HAZARDOUS WASTE

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Over the last ten years, Pennsylvania has made steady progress in reducing the amount of EPA-regulated hazardous waste generated, in cleaning up and redeveloping sites that are contaminated with historic releases of hazardous waste, and in addressing other potential environmental impacts such as storage tanks, abandoned mines, and oil and gas drilling and production practices. From 2001 to 2011, the amount of hazardous waste generated annually in the Commonwealth has decreased by 23 percent. In addition, there has been some progress on the remediation of historic contamination.

In 2013 there were 97 Federal National Priority List (NPL) sites in Pennsylvania that have been listed by the U.S. Environmental Protection Agency (EPA) under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA); remediation construction has been completed at three quarters of these Superfund sites. Pennsylvania's Land Recycling Program has approved 4,841 cleanups from 1995 to 2013, with another 1,220 in progress. Pennsylvania's waste-related environmental challenges extend beyond the boundaries of the Resource Conservation and Recovery Act (RCRA) Subtitle C definition of hazardous waste and include wastes associated with recent oil and gas drilling and production activities, historic coal mining, and the management of coal combustion residuals.

CONDITION AND CAPACTIY

Hazardous Waste Generation

The annual quantity of hazardous waste generated in Pennsylvania has declined by approximately 23 percent over the past ten years (Figure 1). The Pennsylvania Department of Environmental Protection (PA DEP) attributes this decline to a number of factors: cost savings to those that generate hazardous waste, reducing potential future liability, avoiding regulations, growing commitment to environmental protection, and negative economic conditions impacting the chemical manufacturing and primary metals industries (1).

Figure 1. Tons of Hazardous Waste Generated in Pennsylvania

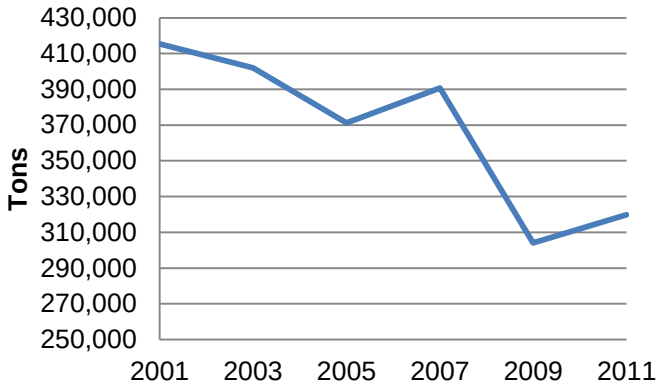


Figure source: (2)

This downward trend can be assessed in terms of other state-wide and national trends. Figure 2 compares normalized trends in hazardous waste generation to normalized trends in the State's Gross Domestic Product (GDP, normalized to 2001 dollars) (3), and enacted environmental protection budget (4), as well as national hazardous waste generation (also normalized to the 2001 generation rate). Pennsylvania's hazardous waste generation rate has exhibited a greater decline than the national rate (2) and has trended downward despite the increase in the state GDP and greatly reduced state funding for environmental protection.

