



United States Environmental Protection Agency
Office of Enforcement and Compliance Assurance
Office of Criminal Enforcement, Forensics and Training

National Enforcement Investigations Center

NEIC

NEICVP1536E01

NEIC CIVIL INVESTIGATION REPORT

Cardinal Power Plant
Brilliant, Ohio 43913

Investigation Dates:

August 14-18, 2023

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APPENDICES (*NEIC-created)

A	Cardinal NPDES Permit OIB00009AE (57 pages)
B	Cardinal Site Map (1 page)
C	Sewage Treatment Plant Process Flow Diagram (2 pages)
D*	Field Photo Log (31 pages)
E	2023 Permit Renewal Application for NPDES Permit OIB00009AE (75 pages)
F	Storm Water Pollution Prevention Plan (SWPPP), Revision 9, dated January 2022 (52 pages)
G	Quarterly Storm Water Sampling Data for Quarter 3, 2022 to Quarter 2, 2023 (56 pages)
H	Industrial Storm Water Fact Sheet Series Sector O (10 pages)
I	Industrial Storm Water Monthly Routine Inspections Table (1 page)
J	Outfall Flow Measurements (18 pages)
K	CDP-SOP-LAB Cycles of Concentration (3 pages)
L	List of Non-compliance Events (30 pages)

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and provides a clear indication of the end of this report.**

INVESTIGATION OVERVIEW

PROJECT OBJECTIVE

U.S. Environmental Protection Agency (EPA) Region 5 requested EPA's National Enforcement Investigations Center (NEIC) to conduct a Clean Water Act (CWA) compliance investigation of the Cardinal Operating Company – Cardinal Power Plant (Cardinal). Cardinal is located at 306 County Road 7E, Brilliant, Ohio in Jefferson County. The investigation focused on the facility's compliance with their National Pollutant Discharge Elimination System (NPDES) permit focusing on coal ash handling and discharge limitations, fluid gas desulfurization wastewater management and treatment, and industrial storm water controls.

Table 1 lists the project team members.

Table 1. PROJECT TEAM MEMBERS		
Team Member	Organization	Project Role
Mike Lukowich	NEIC	Project manager
Jeremy Deyoe	NEIC	Field team – CWA inspector
REGIONAL AND OTHER CONTACTS		
Andi Hodaj	EPA Region 5	Regional field team member
Jake Berger	EPA Region 5	Regional field team member
Molly Smith	EPA Region 5	Regional section supervisor
Aaron Pennington	Ohio Environmental Protection Agency (Ohio EPA)	Ohio EPA inspector
Allison Cycyk	Ohio EPA	Ohio EPA permit writer
Annika Gurrola	Ohio EPA	Ohio EPA inspector
Jim Fath	Ohio EPA	Ohio EPA inspector

FACILITY CONTACT INFORMATION

Table 2 lists the primary facility contacts.

Table 2. FACILITY CONTACT INFORMATION		
Name, Title	Phone No.	Email Address
Nick Kasper, environmental compliance specialist	614-395-0642	nkasper@ohioec.org

FACILITY OVERVIEW

The Cardinal Plant, located between River Miles 76 and 77 of the Ohio River, consists of three coal-fired, supercritical steam electric generating units with a combined generation capacity of 1,920 gross megawatts (MWG) (1,790 net megawatts (MWN)). Unit 1 produces 625 MWG (585 MWN), Unit 2 produces 625 MWG (585 MWN), and Unit 3 produces 670 MWG (620 MWN).

Each generating unit is equipped with an electrostatic precipitator (ESP) for removal of fly ash particulate matter, a selective catalytic reduction (SCR) system for removal of nitrogen oxides (NO_x), and Flue Gas Desulphurization (FGD) systems for the removal of sulfur dioxide (SO₂). The

FGD bleed stream is managed through the Facility FGD Wastewater Treatment Plant. Units 1 & 2 are cooled with a once-through cooling water system. Unit 3 utilizes a cooling tower.

