the facility sign a nonenforceable letter of commitment to implement a specified corrective action and use broad performance standards to guide facility activities.

In addition to these streamlining initiatives, state officials also cited a number of other actions they believe encourage faster cleanups. For example, Louisiana has promulgated regulations that allow a tiered approach for setting minimum cleanup levels for soils and groundwater.

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Under the program, a facility may begin with stringent screening standards and progress through up to three levels of risk-based cleanup standards that are increasingly tailored to the specific conditions at the site. As a safeguard, however, before the facility can apply the tailored cleanup levels, it must conduct extensive site assessment and investigation work. State officials believe this program has helped address past situations where facilities and regulators reached impasses over facilities' risk assessments and that it has allowed facilities to work toward cleanup levels more applicable to a given situation while still achieving environmental goals.

Louisiana officials also adopted a program developed by the EPA Dallas region to encourage reuse of land at cleaned sites. The state regulator reviews a site to determine if investigation and cleanup efforts have confirmed or produced environmental conditions sufficiently protective for redevelopment or revitalization under current or planned land uses (e.g., residential, industrial, agricultural). Under the program, state and EPA officials provide the facility a letter summarizing the site's condition, on-site work performed to investigate and address risks, and a determination that the site is ready for reuse. The determination can apply to the entire site or just a portion. Both EPA regional and state officials said that the determinations encourage faster investigations and cleanups, as well as encourage redevelopment by helping sites posing little environmental risk to avoid the stigma of historical contamination.

Officials from other states also provided examples of actions they believe are encouraging faster cleanups. New Mexico officials said the state achieved better results at its federal facilities by issuing consent orders with detailed action steps and schedules.<sup>22</sup> To encourage faster cleanups, Georgia shortened the timetable for the selection of cleanup remedies by its facilities, requesting that they select cleanup remedies by 2012. The state also has an internal goal for its facilities to complete corrective action by 2020. State officials explained that Georgia's program may be ahead of some states' because it was one of the first ones authorized,

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<sup>22</sup>The New Mexico Environment Department issued an "installation work plan" to Los Alamos National Laboratory and a "determination of imminent and substantial endangerment" to Sandia National Laboratory. The United States challenged both of these issuances in court, asserting, among other things, that RCRA did not apply to certain radioactive waste that does not fit within the definition of solid waste. The cases were settled out of court, resulting in consent orders requiring the laboratories to investigate and remediate the contamination.

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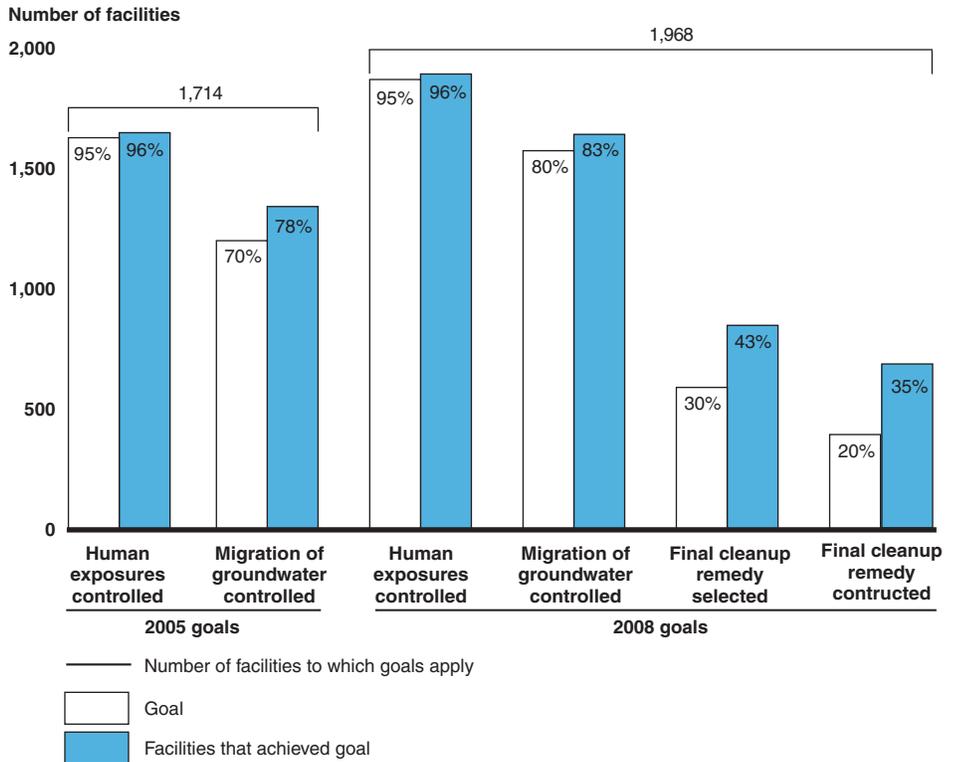
and many facilities have therefore been implementing corrective action measures under Georgia's policies since the late 1980s.

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### The Vast Majority of High-Priority Facilities Have Controlled Contamination

EPA data show that facilities surpassed EPA's 2005 and 2008 performance goals seeking to stabilize the highest-priority sites by controlling human exposures to contaminants and the migration of contaminated groundwater (see fig. 2). By the end of fiscal year 2005, 96 percent of the 1,714 facilities designated at that time as high priority had controlled human exposures to contaminants, and 78 percent had controlled the migration of contaminated groundwater. By the end of fiscal year 2008, 96 percent of the 1,968 facilities designated at that time as high priority had controlled human exposures to contaminants, and the percentage controlling the migration of groundwater contamination had risen to 83 percent. Also by the end of fiscal year 2008, regulators and facilities had selected final remedies at 43 percent of these facilities and completed remedy construction at 35 percent of them.

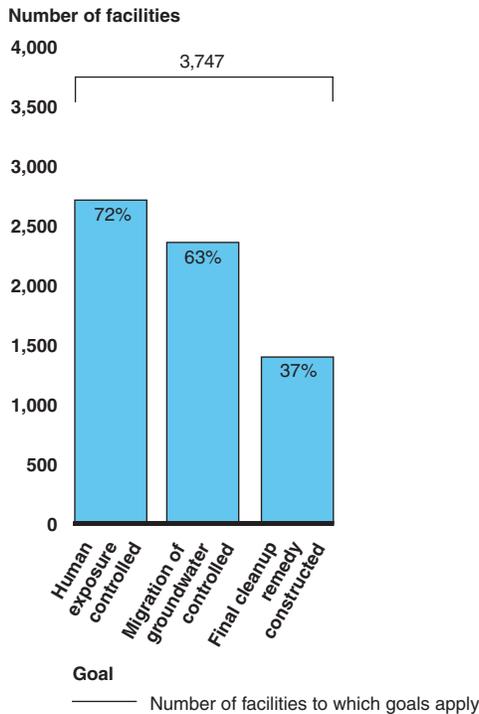
**Figure 2: Percentage of Facilities That Achieved EPA's 2005 and 2008 Corrective Action Performance Goals**



Source: EPA.

