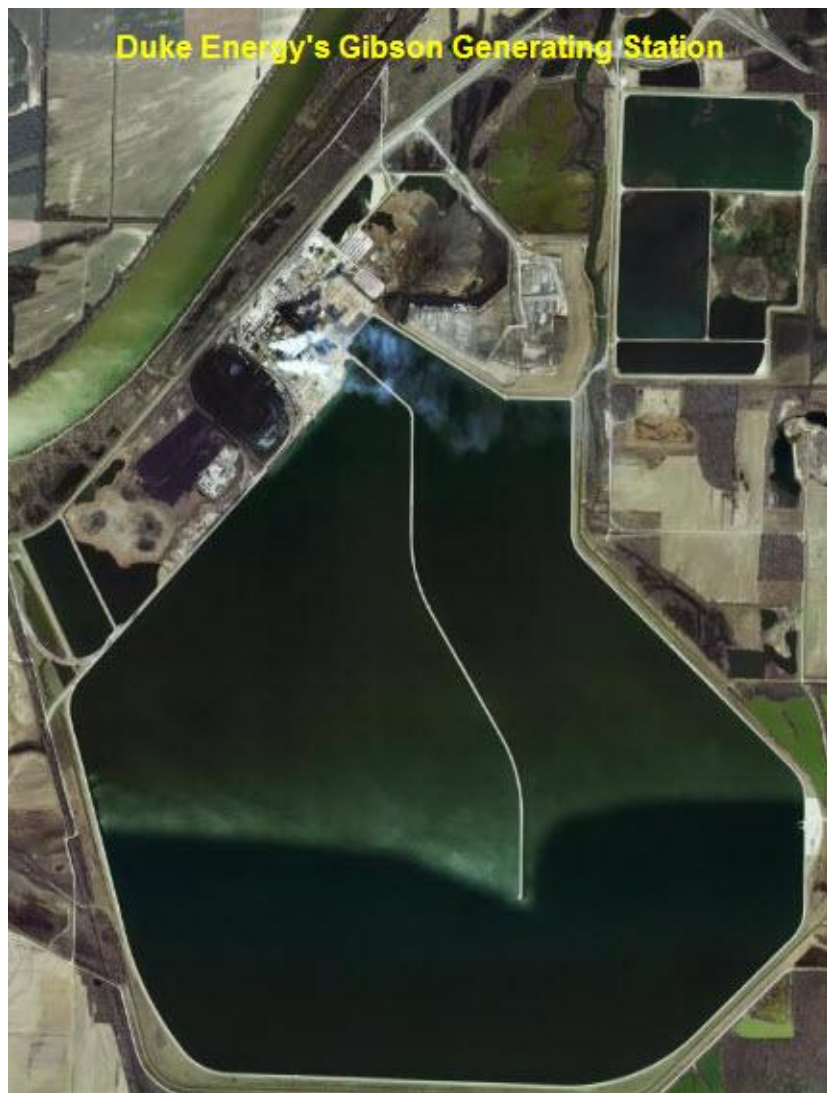


Coming Clean: What the EPA Knows About the Dangers of Coal Ash

**A Summary of the United States Environmental Protection Agency's 2007 Human
and Ecological Risk Assessment of Coal Combustion Wastes**

**A Report by The Environmental Integrity Project and Earthjustice
May 2009**



Source: Google Earth Satellite Image (38° 21' 02.44" N, 87° 46' 03.02"W) (May 2009).

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The Environmental Integrity Project (<http://www.environmentalintegrity.org>) is a nonpartisan and nonprofit organization established in March 2002 to advocate for more effective enforcement of environmental laws. EIP was founded by Eric Schaeffer, who was director of the U.S. Environmental Protection Agency's Office of Regulatory Enforcement. He resigned in 2002 after publicly expressing his frustration with efforts of the Bush Administration to weaken enforcement of the Clean Air Act and other laws.

Earthjustice (<http://www.earthjustice.org>) is a non-profit public interest law firm dedicated to protecting the magnificent places, natural resources, and wildlife of this earth, and to defending the right of all people to a healthy environment. Earthjustice brings about far-reaching change by enforcing and strengthening environmental laws on behalf of hundreds of organizations, coalitions and communities.

Coming Clean: What the EPA Knows About the Dangers of Coal Ash

Each year, coal-fired power plants dispose of nearly 100 million tons of toxic fly ash, bottom ash, and scrubber sludge in wet ponds and landfills. Can living next to one of these dumpsites increase your risk of getting cancer or other diseases? The U.S. Environmental Protection Agency (EPA) thinks so, especially if you live near one of those wet ash ponds, or surface impoundments, that dot the landscape near large coal plants, the pond has no protective liner, and you get your drinking water from a well. According to a comprehensive but little known risk assessment released by the EPA in 2007, nearby residents have as much as a 1 in 50 chance of getting cancer from drinking water contaminated by arsenic, one of the most common, and most dangerous, pollutants from coal ash.ⁱ

And that's not all. That same risk assessment says that living near ash ponds increases the risk of damage to the liver, kidney, lungs and other organs as a result of being exposed to toxic metals like cadmium, cobalt, lead, and other pollutants at concentrations far above levels that are considered safe. In addition, the danger to wildlife and ecosystems is simply off the charts, with one contaminant—boron—expected to leach into the environment at levels *two thousand times* thresholds generally considered to be safe.

During the Bush Administration, the EPA made a concerted effort to delay the release of this information. A 2002 screening study, the precursor to the EPA's 2007 risk assessment, identified the same astronomical cancer risks and dangers to aquatic life from coal ash dumps, but it was not made public until *March 4, 2009*—seven years after its publication.ⁱⁱ Freedom of Information Act requests to EPA for the risk assessment data during the Bush Administration were denied or resulted in the production of documents with the cancer and noncancer risk estimates blacked out.

What were they hiding? This brief analysis from the Environmental Integrity Project and Earthjustice highlights key findings from the EPA's 2007 risk assessment, which was based on a detailed analysis of landfills and surface impoundments at 181 coal-fired power plants,ⁱⁱⁱ primarily identified by a 1995 survey by the Electric Power Research Institute.^{iv} Our analysis focuses on the 100 landfills and 110 surface impoundments examined by the EPA that lack effective composite (clay plus synthetic) liners to prevent leaks, since the EPA found unlined and clay-lined waste units present far greater risks to both human health and ecosystems. A complete list of the unlined or clay-lined waste disposal units examined in the EPA's risk assessment can be found in Attachments 1 (surface impoundments) and 2 (landfills).

The EPA's study estimated risks based on a number of factors, including waste characteristics, the type of disposal (e.g., wet pond or "dry" landfill), whether sites were lined, local hydrogeological information, and tests measuring the leaching potential of various pollutants. The assessment was based on predicted exposures of human populations, vegetation, and wildlife to toxic metals that migrate from groundwater contaminated by disposal sites. The human health risks that are discussed below result

from exposure to contaminated drinking water. The study estimates risk associated with classes of disposal sites (e.g. ash ponds) rather than specific facilities.

While the EPA's risk assessment model attempts to make the best use of available data, EPA acknowledges that it is based on assumptions that may lead to underestimation or overestimation of risk. For example, at a given site, the actual exposure of nearby residents to contaminated drinking water may be higher or lower than EPA's model assumed. The study does not consider the risk from additional pathways of exposure, e.g., from the direct discharge of pollutants to surface waters through pipes or ditches, contaminated soils, or fugitive dust from uncovered ash sites. For a more complete explanation of the EPA's methodology and limitations, including a discussion of likely underestimation of risks, see Appendix B.

The EPA's study found that the type of disposal (wet or dry) and whether or not disposal sites have protective composite liners^v to prevent leaking have a dramatic effect on risk. Surface impoundments (wet ponds) consistently show the highest risks, especially if they are unlined. The attached tables identify the size and location of ponds and landfills that are unlined or lined only with clay. Because the data were gathered in the mid-1990s, it is possible that some of the listed dump sites are no longer in use. The EPA study warns, however, that peak pollution from ash ponds can occur long after the waste is placed and is likely to result in peak exposures approximately 78 to 105 years after the ponds first began operation—thus “retired” sites still pose very significant threats.^{vi} Lastly, these tables represent only the units that were captured in the EPA's survey in the risk assessment. The number of unlined and clay-lined ash ponds and landfills currently in operation in the United States is likely to be at least *double* the number of units represented in the tables.^{vii} In fact, the EPA's latest estimate of the number of coal ash waste ponds has recently increased 40% (from 300 to 427 units), based on information recently submitted by 61 utilities in response to the EPA's March 2009 information request letters.^{viii}

Health Risks: Waste Ponds that Mix Coal Combustion Waste and Coal Refuse

A summary of the EPA's assessment of health risks from coal ash ponds can be found in Table A. Seventy of the ash ponds assessed by the EPA's assessment mix both coal ash and other types of coal refuse (e.g., the waste coal produced from coal handling and preparation operations prior to combustion^{ix}), and this category of pond was found to be the most hazardous (see Attachment 1 for a list of these sites). For example, the EPA estimated that up to 1 in 50 nearby residents could get cancer from exposure to arsenic leaking into drinking water wells from unlined waste ponds that mix ash with coal refuse. Arsenic has been found to cause multiple forms of cancer, including cancer of the liver, kidney, lung, and bladder, and an increased incidence of skin cancer in populations consuming drinking water high in inorganic arsenic.^x For context, the Agency typically considers cancer risk to be unacceptable when environmental exposures result in more than one additional cancer per 100,000 people.^{xi} Consequently, a lifetime cancer risk of 1 in 50 represents a risk 2000 times the EPA's regulatory goals.

The EPA also predicts that these unlined ash ponds can increase the risk of other “noncancer” health effects, such as damage to vital organs like the liver and kidneys and, in the case of lead, damage to the central nervous system. The agency has set maximum contaminant levels (“MCLs”) under the Safe Drinking Water Act to limit exposure to hazardous pollutants. But according to the EPA, unlined waste ponds that mix ash and coal refuse will result in exposures up to 9 times the federal standard for lead, a deadly neurotoxin that can damage the central nervous system, especially in young children.

Table A: Surface Impoundments: Highest Health Risks (Groundwater to Drinking Water)

	90th Percentile HQ or Cancer Risk Value^{1 2}		
Chemical	Unlined Units	Clay-Lined Units	Potential health Risks
<i>Conventional CCW</i>			
Arsenic (cancer risk)	1 in 500	1 in 1,111	Nausea; Vomiting; Diarrhea; Cardiovascular Effects; Encephalopathy; Dermal Effects; Peripheral Neuropathy; Skin, Bladder & Lung cancer
Nitrate/nitrite (MCL)	20	10	Methemoglobinemia, infants are particularly vulnerable
Molybdenum	8	5	Fatigue; Headaches; Joint Pains
Boron	7	4	Stomach, Intestines, Kidneys, Liver and Brain Damage; Death; Negative Effects on Male Reproduction
Selenium	2	1	Dizziness; Fatigue; Respiratory Effects; Selenosis (Hair Loss; Nail Brittleness; Neurological Abnormalities)
Lead (MCL)	3	0.7	Learning Disabilities; Kidney, Blood, and Nerve Damage; Children are especially vulnerable to Lead exposure

<i>Codisposed CCW and Coal Refuse</i>			
Arsenic (cancer risk)	1 in 50	1 in 143	Nausea; Vomiting; Diarrhea; Cardiovascular Effects; Encephalopathy; Dermal Effects; Peripheral Neuropathy; Skin, Bladder & Lung cancer
Cadmium	9	3	Diarrhea; Stomach Pains; Severe Vomiting; Bone Fracture; Reproductive Effects; Nerve Damage; Immune System Damage; Psychological Disorders
Cobalt	8	3	Vomiting and Nausea; Vision Problems; Heart Problems; Thyroid Damage
Lead (MCL)	9	1	Learning Disabilities; Kidney, Blood, and Nerve Damage; Children are especially vulnerable to Lead exposure
Molybdenum	3	2	Fatigue; Headaches; Joint Pains

Sources: U.S. Env'tl. Prot. Agency (EPA), Human and Ecological Risk Assessment of Coal Combustion Wastes (released as part of a Notice of Data Availability) (Aug. 6, 2007) (draft), Table 4-7, Page 4-14 (does not include data on composite-lined units); and U.S. Department of Health and Human Services, Agency for Toxic Substances & Disease Registry, "Frequently Asked Questions About Contaminants Found at Hazardous Waste Sites" <<http://www.atsdr.cdc.gov/toxfaq.html>>.

¹ Values are HQs for all chemicals except arsenic; arsenic values are cancer risk.

² The Hazard Quotient (HQ) is the ratio of the exposure estimate (dose of contaminants) to a "no adverse effects level" considered to reflect a "safe" environmental concentration or dose.

For other toxic metals, like cadmium and cobalt, a hazard quotient (“HQ”) is used to define the concentration of a pollutant that is generally assumed to be “safe.” In other words, the HQ is the level at which the pollutant presents no “noncancer” health risks. The EPA estimates that unlined ponds that mix ash and coal refuse will result in exposures up to:

- Nine times the HQ, or “safe” level for cadmium, which can result in kidney disease and fragile bones.^{xiii} The U.S. Department of Health and Human Services has determined that cadmium is a human carcinogen.^{xiii}
- Eight times the HQ for cobalt, which can result in damage to the lung and heart and cause dermatitis. Liver and kidney effects have also been observed in animals exposed to high levels of cobalt.^{xiv}

Clay-lined ponds that mix coal ash and refuse appear to pose less risk, although the smaller number of sites evaluated make extrapolation difficult. Clay-lined impoundments were estimated to result in exposures up to 3 times above the HQ, or “safe” threshold, for cadmium and cobalt. The estimated cancer risk from clay-lined impoundments remains very high, however, and was estimated at 1 in 143 for nearby residents exposed to contaminated drinking water.

Attachment 1 lists the location, size, and ownership of the unlined and clay-lined ponds that mix ash and coal refuse that were evaluated in the EPA’s risk assessment. North Carolina and Tennessee each have eight of these impoundments, while Illinois has seven and Kentucky has six. Southern Company utilities own or operate twelve sites, while ten each are owned or operated by Tennessee Valley Authority or Duke utilities. Again, these ponds represent only a portion of the universe of unlined and clay-lined ash ponds currently operating throughout the United States.