The residual waste of burning coal produces fly ash and bottom ash. Fly ash is stored in dry fly ash silos, where it is loaded onto trucks for disposal at the on-site Landfill. Bottom Ash is sluiced to the Retrofitted Bottom Ash Pond, where it is excavated and decanted, prior to disposal in the landfill. The bottom ash transport water is re-circulated back to the generating units in a closed loop system. Blowdown from the closed loop system is sent to and reused in the FGD system.

The facility receives coal and limestone from barges on the Ohio River. The byproduct of the FGD air emission control system produces synthetic gypsum. Most of the gypsum is loaded onto barges from conveyor belts for beneficial sales (*i.e.*: wallboard). Coal, gypsum, and limestone are loaded/unloaded to and from the facility by conveyor belt systems.

According to the EPA Enforcement and Compliance History Online (ECHO) database, this facility has the following Standard Industry Classification (SIC) code (**Table 3**) for CWA:

Table 3. APPLICABLE SIC CODES	
SIC Code	Description
4911	Electric Services

According to EPA's ECHO website, Cardinal was last inspected for CWA requirements in February 2021 (listed as a state-conducted base program - evaluation).

Cardinal is authorized to discharge once-through non-contact condenser cooling water, treated Fluid Gas Desulfurization (FGD) wastewater, treated sanitary wastewater, storm water associated with industrial activity, fly ash reservoir II (FAR II) water, and onsite landfill leachate to either Blockhouse Hollow Run, Riddles Run or the Ohio River, as specified in the Ohio NPDES permit No. OIB00009*AE (**Appendix A**). The permit was issued by the Ohio EPA, became effective on October 1, 2020, and was last modified on July 1, 2023. The permit has an expiration date of December 31, 2023.

The permit authorizes Cardinal to monitor and/or discharge the waste streams cited above through eight internal monitoring stations (600, 601, 602, 603, 604, 588, 801 and 091) and eight direct outfalls (001, 006, 008, 011, 012, 014, 019, 023). NPDES permit No. OIB00009*AE (**Appendix A**) contains all the monitoring requirements and effluent limitations for each outfall.

Table 4 summarizes the outfalls authorized by the permit.

Table 4. NPDES PERMIT NO. OIB00009*AE - OUTFALLS			
Outfall	Direct/Internal	Receiving Water	Description
<i>Cooling Water Units 1 and 2/FGD WWTP Discharge</i>			
001	Direct	Ohio River	Final outfall: Units #1 and #2 condenser cooling water discharge. Noncontact cooling water (untreated) from Units 1 and 2 and treated effluent from the FGD WWTP (Internal Station 601) discharge through outfall 001.
<i>FGD WWTP</i>			
600	Internal	N/A	FGD bleed stream - WWTP influent prior to treatment.
601	Internal	N/A	FGD bleed stream - WWTP treated effluent to be discharged through outfall 001.
<i>Sewage Treatment Plants</i>			
006	Direct	Ohio River	Units #1 and #2 sewage treatment plant discharge.
008	Direct	Ohio River	Unit #3 sewage treatment plant discharge.
<i>Fly Ash Reservoir II/Landfill Leachate</i>			
019	Direct	Blockhouse Hollow Run	Fly Ash Reservoir II (FAR II) closure activity discharge - samples to be collected below the FAR II Dam at the parshall flume. Fly ash transport water ceased operations in May 2021. Closure activities are anticipated to extend through the permit expiration date.
602	Internal	N/A	Landfill discharge (leachate) to Fly Ash Reservoir to outfall 019 and to Blockhouse Hollow. FAR II is in the process of being drained down and closed and no longer takes the leachate from the landfill. This internal station/discharge was relocated below the FARII dam upstream of outfall 019.
<i>Low Volume Wastewater Pond</i>			
023	Direct	Ohio River	Bottom Ash - Recirculation Pond - discharge to Ohio River. This outfall is to be relocated and referenced as the North Pond Low Volume Wastewater (LVW). Bottom ash transport wastewater is no longer discharged upon completion of the South Pond Coal Combustion Residuals (CCR) retrofit. Metal cleaning wastes are to no longer be discharged. Note: at the time of inspection the South Pond CCR retrofit was completed. LVW was the only Wastestream being discharged through outfall 023. The North Pond LVW was still under construction (a temporary LVW was in use) and the outfall has not yet been relocated.