Beginning in fiscal year 2009, EPA began to measure the extent to which its expanded universe of 3,747 facilities was meeting the performance goals of controlling human exposures to contaminants, containing migration of contaminated groundwater, and constructing final cleanup remedies. EPA regional and state officials explained to us that in fiscal years 2009 and 2010, regulators and facilities continued to pursue cleanup remedies at high-priority facilities, which had long been working toward cleanup. The EPA regions and states also began to evaluate the extent to which the low- and medium-priority facilities added to the workload in 2009 had controlled contamination or constructed remedies to achieve the 2020 goal. As shown in figure 3, 2,712 facilities (72 percent) have controlled human exposures to contaminants, 2,357 facilities (63 percent) have controlled the migration of contaminated groundwater, and 1,396 facilities (37 percent) have constructed final cleanup remedies.

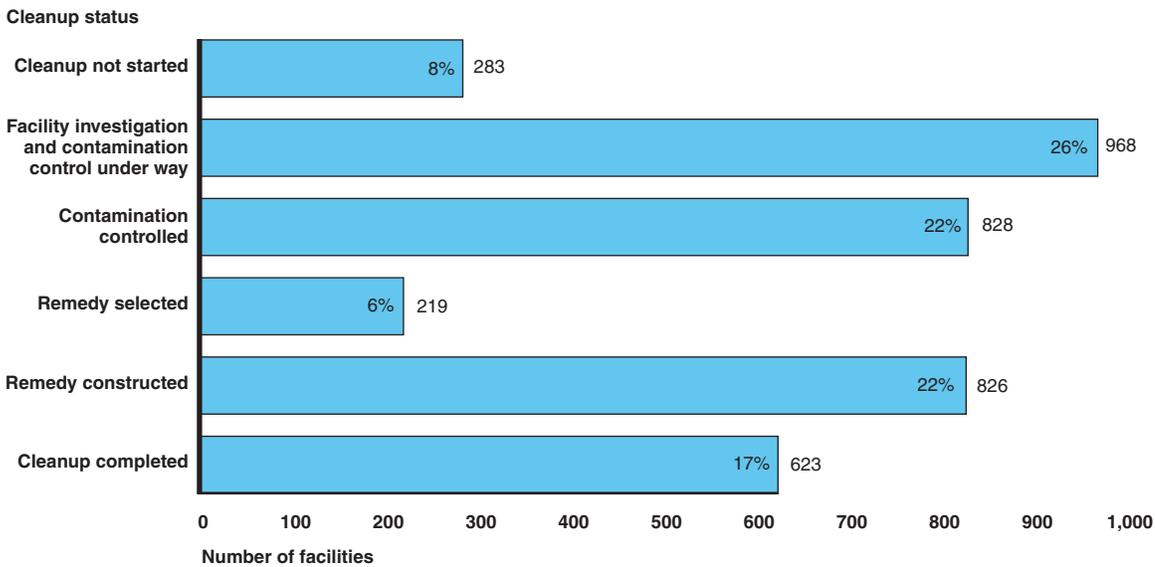
**Figure 3: Number and Percentage of EPA’s Expanded Universe of 3,747 Facilities That Achieved the 2020 Goals as of Fiscal Year 2010**



Source: GAO analysis of EPA data.

Figure 4 shows progress made by the 3,747 facilities covered by the 2020 goals in carrying out major milestones in the corrective action process—including facility investigation, remedy selection, and remedy construction—plus cleanup not yet started and cleanup completed. As the figure shows, by the end of fiscal year 2010, 283 (8 percent) of the 3,747 facilities had not yet begun the cleanup process. Some of these facilities may have been assessed by EPA or the state and assigned a high, medium, or low priority, but no further action had been taken. The facilities in this category are also the ones most recently added to the universe for the 2020 goals.

**Figure 4: Status of 3,747 Facilities Covered by EPA’s 2020 Goals, as of Fiscal Year 2010**



Source: GAO analysis of EPA data.

Note: In this figure, the category “facility investigation and contamination control under way” contains facilities that may have either controlled human exposures to contaminants or controlled the migration of contaminated groundwater but not both. Facilities represented in the category “final cleanup remedy constructed” in figure 3 are represented here in either the category “remedy constructed” or “cleanup completed.”

Our analysis of EPA data found that 968 of the 3,747 facilities (26 percent) at the facility investigation and contamination control stage are completing, or have completed, a thorough investigation of the types and extent of on-site contamination. These facilities have already controlled human exposures to contaminants or controlled the migration of contaminated groundwater but not both. The majority of facilities in this category are medium- and low-priority facilities. But a small number of high-priority facilities still fall into this category and have been unable to contain contamination at their sites despite numerous years as a high-priority facility. One such facility we examined is a small wood treatment operation in Georgia that has been investigating its groundwater contamination for years. According to state officials, under the terms of a 2005 consent order, the facility is required to collect more on-site groundwater contamination data and install remedies by 2011. Georgia officials told us that progress on this site is slow because the facility has been struggling to pay for corrective action work.

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At 828 of the 3,747 facilities (22 percent), steps have been taken and both human exposures to contaminants and the migration of contaminated groundwater have been controlled. Nevertheless, many of these facilities may need to take additional corrective steps to complete their cleanups. These facilities may still be investigating their sites and studying various remedies. They may have completed some remedy construction but may have additional work to do. Some may also have implemented remedies but are awaiting longer-term results to determine if the steps taken can serve as a final remedy.

Two hundred nineteen of the 3,747 facilities (6 percent) have selected final cleanup remedies for all problems at their sites but have not yet completed remedy construction. Eight hundred twenty-six (22 percent) have completed construction of all remedies but have yet to qualify as having completed cleanup. At these facilities, the selected remedies are working, but specific cleanup standards have not yet been met.

