MICHIGAN ENVIRONMENTAL COUNCIL

Impacts of Burning Coal on Michigan's Water Quality

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Executive Summary

Nationally and in Michigan, coal-fired power plants are a major source of water contamination from toxic heavy metals and other pollutants. Coal plants contaminate ground and surface water with toxins like mercury, cadmium, lead and arsenic through three primary pathways: 1) emitting toxins into the air that are deposited into waterbodies, 2) discharging toxic wastewater directly into waterbodies and 3) leaching toxins into our groundwater from unlined coal waste pits.

After a coal plant emits mercury and other toxins into the air, the chemicals fall to the earth, accumulating in soils and our water and in fish tissue. In 2011 the Environmental Protection Agency (EPA) determined that coal-fired power plants are the largest man-made emitter of mercury pollution, accounting for approximately 50 percent of mercury air emissions.[i] Since then first of their kind federal mercury emissions protections have successfully driven down the amount of mercury being emitted into the air from coal plants. Since 2006, net electricity generation from coal dropped 38 percent, but the rate of mercury released into the air per gigawatt hour (GWh) of electricity generated from coal dropped 77 percent.[ii] The majority of mercury waste from coal is now being disposed of on land via coal ash waste where it continues to pose a risk to water quality.

Coal plants also discharge toxins directly into lakes, rivers and streams. Coal-burning power plants are the country's largest industrial source of toxic water pollution, generating more toxic wastewater than the next two largest-polluting industries combined.[iii] Coal plants in Michigan discharged 48,697 pounds of toxic pollutants, like mercury, lead, and arsenic, into Michigan lakes and rivers in 2016 alone.[iv] According to the Environmental Protection Agency, toxic discharges from coal plants into lakes and rivers occur in close "proximity to nearly 100 public drinking water intakes and more than 1,500 public wells across the nation." And about 2.7 million Americans live within three miles of a coal plant that discharges pollutants into a public waterway.

Coal plants also generate an enormous amount of toxic waste called coal ash. Coal ash is a bi-product from coal-burning power plants which contains mercury, lead, arsenic, and other toxic heavy metals. In 2012 more than 470 coal-fired electric utilities burned over 800 million tons of coal and generated approximately 110 million tons of coal ash.[v] In 2016 Michigan's 13 largest coal plants generated 1439.2 thousand tons of coal ash waste and DTE Energy's Monroe coal plant accounted for over half the coal ash generated.[vi] For decades, utilities have regularly dumped wet coal ash sludge into unlined ponds located next to their plants. From these pits, toxins from coal ash seep into groundwater or are discharged by utilities directly into lakes, rivers, and streams. In Michigan, there are 29 coal ash waste units, which include 37 coal ash ponds. A review of that data shows that of the 22 coal ash units with publically available groundwater monitoring data, 17, or 77 percent, showed levels of toxic chemicals like arsenic and lead in the groundwater above state and/or federal drinking water standards.[vii] Those results include Consumers' Karn bottom ash pond where one monitoring well read arsenic levels at 52 times the federal drinking water standard[viii] and a monitoring well at DTE's Belle River diversion basin registering lead levels close to six times higher than Michigan's Part 201 drinking water cleanup criteria standard.[ix]

Our Great Lakes, rivers, streams and drinking water face significant challenges from contamination. Man-made toxins like PFAS are rightly grabbing attention, but decision makers in Michigan should not overlook the volume of toxins from coal-fired power plants that are putting our water and the health of Michigan communities at great risk. Michigan's economy and quality of life depends on clean drinking water and healthy Great Lakes. Michigan needs strong protections in place to stem the flow of the toxins from coal plants into our waterways and groundwater. Speeding up the closure of coal-fired power plants that produce this toxic substance and transitioning towards cleaner sources of energy, like wind and solar are necessary steps for addressing the risks to Michigan communities and drinking water caused by coal ash and coal plants.

Health and Environmental Impacts from Coal-Fired Power Plant Waste

Many pollutants present in coal-fired power plant waste, like mercury, cadmium, lead, arsenic, and other harmful heavy metals, don't easily breakdown in the environment and often linger for years. Human exposure to these toxins results in severe health impacts including cancer, cardiovascular disease, neurological disorders, kidney and liver damage, and lowered IQ in children. Wildlife such as fish also experience deformities and reproductive health issues when exposed to toxic discharges from coal plants.[x]

According to the Environmental Protection Agency (EPA), toxic discharges from coal plants into lakes and rivers occur in close "proximity to nearly 100 public drinking water intakes and more than 1,500 public wells across the nation."[xi] And about 2.7 million Americans live within three miles of a coal plant that discharges pollutants into a public waterway.[xii] Several studies sited by the EPA in their rulemaking process indicate that coal plant toxins discharged into water bodies and into groundwater have exceeded safe drinking water standards and have adversely impacted drinking water supplies.