Health Risks: Ash Ponds Containing Only Coal Combustion Waste

Forty of the coal ash ponds studied by the EPA contained only coal combustion waste. Unlined sites present a lower but still very substantial arsenic cancer risk to nearby residents of about 1 in 500 and about 1 in 1000 for clay-lined sites. These risks are 200 times and 100 times, respectively, greater than the EPA’s regulatory goals for limiting cancer risk.

In addition, the risk of other diseases is high:

- Unlined ponds are predicted to result in drinking water exposures of nitrate/nitrites at up to 20 times the “maximum contaminant levels” established under the Safe Drinking Water Act; even clay-lined sites are expected to exceed those limits by a factor of ten. Nitrates/nitrites are associated with methemoglobinemia (“blue baby syndrome”), which decreases the ability of the blood to transport oxygen, a condition that can

cause death in infants.^{xv} Lead levels in drinking water are predicted to reach up to 3 times the federal limit.

- Exposure to boron leached from unlined ponds is expected to exceed the HQ, or “safe” level, by up to a factor of eight, and by up to a factor of four for clay-lined ponds. High levels of boron have been linked to serious ailments of multiple organs, including the stomach, kidney, liver and brain.^{xvi} The study also showed high levels of molybdenum, which can lead to mineral imbalances, anemia and developmental problems.^{xvii}
- Five of the unlined ash ponds evaluated in the EPA study containing only coal combustion waste are in North Carolina; three each are in Michigan, Ohio, and West Virginia.

Health Risks: Landfills

The EPA’s risk assessment predicted that coal ash landfills posed less risk to human health than coal ash ponds. Still, the EPA determined that the cancer risk from exposure to arsenic is as high as 50 times the agency’s regulatory goals. The EPA found the risk to be 1 in 2000 from exposure to arsenic in drinking water for residents living near unlined landfills containing coal ash and coal refuse. The study also found that unlined landfills would result in thallium exposures at 3 times the “no risk” threshold. Exposure to high levels of thallium over a short time can lead to vomiting, diarrhea, temporary hair loss, and effects on the nervous system, lungs, heart, liver, and kidneys, and even death.^{xviii} Animal data suggest that the male reproductive system may be susceptible to damage by low levels of thallium.^{xix} In addition, the EPA found clay-lined and unlined landfills pose elevated risks from exposure to antimony and molybdenum. A list of unlined landfills can be found in Attachment 2.

The study’s conclusions concerning coal ash landfills may have significantly underestimated risk. In fact, the EPA’s list of actual damage cases includes numerous examples of landfills that have poisoned drinking water and surface water.^{xx} For example, drinking water wells surrounding a “dry landfill” in Anne Arundel County, Maryland were found to exceed federal drinking water standards for several toxic metals, including arsenic, cadmium, thallium, beryllium, aluminum and manganese. The contaminants were traced to leachate from the landfill, and Constellation Energy paid \$54 million to settle a lawsuit brought by nearby residents.^{xxi} In addition, a northern Indiana town has become a Superfund site due to the leaching of chemicals from a partially unlined coal ash landfill.^{xxii}

Table B: Landfills: Highest Health Risks (Groundwater to Drinking Water)			
	90th Percentile HQ or Cancer Risk Value ^{1 2}		
Chemical	Unlined Units	Clay-Lined Units	Potential Health Risks
Conventional CCW			
Arsenic (cancer risk)	1 in 2,500	1 in 5,000	Nausea; Vomiting; Diarrhea; Cardiovascular Effects; Encephalopathy; Dermal Effects; Peripheral Neuropathy; Skin, Bladder & Lung Cancer
Thallium	3	2	Stomach Pains; Nerve Damage; Joint Pains; Vision Damage; Fatigue; Headaches
Antimony	2	0.8	Eye Irritation; Hair Loss; Lung Damage; Heart and Fertility Problems. Liver and Blood Damage; Skin Irritation
Codisposed CCW and Coal Refuse			
Arsenic (cancer risk)	1 in 2,000	1 in 5,000	Nausea; Vomiting; Diarrhea; Cardiovascular Effects; Encephalopathy; Dermal Effects; Peripheral Neuropathy; Skin, Bladder & Lung cancer
Thallium	2	1	Stomach Pains; Nerve Damage; Joint Pains; Vision Damage; Fatigue; Headaches
Molybdenum	2	0.6	Fatigue; Headaches; Joint Pains

Sources: U.S. Env'tl. Prot. Agency (EPA), Human and Ecological Risk Assessment of Coal Combustion Wastes (released as part of a Notice of Data Availability) (Aug. 6, 2007) (draft). Table 4-5, Page 4-12 (does not include data on composite-lined units); and U.S. Department of Health and Human Services, Agency for Toxic Substances & Disease Registry, "Frequently Asked Questions About Contaminants Found at Hazardous Waste Sites" <<http://www.atsdr.cdc.gov/toxfaq.html>>.

¹ Values are HQs for all chemicals except arsenic; arsenic values are cancer risk.

² The Hazard Quotient (HQ) is the ratio of the exposure estimate (dose of contaminants) to a "no adverse effects level" considered to reflect a "safe" environmental concentration or dose.

Ecological Risks:

The EPA's study also found very substantial risk from coal ash disposal to aquatic ecosystems and the wildlife they support. The EPA evaluated these ecological risks for both landfills and ponds, but the report does not distinguish risks based on whether liners are in use, or whether ash is commingled with coal refuse. Predicted exposures are compared to ecological hazard quotients for specific pollutants, e.g., concentrations that are thought to be safe for aquatic life.

The results are eye-opening:

- Ash ponds are predicted to leak boron into surface waters at concentrations up to 2000 times higher than levels estimated to be safe for aquatic life (2000 times the HQ). Even landfills will release boron at levels 200 times above the HQ, or safe level, according to the EPA.
- Based on predicted exposures to river otters, lead from ash ponds will reach surface waters at concentrations 20 times higher than the HQ, or safe level, while arsenic and selenium concentrations will be 10 times higher. Selenium is particularly dangerous in aquatic environments because even a very small amount can rapidly attain levels that are toxic to fish and wildlife because of rapid bioaccumulation in food chains and resultant dietary exposure.^{xxiii}
- Toxic metals can also be embedded in the sediment at the bottom of rivers or lakes, where they can be very difficult to remove, and poison plants and bottom feeding fish. The EPA's study predicts lead leached from surface impoundments will reach levels that are 200 times higher than levels considered harmless, while arsenic will exceed the safe threshold by 100 times. Arsenic and lead from landfills are also expected to contaminate sediments at levels several times above "no risk" thresholds.

Table C: Surface Impoundments: Highest Ecological Risk (Groundwater to Surface Water)			
Chemical	90th Percentile HQ¹	Pathway	Receptor
Boron	2000	direct contact	aquatic biota
Lead	20	ingestion	river otter
Arsenic	10	direct contact	aquatic biota
Selenium	10	direct contact	aquatic biota
Cobalt	5	direct contact	aquatic biota
Barium	2	direct contact	aquatic biota
Cadmium	1	direct contact	aquatic biota

Source: U.S. Env'tl. Prot. Agency (EPA), *Human and Ecological Risk Assessment of Coal Combustion Wastes* (released as part of a Notice of Data Availability) (Aug. 6, 2007) (draft), Table 4-14, Page 4-22.

¹The Hazard Quotient (HQ) is the ratio of the exposure estimate to an effects concentration considered to represent a "safe" environmental concentration or dose. Values greater than 1 are indicative of risk to human health.

Table D: Surface Impoundments: Highest Ecological Risk (Groundwater to Sediment)			
Chemical	90th Percentile HQ¹	Pathway	Receptor
Lead	200	ingestion	spotted sandpiper
Arsenic	100	ingestion	spotted sandpiper
Cadmium	20	direct contact	sediment biota

Source: U.S. Env'tl. Prot. Agency (EPA), Human and Ecological Risk Assessment of Coal Combustion Wastes (released as part of a Notice of Data Availability) (Aug. 6, 2007) (draft), Table 4-15, Page 4-23.

¹The Hazard Quotient (HQ) is the ratio of the exposure estimate to an effects concentration considered to represent a "safe" environmental concentration or dose. Values greater than 1 are indicative of risk to human health.

Table E: Landfills: Highest Ecological Risk (Groundwater to Surface Water)			
Chemical	90th Percentile HQ¹	Pathway	Receptor
Boron	200	direct contact	aquatic biota
Lead	4	ingestion	river otter
Selenium	1	direct contact	aquatic biota

Source: U.S. Env'tl. Prot. Agency (EPA), Human and Ecological Risk Assessment of Coal Combustion Wastes (released as part of a Notice of Data Availability) (Aug. 6, 2007) (draft), Table 4-14, Page 4-22.

¹The Hazard Quotient (HQ) is the ratio of the exposure estimate to an effects concentration considered to represent a "safe" environmental concentration or dose. Values greater than 1 are indicative of risk to human health.

Conclusion

The EPA's 2007 risk assessment shows that the disposal of coal ash, especially in unlined ponds, results in alarmingly high risks of cancer and diseases of the heart, lung, liver, stomach and other organs and can seriously harm aquatic ecosystems and wildlife near disposal sites. These risks are driven by exposure to toxic metals that leach from groundwater into drinking water, surface waters and sediment. Some of the sites evaluated by the EPA may no longer be "active," but the Agency has warned that contamination from coal ash ponds will not peak until about 78 to 105 years *after* waste is dumped, while peak exposure from landfills may occur after even longer periods of time.

For too long, the federal government and power industry have left the public in the dark as to the risks presented by the voluminous toxic waste they produce. Even as recently as December 2008, after the 1 billion gallon spill from its Kingston Power Plant, the Tennessee Valley Authority claimed that coal ash posed little risk to human health or the environment. The EPA's 2007 risk assessment, nevertheless, brings the real threats to light.

Given what the Agency already knows, ash ponds must be phased out—and cleaned out—within five years, to keep their toxic cargo from building up and jeopardizing the health of nearby residents, poisoning wildlife, and contaminating rivers

and streams. So called “dry landfills”—especially those that are unlined—also pose unacceptable risks, and ought to be regulated as hazardous waste disposal sites.

There is some good news. The EPA’s evaluation shows that the use of composite liners (double liners composed of clay and synthetic barriers) significantly reduces risk by decreasing the amount of toxins that leak out of ash and into groundwater. These composite liners ought to be required at dry landfills, along with leak detection and monitoring systems to identify and capture any leachate that does escape. On March 2, 2009, 109 public interest organizations recommended that the EPA require these measures, as well as other safeguards, in a letter to EPA Administrator Lisa Jackson.^{xxiv}

The EPA’s risk assessment clearly establishes that unlined coal ash disposal sites—wet and dry—are hazardous to human health and the environment, posing unacceptably high cancer and noncancer risks to those living nearby and poisoning aquatic life of adjacent water bodies with bioaccumulative poisons. We hope the new leadership at the EPA will act on that knowledge before it is too late.

Appendix A. Coal Combustion Waste Constituents: Health and Environmental Effects

Some of the most hazardous constituents in coal combustion waste include:

Arsenic:

Ingesting arsenic, even in low doses, through drinking water or by eating fish in which arsenic has bioaccumulated, “can cause nausea, vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of ‘pins and needles’ in hands and feet.”^{xxv} Freshwater plants and bivalves have been shown to accumulate arsenic,^{xxvi} whereby it enters the food supply for fish, other wildlife, and humans. The toxicity of arsenic in the environment is impacted by a number of factors, including temperature, pH, phosphate concentration, and other parameters.^{xxvii} Arsenic is ranked #1 on the Agency for Toxic Substances and Disease Registry’s (ATSDR) 2007 Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Priority List of Hazardous Substances, which determines contaminant rankings based on a combination of their frequency, toxicity, and potential for exposure at National Priorities List (NPL) sites.^{xxviii}

Boron:

“Exposure to large amounts of boron (about 30 grams of boric acid) over short periods of time can affect the stomach, intestines, liver, kidney and brain and can eventually lead to death.”^{xxix} Boron can also bioaccumulate in plants, and is therefore ingested in fruits and vegetables as well as in drinking water.^{xxx} Boron is also known to be highly toxic to plants and algae, inhibiting growth, protein content, chlorophyll content and photosynthesis.^{xxxi} Chronic exposure to low levels of contamination can impair development in fish, notably the rainbow trout.^{xxxii}

Cadmium:

The Centers for Disease Control’s (CDC) Third National Report Spotlight on Cadmium states that, “exposure to low levels of cadmium in air, food [and]... water over time may build up cadmium in the kidneys and may cause kidney disease,” and that long-term effects of cadmium exposure also include fragile bones.^{xxxiii} Moreover, the U.S. Department of Health and Human Services and the International Agency for Research on Cancer have determined that cadmium and cadmium compounds are known human carcinogens and EPA has determined that cadmium is a probable human carcinogen.^{xxxiv} Cadmium exposure can occur through ingestion of contaminated drinking water or by eating aquatic organisms in which cadmium has accumulated.^{xxxv} Exposure to cadmium is moderately to highly toxic to aquatic plants, invertebrates, and fish.^{xxxvi} Environmental toxicity of cadmium is highly variable depending on hardness, pH, temperature, and other parameters.^{xxxvii} Cadmium is listed 7th on the 2007 CERCLA Priority List of Hazardous Substances.

Cobalt:

Exposure to high levels of cobalt can result in lung and heart effects and dermatitis.^{xxxviii} Liver and kidney damage are also possible.^{xxxix} Moreover, cobalt from CCW is

especially dangerous to human health in the environment when co-disposed with coal refuse because its mobility increases under more acidic conditions.^{xi} Cobalt has been found to inhibit the growth of photosynthetic microorganisms and can be toxic to fish, notably the rainbow trout.^{xli} Cobalt ranks 49th on the 2007 CERCLA Priority List of Hazardous Substances.

Lead:

The detrimental health effects of lead are well known. “No safe blood level has been identified” for lead,^{xlii} making it one of the most toxic constituents of coal waste. Because children absorb lead more easily than adults, “lead levels of 10 micrograms or more in a deciliter of blood can damage ability to learn.”^{xliii} At blood levels greater than or equal to 25 micrograms per deciliter, lead exposure can cause damage to the kidneys, blood and nervous system.^{xliv} “At very high levels, lead poisoning can cause mental retardation, coma, convulsions or death.”^{xlv} Lead ranks second after arsenic on the 2007 CERCLA Priority List of Hazardous Substances.