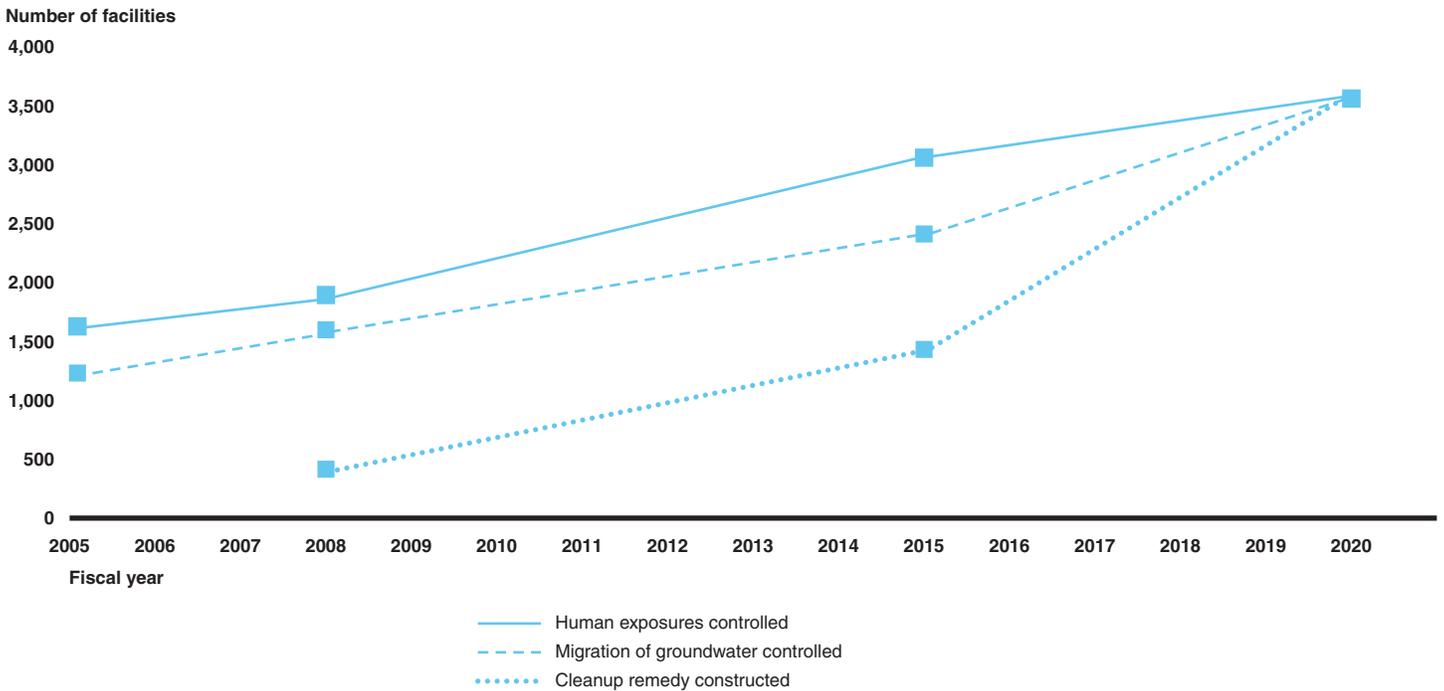
Six hundred twenty-three of the 3,747 facilities (17 percent) have achieved complete cleanup. The majority of these facilities have been medium- and low-priority facilities. High-priority facilities often have complex groundwater contamination problems and are typically more difficult to remediate; as a result, less than one-third of the facilities that had achieved complete cleanup are high-priority.

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### **It Will Be Difficult for EPA, States, and Facilities to Meet EPA's 2020 Goal for Constructing Final Cleanup Remedies**

Given EPA's progress to date in meeting its goals and the progress it needs to make to meet them, it will be difficult to meet the goal of constructing final remedies at not only high-priority facilities but also at the medium- and low-priority facilities included in EPA's expanded universe covered by the 2020 goals. To date, regulators and facilities have made significant progress in controlling both human exposures to contaminants and the migration of contaminated groundwater, but the path toward meeting the challenging, time-consuming, and expensive goal of actually constructing remedies at 95 percent of targeted facilities by 2020 is likely to be more difficult (see fig. 5). Overall, almost 2,300 facilities, or 61 percent, must still complete remedy construction. Of particular note, even though EPA has focused cleanup efforts on high-priority facilities for about 20 years, more than 900 high-priority facilities have yet to complete remedy construction.

**Figure 5: Progress Needed to Achieve EPA’s 2015 and 2020 Corrective Action Goals**



Source: EPA.

Note: Points represent EPA’s actual performance status for fiscal years 2005 and 2008 and stated performance goals for fiscal years 2015 and 2020.

The majority of officials from EPA regions and states we interviewed agreed that while controlling human exposures to contaminants and controlling the migration of contaminated groundwater were achievable at most facilities by fiscal year 2020, constructing final remedies at 95 percent of the facilities by fiscal year 2020 was unlikely to be achieved. Many of these officials offered reasons that meeting the third 2020 remedy construction goal could be more challenging than the numbers alone would suggest. The officials explained that progress to date has included some “easy” accomplishments for all three goals. Specifically, EPA and the states were able to document that some facilities had controlled human exposures to contaminants, contained migration of contaminated groundwater, and achieved remedy construction by reviewing paperwork and examining records of samples and cleanup activities completed years before. One state official also told us that facilities have been addressed where contaminant releases were limited in scope and quickly investigated. Our August 2000 report made the same observation, noting that a number of stakeholders, including

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industry representatives and several state regulators, considered the goals at that time to be more of a paperwork exercise—documenting that facilities had contained contamination—than an effort to bring about additional cleanup actions.<sup>23</sup>

These observations were further echoed by cases of several high-priority facilities we examined for this report with “easy” accomplishments because the remedies were installed about a decade before EPA established its corrective action program performance goals. For example, Louisiana was able to document that an active wood treatment facility had controlled groundwater contamination by using a pump-and-treat system—wells installed to pump contaminated groundwater to the surface for treating—that the facility had installed in 1991. Similarly, several facilities we reviewed in Pennsylvania had controlled the spread of groundwater by removing soils or installing pump-and-treat systems in the 1990s. By reviewing quarterly groundwater monitoring reports and other documentation, EPA was able to document that these Pennsylvania facilities had controlled human exposures to contaminants and the migration of contaminated groundwater and, in some cases, completed construction before 1999. Likewise, several of the facilities we reviewed in Georgia had controlled human exposures to contaminants and the migration of contaminated groundwater by 1999. In Michigan, on the basis of a review of groundwater monitoring reports that showed no significant problems, the state was able to document that several of the facilities in our review had met corrective action program performance goals.