Figure 2. Normalized Trends in Hazardous Waste Generation

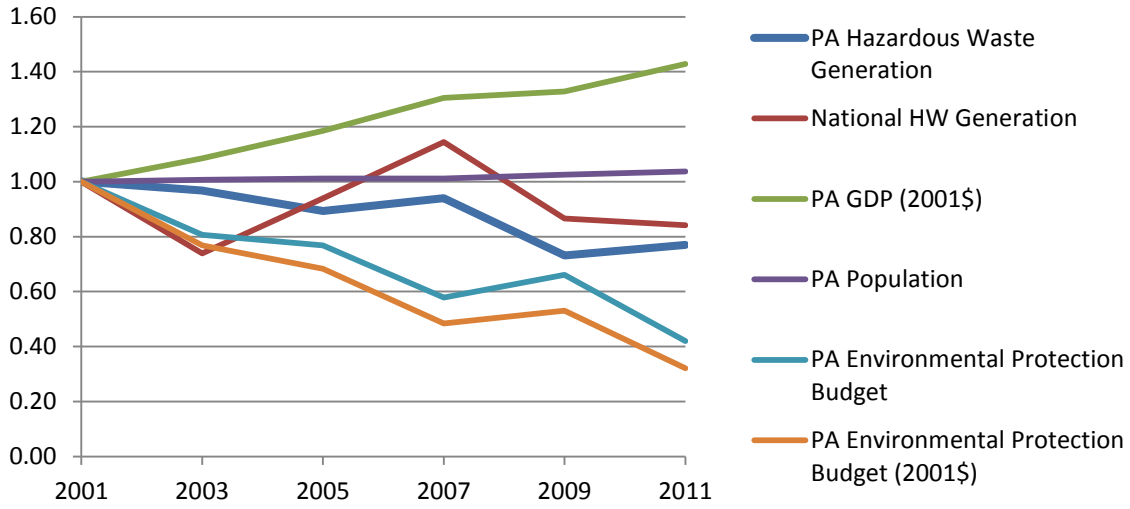


Figure sources: (1-5)

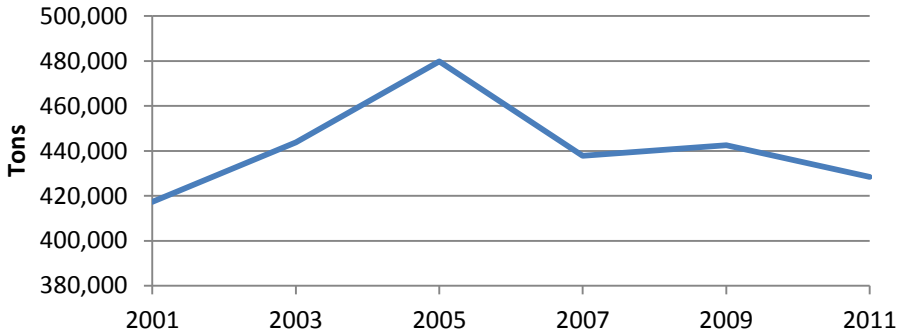
PA DEP conducted 481 inspections of the 1,100 large quantity hazardous waste generator sites, significantly more than the target of 280 inspections set in the state's Hazardous Waste Grant Work Plan Agreement with the EPA. Similarly, PA DEP conducted many more compliance evaluation inspections at the 4,400 small quantity

generator sites than required in the Work Plan (578 actual versus 260 planned) (5). Despite the noted budget constraints, PA DEP has exceeded its target inspection goals at hazardous waste generating facilities.

Hazardous Waste Management

Hazardous waste that is not recycled or reused must eventually be treated and disposed, a process that occurs at treatment, storage and disposal facilities (TSDFs). The Commonwealth's environmental performance can be assessed in terms of the volumes managed at these permitted TSDFs (Figure 3) (2) and also how much hazardous waste is imported from other states or exported into the Commonwealth. Over the past decade, an annual average of 440,000 tons of hazardous waste was managed in Pennsylvania TSDFs (varying less than 5 percent on an annual basis). Pennsylvania shipped 154,000 tons of hazardous waste out of state and received 288,000 tons of waste from out of state for management in 2011 (2). Outgoing shipments to other states are trending somewhat lower over the past ten years, reflective of state-wide reductions in generation rates over the same period.

Figure 3. Tons of Hazardous Waste Received by Hazardous Waste TSDFs



Hazardous waste management practices and oversight by PA DEP appear to be well established and stable. For example, PA DEP conducted 78 compliance evaluation inspections at the 40 permitted hazardous waste management facilities, more than the 68 targeted in the Work Plan (5). The Commonwealth's hazardous waste generation and management regulations also appear to be consistent with American Society of Civil Engineers' (ASCE's) Policy Statement 331 regarding hazardous waste reduction and management.

CLEANUP OF HISTORICAL CONTAMINATION

A major component of Pennsylvania's management of hazardous waste is the remediation of past releases. There are a range of programs to address these releases, including the Federal CERCLA Superfund program, the state's Hazardous Sites Cleanup Act (HSCA) program, RCRA Corrective Action cleanups, and Pennsylvania's Act 2 Program.

Federal Superfund Sites in Pennsylvania

The U.S. Environmental Protection Agency's Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) program, commonly referred to as Superfund, is designed to address highly contaminated abandoned sites and federal facilities. Pennsylvania currently has 97 Federal National Priority List (NPL) sites, the third highest number in the nation behind New Jersey and California (6) (7). NPL sites are addressed through a sequential process of site studies to determine the extent of contamination and options, the completion of construction of remedial action and finally, removal from the NPL list (also known as "delisting").