Table 4. NPDES PERMIT NO. OIB00009*AE - OUTFALLS			
Outfall	Direct/Internal	Receiving Water	Description
Storm Water Associated with Industrial Activity			
011	Direct	Ohio River	Storm runoff from northeast of Unit #3 plant building
012	Direct	Ohio River	Storm runoff from northeast of Unit #3 plant building
014	Direct	Ohio River	Storm runoff from small drainage area adjacent to Units #1 and #2 sewage treatment plant area.
Bottom Ash Transport Water			
603	Internal	N/A	Bottom ash transport water discharge to the bottom ash pond.
Fly Ash Transport Water			
604	Internal	N/A	Fly ash transport water discharge to the fly ash reservoir. Note: The Fly Ash Reservoir (FAR) II is in the process of being decommissioned and there is no discharge of fly ash water to FAR II. Fly ash is collected through a dry system and landfilled on site.
Continuous Chlorination/Bromination at Outfall 001			
091	Internal	N/A	This monitoring station does not exist but is actually outfall OIB00009001. The purpose of this station is to allow the option of continuous chlorination/bromination in the non-contact cooling water system. Note: The facility does not chlorinate/brominate continuously with monitoring and effluent limits used at outfall 001.
Background			
801	Internal	N/A	Upstream monitoring station - samples to be collected from a location without the influence of any of the permittee's outfalls. Note: Upstream monitoring in the Ohio River is at a marina upstream of the power plant. This location is used to obtain a mercury background concentration in the Ohio River.

The outfalls listed in **Table 4** along with key features of the power plant are depicted in the Cardinal site map (**Appendix B**).

The NPDES permit contains additional conditions for the facility such as:

- Cooling water intake structure monitoring requirements
- Discharge of metal cleaning wastewater
- Storm water management conditions and monitoring
- Sludge disposal requirements from both sanitary wastewater treatment plants

Cardinal is also authorized to discharge storm water associated with industrial activity (outfalls 011, 012, and 014) under NPDES permit No. OIB00009*AE.

Cardinal has storm water control measures and pollution prevention programs required under the individual NPDES permit, such as:

- Routine facility inspections/quarterly visual assessment of storm water discharges
- Control measures/Best Management Practices (BMPs)
- Storm water Pollution Prevention Plan (SWPPP)/Keeping SWPPP current
- Monitoring and reporting requirements

No other storm water discharges associated with industrial activity, outside the outfalls described above and in **Table 4**, are authorized in the current NPDES permit.

Industrial Storm Water

The Cardinal facility is a coal fired steam electric generating power station which is one of eleven categories of industrial activities for which EPA has developed permitting regulations under the NPDES program to control storm water discharges. NEIC observed that the following on-site process activities and materials are generally exposed to storm water at the Cardinal Facility: coal raw materials offloading and storage; limestone raw materials offloading and storage; gypsum product loading; equipment storage yards; laydown yards; vehicle and equipment fueling; storage of hazardous and/or non-hazardous containers; and tracking of materials around loading areas of facility. Storm water that comes into contact with these areas is storm water associated with industrial activity.

Cardinal's SWPPP indicates that the previously permitted industrial storm water outfalls 010, 013, 015, 016, 017, and 018 have all been rerouted as follows and are no longer referenced in the Cardinal NPDES permit:

- Outfall 010 has been rerouted to the north coal yard runoff pond.
- Outfall 013 has been rerouted to the Bottom Ash Pond and is no longer listed in the permit.
- Outfall 015 has been rerouted and is no longer listed in the permit.
- Outfall 016 has been rerouted to the drainage area of Outfall 011.
- Outfall 017 has been removed and the area regraded to promote sheet flow.
- Outfall 018 has been rerouted and is no longer listed in the permit.

Storm water associated with industrial activity inside the production area drains to either the north or south coal pile runoff ponds. These ponds pump the water to the low volume waste water lined pond and is discharged and monitored through outfall 023.