Molybdenum:

The American Cancer Society warns that “symptoms of too much molybdenum include tiredness, dizziness, rashes, low white blood cell counts, and anemia. High molybdenum levels are also linked to gout.”^{xlvi} The Environmental Working Group also links molybdenum ingestion to reproductive and fertility complications.^{xlvii}

Nitrates/Nitrites:

Studies show that “short term exposure to nitrate levels above the MCL can cause serious illness and even death, especially in infants,” because nitrate converts to nitrite in the body, which oxidizes the iron in blood hemoglobin to the point that it cannot carry oxygen.^{xlviii} Symptoms of “blue baby syndrome,” as the condition is commonly known, include shortness of breath and bluish skin. Moreover, long term exposure to contaminant levels above the MCL may cause “dieresis, increased starchy deposits, and hemorrhaging of the spleen.”^{xlix} The environmental effects of nitrate are well known; adding large quantities of limiting nutrients to rivers and streams contributes to algal blooms and decreased oxygen concentrations that choke out wildlife and ultimately contribute to downstream water impairment, the most devastating of which is the gulf coast “dead zone.”

Selenium:

Short term oral exposure to high concentrations of selenium causes nausea, vomiting, and diarrhea, while chronic exposure to “mildly excessive” concentrations can lead to selenosis, a condition resulting in brittle hair, deformed nails and numbness in the limbs.¹ Selenium causes respiratory and liver damage in animals and may affect reproduction in farm animals.^{li} Moreover, because selenium bioaccumulates in plants, farm animals are particularly susceptible to toxic effects from selenium ingestion.^{lii} Selenium ranks 147th out of 275 toxic constituents on the 2007 CERCLA Priority List of Hazardous Substances.

Appendix B. Methodology and Limitations

EPA's Methodology

In order to evaluate the risks posed by coal combustion waste (CCW) to individuals who live near landfills and surface impoundments used for CCW disposal, the EPA compiled a database of 41 “constituents of concern in CCW” in 2002 and 2003.^{liii} The database includes waste concentration data from three types of waste samples: landfill leachate analyses; porewater analyses from surface impoundments and landfills, and analyses of whole waste samples.^{liv} In order to determine which constituents were potentially hazardous enough to warrant a full-scale analysis, the EPA first engaged in Hazard Identification to select only those constituents with human health or ecological benchmarks and then conducted Constituent Screening to compare health-based benchmarks with conservative estimates of exposure concentrations to screen out constituents and exposure pathways that posed no significant concern.^{lv} The remaining 21 CCW constituents and 3 exposure pathways not screened out were then evaluated in a Full-Scale Monte Carlo Risk Analysis.^{lvi}

The full-scale analysis modeled risks based on surveyed characteristics from 181 CCW disposal sites^{lvii} using a site-based probabilistic approach that provided a distribution of risks for each receptor by allowing for variability of some factors. The EPA modeled two waste management options, surface impoundments and landfills, as well as three liner conditions, unlined, clay-lined, and composite-lined.^{lviii} It also modeled three waste types, conventional CCW, FBC wastes, and codisposed CCWs and coal refuse.^{lix} The site-based approach allowed for modeling of different factors such as waste management practices, environmental settings (e.g. hydrogeology, climate, and hydrology), and groundwater ingestion scenarios. Notably, to estimate the release of constituents from waste management units (WMUs), the EPA used a survey conducted by the Electric Power Research Institute (EPRI) in 1995 to determine size, design (including liner characteristics), and locations of onsite CCW landfills,^{lx} which does not take into account disposal that has continued at these sites or the reality that there are often long lead times before peak pollution events.

In order to determine probabilistic risks, the EPA used a Monte Carlo simulation, by which many model input parameter values were varied over 10,000 iterations of the model per waste management scenario to yield a statistical distribution of exposures and risks.^{lxi} Probabilistic risks were then evaluated at the 50th and 90th percentiles. A risk or hazard estimate at the 90th percentile, which the EPA used as the high end of the risk distribution, represents the scenario in the statistical distribution at which 90% of probabilistic exposure scenarios pose lower risks and 10% pose equal or higher risks than that value.

The Risk Assessment analyzed exposures and risks to determine which CCW disposal scenarios and environmental conditions were above applicable risk criteria.^{lxii} The EPA adopted a risk criteria factor of 10^{-5} for excess cancer risks and a hazard quotient (HQ) of greater than 1 for noncancer effects to human and ecological receptors.

HQ is the ratio of the likely exposure concentration to the highest concentration at which there are no observable adverse effects.^{lxiii} To determine the “HQ” for non-cancer health effects, the EPA compares the exposure concentration (mg/kg/day) to the ATSDR’s Minimal Risk Level (MRL) or the EPA’s Reference Dose (RfD), which quantifies the level of an exposure to a chemical at which no adverse health effects will occur. Thus: $HQ = \text{Exposure concentration (mg/kg/day)} / \text{MRL or RfD}$. Accordingly, an HQ of 1 represents the highest concentration of likely exposure at which there are no observable adverse effects. Likewise, an HQ of 3 means that the maximum concentration of likely exposure is three times the concentration at which there are no observable adverse effects. However, although there is a positive correlation between HQ and harm, it is not necessarily a 1:1 ratio. For example, at an HQ of 3, the concentration of likely exposure is three times higher than the no observable adverse effects limit, but the increased risk of harm cannot be definitively said to be greater than or less than 300%.

Limitations of EPA’s Risk Assessment

EPA conducted a peer review of its 2007 risk assessment in 2008, calling on five scientists from a variety of disciplines.^{lxiv} Some scientists alleged that the assessment overestimated risk, and others claimed that it was an underestimation. For example, one scientist stated that the ecological database and benchmarks used to calculate the ecological HQs were overly conservative and that the model used to calculate the transport of contaminants overestimated the movement of some pollutants.^{lxv} Another scientist indicated that the assessment would be improved by the inclusion of more data revealing the actual location of drinking water wells near ash ponds and landfills.^{lxvi}

On the other hand, significant criticisms alleging underestimation of risk by the scientists chosen by the EPA to review the assessment included: (1) the failure of the EPA to assess how coal ash pollutants interact with each other to increase risk to human health and aquatic organisms;^{lxvii} (2) the EPA’s failure to consider critical exposure pathways including direct exposure to the slurried wastes in impoundments and direct exposure to the effluent from impoundments discharged offsite;^{lxviii} (3) the EPA’s failure to consider the inhalation pathway for human health risks;^{lxix} (4) the EPA’s failure to assess the true time of exposure to contaminants in landfills and surface impoundments from the date of deposition until removal of wastes;^{lxx} (5) the EPA’s failure to assess multiple exposure pathways for humans and ecological receptors;^{lxxi} (6) the EPA’s failure to employ data that reflects the actual concentration of pollutants in waste pond water and landfill leachate;^{lxxii} (7) the EPA’s failure to consider the likelihood of liner failure at landfills and impoundments;^{lxxiii} (8) the EPA’s failure to consider the disposal of coal ash in landfills below the water table and to consider the limits of the clay and composite liners currently in use at most waste units;^{lxxiv} (9) the EPA’s failure to consider the impact of exposure of infants and children to coal ash contaminants;^{lxxv} and (10) the EPA’s failure to consider additional coal ash contaminants that commonly leach from coal ash.^{lxxvi}

In addition, in public comments, additional scientists criticized the model the EPA used as the basis for groundwater modeling in its risk assessment, EPACMTP, for its

propensity to significantly *underestimate* risks from a variety of factors.^{lxxvii} Among the many shortcomings of EPACMTP is that it “cannot simulate scenarios where the waste is disposed within the underlying aquifer,” despite the frequent disposal of CCW in landfills within the saturated zone and despite the fact that such disposal below the water table expedites leaching of contaminants from the waste.^{lxxviii} In addition, EPACMTP cannot account for multiple or changing leachate compositions, nor can it simulate instances where leachate alters the properties of the receiving aquifer, such as how pH and Eh can impact the mobility of many CCW contaminants.^{lxxix}

In fact, EPA acknowledged that there were uncertainties it could not explicitly address, resulting in an *underestimation* of many risks. For example, because porewater data was unavailable to determine leachate from CCW landfills, EPA relied on Toxicity Characteristic Leaching Procedure (TCLP) analyses, which underestimated risks from selenium, which EPA recognizes is a frequent cause of CCW damage cases.^{lxxx} Also, the high number of nondetect values for mercury in CCW leachate from landfills and surface impoundments and for antimony and thallium in surface impoundments likely means the EPA *significantly* underestimated risks to human health and ecological receptors.^{lxxxi} In addition, the EPA admits that it failed to estimate risk for terrestrial amphibians despite damage cases indicating risk to these amphibians from exposure to selenium, failed to address impacts on endangered species, critical habitats, or managed lands, and failed to analyze synergistic or additive risks of being exposed to multiple constituents or by multiple pathways, all of which will result in an understatement of risk.

Perhaps the most critical limitation in the EPA’s 2007 Risk Assessment was that it failed to “address direct releases to surface water, which are permitted under the National Pollutant Discharge Elimination System (NPDES) of the Clean Water Act.”^{lxxxii} One of the EPA’s peer reviewers commented that the risk assessment “grossly underestimates risks from surface impoundments to humans and the environment” because of this deficiency.^{lxxxiii} By not addressing “direct releases to surface water,” the EPA has also failed to address unpermitted discharges to surface water, the precise scenario that occurred at TVA’s Kingston plant in December of 2008. By not addressing the effects of major discharges like those that occurred at TVA’s Kingston plant or any less dramatic discharges of that nature, EPA clearly, and significantly, underestimated the risks CCW can pose.

Endnotes

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- ⁱ U.S. Env'tl. Prot. Agency (EPA), Human and Ecological Risk Assessment of Coal Combustion Wastes (released as part of a Notice of Data Availability) (Aug. 6, 2007) (draft) (hereinafter EPA Risk Assessment).
- ⁱⁱ Constituent Screening for Coal Combustion Wastes, prepared for EPA, Office of Solid Waste, by RTI, Contract No. 68-W-98-085 (Oct. 2002), Docket No. EP-HQ-RCRA-2006-0796-0470 (posted at www.regulations.gov on Mar. 4, 2009).
- ⁱⁱⁱ EPA Risk Assessment, *supra* note i, at appendix B-10. For a table detailing CCW plants with onsite landfills and surface impoundments modeled in EPA's full-scale analysis, see *id.* at 2-8, tbl. 2-4.
- ^{iv} *Id.* at 3-1 (citing Electric Power Research Institute (EPRI), Coal Combustion By-Products and Low Volume Wastes Comanagement Survey (June 1997)). For a complete list of CCW Disposal Sites (Plants) modeled, see *id.* at Appendix B-1-1.
- ^v EPA defines "composite" liners as a system that combines a plastic (e.g., high-density polyethylene (HDPE) membrane) over either geosynthetic or natural clays. *Id.* at B-3.
- ^{vi} *Id.* at 4-7 to 4-8.
- ^{vii} Final Regulatory Determination on Wastes from the Combustion of Fossil Fuels, 65 Fed. Reg. 32,214 (Env'tl. Prot. Agency, May 22, 2000) at 32,216.
- ^{viii} Statement of Barry Breen, Assistant Administrator, Office of Resource Conservation, US EPA before the Subcommittee on Environment and Water Resources, House Committee on Transportation and Infrastructure, April 30, 2009.
- ^{ix} Coal refuse is the waste coal produced from coal handling, crushing, and sizing operations, and tends to have a high sulfur content and low pH from high amounts of sulfide minerals (like pyrite). Coal refuse includes "combined ash and coal gob," "combined ash and coal refuse," and "combined bottom ash and pyrites." EPA Risk Assessment, *supra* note i, at 1-5, fn. 4.
- ^x EPA, Integrated Risk Information System (IRIS), Arsenic (CASRN 7440-38-2). http://cfpub.epa.gov/ncea/iris/index.cfm?fuseaction=iris.showQuickView&substance_nmbr=0278.
- ^{xi} EPA Risk Assessment, *supra* note 1, at 4-1.
- ^{xii} Agency for Toxic Substances and Disease Registry (ATSDR), ToxFaqs for Cadmium, <http://www.atsdr.cdc.gov/tfacts5.html#bookmark05>.
- ^{xiii} *Id.*
- ^{xiv} ATSDR, ToxFaqs for Cobalt. <http://www.atsdr.cdc.gov/tfacts33.html>.
- ^{xv} Consumer Fact Sheet on Nitrates/Nitrites, EPA Office of Groundwater and Drinking Water, available at <http://www.epa.gov/OGWDW/dwh/c-ioc/nitrates.html>. See also EPA, Integrated Risk Information System, <http://www.epa.gov/iris/subst/0076.htm> (nitrate) and <http://www.epa.gov/iris/subst/0078.htm> (nitrite).
- ^{xvi} ATSDR, ToxFaqs for Boron, <http://www.atsdr.cdc.gov/tfacts26.html#bookmark05>.
- ^{xvii} EPA, Integrated Risk Information System, Molybdenum (CASRN 7439-98-7), <http://www.epa.gov/iris/subst/0425.htm>.
- ^{xviii} ATSDR, ToxFaqs for Thallium, <http://www.atsdr.cdc.gov/tfacts54.html>.
- ^{xix} *Id.*
- ^{xx} EPA, Coal Combustion Waste Damage Case Assessments, available at www.regulations.gov, Document ID EPA-HQ-RCRA-2006-0796-0015 (July 9, 2007).
- ^{xxi} Brendan Kearney, Judge Approves \$54M Fly-Ash Suit Settlement, Maryland Daily Record, Dec. 30, 2008, <http://www.envirovaluation.org/index.php/2009/01/12/judge-approves-54m-fly-ash-suit-settleme>.
- ^{xxii} EPA, Pines Ground Water Plume Site, <http://www.epa.gov/region5/sites/pines/> (last visited May 5, 2009). See also "Not in My Lifetime: The Fight for Clean Water in Town of Pines, Indiana," Clean Air Task Force, 2004, <http://www.catf.us/publications/view/23>.
- ^{xxiii} Dennis A. Lemly, Aquatic Selenium Pollution is a Global Environmental Safety Issue, 59 *Ecotoxicology and Environmental Safety* 44, at 44 (2004), available at <http://www.treesearch.fs.fed.us/pubs/7293>.
- ^{xxiv} Letter from Environmental Integrity Project, Earthjustice, and others to Lisa Jackson, U.S. EPA Administrator (Mar. 2, 2009), available at <http://www.environmentalintegrity.org/pub607.cfm>.
- ^{xxv} ATSDR, ToxFaqs, available at www.atsdr.cdc.gov/tfacts2.html.