EPA and state officials have acknowledged to us that the facilities that can be characterized as “easy” or “low-hanging fruit” have largely been addressed and will therefore constitute a smaller percentage of the workload that lies ahead. Most of the work has been completed that evaluates the extent to which facilities have controlled human exposures to contaminants and contained the migration of contaminated groundwater (especially at high-priority facilities). The officials explained that the majority of the work ahead will involve selecting and constructing remedies, which in many cases will likely prove more difficult. Several officials also told us that the remedy construction goal will be increasingly

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<sup>23</sup>[GAO/RCED-00-224](#).

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harder to attain because the remaining facilities will tend to be larger, more complex, and more labor-intensive to clean up.

EPA Region 5 officials in Chicago told us that facilities in their region in particular are not progressing at the same rate as those in other regions, and they would be hard-pressed to meet the remedy construction goal by 2020. More than 20 percent of facilities that have yet to complete remedy construction are located in that heavily industrialized region. The officials predicted that after 2015, the region would likely have an even larger share of facilities yet to complete remedy construction because the other regions will most likely be further along. Their views were substantiated by state officials in Ohio and Michigan. Ohio represents more than 36 percent of Region 5's remaining workload, and Michigan, 18 percent. State officials in Ohio told us they were uncertain if they could meet the remedy construction goal by 2020, and those in Michigan said they definitely could not reach the remedy construction goal by 2020. The federal and state officials cited the lack of sufficient resources as the primary reason they could not do so. Region 5 and Michigan also cited the bankruptcies of General Motors and Chrysler as increasing their workload in a way that has diverted attention away from facilities on the 2020 list.

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**EPA Regions, the States, and Industry Representatives Collectively Identified Resource Constraints and Groundwater Remediation as Key Challenges to Meeting Future Cleanup Goals**

Officials in EPA regions and the states identified fiscal and human resource constraints as the preeminent challenge for achieving the 2020 goals on time. The technical complexity associated with groundwater remediation may also continue to impede progress, and industry representatives noted that difficulty reaching agreement on the type of groundwater remediation will continue to cause delays in cleanup progress at some facilities.

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Officials in EPA’s Regional  
Offices and the States  
Identified Resource  
Constraints as a Primary  
Challenge

EPA and selected state officials identified resource constraints—both in terms of money and staff—as the preeminent challenge that is likely to impede their future cleanup efforts. The problem will likely worsen if federal, state, or facilities’ fiscal problems deteriorate further.

Constraints on EPA Program  
Funds

The gap between workload and available resources has affected the progress of the corrective action program since it began. In our previous reports, we cited resource shortfalls as a major barrier to cleanups—shortfalls that have continued to the present day.<sup>24</sup> Specifically, EPA’s funding for program operations in headquarters and the regions has stayed generally the same since fiscal year 2004, with EPA receiving \$39 million in fiscal year 2004 and \$39 million in fiscal year 2010—effectively a decrease when adjusted for inflation. Officials from several EPA regions we visited noted in particular the impact this flat funding has had on funding available for outside contracts, called contract funds. The regions use contract funds for a variety of purposes, including for monitoring cleanup work at facilities and providing site-specific support to the states. For example, officials from several regions reported using these funds for hiring the Army Corps of Engineers to monitor construction, hiring hydrologists to provide technical assistance, or conducting limited cleanup work at financially struggling or bankrupt facilities. These funds decreased from \$5.2 million in fiscal year 2004 to \$3.7 million in fiscal year 2010 in nominal dollars.<sup>25</sup> Several regional officials told us that the decrease has limited their ability to oversee work at facilities or assist the states.

As funding has decreased, so has the total number of full-time-equivalent EPA employees dedicated to the corrective action program. EPA corrective action program staffing has fallen from 275 full-time equivalents in fiscal year 2004 to 245 in fiscal year 2011. At the same time, according to both headquarters and regional officials we interviewed, corrective action program responsibilities increased. In 2007, for example, EPA

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<sup>24</sup>GAO, *Hazardous Waste: Progress under the Corrective Action Program Is Limited, but New Initiatives May Accelerate Cleanups*, [GAO/RCED-98-3](#) (Washington, D.C.: Oct. 21, 1997), and GAO, *Hazardous Waste: EPA Has Removed Some Barriers to Cleanups*, [GAO/RCED-00-224](#) (Washington, D.C.: Aug. 31, 2000).

<sup>25</sup>The nominal dollar value of a good or service is its value in terms of prices current at the time the good or service is acquired or sold.

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shifted the management of cleanup of PCBs (polychlorinated biphenyls) to the office that implements the corrective action program. Several regional officials told us that a renewed emphasis on community outreach has also taken a significant amount of additional staff time.<sup>26</sup> These officials expressed agreement with the principle of community outreach but noted that the new approach had significantly affected their resources.

Officials in several regional offices also cited an inability to replace retiring regional staff as an additional problem that has slowed progress toward corrective action goals, noting that over a period of several years, they could replace three experienced staff members with only one new hire. Several officials added that this dilemma continues, with many experienced project managers approaching retirement when the regional offices are tackling remedy selection and construction at some of the most difficult sites.

#### Constraints on EPA Grants to States

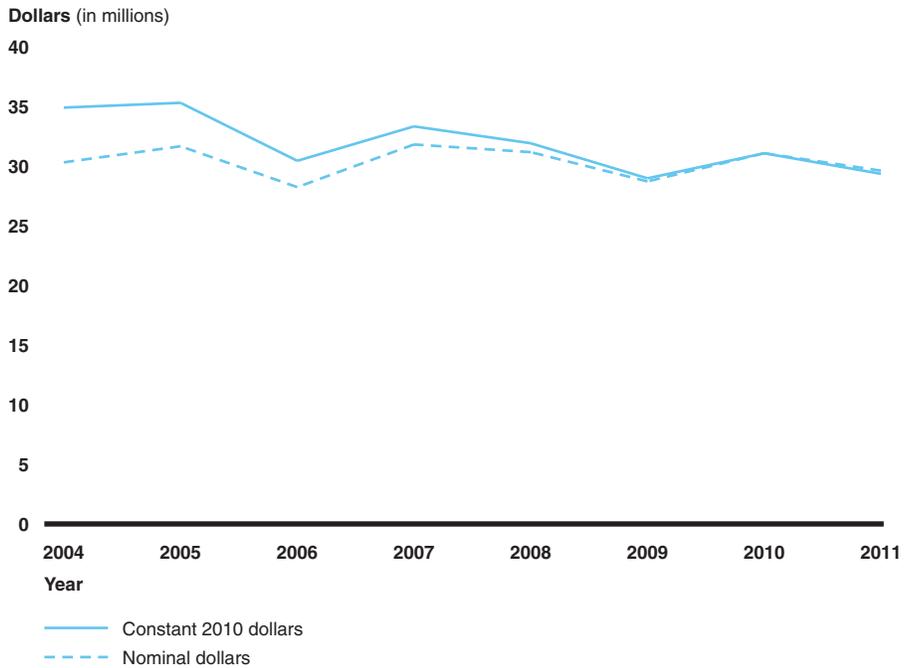
Added to restrictions on the agency's own spending, EPA's grants to states have also experienced restrictions. As shown in figure 6, grant funding EPA provides to authorized states to help pay for the corrective action program has remained virtually flat in nominal dollars and decreased somewhat in constant dollars.<sup>27</sup> In 2010 constant dollars, EPA's corrective action grants to the states totaled \$34.9 million in fiscal year 2004 to \$31 million in fiscal year 2010, a decrease of 13 percent. Officials in several EPA regions we visited told us that this level of support would not be adequate to keep states on track to achieve the 2020 goals. A representative of the Association of State and Territorial Solid Waste Management Officials noted that grants have not kept pace with inflation, increases in worker salaries, health insurance costs, and increasing workloads.