Progress can be assessed in terms of the percentage of NPL sites with completed remediation construction; this completion rate has increased from 63 percent to 76 percent over the past years, as illustrated in Table 1. While Pennsylvania has the third highest number of NPL sites, the high rate of remediation construction completion is an indication that the immediate threats to human health and the environments at these sites has been addressed. The high number of NPL sites is largely an artifact of the Commonwealth's rich industrial history.

Table 1. Progression of Pennsylvania NPL Sites through Remediation

Year	Percent of sites		
	proposed to be added	completed studies	completed construction
2013	1%	23%	76%
2012	2%	23%	76%
2011	2%	30%	68%
2010	2%	33%	65%
2009	3%	33%	64%
2008	2%	35%	63%

Progress can also be assessed in terms of the rate of NPL site delisting. As of 2008, a total of 27 Pennsylvania sites had been delisted; one additional site was removed in 2009. The slow pace of delisting is a reflection of the complexity of the sites and the level of available funding. To fund remediation of these NPL sites, the federal government initially established a fund called the Hazardous Substance Superfund, or simply Superfund, with monies provided from federal excise taxes on chemical feedstock and petroleum and a tax on all corporate income. However, Congress allowed the taxes to expire in December 1995, and since then Superfund is financed from general Treasury appropriations, private-party contributions and cost recoveries from the parties responsible for the contamination. Annual congressional appropriations for the Federal Superfund program have steadily declined in recent years after peaking at $2 billion in 1998. The appropriation for 2010 was $1.2 billion (8). The declining federal budget limits EPA and the states' implementation of the Superfund program and the subsequent removal of sites from the Federal NPL.

The Commonwealth is responsible for funding some portion of the remedial actions at 19 Pennsylvania NPL sites; for the 2012-2013 budget year, estimated costs were $1.7 million. Annual expenditures fluctuate from year to year ($1.2 to $9.6 million over the past seven years), which would be expected as the remedial actions at these diverse

sites progress. Data were not available to determine whether remediation progress has been limited by funding availability.

State Hazardous Site Cleanup Projects

Many contaminated sites in Pennsylvania do not pose enough risk to be included on the NPL list, but are still contaminated enough to require clean up. These sites, and specifically those that involve bankrupt facility owners, abandoned facilities and inappropriate disposal of hazardous substances, are managed under the Commonwealth's HSCA Program. Pennsylvania spent $16.2 million in 2012-13 on cleanup at 127 non-NPL HSCA sites (7). As with the NPL sites, funding for remediation at these non-NPL sites fluctuates from year to year ($10.0 to $19.8 million over the past seven years).

RCRA Corrective Action of Hazardous Waste Releases

Active facilities in the Commonwealth with contamination that warrants remediation are subject to the federal Resource Conservation and Recovery Act (RCRA) Subtitle C Corrective Action (RCRA CA) process. As of mid-2013, Pennsylvania had 355 high, medium and low priority sites subject to RCRA CA (7) (9). The number of high priority sites in Pennsylvania has decreased from 161 to 156 over the past six years and human exposure to contaminants is controlled at 153 of these. Twenty-eight (28) percent of these high priority sites have achieved final cleanup, an increase from 21 percent six years ago.

About 200 of the RCRA CA sites are medium and low priority, approximately 24 percent of which have achieved final cleanup. This is a significant improvement over the sole final cleanup tallied in 2009 for these sites.

Act 2 Remediation and Brownfields Sites

Not all contaminated sites fall into the NPL, state HSCA or RCRA CA programs. These remaining sites, which generally include spills, releases, underground storage tank (UST) closures and underutilized industrial sites (commonly known as "Brownfields") are addressed in PA DEP's Land Recycling Program (familiarly known as "Act 2", referencing the enabling 1995 legislation).

Brownfields is a term used to describe land parcels that have some level of environmental contamination but are not subject to the formal requirements of the Superfund, HSCA, or RCRA CA programs. Uncertainty about long-term liability and remediation costs associated with these properties deter potential developers from cleaning them up and returning them to productive use. To address the redevelopment hurdles and streamline the general remediation process, Pennsylvania enacted the Land Recycling Program legislation in 1995, providing uniform cleanup standards, liability relief, financial assistance, and regulatory support.