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- ^{xxvi} World Health Organization International Programme on Chemical Safety INCHEM: Environmental Health Criteria for Arsenic (IPCS INCHEM EHC), available at <http://www.inchem.org/documents/ehc/ehc/ehc224.htm#5.1.8>.
- ^{xxvii} Id.
- ^{xxviii} ATSDR, 2007 CERCLA Priority List of Hazardous Substances, available at www.atsdr.cdc.gov/cercla/07list.html.
- ^{xxix} ATSDR Public Health Statement, available at www.atsdr.cdc.gov/toxprofiles/phs26.html
- ^{xxx} United Nations Environment Program, International Program on Chemical Safety and Environmental Health Criteria, available at www.inchem.org/documents/ehc/ehc/ehc204.htm#SectionNumber:5.2.
- ^{xxxi} IPCS INCHEM EHC for Boron, available at <http://www.inchem.org/documents/ehc/ehc/ehc204.htm#PartNumber:9>.
- ^{xxxii} Id.
- ^{xxxiii} Centers for Disease Control and Prevention (CDC), Third National Report Spotlight on Cadmium, available at www.cdc.gov/exposurereport/pdf/factsheet_cadmium.pdf.
- ^{xxxiv} ATSDR Public Health Statement, available at www.atsdr.cdc.gov/toxprofiles/phs5.html.
- ^{xxxv} Id.
- ^{xxxvi} IPCS INCHEM EHC for Cadmium, available at <http://www.inchem.org/documents/ehc/ehc/ehc135.htm#PartNumber:6>.
- ^{xxxvii} Id.
- ^{xxxviii} ATSDR, ToxFAQs for Cobalt, available at www.atsdr.cdc.gov/tfacts33.html.
- ^{xxxix} Id.
- ^{xl} ATSDR Public Health Statement, available at <http://www.atsdr.cdc.gov/toxprofiles/phs33.html>.
- ^{xli} IPCS INCHEM, Concise International Chemical Assessment Document 69, Cobalt, at chpt. 10, available at <http://www.inchem.org/documents/cicads/cicads/cicad69.htm#10.0>.
- ^{xlii} CDC, Third National Report on Human Exposure to Environmental Chemicals: Spotlight on Lead, available at www.cdc.gov/exposurereport/pdf/factsheet_lead.pdf.
- ^{xliii} Id.
- ^{xliv} Id.
- ^{xlvi} Id.
- ^{xlvi} American Cancer Society, Making Treatment Decisions, Molybdenum, www.cancer.org/docroot/ETO/content/ETO_5_3x_Molybdenum.asp.
- ^{xlvi} Environmental Working Group, Chemical Index, Molybdenum, www.ewg.org/chemindex/chemicals/23518.
- ^{xlviii} Eugene R. Weiner, Applications of Environmental Chemistry 228 (2000).
- ^{xlix} Id.
- ^l ATSDR Public Health Statement, available at www.atsdr.cdc.gov/toxprofiles/phs92.html; ATSDR ToxFAQs, available at www.atsdr.cdc.gov/tfacts92.html.
- ^{li} IPCS INCHEM EHC for Selenium, available at <http://www.inchem.org/documents/ehc/ehc/ehc58.htm#SubSectionNumber:1.1.5>.
- ^{lii} Id. at <http://www.inchem.org/documents/ehc/ehc/ehc58.htm#SubSectionNumber:7.1.1>.
- ^{liii} EPA Risk Assessment, supra note 1, at A-2.
- ^{liv} Id. The data used to create the database included waste characterization data from its 1999 Report to Congress (“RTC”), public comments from the RTC and the May 22, 2000 Final Regulatory Determination, data available to EPA after the comment period for the Final Regulatory Determination, and data identified in literature searches. See id. at A-1-1 for the complete list of data sources used in the 2003 CCW constituent database.
- ^{lv} EPA Risk Assessment, supra note 1, at A-6.
- ^{lvi} Id. at ES-3.
- ^{lvii} Id. at B-10.
- ^{lviii} Id. at 1-5.
- ^{lix} Id. Coal refuse is defined as “waste coal produced from coal handling, crushing, and sizing operations, and tends to have a high sulfur content and low pH from high amounts of sulfide minerals (like pyrite),” and includes “combined ash and coal gob,” “combined ash and coal refuse,” and “combined bottom ash and pyrites.”” See id. at 1-5 &n.4.
- ^{lx} Id. at 1-2.

^{lxi} Id. at 4-1.

^{lxii} Id. at 6-1.

^{lxiii} See EPA Superfund Glossary, available at www.epa.gov/region5superfund/ecology/html/glossary.html#hazard.

^{lxiv} Peer Review of “Draft Human and Ecological Risk Assessment of Coal Combustion Wastes,” EPA-HQ-RCRA-2006-0796-0467 (Sept. 25, 2008), available at www.regulations.gov.

^{lxv} Id. See comments of Nicolas Basta, Ph.D., Ohio State University, at 4 and 8.

^{lxvi} Id. See comments of Charles Harvey, Ph.D., Massachusetts Institute of Technology, at 1.

^{lxvii} Id. See comments of Charles Harvey, Ph.D., Massachusetts Institute of Technology, at 4, William Hopkins, Ph.D. Virginia Polytechnic Institute and State University, at 6 (hereinafter Peer Review comments).

^{lxviii} Id. See Comments of William Hopkins at 2–3.

^{lxix} Id. See Comments of William Hopkins at 6.

^{lxx} Id. See Comments of William Hopkins at 7.

^{lxxi} Id. See Comments of William Hopkins at 8.

^{lxxii} Id. See Comments of William Hopkins at 9, R. Kerry Rowe, Ph.D., at 4, and Donna J. Vorhees, Sc.D., at 6.

^{lxxiii} Id. See Comments of R. Kerry Rowe at 6.

^{lxxiv} Id. See Comments of R. Kerry Rowe at 9.

^{lxxv} Id. See Comments of Donna J. Vorhees, Sc.D., The Science Collaborative, at 2.

^{lxxvi} Id. See Comments of Donna J. Vorhees, Sc.D., The Science Collaborative, at 3, and R. Kerry Rowe at 6.

^{lxxvii} See, e.g., Letter from Charles H. Norris, P.G. and Mark A. Hutson, P.G. to Stephen Johnson, EPA Administrator, Re: Docket ID No. EPA-HQ-RCRA-2006-0796, Feb. 11, 2008, at Document ID EPA-HQ-RCRA-2006-0796-0446.2, at 2.

^{lxxviii} Id. at 2, 4.

^{lxxix} Id. at 2, 3.

^{lxxx} See, e.g., EPA Risk Assessment, supra note 1, at ES-11 (stating that “available data for landfills were mainly Toxicity Characteristic Leaching Procedure (TCLP) analyses, which may not be representative of actual CCW leachate. . . . This suggests that selenium risks may be *underestimated*, which is consistent with selenium as a cause for CCW damage cases”) (emphasis added).

^{lxxxi} See EPA Risk Assessment, supra note 1, at ES-11. For example, exposure to antimony, even at very low levels, causes significant health effects, and one type of antimony, antimony trioxide, is a possible carcinogen. See Appendix A. In addition, EPA has classified mercury as a possible carcinogen, and mercury has also been linked to nervous system, brain, and lung damage and been deemed extremely harmful to children and fetuses. See Appendix A. Thallium bioaccumulates in plants and animals and has been linked to numerous human health effects including hair loss, damage to lungs, heart, liver, and kidneys, and death. See Appendix A.

^{lxxxii} EPA Risk Assessment, supra note 1, at 1-3.

^{lxxxiii} Peer Review comments, supra note lxxvii. Comments of William Hopkins at 2 (emphasis added).

Combined Attachments 1 and 2 - Surface Impoundments and Landfills Analyzed in EPA Risk Assessment (Unlined and Clay-Lined)

WMU Type	Plant	Utility Name	County	State	Area (acres)	Capacity (cubic yards)	Waste Type	Liner Type	Leachate Collection System	Groundwater Monitoring
SI	James H Miller Jr.	Alabama Power Co.	Jefferson	AL	200	5,500,000	Ash	Clay	No	Yes
SI	Greene County	Alabama Power Co.	Walker	AL	480	5,000,000	Ash	Clay	No	No
SI	Widows Creek	Tennessee Valley Authority	Jackson	AL	222	12,400,000	Ash	Clay	No	Yes
SI	Gadsden	Alabama Power Co.	Etowah	AL	60	484,000	Ash and Coal Waste	Clay	No	No
SI	Gorgas	Alabama Power Co.	Walker	AL	1,500	15,000,000	Ash and Coal Waste	Clay	No	No
SI	Gorgas	Alabama Power Co.	Walker	AL	283	24,100,000	Ash and Coal Waste	Clay	No	No
SI	Gorgas	Alabama Power Co.	Walker	AL	250	Not Reported	Ash and Coal Waste	Clay	No	No
SI	Barry	Alabama Power Co.	Mobile	AL	63	1,900,000	Ash and Coal Waste	No Liner	No	No
SI	Widows Creek	Tennessee Valley Authority	Jackson	AL	110	3,500,000	Ash and Coal Waste	No Liner	No	Yes
SI	Flint Creek	Southwestern Electric Power Co.	Benton	AR	36	Not Reported	Ash and Coal Waste	No Liner	No	No
LF	Flint Creek	Southwestern Electric Power Co.	Benton	AR	40	1,508,250	Ash and Coal Waste	No Liner	No	Yes
SI	Cholla	Arizona Public Service Co.	Navajo	AZ	171	2,600,000	Ash	No Liner	Yes	Yes
LF	Springerville	Tucson Electric Power Co	Apache	AZ	57	6,400,000	Ash	No Liner	No	Yes
LF	St Johns River Power	JEA	Duval	FL	129	Not Reported	Ash and Coal Waste	Clay	Yes	Yes
LF	Stanton Energy Ctr.	Orlando Utilities Comm.	Orange	FL	312	Not Reported	Ash	No Liner	No	Yes
LF	C D McIntosh Jr.	Lakeland, City of	Polk	FL	26	Not Reported	Ash and Coal Waste	No Liner	No	Yes
LF	Crist	Gulf Power Co.	Escambia	FL	12	Not Reported	Ash and Coal Waste	No Liner	Yes	Yes
SI	Wansley	Georgia Power Co.	Heard	GA	43	Not Reported	Ash	No Liner	No	No
LF	Bowen	Georgia Power Co.	Bartow	GA	26	406,971	Ash	No Liner	No	Yes
LF	Bowen	Georgia Power Co.	Bartow	GA	25	491,400	Ash	No Liner	No	No
SI	Hammond	Georgia Power Co.	Floyd	GA	56	576,256	Ash and Coal Waste	No Liner	No	No
SI	Harllee Branch	Georgia Power Co.	Putnam	GA	324	7,898,277	Ash and Coal Waste	No Liner	No	No
SI	Harllee Branch	Georgia Power Co.	Putnam	GA	203	7,634,000	Ash and Coal Waste	No Liner	No	No
SI	Jack McDoNough	Georgia Power Co.	Cobb	GA	73	1,531,893	Ash and Coal Waste	No Liner	No	No
SI	Kraft	Savannah Electric & Power Co	Chatham	GA	60	Not Reported	Ash and Coal Waste	No Liner	No	No
SI	Scherer	Georgia Power Co.	Monroe	GA	490	22,262,030	Ash and Coal Waste	No Liner	No	No
SI	Wansley	Georgia Power Co.	Heard	GA	330	18,712,850	Ash and Coal Waste	No Liner	No	No
LF	Arkwright	Georgia Power Co.	Bibb	GA	54	415,907	Ash and Coal Waste	No Liner	Yes	Yes
SI	Louisa	MidAmerican Energy Co.	Louisa	IA	30	500,000	Ash	Clay	No	Yes
SI	Lansing	Interstate Power Co.	Allamakee	IA	15	Not Reported	Ash	Clay	No	Yes
LF	Muscatine Plant #1	Muscatine, City of	Muscatine	IA	36	2,000,000	Ash	Clay	Yes	Yes

Combined Attachments 1 and 2 - Surface Impoundments and Landfills Analyzed in EPA Risk Assessment (Unlined and Clay-Lined)