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<sup>26</sup>Working for environmental justice is currently one of EPA's key priorities identified by the Administrator. The agency has a draft strategy to help integrate environmental justice into its programs.

<sup>27</sup>Constant dollar values are those adjusted to remove the effects of inflation by dividing the nominal value (also called the current dollar value) by the appropriate price index. The resulting amount can be labeled real or inflation adjusted. Real dollar values can reflect a measure of purchasing power, such as real income, or a measure of quantity, such as real gross domestic product. Real dollars are frequently called constant dollars when referring to measures of purchasing power.

**Figure 6: EPA's Grant Funding to States for Corrective Action, Fiscal Years 2004 to 2011**



Source: EPA.

### Constraints on States' Own Funding and Staffing

The grants EPA provides to the states only partially support states' corrective action programs. States are required to supplement the grants with at least \$1 for every \$3 in federal funds. According to the Association of State and Territorial Solid Waste Management Officials, some states contribute more than the minimum required by the grant. The program's heavy reliance on state funds helps explain the impact of state governments' recent budget crises on the program. According to officials in the EPA regional offices we visited, many states in their regions have sustained severe funding shortages, leading to furloughs and hiring freezes. The majority of state officials we interviewed told us that budget problems have led to fewer staff available for the corrective action program, with remaining staff having to absorb heavier workloads, leading to delays in cleanup efforts. Officials in two states specified that limited resources have constrained their ability to visit facilities for oversight purposes and obtain validating samples.

According to the Association of State and Territorial Solid Waste Management Officials representative we interviewed, most states have

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streamlined their corrective action programs to cope with funding or staff cuts. He added that this streamlining, combined with the substantial experience of many state staff, has so far helped dampen the cuts' effects. He noted, however, that state capacity will likely shrink as experienced workers retire and not all are replaced.

EPA headquarters and regional officials and state officials all told us that if program resources continued to decline, they would likely be unable to meet their 2020 goals. EPA headquarters officials explained that they see value in having aggressive goals for the program but have in recent years begun to acknowledge that they may have to adjust them to better reflect the realities of available resources. The agency has not, however, performed a systematic analysis of the funding that would be needed to achieve the goals or to determine how the goals should be adjusted. Headquarters officials explained that predicting funding needs for corrective action is complicated because the workload model reflects 43 states and requires funding from federal, state, and owners' or operators' resources. These officials noted that in developing the shorter-term 2005, 2008, and 2015 goals, they did in fact discuss with regional and state officials what could actually be achieved within prescribed time frames. They explained, however, that the long-term 2020 goals—originally developed in 2003—were viewed at the time as reflecting a long-term “vision” and, as such, not warranting a robust analysis of the resources needed to achieve them. With the passage of time, however, what was once viewed as a long-term vision is being increasingly treated as a high-profile, nearer-term target, whose practicality, we believe, should be assessed.

### Constraints on Facilities' Resources

According to several regional and state officials we interviewed, economic hardship has also tightened facilities' own budgets for identifying and constructing remedies. One state official told us that the state has the enforcement tools to compel compliance, but some facilities do not have sufficient cleanup funds. Another state official explained that financial conditions in some industries have translated into a reluctance among facilities to assign as high a priority to cleanup work as in the past. Still another state official told us that whereas the state had previously succeeded in getting facilities to clean up sites with redevelopment potential, the recent economic downturn has reduced this incentive for cleanups. Officials from several regions and states also told us that some facilities within their jurisdictions are bankrupt or nearly so.

The sites we reviewed included a number of facilities with funding difficulties. In Georgia, two of the facilities that have not completed final

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remedy construction lack adequate funds, according to state officials. One of them has struggled to pay for investigation of its groundwater contamination and can pay only \$2,000 to \$3,000 a year toward it. At the second facility, the state was concerned that contamination may be reaching a nearby stream, so the state and EPA worked together using EPA contract funds to investigate the site and found that contamination was under control. In Louisiana, one site was the location of a large chemical plant, most of which is now closed. Louisiana officials said they are working on cleanup standards for a contaminated groundwater plume and that standards are likely to be strict because the groundwater plume lies over a potential source of drinking water. The officials said that the cleanup will be expensive and that the company will have to budget to complete it.

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### Technical Complexity and Disagreements over Groundwater Remediation Complicates Cleanup at Some Sites

Cleaning up contaminated groundwater is inherently complex, requiring large expenditures and long time periods—many centuries in some cases—according to a 1994 National Research Council report.<sup>28</sup> The report states, however, that it is often difficult to characterize with precision the nature and extent of groundwater contamination, citing as complicating factors the diversity of materials, such as sand, gravels, and solid rock, layered under the ground. For example, water, along with any dissolved contaminants, flows through these materials along pathways that are hard to predict. In addition, organic solvents once used at many hazardous waste sites do not mix with water. Heavier or lighter than groundwater, these chemicals may migrate to or become trapped in inaccessible spaces, adhere to solid particles underground, and remain a source of continuing groundwater contamination. Flushing out such contaminants using conventional pump-and-treat systems can be difficult, time-consuming, costly, and inefficient or impracticable. Alternatives to conventional pump-and-treat systems rely on a variety of biological, chemical, or physical technologies to treat or contain the contaminated groundwater in place underground. Like conventional pump-and-treat methods, alternative technologies can also be time-consuming, although they can potentially reduce costs. Nevertheless, the use of innovative cleanup methods has been limited by technical, institutional, and economic barriers.