Eating fish from approximately half the water bodies that receive wastewater discharges from power plants poses a serious health risk. Additionally, close to half of the water bodies into which steam electric power plants, like coal plants, discharge wastewater exhibit unsafe levels of the same pollutants that are present in coal plant wastewater discharges.[xiii]

Minority and low income communities are at greatest risk of exposure to coal plant toxins and shoulder a disproportionate amount of the negative health impacts. This is due both to those communities' closer proximity to coal plants and greater consumption of fish from contaminated waterbodies.

Mercury Water Contamination from Coal-Fired Power Plant Emissions

Toxins from coal-fired power plants, like mercury, buildup in our waterways when they are emitted into the air when coal is burned and then fall to earth. Once deposited into water, bacteria transforms mercury into methylmercury- a highly toxic form of the chemical that accumulates in the tissue of humans, fish and other wildlife. As the mercury in fish tissue makes its way up the food chain it increases in concentration. Due to this, large predator fish can have mercury concentrations in their tissue that are a thousand or a million times higher than the waterbodies where they are found.[xiv]

In 2011 the EPA estimated that coal-fired power plants werer the largest man-made emitter of mercury pollution accounting for approximately 50 percent of mercury air emissions.[xv] However, as a result of very successful air quality protections put in place at the federal level, between 2006 and 2016 electric utilities reduced total mercury air emissions by 85 percent and the rate of mercury released into the air per gigawatt hour (GWh) of electricity generated from coal dropped 77 percent.[xvi] In comparsion, over that time period net energy generated from coal only reduced 38 percent.[xvii]

Mercury emissions from coal plants that fall locally have led to "hot spots" of contamination. However, mercury emitted into the air can also stay in the atmosphere and travel longer distances away from coal plants. As a result, we see mercury contamination from coal plants occurring thousands of miles away from its source.[xviii] In Michigan, mercury contamination has led to fish advisories and contaminated waterways across the state, regardless of proximity to coal plants.

Surface Water Contamination from Coal-Fired Power Plant Discharges

Another primary vector for water contamination from coal plant waste is by direct discharged of toxins from coal plants into lakes, rivers and streams. For decades, coal plants have released millions of pounds of toxic metals and other harmful pollutants, like mercury, arsenic, selenium, chromium, and lead, into waterways every year.[xix] Coal-burning power plants are the country's largest industrial source of toxic water pollution, generating more toxic wastewater than the next two largest-polluting industries combined.[xx] This practice has contaminated thousands of miles of America's rivers and streams.[xxi]

According to data compiled by Michigan Environmental Council from the EPA's Toxic Release Inventory, coal plants in Michigan discharged 48,697 pounds of toxic pollutants into water bodies in 2016 alone (See Appendix C).[xxii] Close to half of that contamination came just from DTE Energy's Monroe power plant.

Groundwater Contamination from Coal Ash in Michigan

Recently, the U.S. has made progress reducing the amount of pollution flowing into our air from coal plant emissions. Several federal protective Clean Air Act standards have pushed utilities to install better air pollution technology and controls at their coal plants. This has significantly reduced the amount of toxins like mercury that are being emitted into our air. Toxins not emitted into the air attach themselves to coal ash, which is the waste byproduct left over from burning coal. As a result of utilities releasing less toxins into the air, the overall toxicity of the coal ash waste has increased. For example, the majority of mercury waste from coal plants is now being disposed of on land in coal ash waste disposal sites instead of being emitted into the air.[xxiii]

Coal plant operators use water to rinse the toxic ash and waste off their scrubbers and to flush bottom ash from their boilers. The process results in the creation of an ash sludge filled with chemicals like arsenic, mercury, lead, and cadmium. For decades utilities regularly dumped this wet toxic sludge into unlined waste ponds.

The absence of protective impervious liners at these waste ponds has resulted in toxins leaching into groundwater. In 2017, utilities, as required by federal law, collected groundwater monitoring data around coal ash ponds. That data showed that about 95 percent of the 1,400 coal ash waste sites across the country have contaminated groundwater.[xxiv]

That same monitoring data demonstrates clearly that coal ash waste ponds are contaminating Michigan's groundwater with toxins like arsenic, mercury, lead, and boron to levels the EPA has deemed unsafe to drink.[xxv] In 2018, as required by federal rules, Michigan utilities publically reported preliminary groundwater monitoring results for 22 of the 29 coal ash units in Michigan. Of those 22 units 17, or 77 percent, showed levels of toxic chemicals like arsenic and lead in the groundwater above state and/or federal drinking water standards (see Appendix B for full list).[xxvi] Examples of concerning groundwater contamination include:

- At Consumers' Karn bottom ash pond, one monitoring well read arsenic levels at 52 times the federal drinking water standard.[xxvii]
- A comparison between the background wells and the downgradient wells at Consumers' bottom ash pond units 1 & 2 revealed statistically significant increases above the background concentrations of boron, calcium, chloride, pH, sulfate and total dissolved solids in the downgradient wells in September 2017. Samples from three out of five downgradient wells exceeded the EPA Maximum Contaminant Level for drinking water for arsenic by up to 4.5 times.[xxviii]

- A monitoring well at DTE's Belle River diversion basin registered lead well above the Michigan Part 201 drinking water cleanup criteria, with one well having lead levels close to six times higher than the protective state standard.[xxix]
- At DTE Energy's River Rouge bottom ash basin, groundwater monitoring revealed increased levels of boron, fluoride, and pH.[xxx] Monitoring also detected levels of arsenic, lead, thallium, radium 226-228, and radium 226 in the groundwater above federal and/or state drinking water standards.[xxxi]
- Monitoring and analysis that Holland Board of Public Works (HBPW) began in 2011 at three bottom ash ponds located at the James De Young coal plant identified that "certain metals were present in the groundwater above the U.S. EPA Safe Drinking Water Act's maximum contaminant level (MCL) established in 40 CFR §141.62, and concluded that the groundwater quality in the surrounding area may have been affected by the historical use of the CCR units."[xxxii] Further monitoring in 2017 revealed exceedances of federal and state drinking water standards for boron, chloride, pH, sulfate, total dissolved solids, cobalt, lead, fluoride, lithium, and thallium.[xxxiii]

Unfortunately, the groundwater monitoring data that is publicly available only covers a limited number of the total coal ash sites. As stated above, only 22 of the 29 units have publicized the results of the first round of detection monitoring. Additionally, inactive ponds at power plants that are no longer producing energy were exempt from federal monitoring requirements. Inactive ponds are defined as ones that were no longer receiving coal ash waste in 2015 when a new federal rule went into effect. However, data collected by the Environmental Integrity Project from 2010 through 2013 shows that many of these inactive sites are also "leaking large quantities of toxins that are contaminating Michigan groundwater."[xxxiv]

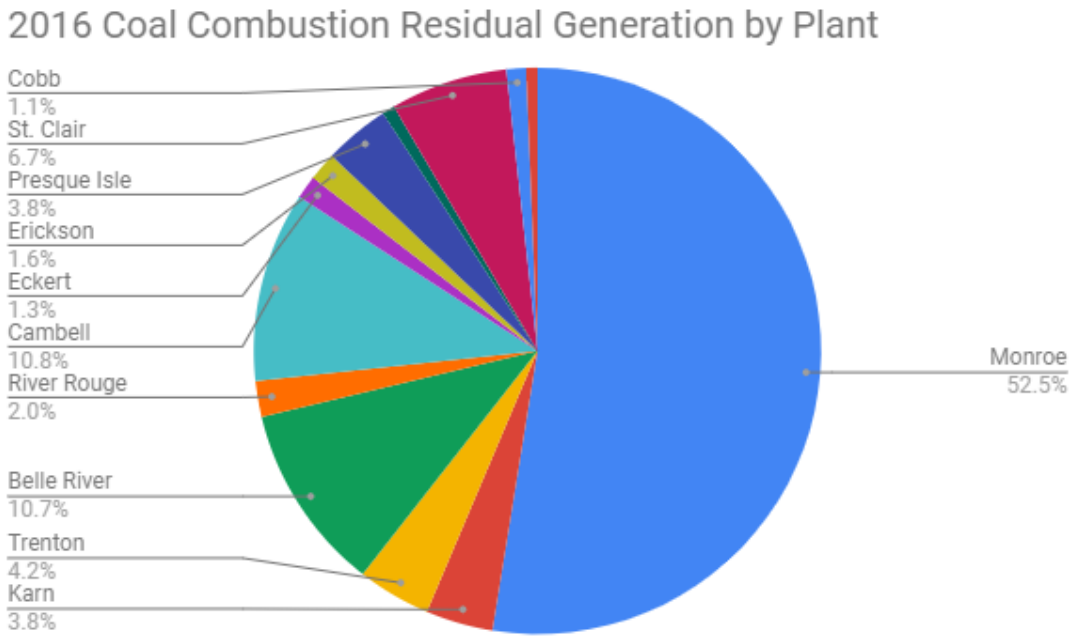
Toxic coal ash waste is also discharged into waterbodies when there is a breach in a dyke or dam at a coal ash waste pond. Recent studies of a coal ash pond breach at the Tennessee Valley Authority's Kingston coal ash pond showed that the spill released large amounts of mercury and radioactive materials into nearby rivers and lakes.[xxxv] Monitoring also found lead levels that were 400 times higher than federal standards and berylliym at 160 times higher downstream of where the spill occurred.[xxxvi]