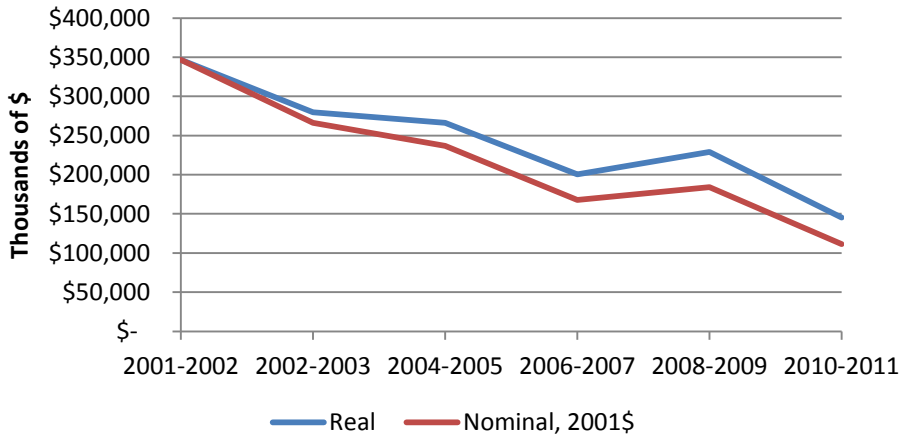
Since its enactment in 1995, the Act 2 Program has overseen the completion of cleanup at 4,841 sites (as of December 2013), with another 1,220 sites in the process of being remediated (10) (11). PA DEP also provides an on-line inventory of available Brownfield properties identified voluntarily by property owners and community redevelopment

organizations. The inventory currently contains 71 Brownfield properties (12). Programmatic features such as Pennsylvania's Act 2 Program and the Brownfield database are examples of how the Commonwealth has been innovative and forward-thinking when it comes to impaired environmental properties.

FUNDING AND FUTURE NEEDS

The Commonwealth of Pennsylvania's budget for environmental protection has steadily declined over the past decade. The 2010-2011 budgets are 42 percent of 2001-2002 levels (Figure 4). Over this time period, PA DEP has witnessed the clean-up of thousands of sites and an overall reduction in the quantity of waste generation, but has also taken on significant new responsibilities with regard to the booming unconventional oil and gas industry in the Marcellus shale formation. It is to Pennsylvania's credit that the pace of environmental stewardship across the Commonwealth has not slowed further in light of these budget reductions and new environmental challenges.

Figure 4. Pennsylvania Enacted State Budget for Environmental Protection



The Hazardous Waste program is funded by a combination of EPA grant dollars and 25 percent PA DEP match. For the past three years, the EPA contribution has remained steady at $4.7 million. Funding for a majority of the remaining PA DEP programs comes from the Growing Greener Program (signed into law in 1999 and reauthorized in 2002). Growing Greener funds come largely from a permanent $4/ton municipal waste disposal fee; the annual dollar commitment to PA DEP has been $94 million through 2012 (13). However, the total tonnage of disposed municipal waste has been decreasing, which is a factor in the overall reduction in PA DEP funding.

To provide additional funding to PA DEP as well as other programs, Growing Greener II was signed into law in 2005. Growing Greener II provided another $230 million to PA DEP to clean up rivers and streams, address environmental problems at abandoned mines and contaminated industrial sites, finance the development and deployment of advanced energy projects and restore funding in the short term for the HSCA Fund,

specifically providing $50 million over two years to shore up the HSCA Program (14). This short-term funding was a significant improvement as compared to recent HSCA annual expenditures (e.g., 11-12 of $20.3 million); however, this appears to be a temporary stop-gap measure with little long-term assurance of future funding.

RELATED WASTE ISSUES

There are other waste-related issues in Pennsylvania that do not fit under the formal RCRA definition of hazardous waste. These issues are worthy of discussion in this Report Card because of their potential impact on human health and the environment and include: wastes from unconventional oil and gas drilling and production operations, storage tanks, coal combustion residuals, and abandoned mine lands.