WMU Type	Plant	Utility Name	County	State	Area (acres)	Capacity (cubic yards)	Waste Type	Liner Type	Leachate Collection System	Groundwater Monitoring
SI	Council Bluffs	MidAmerican Energy Co.	Pottawattamie	IA	200	Not Reported	Ash	No Liner	Yes	Yes
LF	Neal North	MidAmerican Energy Co.	Woodbury	IA	200	Not Reported	Ash	No Liner	No	No
LF	Neal South	MidAmerican Energy Co.	Woodbury	IA	150	Not Reported	Ash	No Liner	No	No
SI	Neal North	MidAmerican Energy Co.	Woodbury	IA	150	Not Reported	Ash and Coal Waste	No Liner	No	No
LF	Duck Creek	Central IlliNois Light Co.	Fulton	IL	21	1,500,000	Ash	Clay	No	Yes
LF	Dallman	Springfield, City of	Sangamon	IL	22	1,800,000	Ash	Clay	No	No
LF	Marion	Southern IlliNois Power Coop	Williamson	IL	38	1,000,000	Ash	Clay	Yes	Yes
SI	Crawford	Commonwealth Edison Co.	Cook	IL	25	642,000	Ash and Coal Waste	Clay	No	No
SI	Will County	Commonwealth Edison Co.	Will	IL	60	599,256	Ash and Coal Waste	Clay	No	Yes
LF	Waukegan	Commonwealth Edison Co.	Lake	IL	60	4,000,000	Ash and Coal Waste	Clay	Yes	Yes
SI	Dallman	Springfield, City of	Sangamon	IL	417	3,800,000	Ash	No Liner	No	Yes
LF	Marion	Southern IlliNois Power Coop	Williamson	IL	105	2,200,000	Ash	No Liner	No	Yes
LF	Newton	Central IlliNois Pub Serv. Co.	Jasper	IL	309	Not Reported	Ash	No Liner	No	Yes
SI	Baldwin	IlliNois Power Co.	Randolph	IL	107	4,000,000	Ash and Coal Waste	No Liner	No	No
SI	E D Edwards	Central IlliNois Light Co.	Peoria	IL	145	11,000,000	Ash and Coal Waste	No Liner	Yes	No
SI	Hennepin	IlliNois Power Co.	Putnam	IL	150	3,460,600	Ash and Coal Waste	No Liner	No	Yes
SI	Joliet 29	Commonwealth Edison Co.	Will	IL	63	1,012,000	Ash and Coal Waste	No Liner	No	No
SI	Vermilion	IlliNois Power Co.	Vermilion	IL	43	8,100,000	Ash and Coal Waste	No Liner	No	Yes
SI	Petersburg	Indianapolis Power & Light Co.	Pike	IN	250	19,750,000	Ash	Clay	No	Yes
LF	A B Brown	Southern Indiana Gas & Elec. Co.	Posey	IN	176	10,360,000	Ash	Clay	Yes	Yes
LF	Gibson	PSI Energy, Inc.	Gibson	IN	85	20,000,000	Ash	Clay	No	Yes
SI	R Gallagher	PSI Energy, Inc.	Floyd	IN	170	20,000,000	Ash and Coal Waste	Clay	No	No
SI	Warrick	Southern Indiana Gas & Elec. Co.	Warrick	IN	140	4,500,000	Ash and Coal Waste	Clay	No	No
SI	Petersburg	Indianapolis Power & Light Co.	Pike	IN	157	Not Reported	Ash	No Liner	No	No
LF	Merom	Hoosier Energy R E C, Inc.	Sullivan	IN	65	8,500,000	Ash	No Liner	No	Yes
LF	R M Schahfer	Northern Indiana Pub. Serv. Co.	Jasper	IN	200	17,200,000	Ash	No Liner	No	Yes
SI	Cayuga	PSI Energy, Inc.	Vermillion	IN	280	25,000,000	Ash and Coal Waste	No Liner	No	No
SI	F B Culley	Southern Indiana Gas & Elec. Co.	Warrick	IN	82	2,600,000	Ash and Coal Waste	No Liner	No	Yes
SI	Frank E Ratts	Hoosier Energy R E C, Inc.	Pike	IN	39	1,250,000	Ash and Coal Waste	No Liner	No	No
SI	Gibson	PSI Energy, Inc.	Gibson	IN	875	55,000,000	Ash and Coal Waste	No Liner	No	No
SI	R M Schahfer	Northern Indiana Pub. Serv. Co.	Jasper	IN	80	1,030,000	Ash and Coal Waste	No Liner	No	No

Combined Attachments 1 and 2 - Surface Impoundments and Landfills Analyzed in EPA Risk Assessment (Unlined and Clay-Lined)

WMU Type	Plant	Utility Name	County	State	Area (acres)	Capacity (cubic yards)	Waste Type	Liner Type	Leachate Collection System	Groundwater Monitoring
SI	Wabash River	PSI Energy, Inc.	Vigo	IN	120	14,000,000	Ash and Coal Waste	No Liner	No	No
LF	GeNoa	PSI Energy, Inc.	Gibson	IN	100	Not Reported	Ash and Coal Waste	No Liner	No	Yes
LF	Lawrence EC	KPL Western Resources Co.	Douglas	KS	825	34,300,000	Ash	Clay	No	Yes
LF	Lawrence EC	KPL Western Resources Co.	Douglas	KS	30	1,000,000	Ash	Clay	No	Yes
LF	Lawrence EC	KPL Western Resources Co.	Douglas	KS	22	1,360,000	Ash	Clay	No	Yes
LF	Tecumseh EC	KPL Western Resources Co.	Shawnee	KS	540	Not Reported	Ash	Clay	No	Yes
LF	Holcomb	Sunflower Electric Power Corp.	Finney	KS	8	Not Reported	Ash	No Liner	No	Yes
SI	Trimble County	Louisville Gas & Electric Co.	Trimble	KY	115	6,856,667	Ash	Clay	No	Yes
SI	E W Brown	Kentucky Utilities Co.	Mercer	KY	84	2,710,000	Ash	No Liner	No Data	No Data
SI	E W Brown	Kentucky Utilities Co.	Mercer	KY	33	1,000,000	Ash	No Liner	No Data	No Data
SI	Paradise	Tennessee Valley Authority	Muhlenberg	KY	200	5,000,000	Ash	No Liner	No	No
SI	Tyrone	Kentucky Utilities Co.	Woodford	KY	6	351,699	Ash	No Liner	No	No
SI	Big Sandy	Kentucky Power Co.	Lawrence	KY	115	12,052,100	Ash and Coal Waste	No Liner	No	Yes
SI	Dale	East Kentucky Power Coop, Inc.	Clark	KY	115	7,408,274	Ash and Coal Waste	No Liner	No	Yes
SI	Green River	Kentucky Utilities Co.	Muhlenberg	KY	36	2,331,219	Ash and Coal Waste	No Liner	No	No
SI	Shawnee	Tennessee Valley Authority	McCracken	KY	180	5,810,000	Ash and Coal Waste	No Liner	No	Yes
SI	Tyrone	Kentucky Utilities Co.	Woodford	KY	8	500,123	Ash and Coal Waste	No Liner	No	No
SI	Tyrone	Kentucky Utilities Co.	Woodford	KY	5	327,500	Ash and Coal Waste	No Liner	No	No
LF	Dolet Hills	CLECO Corporation	De Soto	LA	109	8,500,000	Ash	Clay	Yes	Yes
SI	Big Cajun 2	Cajun Electric Power Coop, Inc.	Pointe Coupee	LA	241	4,990,003	Ash	Clay	No	No
SI	Rodemacher	CLECO Corporation	Rapides	LA	109	2,500,000	Ash	Clay	No	Yes
SI	Rodemacher	CLECO Corporation	Rapides	LA	36	1,200,000	Ash	Clay	No	Yes
SI	Dolet Hills	CLECO Corporation	De Soto	LA	66	850,000	Ash and Coal Waste	No Liner	Yes	Yes
LF	C P Crane	Baltimore Gas & Electric Co.	Baltimore City	MD	35	800,000	Ash	No Liner	No	Yes
LF	Dickerson	Potomac Electric Power Co.	Montgomery	MD	206	12,600,000	Ash	No Liner	Yes	Yes
LF	Brandon Shores	Baltimore Gas & Electric Co.	Anne Arundel	MD	246	5,600,000	Ash and Coal Waste	No Liner	No	Yes
LF	Chalk Point	Potomac Electric Power Co.	Prince Georges	MD	596	4,634,000	Ash and Coal Waste	No Liner	No	No
LF	Morgantown	Potomac Electric Power Co.	Charles	MD	212	7,700,000	Ash and Coal Waste	No Liner	Yes	Yes
SI	Eckert Station	Lansing, City of	Ingham	MI	151	7,200,000	Ash	No Liner	No	No
SI	J R Whiting	Consumers Energy Co.	Monroe	MI	6	140,000	Ash	No Liner	No	No
SI	Monroe	Detroit Edison Co.	Monroe	MI	400	15,000,000	Ash	No Liner	No	No

Combined Attachments 1 and 2 - Surface Impoundments and Landfills Analyzed in EPA Risk Assessment (Unlined and Clay-Lined)

WMU Type	Plant	Utility Name	County	State	Area (acres)	Capacity (cubic yards)	Waste Type	Liner Type	Leachate Collection System	Groundwater Monitoring
LF	Eckert Station	Lansing, City of	Ingham	MI	174	6,460,000	Ash	No Liner	No	Yes
LF	Presque Isle	Wisconsin Electric Power Co.	Marquette	MI	292	14,200,000	Ash	No Liner	No	Yes
SI	J H Campbell	Consumers Energy Co.	Ottawa	MI	267	6,900,000	Ash and Coal Waste	No Liner	No	Yes
LF	Monroe	Detroit Edison Co.	Monroe	MI	400	20,000,000	Ash and Coal Waste	No Liner	No	No
SI	Syl Laskin	Minnesota Power, Inc.	St Louis	MN	75	726,000	Ash and Coal Waste	No Liner	No	Yes
LF	Hoot Lake	Otter Tail Power Co.	Otter Tail	MN	72	800,000	Ash and Coal Waste	No Liner	No	Yes
SI	Blue Valley	Independence, City of	Jackson	MO	23	372,000	Ash and Coal Waste	Clay	No Data	No Data
SI	Meramec	Union Electric Co.	St Louis	MO	61	591,200	Ash and Coal Waste	No Liner	No	No
LF	Victor J Daniel Jr	Mississippi Power Co.	Jackson	MS	49	Not Reported	Ash	Clay	Yes	No
SI	Jack Watson	Mississippi Power Co.	Harrison	MS	100	Not Reported	Ash	No Liner	No	No
LF	Colstrip	Montana Power Co.	Rosebud	MT	9	Not Reported	Ash	No Liner	No	Yes
SI	Cliffside	Duke Power Co.	Cleveland	NC	82	2,200,000	Ash	Clay	No	No
SI	Asheville	Carolina Power & Light Co.	Buncombe	NC	140	3,200,000	Ash	No Liner	No	No
SI	Cape Fear	Carolina Power & Light Co.	Chatham	NC	60	2,300,000	Ash	No Liner	No	Yes
SI	Mayo	Carolina Power & Light Co.	Person	NC	65	2,400,000	Ash	No Liner	No	No
SI	Mayo	Carolina Power & Light Co.	Person	NC	30	185,000	Ash	No Liner	No	Yes
SI	Riverbend	Duke Power Co.	Gaston	NC	143	3,200,000	Ash	No Liner	No	No
LF	Belews Creek	Duke Power Co.	Stokes	NC	315	14,000,000	Ash	No Liner	No	No
LF	Marshall	Duke Power Co.	Catawba	NC	110	7,826,000	Ash	No Liner	No	Yes
LF	Roxboro	Carolina Power & Light Co.	Person	NC	55	4,165,000	Ash	No Liner	No	Yes
SI	Belews Creek	Duke Power Co.	Stokes	NC	512	2,200,000	Ash and Coal Waste	No Liner	Yes	Yes
SI	Buck	Duke Power Co.	Rowan	NC	90	4,840,000	Ash and Coal Waste	No Liner	No	Yes
SI	Dan River	Duke Power Co.	Rockingham	NC	72	2,097,000	Ash and Coal Waste	No Liner	Yes	Yes
SI	G G Allen	Duke Power Co.	Gaston	NC	210	6,545,000	Ash and Coal Waste	No Liner	No	No
SI	L V Sutton	Carolina Power & Light Co.	New HaNover	NC	162	7,696,000	Ash and Coal Waste	No Liner	No	No
SI	Lee	Carolina Power & Light Co.	Wayne	NC	35	1,936,000	Ash and Coal Waste	No Liner	No	No
SI	Marshall	Duke Power Co.	Catawba	NC	340	19,689,000	Ash and Coal Waste	No Liner	No	No
SI	W H Weatherspoon	Carolina Power & Light Co.	Robeson	NC	26	1,200,000	Ash and Coal Waste	No Liner	No	Yes
LF	Leland Olds	Basin Electric Power Coop	Mercer	ND	37	1,800,000	Ash	Clay	Yes	Yes
LF	Coal Creek	Coop Power Assn.	McLean	ND	70	4,700,000	Ash	Clay	No	Yes
LF	Milton R Young	Minnkota Power Coop, Inc.	Oliver	ND	80	6,500,000	Ash	Clay	No	Yes

Combined Attachments 1 and 2 - Surface Impoundments and Landfills Analyzed in EPA Risk Assessment (Unlined and Clay-Lined)

WMU Type	Plant	Utility Name	County	State	Area (acres)	Capacity (cubic yards)	Waste Type	Liner Type	Leachate Collection System	Groundwater Monitoring
LF	Antelope Valley	Basin Electric Power Coop	Mercer	ND	27	3,500,000	Ash	No Liner	Yes	Yes
LF	Leland Olds	Basin Electric Power Coop	Mercer	ND	20	458,000	Ash and Coal Waste	No Liner	No	Yes
LF	Sheldon	Nebraska Public Power District	Lancaster	NE	9	375,000	Ash	Clay	No	Yes
LF	Nebraska City	Omaha Public Power District	Otoe	NE	17	600,000	Ash and Coal Waste	Clay	No	No
LF	North Omaha	Omaha Public Power District	Douglas	NE	13	105,000	Ash and Coal Waste	Clay	No	No
LF	Lon Wright	Fremont, City of	Dodge	NE	Not Reported	170,000	Ash	No Liner	No	Yes
LF	Mohave	Southern California Edison Co.	Clark	NV	250	21,500,000	Ash	No Liner	No	Yes
LF	Reid Gardner	Nevada Power Co.	Clark	NV	113	4,520,000	Ash	No Liner	No	Yes
LF	Dunkirk	Niagara Mohawk Power Corp.	Chautauqua	NY	12	1,126,080	Ash	Clay	Yes	Yes
LF	Richard Gorsuch	American Mun. Power-Ohio, Inc.	Washington	OH	Not Reported	3,003,600	Ash	Clay	Yes	Yes
LF	Conesville	Columbus Southern Power Co.	Coshocton	OH	300	10,000,000	Ash	Clay	No	No
LF	Gen J M Gavin	Ohio Power Co.	Gallia	OH	99	12,000,000	Ash	Clay	Yes	Yes
LF	Miami Fort	Cincinnati Gas & Electric Co.	Hamilton	OH	80	4,000,000	Ash	Clay	Yes	Yes
SI	Killen Station	Dayton Power & Light Co.	Adams	OH	Not Reported	99,935	Ash and Coal Waste	Clay	No	Yes
SI	Cardinal	Cardinal Operating Co.	Jefferson	OH	123	8,437,500	Ash	No Liner	No	No
SI	J M Stuart	Dayton Power & Light Co.	Adams	OH	88	8,357,000	Ash	No Liner	No	Yes
SI	Walter C Beckjord	Cincinnati Gas & Electric Co.	Clermont	OH	Not Reported	2,000,000	Ash	No Liner	No	No
LF	Bay Shore	Toledo Edison Co.	Lucas	OH	85	Not Reported	Ash	No Liner	No	Yes
LF	Walter C Beckjord	Cincinnati Gas & Electric Co.	Clermont	OH	14	1,000,000	Ash	No Liner	No	Yes
SI	Gen J M Gavin	Ohio Power Co.	Gallia	OH	300	30,000,000	Ash and Coal Waste	No Liner	No	No
LF	Conesville	Columbus Southern Power Co.	Coshocton	OH	100	2,500,000	Ash and Coal Waste	No Liner	Yes	Yes
LF	Muskogee	Oklahoma Gas & Electric Co.	Muskogee	OK	36	1,247,112	Ash	Clay	No	Yes
SI	Hugo	Western Farmers Elec. Coop, Inc.	Choctaw	OK	151	Not Reported	Ash and Coal Waste	Clay	No	No
LF	Hugo	Western Farmers Elec. Coop, Inc.	Choctaw	OK	40	4,000,000	Ash	No Liner	No	No
LF	Hunter	Western Farmers Elec. Coop, Inc.	Choctaw	OK	280	12,000,000	Ash	No Liner	No	No
LF	Northeastern	Public Service Co. of Oklahoma	Rogers	OK	69	3,185,190	Ash	No Liner	No	Yes
LF	Mitchell - PA	West Penn Power Co.	Washington	PA	70	5,600,000	Ash	No Liner	Yes	Yes
LF	Shawville	GPU Service Corporation	Clearfield	PA	68	8,000,000	Ash	No Liner	Yes	Yes
LF	Hatfield's Ferry	West Penn Power Co.	Greene	PA	20	790,000	Ash and Coal Waste	No Liner	Yes	Yes
LF	Keystone	GPU Service Corporation	Armstrong	PA	155	22,663,120	Ash and Coal Waste	No Liner	Yes	Yes
LF	Portland	Metropolitan Edison Co.	Northampton	PA	15	2,200,000	Ash and Coal Waste	No Liner	No	Yes