Coal Ash Generated In Michigan

In the U.S., coal ash is the second largest form of waste. According to the EPA, more than 470 coal-fired electric utilities burned over 800 million tons of coal and generated approximately 110 million tons of coal ash in 2012.[xxxvii]

Electric generation in Michigan is still dependent upon coal, although our utilities are starting the process of transitioning away from this source of energy. In 2016, Consumers Energy retired seven of its smaller coal plants. This contributed to bringing Michigan's net electricity generation provided by coal-fired power plants down from over 50 percent in 2014 to 37 percent in 2017.[xxxviii] DTE Energy is, however, still heavily reliant on coal generation, with 65 percent of its energy coming from coal-fired plants in 2017.

In 2016, before the closure of the seven Consumers' coal plants, there were 23 coal plants of varying sizes operational in Michigan. Smaller coal generating units are exempt from national coal ash reporting requirements, so it is unclear the exact amount produced in Michigan. However, in 2016, the 13 largest coal plants generated 1439.2 thousand tons of coal ash waste (see Appendix A).[xxxix] DTE Energy's Monroe coal plant accounted for over half the coal ash generated.



Coal Ash Disposal in Michigan

In Michigan, utilities are allowed to dispose of coal ash in a number of ways, including:

- Selling it for reuse in construction fill, concrete wallboard, cement, and other products and materials (called “beneficial reuse”)
- Disposing it in municipal solid waste landfills
- Disposing it in landfills owned by the utility companies (“captive landfills”)
- Disposing it in surface impoundments, basins, and ponds owned by utility companies

In 2016, the majority of coal ash generated by Michigan utilities was disposed of in a landfill or sold for reuse.[xl] However, utilities also stored, and continue to store, thousands of tons of toxic coal ash in unlined ponds and impoundments scattered throughout the state.[xli] These ponds vary in size, but the national average is equivalent to nearly 40 football fields.[xlii]

The Michigan Department of Environmental Quality (DEQ) annually reports the amount of coal ash disposed of in both utility owned and municipal landfills in Michigan. In 2016, 1,104,968 cubic yards of coal ash generated in Michigan was disposed of at landfills in the state. On top of this, 46,852 cubic yards of coal ash generated outside of Michigan was imported into the state and disposed of in landfills here.[xliii]

Coal Ash Landfills and Waste Ponds in Michigan

Currently, there are 29 coal ash units that store toxic coal waste across Michigan that are regulated under federal standards. Nine of the 29 units owned and operated by electric utility companies, including four coal ash ponds, have historically been regulated under Michigan’s part 115 solid waste rules. Those include:

- Five Michigan Part 115 Type III Low Hazardous Waste Landfills: JH Cambell dry ash landfill, DE Karn Landfill, JC Weadock dry ash landfill, Presque Isle ash landfill #3, Holland Board of Public Works Zeeland Township landfill.

- Two Part 115 Type III Industrial Waste Landfills: Range Road landfill and Sibley Quarry landfill
- Two Part 115 Type III Surface Impoundments: Monroe Power Plant fly ash impoundment (and landfill) and JR Whiting ponds 1-2 and pond 6

Only two of these landfills have synthetic liners - JH Cambell dry ash landfill and Presque Isle ash landfill #3.

Another 19 units with a total of 33 coal ash ponds were completely unregulated until 2015 when the new federal standards were finalized. Those include:

- JH Cambell: 1-2 bottom ash pond, unit 3 bottom ash pond, and pond A
- DE Karn: bottom ash pond and lined bottom ash pond
- JC Weadock: bottom ash pond
- BC Cobb: Ponds 0-8 and bottom ash pond
- Belle River: bottom ash pond north and south and bottom ash diversion basin
- St Clair: east and west bottom ash basin and scrubber ash impoundment
- Monroe: bottom ash impoundment
- River Rouge: bottom ash basin
- JB Sims: unit 1 and 2 surface impoundment and unit 3 ponds east and west
- Shiras: surface impoundment
- James De Young: 3 bottom ash ponds
- Erickson: retention basin within its wastewater treatment system

Of the 37 ponds that store coal ash only two have synthetic liners - Consumers Energy's new bottom ash pond at the DE Karn coal plant and Lansing Board of Water and Light's wastewater treatment system.