Hydraulic Fracturing Industry Wastes

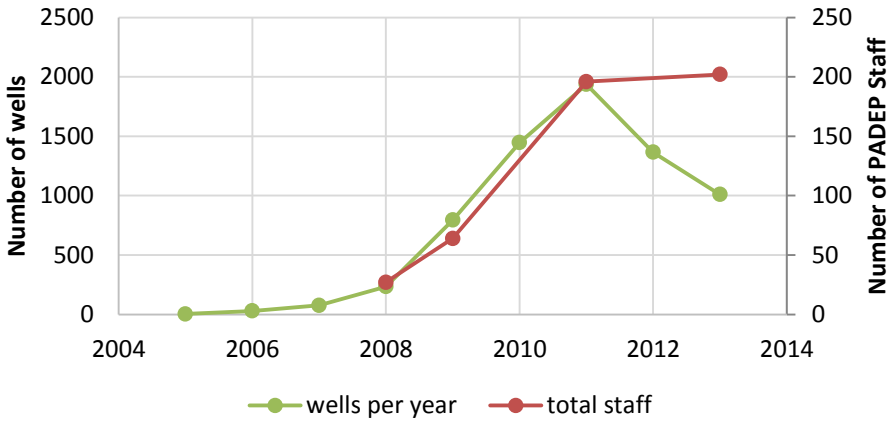
Wastes generated during the exploration and production of oil and natural gas are categorized by the EPA as “special wastes” and are exempt from federal hazardous waste regulations. Unconventional drilling and production operations have increased significantly in Pennsylvania in the past few years, due mostly to recent developments and improvements in shale energy production techniques. These techniques, including hydraulic fracturing, have resulted in a new waste stream (known as “frac water” or “flow-back water”). In the second half of 2010, over 5.5 million barrels of liquid wastes and 0.20 million tons of solid wastes were reported from these operations; in the first six months of 2013, these quantities increased to 15 million barrels of liquids and 0.56 million tons of solid waste.

At the onset of the surge in unconventional drilling in 2008, Pennsylvania’s infrastructure was inadequately prepared to deal with the unique challenges of this new drilling technique. This resulted in frac water disposal at wastewater treatment facilities not equipped to handle the high total dissolved solids (TDS) in the waste stream. If left unaddressed, this load has the potential to impact drinking water sources, especially during low flow conditions (15) (16). On April 19, 2011, PA DEP issued a “Call to Action” letter to all gas drilling operators to cease, within 30 days, delivering this wastewater to facilities that had been accepting the water under special provisions of the Commonwealth's regulations that exempted these facilities from TDS treatment requirements (17). Since this Call to Action, the percentage of wastewater going to treatment facilities has decreased from 57 to 16 percent and the amount of on-site reuse of frac water has increased from 31 to 74 percent (18).

In 2008, PA DEP substantially increased fees for drilling permit applications. The application fee was raised from $100 to a sliding scale based on total wellbore length, with the average well permit application costing more than $3,200 (19)**Error! Reference ource not found.**. All revenue was invested to increase oversight. To support new staffing levels in the future, PA DEP has proposed new rulemaking to increase permit fees to a flat fee of $5,000 (20). The permit fee increases have allowed PA DEP’s Bureau of Oil and Gas to increase its staff significantly, from 64 in 2009 to 202 in 2013 (Figure 5). The proposed rule was presented to Pennsylvania’s Oil and Gas Technical Advisory Board in April 2013 and was presented to the EQB in July 2013, which

approved the proposed rulemaking. PA DEP is proceeding to move the rulemaking through the remainder of the regulatory development process. (21). Figure 5 demonstrates an increase in PADEP staff commensurate with the increase in Marcellus wells installed between 2008 and 2013. Recommendations from an independent peer review group indicate that PA DEP should conduct a workload analysis to determine the need for additional staff to meet current and future needs (20).