Combined Attachments 1 and 2 - Surface Impoundments and Landfills Analyzed in EPA Risk Assessment (Unlined and Clay-Lined)

WMU Type	Plant	Utility Name	County	State	Area (acres)	Capacity (cubic yards)	Waste Type	Liner Type	Leachate Collection System	Groundwater Monitoring
LF	Cross	South Carolina Pub Serv. Auth.	Berkeley	SC	60	Not Reported	Ash and Coal Waste	Clay	No	Yes
LF	Cross	South Carolina Pub Serv. Auth.	Berkeley	SC	320	Not Reported	Ash	No Liner	No	Yes
SI	H B Robinson	Carolina Power & Light Co.	Darlington	SC	30	Not Reported	Ash and Coal Waste	No Liner	No	No
SI	W S Lee	Duke Power Co.	Anderson	SC	41	1,634,000	Ash and Coal Waste	No Liner	No	Yes
LF	Cross	South Carolina Pub Serv. Auth.	Berkeley	SC	230	Not Reported	Ash and Coal Waste	No Liner	Yes	Yes
LF	Cross	South Carolina Pub Serv. Auth.	Berkeley	SC	30	Not Reported	Ash and Coal Waste	No Liner	No	Yes
LF	Cross	South Carolina Pub Serv. Auth.	Berkeley	SC	30	Not Reported	Ash and Coal Waste	No Liner	No	Yes
LF	Ben French	Black Hills Corp.	Pennington	SD	5	Not Reported	Ash	Clay	No	Yes
LF	Big Stone	Otter Tail Power Co.	Grant	SD	3	80,000	Ash	Clay	No	No
LF	Big Stone	Otter Tail Power Co.	Grant	SD	106	8,000,000	Ash	No Liner	No	No
LF	John Sevier	Tennessee Valley Authority	Hawkins	TN	51	4,800,000	Ash	Clay	No	Yes
SI	Allen	Tennessee Valley Authority	Shelby	TN	85	1,500,000	Ash	No Liner	No Data	No Data
SI	Cumberland	Tennessee Valley Authority	Stewart	TN	295	9,500,000	Ash	No Liner	No	Yes
SI	Bull Run	Tennessee Valley Authority	Anderson	TN	41	650,000	Ash and Coal Waste	No Liner	No	No
SI	Cumberland	Tennessee Valley Authority	Stewart	TN	75	1,750,000	Ash and Coal Waste	No Liner	No	Yes
SI	Gallatin	Tennessee Valley Authority	Sumner	TN	341	4,300,000	Ash and Coal Waste	No Liner	No	Yes
SI	John Sevier	Tennessee Valley Authority	Hawkins	TN	105	7,000,000	Ash and Coal Waste	No Liner	No	Yes
SI	John Sevier	Tennessee Valley Authority	Hawkins	TN	57	1,600,000	Ash and Coal Waste	No Liner	No	Yes
SI	Johnsonville	Tennessee Valley Authority	Humphreys	TN	91	2,900,000	Ash and Coal Waste	No Liner	No	Yes
SI	Kingston	Tennessee Valley Authority	Roane	TN	275	8,900,000	Ash and Coal Waste	No Liner	No	Yes
SI	Kingston	Tennessee Valley Authority	Roane	TN	41	11,000,000	Ash and Coal Waste	No Liner	No	Yes
LF	W A Parish	Houston Lighting & Power Co.	Fort Bend	TX	29	Not Reported	Ash	Clay	No	Yes
SI	Fayette Power Prj.	Lower Colorado River Authority	Fayette	TX	190	4,351,644	Ash	Clay	No	No
LF	Martin Lake	Texas Utilities Electric Co.	Rusk	TX	290	30,000,000	Ash	Clay	No	Yes
LF	Sandow	Texas Utilities Electric Co.	Milam	TX	125	1,300,000	Ash	Clay	No	Yes
SI	Coleto Creek	Central Power & Light Co.	Goliad	TX	315	Not Reported	Ash and Coal Waste	Clay	No	Yes
SI	Oklaunion	West Texas Utilities Co.	Wilbarger	TX	291	6,056,820	Ash	No Liner	No	No
SI	Oklaunion	West Texas Utilities Co.	Wilbarger	TX	19	718,060	Ash	No Liner	No	No
SI	Oklaunion	West Texas Utilities Co.	Wilbarger	TX	11	408,940	Ash and Coal Waste	No Liner	No	No
SI	Sandow	Texas Utilities Electric Co.	Milam	TX	45	1,351,973	Ash and Coal Waste	No Liner	No	No
LF	Sandow	Texas Utilities Electric Co.	Milam	TX	48	903,467	Ash and Coal Waste	No Liner	No	No

Combined Attachments 1 and 2 - Surface Impoundments and Landfills Analyzed in EPA Risk Assessment (Unlined and Clay-Lined)

WMU Type	Plant	Utility Name	County	State	Area (acres)	Capacity (cubic yards)	Waste Type	Liner Type	Leachate Collection System	Groundwater Monitoring
LF	Huntington	PacifiCorp	Emery	UT	70	11,400,000	Ash	No Liner	Yes	No
LF	Intermountain	Los Angeles, City of	Millard	UT	339	17,800,000	Ash	No Liner	No	Yes
LF	Carbon	PacifiCorp	Carbon	UT	12	Not Reported	Ash and Coal Waste	No Liner	No	No
SI	Possum Point	Virginia Electric & Power Co.	Prince William	VA	56	Not Reported	Ash and Coal Waste	No Liner	No	No
LF	Port Washington	Wisconsin Electric Power Co.	Ozaukee	WI	300	1,900,000	Ash and Coal Waste	Clay	No	Yes
LF	South Oak Creek	Wisconsin Electric Power Co.	Milwaukee	WI	45	4,050,000	Ash and Coal Waste	Clay	Yes	Yes
LF	Valley	Wisconsin Electric Power Co.	Milwaukee	WI	16	534,000	Ash and Coal Waste	Clay	No	Yes
LF	Bay Front	Northern States Power Co.	Ashland	WI	10	350,000	Ash	No Liner	No	Yes
LF	South Oak Creek	Wisconsin Electric Power Co.	Milwaukee	WI	130	4,600,000	Ash	No Liner	No	Yes
LF	Weston	Wisconsin Public Service Corp.	Marathon	WI	18	600,000	Ash	No Liner	No	Yes
LF	Edgewater	Wisconsin Power & Light Co.	Sheboygan	WI	25	1,655,700	Ash and Coal Waste	No Liner	No	Yes
LF	John E Amos	Appalachian Power Co.	Putnam	WV	200	14,000,000	Ash and Coal Waste	Clay	Yes	Yes
LF	Mt Storm	Virginia Electric & Power Co.	Grant	WV	900	8,800,000	Ash and Coal Waste	Clay	Yes	Yes
SI	Harrison	MoNongahela Power Co.	Harrison	WV	300	28,000,000	Ash	No Liner	No	Yes
SI	John E Amos	Appalachian Power Co.	Putnam	WV	100	13,000,000	Ash	No Liner	No	No
SI	John E Amos	Appalachian Power Co.	Putnam	WV	10	3,078,000	Ash	No Liner	No	No
LF	Fort Martin	MoNongahela Power Co.	MoNongalia	WV	17	1,900,000	Ash	No Liner	Yes	Yes
SI	Mitchell - WV	Ohio Power Co.	Marshall	WV	Not Reported	12,030,000	Ash and Coal Waste	No Liner	No	No
LF	Dave Johnston	PacifiCorp	Converse	WY	45	296,100	Ash	Clay	Yes	Yes
SI	Laramie R Station	Basin Electric Power Coop	Platte	WY	11	464,156	Ash and Coal Waste	Clay	No	Yes
LF	Jim Bridger	PacifiCorp	Sweetwater	WY	120	7,940,941	Ash	No Liner	No	Yes
SI	Jim Bridger	PacifiCorp	Sweetwater	WY	140	3,400,000	Ash and Coal Waste	No Liner	No	Yes
SI	Jim Bridger	PacifiCorp	Sweetwater	WY	125	6,500,000	Ash and Coal Waste	No Liner	No	Yes
LF	Jim Bridger	PacifiCorp	Sweetwater	WY	241	24,000,000	Ash and Coal Waste	No Liner	Yes	Yes

Source: U.S. Env'tl. Prot. Agency (EPA), Human and Ecological Risk Assessment of Coal Combustion Wastes (released as part of a Notice of Data Availability) (Aug. 6, 2007) (draft) Attachments B-1 & B-2.

Attachment 3 - Surface Impoundment and Landfill Disposal Data Reported to the Energy Information Administration (2005)¹

Utility	Plant	State	County	Fly Ash Disposed in Landfill (tons)	Bottom Ash Disposed in Landfill (tons)	Fly Ash Disposed in Surface Impoundment (tons)	Bottom Ash Disposed in Surface Impoundment (tons)
Alabama Power Co	Barry	AL	Mobile	0	0	226,300	56,600
Alabama Electric Coop Inc	Charles R Lowman	AL	Washington	18,900	0	17,700	10,700
Tennessee Valley Authority	Colbert	AL	Colbert	262,900	0	0	29,200
Alabama Power Co	E C Gaston	AL	Shelby	284,000	89,100	0	0
Alabama Power Co	Gadsden	AL	Etowah	0	0	27,300	6,800
Alabama Power Co	Gorgas	AL	Walker	0	48,000	304,900	0
Alabama Power Co	Greene County	AL	Greene	0	0	171,500	40,400
Alabama Power Co	James H Miller Jr	AL	Jefferson	108,300	92,300	0	61,500
Tennessee Valley Authority	Widows Creek	AL	Jackson	0	0	407,600	0
Domtar Industries Inc	Ashdown	AR	Little River	0	0	6,000	34,300
Southwestern Electric Power Co	Flint Creek	AR	Benton	33,100	0	0	19,400
Entergy Arkansas Inc	Independence	AR	Independence	71,720	51,020	0	0
Entergy Arkansas Inc	White Bluff	AR	Jefferson	67,000	61,800	0	0
Arizona Electric Pwr Coop Inc	Apache Station	AZ	Cochise	0	0	14,000	19,000
Arizona Public Service Co	Cholla	AZ	Navajo	0	0	142,000	116,000
Salt River Proj Ag I & P Dist	Coronado	AZ	Apache	15,000	56,000	0	0
UNS Electric Inc	H Wilson Sundt Generating Station	AZ	Pima	3,200	0	0	0
Salt River Proj Ag I & P Dist	Navajo	AZ	Coconino	28,700	134,450	0	0
UNS Electric Inc	Springerville	AZ	Apache	517,540	184,440	0	0
Public Service Co of Colorado	Hayden	CO	Routt	187,900	41,700	0	0
Colorado Springs City of	Martin Drake	CO	El Paso	115,600	16,500	0	0
Tri-State G & T Assn Inc	Nucla	CO	Montrose	113,000	22,600	0	0
Public Service Co of Colorado	Pawnee	CO	Morgan	1,380	0	0	0
Platte River Power Authority	Rawhide	CO	Larimer	51,200	3,000	2,700	3,000
Colorado Springs City of	Ray D Nixon	CO	El Paso	33,200	4,500	0	0
Public Service Co of Colorado	Valmont	CO	Boulder	46,300	8,400	0	0
Indian River Operations Inc	Indian River Generating Station	DE	Sussex	141,000	8,000	0	0
Tampa Electric Co	Big Bend	FL	Hillsborough	0	0	200	0
Gulf Power Co	Crist	FL	Escambia	124,500	14,300	0	0
Progress Energy Florida Inc	Crystal River	FL	Citrus	17,300	39,800	0	0
Gainesville Regional Utilities	Deerhaven Generating Station	FL	Alachua	400	0	0	0