A 2013 report by Clean Water Fund[xliv] and additional research conducted by Michigan Environmental Council identified 13 legacy coal ash sites, including:
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- Five closed coal ash ponds: BC Cobb 9-11, Harbor Beach impoundment, and Erickson impoundment
- Five closed Type III landfills: BC Cobb landfill, Muskegon County landfill, North Lansing landfill, Pine Hill landfill, and Warden Station landfill
- Six Known Michigan Part 201 contaminated sites (brownfields): Comfort street site (Lansing), Consumers Energy (Kalamazoo), GenCo. "Historic coal ash dump" (Marquette), MLK/Grand River Street site (Lansing), MSU ash disposal area (East Lansing), Wolverine Advanced Power Plant

Many of the current and former coal ash ponds in Michigan are underlain by porous sand, native soils, and peat that easily allows for the flow of toxins from the wet coal ash waste into groundwater. For example, boreholes taken at the three coal ash pond units at the Cambell coal plant encountered only native material composed of poorly-graded, fine- to medium-grained sand directly under the coal ash waste. Some waste ponds are located in areas of Michigan where native clay soil is present, but still, these sites fail to meet federal groundwater protection standards. Furthermore, monitoring has shown that groundwater contamination can and is still occurring where native clay is the more dominant underlayment (See Appendix B).[xlv]

Federal Rollbacks of Water Quality Protection from Coal Plant Toxins

Federal Regulation of Coal Ash

In 2015 the Obama administration finalized a new rule intended to protect water and air quality from coal ash. Previous to this rule, coal ash was considered exempt under the Resource Conservation and Recovery Act (RCRA), a federal law that sets minimum standards for the management of hazardous and non-hazardous solid waste.[xlvi] In the absence of federal standards, states created a patchwork of regulations and laws to govern some coal ash ponds and landfills. This left most coal ash impoundments and ponds largely unregulated until the federal rules were finalized.[xlvii]

The 2015 federal rule requires the closure of surface impoundments and landfills that fail to meet structural safety standards. The rule also calls for the immediate clean up and closure of unlined impoundments that are contaminating groundwater. Utilities are also required to ensure surface impoundments are regularly inspected, so that structural weaknesses can be identified and fixed. The rule requires the use of fugitive dust controls to limit windblown coal ash dust for annual groundwater monitoring, and mandates liner barriers for new impoundments. Lastly, the rule calls for proper closure of structures that are no longer receiving coal ash and prohibits the dumping of coal ash within five feet of an aquifer.

While this rule was a step in the right direction, it failed in several respects to fully protect ground and surface water from toxic coal ash contamination. Environmental groups challenged it in court, arguing that many provisions were not protective enough of water quality. The D.C. Court of Appeals agreed with the environmentalists that the rule was "inadequate."[xlviii] In particular, the Court called into question a provision that allowed unlined ponds to continue to receive coal ash waste indefinitely until groundwater contamination was detected. Furthermore, the court struck down a portion of the rule that allows ponds that have a two-foot thick compacted clay underlayment to stay open, stating that the EPA ignored the risk of leakage from these ponds. The court also struck down a provision of the rule that exempts inactive ponds at power plants that are no longer producing energy.

Despite clear indications from the court that the rule doesn't go far enough, the Trump administration has begun efforts to weaken the 2015 rule further. In July, the EPA issued a package of changes to the Obama-era rules that allow states to stop monitoring groundwater near coal ash sites in certain situations and gave utilities more time to close leaking, unlined ponds.[xlix] The Trump administration has also indicated its intention to issue further rule changes in the near future.

The Michigan Legislature is also currently debating a bill that would allow the state to assume regulatory authority via a new permitting program for coal combustion residual units, including coal ash ponds. The introduced version of the bill would put in place weaker water quality protections than the federal rules and would further hamstring efforts to prevent water contamination from coal ash waste and to clean up the contamination that is already occurring.

Federal Regulation of Releases of Toxins into Surface Waters

In 2015, the Obama administration finalized an update to a set of rules that would set limits on toxic metals and other water pollution discharged into lakes and rivers from coal power plants to help protect drinking water supplies and reduce human and wildlife exposure to harmful toxins. Specifically the 2015 Clean Water Act Effluent Limitation rule would have reduced the annual discharge of 1.4 billion pounds of toxic heavy metals and other pollution from coal plants into lakes and rivers. Additionally, this rule would have reduced the releases of selenium, mercury and lead

into water bodies by 95 percent.[I] At the time the rule was finalized the EPA estimated the pollution reduction resulting from the rules would save Americans $463 million a year through health benefits.[Ii] The rule was last updated in 1982.