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<sup>28</sup>National Research Council, *Alternatives for Ground Water Cleanup* (Washington, D.C.: National Academies Press, 1994).

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Given such inherent difficulties, various groups with an interest in groundwater cleanup are critical of the levels some states set for groundwater cleanup and disagree with methodologies proposed by states to meet those standards. EPA's recommendation that cleanup remedies at groundwater-contaminated sites be selected on the basis of "maximum beneficial use" recognizes both that it may be technically impossible to remediate groundwater contamination at all sites to drinking water standards and that less stringent cleanup levels may be appropriate for groundwater that is not a current or reasonably expected future source of drinking water.

Some states, however, designate all groundwater as a current or future source of drinking water, meaning that stringent standards must always be applied. In other states where drinking water standards do not apply to all groundwater, facilities may disagree with regulators about the designation of a particular source of groundwater as drinking water. Such disagreements tend to slow cleanup progress while regulators and facilities spend time negotiating cleanup terms.

Illustrating such disagreements, a representative from an industry group representing Fortune 50 companies with whom we met expressed concern that facilities have been required to apply drinking water standards to groundwater remediation efforts in situations where groundwater had not been used for that purpose and was not likely to be used as such in the foreseeable future. He also cited instances in which it was technically impracticable to achieve drinking water standards. The industry representative also noted that facilities may hesitate to install remedies that may not be able to achieve the applicable cleanup level when new or additional systems may later be required as technology advances. He went on to say that, in his view, EPA has not provided enough guidance to states and that some states are not implementing the guidance the agency does provide—for example, guidance about less stringent cleanups or waivers that may be granted to facilities where cleanup to drinking water standards is technically impracticable.

EPA officials and some state regulators explained to us that a natural tension exists between regulatory and industry positions. Regulatory officials and the industry representatives agreed that because of the cost and long time frames involved in groundwater cleanup, facilities may be reluctant to invest in groundwater cleanup equipment. In essence, they say that disagreements center on judgments over questions like, "How clean is clean enough?" and on whether, for example, industrial sites should be cleaned up to the same levels as sites in or near residential

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areas. Disagreements also arise when the final remedy required under the corrective action program is one that contains contaminated groundwater (which requires long-term controls, operation, and monitoring), rather than eliminates groundwater contaminants. We heard from state regulators in Georgia and Michigan that while affected facilities may want to focus only on controlling contamination, regulators may want to see removal or effective treatment in place that eliminates as much of any continuing sources of contamination as possible before emphasizing containment of the remainder. Michigan officials noted that this issue is especially important given the possibility that, in the event of bankruptcies, future long-term management and costs of operating the containment systems may fall to the state, EPA, or both.

It is difficult to gauge the extent to which such disagreements may stand in the way of achieving EPA's 2020 goals. State and EPA regional officials we interviewed said that state standards and procedures would not limit their ability to reach the 2020 goals. Given the state lead on groundwater-related issues, EPA headquarters officials noted that the agency generally defers to state judgment on these issues. Officials from three states with particularly strict groundwater cleanup policies—Georgia, Michigan, and New Mexico<sup>29</sup>—told us that their groundwater policies do not factor into their ability to reach the remedy construction goal by 2020. In fact, in reviewing a draft of this report, Michigan officials noted that addressing concerns raised by the public about the sufficiency of the standards may have more of an impact on their ability to reach the 2020 goals. Officials in Georgia added that, in their experience, less stringent standards do not significantly expedite cleanup. Specifically, officials said that allowing facilities to contain groundwater contamination or restrict its use, rather than remediate it, does not motivate most facilities with a history of delaying corrective action to clean up. The officials also noted that weakening cleanup standards with the hope of increasing the number of facilities that reach the 2020 goals would put facilities that have complied with existing regulations at an economic disadvantage with respect to competitors that have delayed compliance.

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<sup>29</sup>Georgia state officials told us that it is the policy of Georgia to consider all groundwater as a potential source of drinking water and thus always apply drinking water standards to groundwater remediation. New Mexico state officials told us that 85-90 percent of drinking water in that state comes from groundwater and is thus subject to drinking water standards, which officials told us are in some cases higher than the standards mandated under the federal Safe Drinking Water Act. According to EPA, Michigan starts from the premise that all groundwater is a potential source of drinking water but allows for waivers.

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In contrast, the industry representative cited above acknowledged that groundwater policy decisions are in fact largely state prerogatives, but he maintained that EPA's failure to more forcefully promote alternatives that were less costly and easier to implement (while still protective of human health and the environment) stood in the way of achieving the 2020 goals at many facilities.

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## Conclusions

EPA, states, and facilities have made significant progress over the past decade in streamlining RCRA corrective action processes, setting performance goals to better direct the corrective action program and accomplishing on-the-ground cleanups of hazardous waste. Nevertheless, resource constraints, the size and cost of the program's remaining workload, and projected federal and state budget cuts are leading EPA and state regulators to question whether this rate of progress can be sustained. Without realistically taking these factors into account, EPA cannot reliably determine the extent to which the program has the resources it needs to meet its 2020 vision and goals nor better align the 2020 goals with resources it will take to attain them.

We acknowledge the complexities associated with a definitive and detailed analysis of the program's costs, given the number and complexity of cleanups required and the varied federal, state, and industry sources that fund it. Nevertheless, short of an exhaustive, facility-by-facility study, we believe that much useful information can be gained from a more limited effort in which EPA headquarters, EPA regions, and participating states collaborate in an analysis that sheds light on the practicality of the 2020 goals—particularly one that takes into account the recent economic and fiscal events that have affected program participants and the funding they rely on. We believe that such an analysis could provide useful information to senior EPA managers and to Congress and would help inform decisions about the program's future direction.

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## Recommendation for Executive Action

To sustain progress in the RCRA corrective action program and better align the 2020 program goals with resources it will take to attain them, we recommend that the EPA Administrator direct cognizant officials to assess the agency's remaining corrective action workload, determine the extent to which the program has the resources it needs to meet these goals, and take steps to either reallocate its resources to the program or revise the goals.

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## Agency Comments and Our Evaluation

We provided a draft of this report to EPA for review and comment; the agency's written comments are reproduced in appendix IV. EPA's July 6, 2011, letter stated that the report was accurate in its representation of the corrective action program, noting specifically that it "provides a good summary . . . on the Corrective Action Program, highlights some of the challenges and issues the program faces, and notes initiatives that individual states or regions have taken." The letter also expressed agreement with the recommendation to assess the program's workload and potentially make adjustments in either program resources or in program goals. Toward this end, EPA noted that it will "work with its regional offices and authorized state programs to define . . . remaining workloads, identify efficiencies to help with addressing the workload, and strive to use resources in the most focused way possible to achieve these goals."