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Utility	Plant	State	County	Fly Ash Disposed in Landfill (tons)	Bottom Ash Disposed in Landfill (tons)	Fly Ash Disposed in Surface Impoundment (tons)	Bottom Ash Disposed in Surface Impoundment (tons)
Gulf Power Co	Lansing Smith	FL	Bay	0	0	63,300	7,000
JEA	Northside Generating Station	FL	Duval	76,400	234,800	0	0
Seminole Electric Coop Inc	Seminole	FL	Putnam	250,000	0	0	0
JEA	St Johns River Power Park	FL	Duval	156,400	400	0	0
Orlando Utilities Comm	Stanton Energy Center	FL	Orange	17,600	1,400	0	0
Georgia Power Co	Bowen	GA	Bartow	215,200	0	93,300	0
Georgia Power Co	Hammond	GA	Floyd	144,700	25,500	0	0
Georgia Power Co	Harlee Branch	GA	Putnam	0	0	344,300	72,000
International Paper Co	International Paper Savanna Mill	GA	Chatham	2,120	0	0	0
Georgia Power Co	Jack McDonough	GA	Cobb	115,820	3,930	0	0
Savannah Electric & Power Co	Kraft	GA	Chatham	0	0	0	10,000
Savannah Electric & Power Co	McIntosh	GA	Effingham	0	0	9,400	5,600
Georgia Power Co	Scherer	GA	Monroe	0	0	359,500	111,100
Georgia Power Co	Wansley	GA	Heard	0	0	455,100	81,600
Georgia Power Co	Yates	GA	Coweta	255,400	62,900	0	0
MidAmerican Energy Co	Council Bluffs	IA	Pottawattamie	0	0	68,900	35,600
MidAmerican Energy Co	George Neal North	IA	Woodbury	91,500	0	0	50,200
MidAmerican Energy Co	George Neal South	IA	Woodbury	0	14,800	0	0
Interstate Power & Light Co	Lansing	IA	Allamakee	0	0	18,500	5,500
MidAmerican Energy Co	Louisa	IA	Louisa	35,600	0	0	23,000
Muscatine City of	Muscatine Plant #1	IA	Muscatine	8,700	0	0	0
Dynegy Midwest Generation Inc	Baldwin Energy Complex	IL	Randolph	0	0	114,000	2,000
Springfield City of	Dallman	IL	Sangamon	0	0	61,200	10,900
Ameren Energy Resources Generating	Duck Creek	IL	Fulton	0	0	44,000	19,000
Ameren Energy Resources Generating	E D Edwards	IL	Peoria	0	0	0	52,000
Dynegy Midwest Generation Inc	Havana	IL	Mason	0	0	70,000	16,000
Dynegy Midwest Generation Inc	Hennepin Power Station	IL	Putnam	0	0	11,900	8,900
Ameren Energy Generating Co	Hutsonville	IL	Crawford	0	0	26,000	5,000
Ameren Energy Generating Co	Meredosia	IL	Morgan	0	0	34,000	14,000
Ameren Energy Generating Co	Newton	IL	Jasper	8,000	0	35,000	74,000
Dynegy Midwest Generation Inc	Vermilion	IL	Vermilion	0	0	8,400	5,300

Attachment 3 - Surface Impoundment and Landfill Disposal Data Reported to the Energy Information Administration (2005)¹

Utility	Plant	State	County	Fly Ash Disposed in Landfill (tons)	Bottom Ash Disposed in Landfill (tons)	Fly Ash Disposed in Surface Impoundment (tons)	Bottom Ash Disposed in Surface Impoundment (tons)
Dynegy Midwest Generation Inc	Wood River	IL	Madison	0	0	8,100	6,100
Southern Indiana Gas & Elec Co	A B Brown	IN	Posey	0	0	132,600	33,150
Northern Indiana Pub Serv Co	Bailly	IN	Porter	18,500	0	0	0
PSI Energy Inc	Cayuga	IN	Vermillion	0	0	168,700	42,200
Indiana-Kentucky Electric Corp	Clifty Creek	IN	Jefferson	112,400	800	0	21,700
PSI Energy Inc	Edwardsport	IN	Knox	0	0	9,200	2,300
Southern Indiana Gas & Elec Co	F B Culley	IN	Warrick	0	0	5,800	29,800
Hoosier Energy R E C Inc	Frank E Ratts	IN	Pike	0	0	33,800	6,000
PSI Energy Inc	Gibson	IN	Gibson	0	0	718,200	179,600
Indianapolis Power & Light Co	Harding Street	IN	Marion	0	0	133,900	42,000
Hoosier Energy R E C Inc	Merom	IN	Sullivan	286,700	31,900	0	0
Northern Indiana Pub Serv Co	Michigan City	IN	La Porte	25,700	0	0	0
PSI Energy Inc	R Gallagher	IN	Floyd	0	0	100,500	25,100
Northern Indiana Pub Serv Co	R M Schahfer	IN	Jasper	151,600	0	0	0
Indiana Michigan Power Co	Rockport	IN	Spencer	399,400	0	0	11,800
Indiana Michigan Power Co	Tanners Creek	IN	Dearborn	0	0	140,600	0
PSI Energy Inc	Wabash River	IN	Vigo	0	0	153,700	38,400
Alcoa Power Generating Inc	Warrick	IN	Warrick	0	0	193,600	48,300
Sunflower Electric Power Corp	Holcomb	KS	Finney	63,700	16,100	0	0
Westar Energy	Jeffrey Energy Center	KS	Pottawatomie	0	0	167,500	16,600
Kansas City Power & Light Co	La Cygne	KS	Linn	50,900	0	0	0
Westar Energy	Lawrence Energy Center	KS	Douglas	88,800	22,400	0	0
Kansas City City of	Nearman Creek	KS	Wyandotte	0	0	0	10,200
Westar Energy	Tecumseh Energy Center	KS	Shawnee	9,400	9,500	0	0
Kentucky Power Co	Big Sandy	KY	Lawrence	0	0	272,900	25,400
Louisville Gas & Electric Co	Cane Run	KY	Jefferson	117,400	0	6,200	30,900
East Kentucky Power Coop Inc	Cooper	KY	Pulaski	75,400	18,900	0	0
Western Kentucky Energy Corp	D B Wilson	KY	Ohio	112,400	29,900	0	0
East Kentucky Power Coop Inc	Dale	KY	Clark	0	0	48,000	12,000
Kentucky Utilities Co	E W Brown	KY	Mercer	0	0	112,400	28,100
Cincinnati Gas & Electric Co	East Bend	KY	Boone	0	0	138,300	34,600

Attachment 3 - Surface Impoundment and Landfill Disposal Data Reported to the Energy Information Administration (2005)¹

Utility	Plant	State	County	Fly Ash Disposed in Landfill (tons)	Bottom Ash Disposed in Landfill (tons)	Fly Ash Disposed in Surface Impoundment (tons)	Bottom Ash Disposed in Surface Impoundment (tons)
Kentucky Utilities Co	Ghent	KY	Carroll	0	0	507,100	127,600
Kentucky Utilities Co	Green River	KY	Muhlenberg	0	0	24,500	6,100
East Kentucky Power Coop Inc	H L Spurlock	KY	Mason	541,700	0	4,300	0
Western Kentucky Energy Corp	HMP&L Station Two Henderson	KY	Henderson	45,300	0	0	12,300
Western Kentucky Energy Corp	Kenneth C Coleman	KY	Hancock	145,300	38,600	0	0
Louisville Gas & Electric Co	Mill Creek	KY	Jefferson	170,600	0	36,000	28,700
Tennessee Valley Authority	Paradise	KY	Muhlenberg	0	0	125,700	0
Western Kentucky Energy Corp	R D Green	KY	Webster	117,800	0	0	21,800
Tennessee Valley Authority	Shawnee	KY	McCracken	243,600	0	0	61,100
Louisville Gas & Electric Co	Trimble County	KY	Trimble	0	0	130,200	20,700
Kentucky Utilities Co	Tyrone	KY	Woodford	0	0	15,100	3,800
Louisiana Generating LLC	Big Cajun 2	LA	Pointe Coupee	0	0	132,300	7,100
Cleco Power LLC	Dolet Hills	LA	De Soto	425,100	0	0	51,900
International Paper Co	Mansfield Mill	LA	De Soto	0	14,500	0	0
Mirant Mid-Atlantic LLC	Chalk Point LLC	MD	Prince Georges	167,000	0	0	0
Mirant Mid-Atlantic LLC	Dickerson	MD	Montgomery	202,000	0	0	0
Mirant Mid-Atlantic LLC	Morgantown Generating Plant	MD	Charles	52,800	1,500	0	0
Allegheny Energy Supply Co LLC	R Paul Smith Power Station	MD	Washington	0	0	20,100	5,000
MeadWestvaco Corp	Rumford Cogeneration	ME	Oxford	11,500	3,500	0	0
S D Warren Co	Somerset Plant	ME	Somerset	688,800	154,900	0	0
Detroit Edison Co	Belle River	MI	St Clair	68,000	48,000	0	0
Consumers Energy Co	Dan E Karn	MI	Bay	0	0	108,800	0
Lansing City of	Erickson Station	MI	Eaton	0	0	0	5,100
MeadWestvaco Corp	Escanaba Paper Company	MI	Delta	51,100	3,400	0	0
Detroit Edison Co	Harbor Beach	MI	Huron	12,500	600	0	0
Consumers Energy Co	J C Weadock	MI	Bay	0	0	69,900	0
Consumers Energy Co	J H Campbell	MI	Ottawa	200,400	0	0	0
Consumers Energy Co	J R Whiting	MI	Monroe	30,500	0	3,400	0
Detroit Edison Co	Monroe	MI	Monroe	0	0	482,000	0
Wisconsin Electric Power Co	Presque Isle	MI	Marquette	74,100	8,000	0	0
Detroit Edison Co	St Clair	MI	St Clair	99,900	34,000	0	0

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Utility	Plant	State	County	Fly Ash Disposed in Landfill (tons)	Bottom Ash Disposed in Landfill (tons)	Fly Ash Disposed in Surface Impoundment (tons)	Bottom Ash Disposed in Surface Impoundment (tons)
Detroit Edison Co	Trenton Channel	MI	Wayne	122,000	17,000	0	0
Northern States Power Co	Allen S King	MN	Washington	38,300	300	0	0
Northern States Power Co	Black Dog	MN	Dakota	1,000	0	0	4,800
Allete Inc	Clay Boswell	MN	Itasca	0	0	105,600	57,800
Northern States Power Co	High Bridge	MN	Ramsey	0	0	10	0
Otter Tail Power Co	Hoot Lake	MN	Otter Tail	15,300	6,400	0	0
Northern States Power Co	Riverside	MN	Hennepin	14,300	0	2,400	4,300
Northern States Power Co	Sherburne County	MN	Sherburne	207,600	0	355,700	0
Cleveland Cliffs Inc	Silver Bay Power	MN	Lake	14,100	5,500	0	0
Allete Inc	Syl Laskin	MN	St Louis	0	0	16,100	4,100
Allete Inc	Taconite Harbor Energy Center	MN	Cook	26,100	6,700	0	0
Empire District Electric Co	Asbury	MO	Jasper	0	0	21,400	32,100
Independence City of	Blue Valley	MO	Jackson	0	0	23,800	5,950
Kansas City Power & Light Co	Iatan	MO	Platte	0	0	16,400	0
Springfield City of	James River Power Station	MO	Greene	22,500	0	0	0
Ameren UE	Labadie	MO	Franklin	0	0	98,000	152,000
Ameren UE	Meramec	MO	St Louis	0	0	62,000	49,000
Kansas City Power & Light Co	Montrose	MO	Henry	53,800	0	0	0
Associated Electric Coop Inc	New Madrid	MO	New Madrid	0	0	85,400	23,800
Ameren UE	Rush Island	MO	Jefferson	0	0	15,000	81,000
Aquila Inc	Sibley	MO	Jackson	51,500	0	0	0
Sikeston City of	Sikeston Power Station	MO	Scott	0	0	2,400	8,900
Ameren UE	Sioux	MO	St Charles	0	0	66,000	36,000
Springfield City of	Southwest Power Station	MO	Greene	22,200	17,700	0	0
Associated Electric Coop Inc	Thomas Hill	MO	Randolph	54,000	0	0	0
Mississippi Power Co	Jack Watson	MS	Harrison	68,100	0	23,900	15,200
South Mississippi El Pwr Assn	R D Morrow	MS	Lamar	81,500	0	0	0
Tractebel Power Inc	Red Hills Generating Facility	MS	Choctaw	362,400	63,900	0	0
Mississippi Power Co	Victor J Daniel Jr	MS	Jackson	97,100	0	0	0
Weyerhaeuser Co	Weyerhaeuser Columbus MS	MS	Lowndes	0	0	60,000	0
PPL Montana LLC	Colstrip	MT	Rosebud	0	0	691,000	272,600

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Utility	Plant	State	County	Fly Ash Disposed in Landfill (tons)	Bottom Ash Disposed in Landfill (tons)	Fly Ash Disposed in Surface Impoundment (tons)	Bottom Ash Disposed in Surface Impoundment (tons)
Progress Energy Carolinas Inc	Asheville	NC	Buncombe	0	0	83,400	22,600
Duke Energy Corp	Belews Creek	NC	Stokes	218,500	0	36,800	4,600
Duke Energy Corp	Buck	NC	Rowan	0	0	97,500	24,400
Progress Energy Carolinas Inc	Cape Fear	NC	Chatham	0	0	76,000	25,300
Duke Energy Corp	Cliffside	NC	Cleveland	0	0	77,500	19,400
Duke Energy Corp	Dan River	NC	Rockingham	0	0	22,800	5,700
Duke Energy Corp	G G Allen	NC	Gaston	0	0	114,700	28,700
Progress Energy Carolinas Inc	L V Sutton	NC	New Hanover	0	0	131,500	34,500
Progress Energy Carolinas Inc	Lee	NC	Wayne	0	0	88,400	17,700
Duke Energy Corp	Marshall	NC	Catawba	0	0	28,500	5,000
Progress Energy Carolinas Inc	Mayo	NC	Person	3,400	0	166,700	46,100
Duke Energy Corp	Riverbend	NC	Gaston	0	0	74,600	18,500
Progress Energy Carolinas Inc	Roxboro	NC	Person	345,200	0	46,300	0
Progress Energy Carolinas Inc	W H Weatherspoon	NC	Robeson	0	0	37,600	9,400
Weyerhaeuser Co	Weyerhaeuser Plymouth NC	NC	Martin	0	38,600	0	0
Basin Electric Power Coop	Antelope Valley	ND	Mercer	390,100	130,200	0	0
Great River Energy	Coal Creek	ND	McLean	102,700	0	0	0
Otter Tail Power Co	Coyote	ND	Mercer	196,400	49,300	0	0
Basin Electric Power Coop	Leland Olds	ND	Mercer	147,800	0	0	194,800
Minnkota Power Coop Inc	Milton R Young	ND	Oliver	82,200	109,300	0	0
MDU Resources Group Inc	R M Heskett	ND	Morton	53,600	4,200	0	0
Great River Energy	Stanton	ND	Mercer	25,500	47,400	0	0
Nebraska Public Power District	Gerald Gentleman	NE	Lincoln	88,300	200	0	0
Fremont City of	Lon Wright	NE	Dodge	5,300	0	0	0
Omaha Public Power District	Nebraska City	NE	Otoe	41,300	0	0	0
Omaha Public Power District	North Omaha	NE	Douglas	0	5,600	0	0
Nebraska Public Power District	Sheldon	NE	Lancaster	12,400	13,400	0	0
Public Service Co of NH	Merrimack	NH	Merrimack	2,600	0	0	0
Arizona Public Service Co	Four Corners	NM	San Juan	0	0	461,700	0
Southern California Edison Co	Mohave	NV	Clark	19,800	129,500	0	0
Sierra Pacific Power Co	North Valmy	NV	Humboldt	145,800	40,400	0	0