Cardinal's NPDES permit and associated storm water pollution prevention plan (SWPPP) both identify that there are three permitted outfalls that solely discharge storm water associated with industrial activity. These outfalls are identified as outfalls 011, 012, and 014. The SWPPP includes maps that identify the drainage areas for each of these outfalls. All three outfalls discharge through respective pipes on the bank of the Ohio River.

Compliance Schedule

Cardinal has a Schedule of Compliance in the current NPDES permit. The following is a summary of compliance items listed in the NPDES permit and the status:

- Schedule to meet final effluent limitations for copper at outfall 006 (Completed)
- Schedule to meet final effluent limitations for dissolved Hexavalent Chromium and Mercury at outfall 019 (Completed)
- Units 1 & 2 Cooling Water Intake Structure Compliance (Completed)

FACILITY OPERATIONS SUMMARY

Fly Ash/Fly Ash Reservoir II

Burning coal produces the residual waste of fly ash and bottom ash. Historically, fly ash was sluiced with transport water and sent to Fly Ash Reservoir II. The reservoir received the fly ash water at the front of the reservoir and settled out suspended solids prior to discharging the treated water to Blockhouse Hollow Run, which is monitored at outfall 019.

Cardinal has successfully achieved zero liquid discharge of fly ash transport water as required by the 2015 Effluent Limitations Guidelines (ELG) Rule. This was accomplished by converting the generating units to a dry fly ash system and disposing of the dry fly ash at the Residual Solid Waste Landfill (described below). Fly ash is stored in dry fly ash silos, where it is loaded onto trucks for disposal at the on-site landfill. This project was completed in 2021.

Because the reservoir no longer receives transport fly ash water, FAR II is in the process of being decommissioned. The water level in the reservoir is slowly being lowered and closure of FAR II is expected in the coming years. Landfill leachate used to be routed into FAR II and discharged with the fly ash water and monitored at outfall 019. Because FAR II is being decommissioned the leachate is now redirected to Blockhouse Hollow Run just upstream of outfall 019. Monitoring of the leachate is at internal monitoring station 602.

Bottom Ash

The bottom ash collection/storage/treatment system located at the southern end of the site was composed of a “North” and “South” pond system. According to Cardinal staff, once the “South” Pond closure and retrofit were complete, the bottom ash transport waters were routed directly to the “South” Pond. The temporary pump system that connects the “North” Pond to the Recirculation Pumphouse was removed. The “South” Pond has resumed pumping directly to the Recirculation Pumphouse to allow for the bottom ash transport waters to be reused in Ash Handling Units 1, 2, & 3.

Bottom Ash is sluiced to the Retrofitted Bottom Ash Pond (“South” Pond), where it is excavated and decanted, prior to disposal in the landfill or reused offsite. The bottom ash transport water is re-circulated back to the generating units in a closed loop system. Blowdown from the closed loop system is sent to the FGD system for reuse in that air control unit.

Notification of zero ash transport water discharge was submitted to Ohio EPA on April 6, 2023.

The “North” Pond will be “clean closed” and retrofitted with a NPDES compliant liner. The removal of coal combustion residual (CCR) materials and the installation of the new liner will be completed in two parts.

In the first phase and at the time of the inspection, the existing CCR materials within the “North” Pond are being reshaped to divide the “North Pond” into north and south areas of the pond. Additionally, a temporary liner was placed on the northern portion of the “North” Pond to receive low volume waste (LVW).

The southern portion of the “North” Pond will be the first to be cleaned and retrofitted. All low volume wastewaters will continue to be directed to the northern portion of the “North” Pond, which will continue to be pumped via the temporary system and discharged via the current Outfall 023 location to the Ohio River. During removal of CCR materials from the southern portion of the “North” Pond, the new Outfall 023 will be installed in the southeast corner of the “North” Pond.

Once the southern portion of the “North” Pond is lined, the low volume wastewaters will be routed to discharge into the newly retrofit section of the “North” Pond and will gravity discharge through the new location for Outfall 023. The northern portion of the “North” Pond will then be dewatered via Outfall 023, clean closed, and re-lined with a NPDES compliant liner before the divider is removed to reconnect the northern and southern areas (LVW Pond).

Once the dewatering activities of the northern section of the “North” Pond are completed, no bottom ash transport waters or metal cleaning waste will be discharged via Outfall 023, and the Final Phase for Outfall 023 may begin.