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As agreed with your office, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies to the appropriate congressional committees, the Administrator of EPA, and other interested parties. In addition, this report will be available at no charge on the GAO Web site at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-3841 or [trimbled@gao.gov](mailto:trimbled@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. Key contributors to the report are listed in appendix V.

Sincerely yours,



David C. Trimble  
Director, Natural Resources and Environment

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# Appendix I: U.S. States and Territories Authorized to Manage a Corrective Action Program

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Alabama	Nevada
Arizona	New Hampshire
Arkansas	New Mexico
California	New York
Colorado	North Carolina
Connecticut	North Dakota
Delaware	Ohio
Florida	Oklahoma
Georgia	Oregon
Guam	Rhode Island
Hawaii	South Carolina
Idaho	South Dakota
Illinois	Tennessee
Indiana	Texas
Kentucky	Utah
Louisiana	Vermont
Maine	Virginia
Massachusetts	Washington
Michigan	West Virginia
Minnesota	Wisconsin
Missouri	Wyoming
Montana	

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# Appendix II: Objectives, Scope, and Methodology

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Our objectives were to determine (1) the actions the Environmental Protection Agency (EPA) has taken to establish goals for the Resource Conservation and Recovery Act (RCRA) corrective action program and to expedite cleanup; (2) the progress EPA, the states, and facilities have made in meeting performance goals; and (3) the challenges, if any, that EPA, the states, and facilities may face in meeting future cleanup goals.

To determine the actions EPA has taken to establish goals for the corrective action program and expedite cleanup, we reviewed relevant EPA strategic plans. We reviewed the process the agency has adopted to establish goals and the methodology used to identify which facilities will be monitored for progress toward meeting those goals. We also reviewed the procedures established to evaluate whether facilities have met the goals. To determine the actions taken by EPA to expedite cleanup, we reviewed applicable guidance and training materials. We also reviewed strategy documents each region prepared to address actions to be taken to meet EPA's 2020 goals for the program. We obtained the budget for, and number of full-time-equivalent EPA employees dedicated to, the corrective action program for fiscal years 2004 through 2011.

To determine the progress EPA, the states, and facilities have made in meeting corrective action performance goals, we reviewed EPA's fiscal years 2005 and 2008 *Performance and Accountability Report* to Congress and obtained data from EPA on the status of the corrective action program at the end of fiscal years 2005 and 2008. To determine the current status of the program toward meeting the 2020 goals, we collected and analyzed data from EPA's national program management and inventory system of hazardous waste handlers, RCRAInfo. This system includes a range of information on treatment, storage, and disposal facilities, including permit and closure status, compliance with federal and state regulations, and cleanup activities. We focused our analysis on the facilities that EPA has identified as part of the universe of facilities to meet its 2020 corrective action performance goals. We determined the number of facilities designated by EPA as having controlled human exposures to contaminants, contained the migration of contaminated groundwater, and constructed final cleanup remedies. We also compared the status of facilities in this group that EPA has designated as high priority with the status of facilities the agency has designated as medium- and low-priority. To illustrate facilities' cleanup progress, we also grouped facilities into categories generally corresponding with stages in the corrective action process: cleanup not started, facility investigation and contamination control under way, contamination controlled, remedy selected, remedy constructed, and

cleanup completed. We assessed the reliability of the RCRAInfo data elements necessary to our engagement by (1) performing electronic testing of required data elements, (2) reviewing existing information about the data and the system that produced them, and (3) interviewing agency officials knowledgeable about the data. We determined that the data were sufficiently reliable for the purposes of this report.

To better understand progress made; identify any initiatives by EPA and states to expedite cleanups; and identify challenges EPA, the states, and facilities may face in meeting future cleanup goals, we interviewed officials responsible for the corrective action program at EPA headquarters and at a nonprobability sample of 4 of EPA's 10 regional offices. We selected the regions because they had the largest caseloads (as determined by the number of facilities subject to the program that are under their jurisdictions). Taken together, the 4 regions—Region 3 in Philadelphia, Region 4 in Atlanta, Region 5 in Chicago, and Region 6 in Dallas—account for approximately 65 percent of facilities EPA has identified that are to meet its goals for the corrective action program. To gain a perspective from a region with a relatively smaller caseload, we also interviewed EPA officials in Region 10 in Seattle. The findings from our interviews at these regional offices cannot be generalized to those we did not include in our nonprobability sample. Within the 5 regions, we visited or spoke with officials from nine states: Alabama, Georgia, Louisiana, Michigan, New Mexico, Ohio, Oregon, Pennsylvania, and Virginia. Except Pennsylvania, these states are authorized to implement the corrective action program (see app. I). We examined a nongeneralizable, random sample of 32 facilities (located in Georgia, Louisiana, Michigan, and Pennsylvania) selected from 1,658 facilities that met criteria set by EPA for facilities deemed to pose a high risk to human health and the environment. We randomly selected the 32 to ensure an objective selection of facilities to examine more closely. We did not generalize our findings from this sample to the population. Included in the information collected about these facilities were the types of activities conducted to reach the goals at the facility and the type of work remaining.

In addition, we discussed cleanup challenges with various stakeholder groups. These included the RCRA Corrective Action Project, a group of major corporations with facilities in the corrective action program, represented by attorneys and cleanup managers. We also met with officials from the Association of State and Territorial Solid Waste Management Officials and the Environmental Council of States.

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We conducted this performance audit from December 2009 through July 2011, in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

# Appendix III: EPA Regions and Distribution of Facilities Covered by Corrective Action Goals for 2020

**Figure 7: EPA Regions and Number of Facilities in Each State That Were Covered by EPA's 2020 Goals as of Fiscal Year 2010**



Source: GAO analysis of EPA data; MapInfo (map).

# Appendix IV: Comments from the Environmental Protection Agency



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

JUL 05 2011

Mr. David C. Trimble  
Acting Director, Natural Resources and Environment  
U.S. Government Accountability Office  
Washington, D.C. 20508

OFFICE OF  
PUBLIC AFFAIRS  
EPA HEADQUARTERS  
WASHINGTON, D.C. 20460

Dear Mr. Trimble,

Thank you for sending us the draft of your report to Congressman Markey on EPA's Corrective Action Program under the Resource Conservation and Recovery Act (RCRA). We appreciate the opportunity to review the report and provide comments. On the whole, the report is well written and accurate in its representation of the Corrective Action Program. We have some small technical comments that we will enclose with this letter. In this letter, I would like to present a general discussion of our reactions to the content and suggestions of the report.