Figure 5. Marcellus Wells vs. PADEP Staff



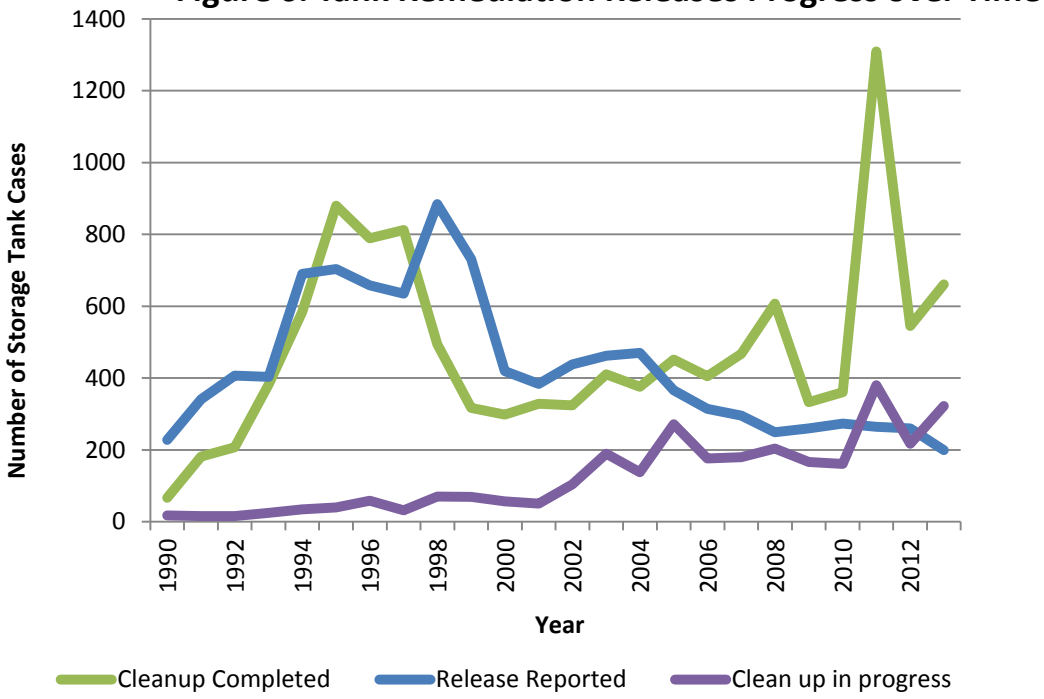
To minimize the impairment of groundwater used for drinking water purposes, PA DEP in February 2011 amended its regulations regarding well design and construction to provide enhanced casing and cementing standards for new well construction (20). Additionally, PA DEP instituted requirements for mechanical integrity testing of all operating oil and gas wells, including Marcellus Shale wells, effective the fourth quarter of 2013 (22). The 2012 Oil and Gas Act includes a provision that Marcellus Shale operators are presumed responsible for any drinking water well impacts that occur within 2,500 feet of an unconventional gas well and within 12 months of drilling, stimulation, completion or alteration activities (22). Recent independent research of drinking water wells in the vicinity of unconventional gas wells has provided conflicting results, including "…statistical analyses…did not suggest major influences from gas well drilling or hydro-fracturing…" (23) and "…data suggest that some homeowners living <1 km from gas wells have drinking water contaminated with stray gases" (24). Based on the wide range of results, the PA DEP needs to diligently monitor industry developments and research to ensure they are protecting human health and the environment and meeting the policies established by ASCE for groundwater management in Policy Statement 243 (PS 243).

Storage Tanks

PA DEP has jurisdiction over more than 13,000 aboveground and 19,000 underground storage tanks. All of these tanks are regulated under the Storage Tank and Spill Prevention Act of 1989 which follows a storage tank through its lifecycle (tank installation and design, tank registration, tank permitting, tank inspections and maintenance, spill reporting and spill corrective actions) (25).

Approximately 17,000 tank releases have been reported since program initiation in 1989. Almost 68 percent of these releases have been cleaned to applicable cleanup standards. The remaining 5,300 releases are either in the process of being remediated or are classified as low priority by the PA DEP. As shown in Figure 6, every year since 2005 the number of releases cleaned up has exceeded the number of new releases (26).

Figure 6. Tank Remediation Releases Progress over Time



Annually the Commonwealth receives $50 to $300 for registration of each storage tank equating to over $3 million to run its oversight program. Approximately 30 corrective action sites are led by the PA DEP and are funded by the Underground Storage Tank Indemnification Fund ($2 million annually) (27) (28).

To encourage tank owners to close their tanks, the PA DEP initiated its “Pump and Plug” program. The program has $1 million in grant money to reimburse small business owners up to $2,500 per tank for the costs of pumping, cleaning, and plugging their tanks. The PA DEP also implemented a grant program to assist owners with heating oil underground storage tank corrective actions ($500,000 annually) (27) (28).