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Utility	Plant	State	County	Fly Ash Disposed in Landfill (tons)	Bottom Ash Disposed in Landfill (tons)	Fly Ash Disposed in Surface Impoundment (tons)	Bottom Ash Disposed in Surface Impoundment (tons)
Nevada Power Co	Reid Gardner	NV	Clark	105,000	21,700	0	0
AES Cayuga LLC	AES Cayuga	NY	Tompkins	46,000	0	0	0
AES Greenidge LLC	AES Greenidge LLC	NY	Yates	49,200	0	0	0
AES Somerset LLC	AES Somerset LLC	NY	Niagara	140,000	0	0	0
NRG Huntley Operations Inc	C R Huntley Generating Station	NY	Erie	21,300	2,200	0	0
Dynegy Northeast Gen Inc	Danskammer Generating Station	NY	Orange	23,300	1,500	0	0
Dunkirk Power LLC	Dunkirk Generating Station	NY	Chautauqua	38,700	20,300	0	0
NRG Oswego Power Operations Inc	Oswego Harbor Power	NY	Oswego	400	0	0	0
Rochester Gas & Electric Corp	Rochester 7	NY	Monroe	5,620	0	0	0
Toledo Edison Co	Bay Shore	OH	Lucas	38,200	0	0	0
Cardinal Operating Co	Cardinal	OH	Jefferson	0	0	474,300	16,100
Columbus Southern Power Co	Conesville	OH	Coshocton	7,300	0	21,200	0
Ohio Power Co	General James M Gavin	OH	Gallia	0	0	0	90,700
Dayton Power & Light Co	J M Stuart	OH	Adams	0	0	653,300	0
Dayton Power & Light Co	Killen Station	OH	Adams	0	0	202,100	50,500
Ohio Valley Electric Corp	Kyger Creek	OH	Gallia	0	0	153,800	77,700
Cincinnati Gas & Electric Co	Miami Fort	OH	Hamilton	0	0	167,800	56,500
Ohio Power Co	Muskingum River	OH	Washington	0	0	143,400	0
Columbus Southern Power Co	Picway	OH	Pickaway	0	0	8,500	2,100
American Mun Power-Ohio Inc	Richard Gorsuch	OH	Washington	107,500	23,300	0	0
Cincinnati Gas & Electric Co	W H Zimmer	OH	Clermont	333,600	83,400	0	0
Cincinnati Gas & Electric Co	Walter C Beckjord	OH	Clermont	306,600	0	0	76,700
Grand River Dam Authority	GRDA	OK	Mayes	75,000	12,100	0	0
Western Farmers Elec Coop Inc	Hugo	OK	Choctaw	0	0	2,790	13,770
Public Service Co of Oklahoma	Northeastern	OK	Rogers	35,700	1,100	0	0
Portland General Electric Co	Boardman	OR	Morrow	0	17,500	0	0
Allegheny Energy Supply Co LLC	Armstrong Power Station	PA	Armstrong	39,800	0	0	0
Pennsylvania Power Co	Bruce Mansfield	PA	Beaver	0	0	568,400	0
Orion Power Midwest LP	Cheswick Power Plant	PA	Allegheny	76,800	12,300	0	0
Reliant Energy NE Mgt Co	Conemaugh	PA	Indiana	428,400	84,200	0	0
Zinc Corp of America	G F Weaton Power Station	PA	Beaver	35,600	0	0	0

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Utility	Plant	State	County	Fly Ash Disposed in Landfill (tons)	Bottom Ash Disposed in Landfill (tons)	Fly Ash Disposed in Surface Impoundment (tons)	Bottom Ash Disposed in Surface Impoundment (tons)
Allegheny Energy Supply Co LLC	Hatfields Ferry Power Station	PA	Greene	50,600	40,100	0	0
Midwest Generation	Homer City Station	PA	Indiana	584,300	78,100	0	0
Reliant Energy NE Mgt Co	Keystone	PA	Armstrong	432,100	130,800	0	0
Allegheny Energy Supply Co LLC	Mitchell Power Station	PA	Washington	0	16,900	0	0
Orion Power Midwest LP	New Castle Plant	PA	Lawrence	59,800	13,300	0	0
PG&E National Energy Group	Northampton Generating Company	PA	Northampton	112,000	20,000	0	0
Reliant Energy Mid-Atlantic PH	Portland	PA	Northampton	50,600	11,100	0	0
PPL Corp	PPL Martins Creek	PA	Northampton	0	0	29,800	7,500
Reliant Energy Mid-Atlantic PH	Shawville	PA	Clearfield	160,500	40,300	0	0
Sunbury Generation LLC	WPS Energy Servs Sunbury Gen	PA	Snyder	0	8,400	0	500
South Carolina Electric&Gas Co	Canadys Steam	SC	Colleton	0	0	91,000	10,100
South Carolina Electric&Gas Co	Cope	SC	Orangeburg	0	20,700	0	0
South Carolina Pub Serv Auth	Cross	SC	Berkeley	0	0	0	10,900
South Carolina Pub Serv Auth	Dolphus M Grainger	SC	Horry	0	0	0	7,000
Progress Energy Carolinas Inc	H B Robinson	SC	Darlington	0	0	49,800	12,400
International Paper Co-Eastovr	International Paper Eastover Facility	SC	Richland	54,600	5,700	0	0
South Carolina Pub Serv Auth	Jefferies	SC	Berkeley	0	0	18,000	16,900
South Carolina Electric&Gas Co	McMeekin	SC	Lexington	31,500	7,500	0	0
Stone Container Corp	Stone Container Florence Mill	SC	Florence	26,700	0	0	0
South Carolina Electric&Gas Co	Urquhart	SC	Aiken	0	0	11,900	600
Duke Energy Corp	W S Lee	SC	Anderson	0	0	50,800	12,700
South Carolina Genertg Co Inc	Williams	SC	Berkeley	30,500	9,400	0	0
South Carolina Pub Serv Auth	Winyah	SC	Georgetown	0	0	6,710	2,240
Otter Tail Power Co	Big Stone	SD	Grant	27,700	52,400	0	0
Tennessee Valley Authority	Bull Run	TN	Anderson	243,500	0	0	22,400
Tennessee Valley Authority	Cumberland	TN	Stewart	158,300	0	0	0
Tennessee Valley Authority	Gallatin	TN	Sumner	0	0	180,500	0
Tennessee Valley Authority	John Sevier	TN	Hawkins	111,300	0	0	10,000
Tennessee Valley Authority	Johnsonville	TN	Humphreys	0	0	0	53,700
Tennessee Valley Authority	Kingston	TN	Roane	0	0	325,900	0
Eastman Chemical Co-TN Ops	Tennessee Eastman Operations	TN	Sullivan	219,500	0	0	0

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Utility	Plant	State	County	Fly Ash Disposed in Landfill (tons)	Bottom Ash Disposed in Landfill (tons)	Fly Ash Disposed in Surface Impoundment (tons)	Bottom Ash Disposed in Surface Impoundment (tons)
TXU Electric Co	Big Brown	TX	Freestone	146,700	188,900	0	0
Topaz Power Group LLC	Coletto Creek	TX	Goliad	0	0	49,400	14,100
Lower Colorado River Authority	Fayette Power Project	TX	Fayette	0	0	19,490	20,420
Texas Municipal Power Agency	Gibbons Creek	TX	Grimes	0	1,500	0	0
San Antonio Public Service Bd	J K Spruce	TX	Bexar	2,700	0	0	0
San Antonio Public Service Bd	J T Deely	TX	Bexar	4,100	0	0	0
Texas Genco	Limestone	TX	Limestone	0	430,800	0	0
TXU Electric Co	Martin Lake	TX	Rusk	526,000	442,800	0	0
TXU Electric Co	Monticello	TX	Titus	532,500	382,000	0	0
Southwestern Electric Power Co	Pirkey	TX	Harrison	581,100	0	0	120,000
TXU Electric Co	Sadow No 4	TX	Milam	0	209,500	314,400	0
Alcoa Inc	Sadow Station	TX	Milam	77,000	0	0	0
Sempra Energy Resources	Twin Oaks Power One	TX	Robertson	176,100	48,700	0	0
Texas Genco	W A Parish	TX	Fort Bend	51,400	119,300	0	0
Southwestern Electric Power Co	Welsh	TX	Titus	35,400	0	0	0
Deseret Generation & Tran Coop	Bonanza	UT	Uintah	114,700	114,700	0	0
PacifiCorp	Carbon	UT	Carbon	49,000	21,000	0	0
PacifiCorp	Hunter	UT	Emery	391,000	112,000	0	0
PacifiCorp	Huntington	UT	Emery	357,000	89,000	0	0
Los Angeles City of	Intermountain Power Project	UT	Millard	0	0	0	96,700
Kennecott Utah Copper Corporation	KUCC	UT	Salt Lake	0	0	13,700	20,600
Virginia Electric & Power Co	Bremo Bluff	VA	Fluvanna	0	0	68,000	17,000
Virginia Electric & Power Co	Chesapeake	VA	Chesapeake	0	0	0	34,800
Virginia Electric & Power Co	Chesterfield	VA	Chesterfield	0	0	277,200	45,400
Appalachian Power Co	Clinch River	VA	Russell	158,900	0	0	0
Virginia Electric & Power Co	Clover	VA	Halifax	247,000	61,800	0	0
Appalachian Power Co	Glen Lyn	VA	Giles	76,700	0	0	5,800
Mirant Mid-Atlantic LLC	Potomac River	VA	Alexandria	87,000	4,900	0	0
St Laurent Paper Products Co	West Point Mill	VA	King William	29,000	9,400	0	0
Virginia Electric & Power Co	Yorktown	VA	York	91,700	0	0	0
TransAlta Centralia Gen LLC	Transalta Centralia Generation	WA	Lewis	130,900	276,200	0	0

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Utility	Plant	State	County	Fly Ash Disposed in Landfill (tons)	Bottom Ash Disposed in Landfill (tons)	Fly Ash Disposed in Surface Impoundment (tons)	Bottom Ash Disposed in Surface Impoundment (tons)
Dairyland Power Coop	Alma	WI	Buffalo	12,000	12,000	0	0
Wisconsin Power & Light Co	Columbia	WI	Columbia	0	53,000	11,000	0
Wisconsin Power & Light Co	Edgewater	WI	Sheboygan	38,500	0	0	0
Dairyland Power Coop	Genoa	WI	Vernon	6,000	8,000	0	0
Fort James Operating Co	Green Bay West Mill	WI	Brown	9,400	32,100	0	0
Dairyland Power Coop	John P Madgett	WI	Buffalo	6,000	25,000	0	0
Monongahela Power Co	Albright	WV	Preston	78,000	0	0	0
Monongahela Power Co	Fort Martin Power Station	WV	Monongalia	1,300	9,400	0	0
Monongahela Power Co	Harrison Power Station	WV	Harrison	228,300	10,500	0	0
Appalachian Power Co	John E Amos	WV	Putnam	435,400	0	357,500	34,400
Ohio Power Co	Kammer	WV	Marshall	0	0	48,700	0
Appalachian Power Co	Kanawha River	WV	Kanawha	-25,600	0	0	1,600
Ohio Power Co	Mitchell	WV	Marshall	0	0	307,400	0
Appalachian Power Co	Mountaineer	WV	Mason	438,300	0	0	9,500
Virginia Electric & Power Co	Mt Storm	WV	Grant	586,700	40,400	0	0
Central Operating Co	Philip Sporn	WV	Mason	117,700	0	86,800	50,300
Monongahela Power Co	Pleasants Power Station	WV	Pleasants	280,700	5,100	0	0
PPG Industries Inc	PPG Natrium Plant	WV	Marshall	29,800	7,500	0	0
Monongahela Power Co	Rivesville	WV	Marion	16,900	3,000	0	0
Monongahela Power Co	Willow Island	WV	Pleasants	11,700	1,300	0	0
PacifiCorp	Dave Johnston	WY	Converse	131,000	61,000	0	0
PacifiCorp	Jim Bridger	WY	Sweetwater	144,000	252,000	0	0
Basin Electric Power Coop	Laramie River Station	WY	Platte	264,500	0	0	79,100
PacifiCorp	Naughton	WY	Lincoln	0	0	79,000	40,000
PacifiCorp	Wyodak	WY	Campbell	0	0	0	28,000
			TOTAL:	22,556,600	6,108,840	15,322,100	4,374,030

Source: U.S. Env'tl. Prot. Agency (EPA), Human and Ecological Risk Assessment of Coal Combustion Wastes (released as part of a Notice of Data Availability) (Aug. 6, 2007) (draft), Attachments B-1 & B-2; and, U.S. Department of Energy's Energy Information Administration, Form EIA-767, Annual Steam-Electric Plant Operation and Design Data. 2005.

Attachment 3 - Surface Impoundment and Landfill Disposal Data Reported to the Energy Information Administration (2005)¹

Utility	Plant	State	County	Fly Ash Disposed in Landfill (tons)	Bottom Ash Disposed in Landfill (tons)	Fly Ash Disposed in Surface Impoundment (tons)	Bottom Ash Disposed in Surface Impoundment (tons)
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¹This chart contains the tonnage of fly ash and bottom ash disposed in onsite surface impoundments and landfills reported by numerous coal-fired power plants to the Energy Information Administration in 2005. This chart does not attempt to convey the total amount of coal combustion waste disposed by all U.S. power plants, because the EIA database did not include all U.S. plants. Nor did the database include off-site disposal of coal combustion waste, including minefilling of ash. In addition the amount of coal combustion waste listed on the chart does not reflect the total amount of waste generated by each plant (e.g., scrubber sludge is not included). The inclusion of the 2005 EIA data simply provides a snapshot of the waste management practices of numerous plants. In 2005, EIA ceased collecting these data.