The report provides a good summary background on the Corrective Action Program, highlights some of the challenges and issues the program faces, and notes initiatives that individual states or regions have taken.

EPA's RCRA Subtitle C Corrective Action Program was authorized by the Hazardous and Solid Waste Amendments of 1984. Over time, the country has expanded its knowledge and expertise in eliminating the risks of hazardous waste sites at RCRA facilities. There have been many successes. Sites have been cleaned up, redeveloped, and put back into productive use. However, there still are many sites that have yet to make significant progress.

Site remediation was a relatively new field in the 1980s, and EPA's clean-up programs relied on numerous reviews and rigorous processes to assess contamination and choose remedies. The rate of site cleanup was slow to accommodate the close oversight that was being provided. In the late 1990s, recognizing advancement of established approaches and clean-up technologies, EPA undertook two sets of reforms that built on the expertise gained and focused on streamlining the oversight process to maximize results. These reforms have been successful, and today EPA and the authorized state RCRA programs are working with facilities to achieve clean-up milestones at a rate triple the rate prior to the reforms.

To build momentum for this ambitious increase in the rate of progress, EPA also set and achieved goals of having "human exposures under control" at 95 percent of 1,714 facilities by 2005 and having "groundwater migration under control" at 70 percent of these sites. These goals were widely believed to be unattainable for some years. But EPA, authorized states, and facility owners and operators defied the collective previous wisdom, worked together to identify and address issues quickly, and succeeded in achieving the 2005 goals. EPA then expanded the universe to 1,968 facilities and again EPA and its state partners worked with owners and operators to meet identical goals for the additional facilities by 2008.

EPA has found that setting challenge/stretch goals focuses efforts and drives the program to the highest productivity possible. These aggressive goals often provide a useful deadline for completing clean-up negotiations that otherwise can remain in stalemate for years. Without EPA and states focused on meeting these goals and transferring that urgency to site-owners, many sites would not have agreed to establish internal deadlines for clean-up and, instead, might have chosen to draw the process out as long as possible. The report acknowledges that EPA issued the April 2010 National Enforcement Strategy for Corrective Action to provide direction for identifying facilities that warrant enforcement in order to achieve the 2020 remedy construction goal.

Our focus today, in the face of constrained resources, is to maintain the momentum built up over the years in getting corrective action sites cleaned up. We have established 2020 aspirational goals to put final remedies in place at 95 percent of 3,747 sites around the country. We believe that pushing for such an ambitious target is vital to achieving the environmental progress that the public expects from us.

The RCRA Corrective Action program continues to work to improve the program, and is participating in EPA's Integrated Cleanup Initiative (ICI). Under the ICI, individual EPA regions and authorized states are periodically reviewing their workloads, and updating workplans and strategies to meet their 2020 goals. RCRAInfo, the database that we use to track progress at RCRA CA sites, is being modified to include an additional data element that would allow us to better track progress at operating sites. We will be piloting approaches for reporting interim progress at complex RCRA sites to provide additional cleanup information to the public. We are working with other EPA offices to provide information for cross-program measures. Through our enforcement program, we are looking at how we can most effectively use our enforcement authorities where needed at RCRA corrective action facilities to achieve timely and protective cleanups.

The economic downturn, and resulting shrinking revenues and budgets of the facilities themselves, also are contributing to a slower pace of clean up activities at many sites. Several sites are owned by companies that either have sought bankruptcy protection or will hover near bankruptcy in the years to come. It is to everyone's advantage to get these sites addressed while these companies still have some resources that can be claimed for clean-up.

Both EPA and the report note that many of the easier sites have been addressed, while the more challenging complex sites still have much work to be done. Some of these sites have scores of units and/or extensive contamination, and it may take years to assess and implement site-wide final remedies. The more complex sites, as well as many of the less complex sites, require more resources from everyone, meaning that, while the numbers of remaining sites may be going down, the annual resources needed to address the remaining sites may increase.

Acknowledging this situation, the report suggests that EPA "assess the remaining corrective action workload, determine the extent to which the program has resources needed to meet [it's] corrective action] 2020 goals, and take steps to either reallocate its resources or revise its goals."

EPA appreciates GAO's concern over maintaining a vital and successful Corrective Action Program. Slowing down the pace of cleanup is not good for anyone. Deferring action on sites locks up properties that, once remediated, can be vital resources to communities for economic development or green space. Delay also is economically inefficient. In many instances contamination will spread and be more expensive to clean up over time. Most importantly, delaying the protection of human health and the environment fails to provide the protection envisioned by Congress in establishing RCRA.

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**Appendix IV: Comments from the  
Environmental Protection Agency**

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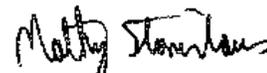
For these reasons, EPA believes strongly that the 2020 aspirational goals should remain as a benchmark for the program. These publically-communicated goals provide an incentive for industry, EPA, and state RCRA programs to push forward with the clean-ups needed and expected by the communities affected by these sites.

At the same time, we agree with the suggestion that it would be prudent to assess the workload and potentially make adjustments in either program resources or in the goals set. Thus, EPA will continue to work with its regional offices and authorized state programs to define our remaining workloads, identify efficiencies to help with addressing the workload, and strive to use resources in the most focused way possible to achieve these goals.

With respect to the overall funding levels for EPA's Corrective Action program, EPA's Administrator and the Administration face extremely difficult decisions about where to allocate scarce resources. The funding level requested as part of the President's Budget request represents what the Administration believes is the best balance of funding decisions across many competing priorities. We will continue to strive to use funding for the RCRA Corrective Action program in the most efficient and productive approach possible.

Again, thank you for the opportunity to review the draft report. The RCRA Hazardous Waste program is complicated and we appreciate the time and effort you and your staff have invested to fully understand the program and its challenges, as well as the support for continued focus on cleaning up our nation's hazardous waste sites.

Sincerely,



Mathy Stanislaus  
Assistant Administrator

Enclosure

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# Appendix V: GAO Contact and Staff Acknowledgments

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## GAO Contact

David C. Trimble, (202) 512-3841 or [trimbled@gao.gov](mailto:trimbled@gao.gov)

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## Staff Acknowledgments

In addition to the individual named above, Steven Elstein (Assistant Director), Antoinette Capaccio, Ellen W. Chu, Melinda Cordero, Cindy Gilbert, Brian Hartman, and Leigh McCaskill White made key contributions to this report.

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