Coal-fired Utilities Waste

Residuals from the combustion of coal to make electricity are currently exempt from hazardous waste classifications (29). Pennsylvania depends on coal-fired utilities to generate over 49 percent of its electricity (30). Conversion of coal into electricity resulted in over 9.3 million tons of coal combustion residuals (CCR) in 2010, including fly ash (46%), bottom ash (19%), and flue gas desulfurization gypsum (34%) (31). Pennsylvania ranks third in the nation in terms of total generation of CCR. The EPA has proposed to change the exempt status of these materials when landfilled or managed in

surface impoundments because of documented risk to human health and the environment (32). While 65 percent of CCR are recycled or reused in Pennsylvania, the remaining 3.3 million tons of CCR may be subject to additional regulatory oversight if the EPA proposal is finalized. Managing this material as regulated hazardous waste will require PA DEP to expand its oversight capabilities (more staffing and budget).

Abandoned Mine Lands

Coal mining began in Pennsylvania in the mid-1700s in support of various industries and continues today, primarily in support of electricity generation. For the first 200 years, coal was extracted and the mines abandoned with little thought of environmental consequences and without formal regulation. This abandoned (and frequently physically unstable) condition created numerous public health, safety and environmental issues, such as loss of life, property damage and polluted waterways from abandoned mine drainage (AMD) (33). Restoration (also called reclamation) of these abandoned mine lands (AML) is necessary to mitigate and prevent ongoing environmental pollution.

The protection of public health and safety from AML is prioritized by PA DEP. The highest priority sites (which pose the most extreme danger) have been inventoried by PA DEP; the estimated cost to reclaim these high priority sites exceeds $1 billion. Pennsylvania accounts for one-third of the country's AML problem and 43 of Pennsylvania's 67 counties have identified abandoned mine problems. PA DEP estimates that acid mine drainage discharges into the Commonwealth's streams and rivers have resulted in 5,596 miles of impacted water as of 2012 (34) (35) (36).

Funding for AML cleanup is provided to Pennsylvania through grants from the federal Office of Surface Mining (OSM) under the authority of the Surface Mining Control and Reclamation Act (SMCRA). SMCRA requires that active coal operators throughout the nation pay an AML fee on each ton of coal mined. OSM collects the fee and distributes it through annual grants to the AML states and tribes according to a distribution formula established in the law. In 2013, PA received an AML grant award of $61.7 million. Collection of the AML fee is currently authorized by SMCRA through federal fiscal year 2021. Pennsylvania expects to receive future AML grants through 2022. Based on current levels of active coal mining, annual AML grants to Pennsylvania over the next few years are projected to be in the range of $50 to 60 million (37). Given the current funding level, a significant amount of the $1 billion need for reclamation at the high priority sites in Pennsylvania will not be addressed when the AML fee collection ends in 2021. Extension of the AML funding mechanism past 2021 will be necessary to ensure a long-term solution to Pennsylvania's AML legacy.

RECOMMENDATIONS

The four Pennsylvania sections of ASCE recommend that the following measures be taken to promote safe and efficient hazardous waste management within Pennsylvania:

- Assess overall PA DEP funding to assess whether recent reductions are preventing the Department from achieving its intended objectives or if the reductions are commensurate with the overall improvement in the Commonwealth's environmental condition and reduced hazardous waste generation.
- Reauthorize the federal Superfund taxes on chemicals, petroleum, and corporations to remove the cost burden of cleanup from the general fund as stated in ASCE's Policy Statement 305 (PS 305). This would be of direct benefit to Pennsylvania and would accelerate the remediation and ultimate delisting of the Commonwealth's long list of NPL sites.
- Increase program funding and establish a long-term funding mechanism to address the many hundreds of AML, RCRA CA, and HSCA sites in Pennsylvania. While acute risks have been eliminated at most of these sites, the long remediation periods and reduced funding prevent the return of these sites to beneficial and productive re-use.
- Diligently monitor the Commonwealth's oil and gas industry to ensure the protection of human health and the environment (see the ASCE policy statement for groundwater management in Policy Statement 243 (PS 243)). Additionally for the oil and gas industry, conduct a PA DEP workload analysis to determine the need for additional staff to meet current and future needs.

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