Fluid Gas Desulfurization/WWTP

FGD

Each of the three Cardinal units is equipped with a Chiyoda CT-121-type jet bubbling reactor (JBR) vessel. Unit 1 and Unit 2 have essentially identical designs and dimensions. Unit 3 is very similar in design, but its dimensions and some specifications differ from the other two units. All three JBRs function in the same manner and the general descriptions and methods of operation are the same. The purpose of each vessel is the removal of sulfur dioxide (SO₂), particulate, mercury, and other air toxins from the gas stream, while producing calcium sulfate (gypsum) slurry as a byproduct.

During normal operation, exhaust gas from the furnace of each unit’s steam generator (boiler) which has already passed through electrostatic precipitators, and selective catalytic reduction (SCR) reactors enter the JBR through a gas cooling zone. The contact between the gas and the recirculated slurry of the JBR begins the process of absorbing SO₂ and other constituents in the gas.

Sodium formate solution is added to the gas cooling headers to act as an alkalinity buffer in the JBR. This permits the absorber to operate at a slightly lower pH, which promotes better dissolution of limestone, resulting in more efficient reagent utilization, higher purity calcium sulfate byproduct, and reduced scaling and fouling inside the JBR while maintaining performance in removal of air toxins in the gas stream.

After passing through the sprays in the gas cooling section, the gases are forced through thousands of tubes on the lower deck of the vessel called sparger tubes. The openings in these tubes are submerged under the operating level of the slurry in the JBR. This submergence of the flue gas openings of the sparger tubes by the JBR slurry completes the scrubbing process via a bubbling action that occurs at jet bubbling zone or “froth zone” of the JBR. The “scrubbed” gas then passes through dozens of larger gas riser tubes to the upper deck of the absorber before passing through mist eliminators, the outlet duct, and then to the stack.

The overall purpose of the byproduct dewatering system is to process the calcium sulfate slurry discharged from the JBRs into a solid byproduct commonly known as gypsum. Process water that is separated from the solids in the byproduct de-watering system becomes reclaim water or blowdown to the FGD WWTP.

The following is a basic description of the Cardinal Plant FGD Wastewater Treatment Plant (WWTP). The WWTP consists of the following unit processes:

- **Equalization Tanks** - The equalization tanks receive blowdown from the FGD dewatering process. Equalization is provided to normalize the flows from the FGD process going to the clarifier as influent flows can vary.
- **Desaturation Tanks** - The purpose of the desaturation process is to reduce the concentration of dissolved sulfate in the wastewater by adding sufficient lime to raise the pH of the influent, resulting in the precipitation of calcium sulfate and metal hydroxides.
- **Primary Clarifiers** - The purpose of primary clarification is to remove the bulk of the suspended solids present in the wastewater and to remove calcium sulfate solids produced in the desaturation tanks. Dilute polymer is added to the primary clarifiers to aid in settling of solids. An organosulfide is also fed to the primary clarifier to aid in mercury removal. The clarified water from each stream flows hydraulically from the primary clarifier to the respective coagulant mix tank. The settled solids (sludge) are transferred from each primary clarifier by two primary clarifier sludge pumps to the respective sludge tanks for dewatering.
- **Coagulation Tanks** - Ferric chloride is fed to each train's coagulant mix tank. This is employed for coagulation of fines prior to the secondary clarifiers. Sulfuric acid may also be added for control of pH, if necessary, but this is not typical.
- **Secondary Clarifiers** - Fine solids that have passed through the primary clarifiers and have coagulated in the coagulant mix tank will then be removed by settling in the secondary clarifiers. Sludge is periodically blown down to a common sludge sump. Polymer is added to the secondary clarifiers to aid in the settling of solids.
- **Effluent Tanks** - Two effluent storage tanks are provided downstream of the secondary clarifiers. Two pumps are provided to pump the effluent from the effluent storage tanks to the outfall. Effluent is also used as flush water within the system and may also be recirculated back to the equalization tanks if off spec effluent is encountered.
- **Solids Dewatering** - The purpose of the dewatering process is to dispose of solid materials separated via the WWTP processes. Two sludge storage tanks are provided, which receive solids (sludge) as described in the primary and secondary clarification

sections. Four filter presses perform the de-watering of the sludge. The filter presses consist of a frame and a series of plates, each of which forms a recessed chamber surrounded by a filter cloth. Dewatered sludge drops from each plate to the sludge storage bunker below. Bunkers are accessible at one end by front-end loaders for loading the de-watered sludge onto trucks for final disposal in the onsite landfill.