The Trump administration, however, postponed the effective date of the new limits. Coal plant owners and operators now have until November 1 of 2020 to comply with the new water protection rule, instead of November 1, 2018. The delay allows coal plants to continue discharging toxic pollutants like arsenic, mercury and lead into water bodies across the country. Environmental groups are currently challenging this two year delay in the courts.

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[iii] Environmental Protection Agency. (2015). "Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category." *Federal Register National Archives*, Federal Register, 67838. www.federalregister.gov/documents/2015/11/03/2015-25663/effluent-limitations-guidelines-and-standards-for-the-steam-electric-power-generating-point-source

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[vi] See Appendix A; Data compiled from Energy Information Administration, "Power Plant Operations Report," (Form 2016 EIA-923), 8/17/2018 https://www.eia.gov/electricity/data/eia923/

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[ix] "Annual Groundwater Monitoring Report". (2018).TRC Solutions DTE Electric Company. Belle River groundwater report https://newlook.dteenergy.com/wps/wcm/connect/0b046014-2446-4a93-9aba-68eb4cc87964/BelleRiverBottomAshImpoundmentDBGWMR2017.pdf?MOD=AJPERES

[x] Environmental Protection Agency. (2015). "Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category." *Federal Register National Archives*, Federal Register, 67838. www.federalregister.gov/documents/2015/11/03/2015-25663/effluent-limitations-guidelines-and-standards-for-the-steam-electric-power-generating-point-source

[xi] *id.*

[xii] Storrow, Benjamin. "Trump's EPA Made It Easier for Coal Plants to Pollute Waterways." (2018). *Scientific American.* https://www.scientificamerican.com/article/trump-rsquo-s-epa-made-it-easier-for-coal-plants-to-pollute-waterways/

[xiii] Environmental Protection Agency. (2015). "Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category." *Federal Register National Archives*, Federal Register, 67838. www.federalregister.gov/documents/2015/11/03/2015-25663/effluent-limitations-guidelines-and-standards-for-the-steam-electric-power-generating-point-source

[xiv] "Mercury Pollution from Coal-fired Power Plants". National Wildlife Federation. https://www.nwf.org/~/media/PDFs/Global-Warming/NWF-Mercury-Power-Plant-Factsheet_March2011.ashx

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[xviii] "Mercury Pollution from Coal-fired Power Plants". National Wildlife Federation. https://www.nwf.org/~/media/PDFs/Global-Warming/NWF-Mercury-Power-Plant-Factsheet_March2011.ashx

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[xliii] Greither, C. Heidi. (2017). *Report of Solid Waste Landfilled in Michigan*. Michigan Department of Environmental Quality, 7. https://www.michigan.gov/documents/deq/deq-wmrpd-sw-FY2016-SW-Landfilled-Rpt_552961_7.pdf pg7

[xliv] "Toxic Trash Exposed: Coal Ash Pollution in Michigan." (2013). *Clean Water Action*, Clean Water Action, https://www.cleanwateraction.org/publications/toxic-trash-exposed-coal-ash-pollution-michigan

[xlv] See Appendix B for full soil description of coal ash impoundment underlayment materials

[xlvi] Adragna, Anthony. (2014). "EPA Regulates Coal Ash as Nonhazardous in First Federal Management Standards." *Bloomberg BNA*, Bloomberg BNA. www.bna.com/epa-regulates-coal-n17179921273/

[xlvii] In Michigan a minority of the coal ash disposal units were regulated under state law as type III low hazardous waste landfills, type III industrial landfills, or type III surface impoundments and managed in accordance with Michigan's solid waste rules.

[xlviii] "Court Sides with Greens, Finds Obama-Era Rule Weak." E&E News. Amanda Reilly (2018). https://www.eenews.net/stories/1060094865

[xlix] "Trump's EPA Rolls Back Obama-Era Coal Ash Regulation." NBC News. Dennis Romero. (2018) https://www.nbcnews.com/news/us-news/trump-s-epa-rolls-back-obama-era-coal-ash-regulations-n892586

[l] Walton, Robert. (2017). "EPA Delays Rule Limiting Toxic Metal Discharges from Coal Plants." *Utility Dive*, Utility Dive. www.utilitydive.com/news/epa-delays-rule-limiting-toxic-metal-discharges-from-coal-plants/505026/

[li] Walton, Robert. (2017). "EPA May Rewrite Limits on Coal Plant Discharges." *Utility Dive*, Utility Dive. www.utilitydive.com/news/epa-may-rewrite-limits-on-coal-plant-discharges/449414/

Appendix A

Coal Ash Generated by Coal Plants in Michigan (2016)

Plant Name	Coal Residual Annual Amount Generated (Thousand Tons)*
Monroe (Monroe, MI)	756.2
DE Karn (Essexville, MI)	55.2
Trenton Channel (Trenton, MI)	60.2
Belle River (St. Clair County, MI)	153.9
River Rouge (River Rouge, MI)	29.5
JH Cambell (West Olive, MI)	156.1
Eckert (Lansing, MI)	19
Erickson (Lansing, MI)	23.3
Presque Isle (Marquette, MI)	54
JR Whiting (Erie, MI)	10.2
St. Clair (St. Clair County, MI)	96.3
BC Cobb (Muskegon, MI)	16.1
JC Weadock (Essexville, MI)	9.2
Total	**1439.2**

*Data compiled by Michigan Environmental Council from Energy Information Administration, “Power Plant Operations Report,” (Form 2016 EIA-923), 8/17/2018 https://www.eia.gov/electricity/data/eia923/

Appendix B

Ground Water Monitoring Results By Coal Ash Unit (2017)

Plant Name	Type	Statistically Significant Increase over Background	Drinking Water Standards Exceedance	Coal Ash Unit Proximity to Surface Water	Liner and/or Underlayment Material
JH Cambell (West Olive, MI)				On shore of Lake Michigan; bounded by Pigeon River	
	Unit 1-2 Bottom Ash Pond	Boron, Calcium, Chloride, pH, Sulfate, TDS	Arsenic, Selenium, Thallium		No liner; boreholes encountered only native material composed of poorly-graded, fine- to medium-grained sand.
	Unit 3 Bottom Ash Pond	Boron, Calcium, Sulfate, TDS	Antimony, Arsenic		No liner; boreholes encountered only native material composed of poorly-graded, fine- to medium-grained sand.
	Pond A	Boron and Sulfate	Arsenic		No liner; boreholes encountered only native material composed of poorly-graded, fine- to medium-grained sand.
	Dry Ash Landfill	Boron, Calcium, Chloride, Sulfate, TDS	No exceedances		Geomembrane lined landfill
DE Karn (Essexville, MI)				Bounded by Saginaw River to the west, Saginaw Bay to the north and east	
	Landfill	N/A	N/A		Unknown, likely no liner
	Bottom Ash Pond	Boron, Fluoride, pH, Sulfate	Arsenic		No liner; boreholes indicated native material was composed of poorly-graded, fine- to medium-grained sand and low-plasticity clayey sand.

	Lined Bottom Ash Pond	N/A	N/A		Liner system was designed as a double composite liner system, with the primary and secondary composite liners
JC Weadock (Essexville, MI)				East of saginaw river and west of Underwood Drain and Saginaw Bay	
	Bottom Ash Pond	Boron, Calcium, pH, Sulfate	Arsenic, Beryllium, Barium, Lithium		No liner; boreholes indicate native material was composed of poorly-graded, fine- to medium-grained sand and low-plasticity clayey sand.
	Dry Ash Landfill	Boron, pH	Arsenic, Radium 226/228, Radium 228		Unknown; likely no liner
BC Cobb (Muskegon, MI)				Bounded by Muskegon River; close proximity to Muskegon Lake	
	Ponds 0-8	Boron, Fluoride, pH	Arsenic, Radium 226/228, Molybdenum,		No liner; boreholes indicated native material was composed of poorly-graded, fine-grained sand interbedded with discontinuous 0.5- to 1.0-foot-thick layers of organic materials and peat.
	Bottom Ash Pond	Boron, Fluoride, pH	Arsenic, Radium 226/228, Molybdenum		No liner; boreholes indicate native material was composed of poorly-graded, fine-grained sand interbedded with discontinuous 0.5- to 1.0-feet thick layers of organic materials and peat.

JR Whiting (Erie, MI)				On the western shore of Lake Erie	
	Ponds 1-2***	Exceedances of federal and Michigan drinking water standards for sulfate and total dissolved solids			No liner; underlain by natural clay
	Pond 6	N/A	N/A		Unknown; likely no liner
Belle River (St. Clair County, MI)				Ponds are one mile west of St. Clair River. Diversion basin discharges into the St. Clair River. Landfill is one half mile west of St. Clair River	
	Bottom Ash Impoundment North and South	pH	Lead, Molybdeum		No liner; dug into native clay
	Bottom Ash Impoundment Diversion Basin	Sulfate	Arsenic, Lead, Thallium, Radium 226-228, Radium 226		No liner; dug into native clay
	Range Road Landfill	Chloride	No exceedances		No liner; dug into native clay
St. Clair (St. Clair County, MI)				Located immediately adjacent to the west of the St. Clair River	
	East and West Bottom Ash Basins	None recorded	Lead		No liner; clay soil barrier
	Scrubber Ash Impoundment	N/A	N/A		Unknown; likely no liner

Monroe (Monroe, MI)				Bottom ash pond and landfill are boardered by lake erie to the east and existing channel to the west (separated from Lake Erie by a dike); fly ash pond is 200 ft sw of Plum Creek and immediately north of Lake Erie	
	Bottom Ash Impoundment	N/A	N/A		No liner
	Fly Ash Impoundment	pH	No exceedances		No lining; clay soil barrier
	Landfill	pH			Unknown; likely no liner
River Rouge (River Rouge, MI)				Located immediately adjacent to the Rouge River; near the intersection of the Rouge River and the Detroit River	
	Bottom Ash Basin	Boron, Fluoride, pH	Arsenic, Molybdenum		No liner
Trenton Channel (Trenton, MI)				One half mile west of the Detroit River	
	Sibley Quarry Landfill	Boron, Chloride, Sulfate, TDS	Radium 228, Radium 226/228, Lithium, Lead		No liner
JB Sims (Grand Haven, MI)				Harbor Island	
	Unit 1 and 2 Surface Impoundments	N/A	N/A		No liner; soil types encountered in soil borings included predominantly ash, sands, and silts.

	Unit 3 Ash ponds East (A) and West (B)	Detection monitoring happening in 2018, however SSIs were likely detected because Grand Haven filed a notice to begin assessment monitoring; background monitoring yielded state and/or drinking water standard exceedances for chlorine, fluoride, pH, sulfate, TDS	Antimony, Arsenic, Beryllium, Cobalt, Lead, Lithium, Molybdenum		3 ft. thick compacted clay underlayment, but doesn't meet federal requirements. Grand Haven reported it was constructing a new liner system for unit 3 in 2017.
Shiras (Marquette, MI)				On the shore of Lake Superior	
	Surface Impoundment (holding pond)	pH	Lead		No liner
Presque Isle (Marquette, MI)				Landfill is close to lake superior; surrounded by forest land	
	Ash Landfill #3	Will complete analysis for potential SSIs in 2018; initial round of monitoring yielded state or federal drinking water exceedances for Boron, Fluoride, pH	Beryllium, Cadmium		Double lined landfill with a primary leachate collection system and secondary leachate detection system
James De Young (Holland, MI)				On the shore of Lake Macatawa	

	3 bottom ash ponds	Initial round of monitoring yielded state or federal drinking water exceedances for Boron, Chloride, pH, Sulfate, and TDS	Cobalt, Lead, Fluoride, lithium, Thallium,		No liner
Erickson (Lansing, MI)				N/A	
	Waste water treatment system with retention basin	[groundwater monitoring coming sometime in the next few months]			Geosynthetic liner

*N/A indicated that no water monitoring data was publicly available
**Data compiled by Michigan Environmental Council. Environmental Protection Agency, List of Publicly Accessible Internet Sites Hosting Compliance Data and Information Required by the Disposal of Coal Combustion Residuals Rule, Michigan, accessed September 2018.
https://www.epa.gov/coalash/list-publicly-accessible-internet-sites-hosting-compliance-data-and-information-required#mi
*** Initially detected a SSI for pH, but verification sampling determined there was no elevation in pH, so no SSI was recorded.

Appendix C

Toxic Coal Plant Discharges into Surface Water in Michigan (2016)

Plant Name	Toxic Surface Water Discharge Amount (in pounds)	Type of Chemicals Discharged
Monroe (Monroe, MI)	21,246	Ammonia, Arsenic, Barium, Chromium, Cobalt, Copper, Lead, Manganese, Mercury, Nickel, Vanadium, Zinc
DE Karn (Essexville, MI)	1,979	Manganese
Trenton Channel (Trenton, MI)	2,031	Barium, Manganese, Nickel, Vanadium, Zinc
Belle River (St. Clair County, MI)	10,639	Barium, Chromium, Copper, Lead, Manganese, Mercury, Nickel, Vanadium, Zinc
River Rouge (River Rouge, MI)	160	Barium
JH Cambell (West Olive, MI)	10,911	Barium, Chromium, Copper, Manganese, Vanadium, Zinc
Eckert (Lansing, MI)	876	Barium
Erickson (Lansing, MI)	130	Barium
Presque Isle (Marquette)	64	Barium, Lead, Manganese, Vanadium
TES Filer Station (Filer City, MI)	85	Barium, Lead, Zinc
JR Whiting (Erie, MI)	355	Barium, Lead
St. Clair (St. Clair County, MI)	No Data	
BC Cobb (Muskegon, MI)	221	Barium
JC Weadock (Essexville, MI)	No Data	
Total	48,697	

*Data compiled by Michigan Environmental Council from EPA Toxic Release Inventory