According to facility staff, Cardinal is currently working towards installing new treatment technology for the Flue Gas Desulfurization (FGD) wastewater treatment plant as required by the October 13, 2020, ELG Reconsideration Rule. Cardinal submitted a Notice of Planned Participation to Ohio EPA stating the intent to close Unit 3 by the end of 2028 and install a new FGD wastewater treatment system for Units 1 & 2. Cardinal is currently working to install the treatment system as soon as possible, but no later than December 31, 2025, as required by the effective rule.

Sewage Treatment Plants (Units 1&2, Unit 3)

Cardinal employs two sewage treatment package plants to treat and discharge sanitary wastewater generated on site. One package plant serves facilities around Units #1 and #2 while the other serves facilities in the Unit #3 area. Both package plants use activated sludge to treat the sanitary wastewater and the unit processes are similar in each system.

The package plants have the following components:

- Surge Tank
- Aeration Chamber(s)
- Secondary clarifiers
- Sand Filters
- UV Disinfection

The WWTP that serves Units #1 and #2 discharges through outfall 006. The WWTP that serves Unit #3 discharges through outfall 008. A more detailed description and process flow diagram is in **Appendix C**.

Landfill

The on-site landfill was built on top of the first Fly Ash Reservoir. The landfill has historically disposed of fly ash and bottom ash as well as solids from the FGD WWTP. Two wastewater streams are currently being conveyed from the landfill to the collection sump, settling tank system and discharged through internal monitoring station 602.

The first waste stream, landfill leachate and storm water, generated by rainwater percolating through the landfill waste or chimney drains is contained within the landfill's liner, collected by an underground leachate collection system, and conveyed by a 36" HDPE pipe to the sump.

Additionally, rainwater and seepage that discharges off the highwall adjacent to the landfill, is routed underneath the landfill as an underdrain and is conveyed by an 18" HDPE pipe to the sump.

Two submersible pumps are placed within the sump to facilitate leachate transport to the settling tanks. Each sump pump is designed to discharge the maximum flow (420 gallons per minute) into the tank system. Therefore, only one sump pump will be in operation at any given time, giving the system redundancy.

Leachate from the sump enters the tanks to allow solids that may precipitate to settle prior to discharge. The settling tanks consist of two, single-walled 50,000-gallon, corrosion-resistant tanks. The settling tanks have a cross tie between each tank. The tank piping is configured such that a single tank can be taken out of service to facilitate maintenance and removal of solids while maintaining operation. The tanks discharge via overflow piping. The overflow nozzle is located high enough above grade to facilitate gravity flow discharge through stainless steel and existing carbon steel piping to internal monitoring station 602. Internal monitoring station 602 now discharges directly into Blockhouse Hollow Run just upstream of outfall 019. Tank drains are routed back to the leachate collection sump.

Coal/Limestone/Gypsum Handling and Storage

Coal is delivered to the Cardinal facility via barges on the Ohio River. Barges are offloaded via two barge offloading facilities, barge unloading 1 and barge unloading 2. Coal is transported via a covered conveyor belt system from barge unloading 1 to the north coal pile and from barge unloading 2 to the south coal pile. Coal is then transported from coal piles located inside the facility to the units via a conveyor belt system. Coal from the north coal pile is used in units 1 and 2, while coal from the south coal pile is used in unit 3.

Limestone is used in air pollution control devices at Cardinal, specifically it is used in the Jet Bubbling Reactors (JBRs) which are part of the wet FGD systems. Limestone is delivered via barges on the Ohio River where it is offloaded via a conveyor belt system and stored in an open-air pile on the northeast corner of the facility adjacent to the confluence of the Ohio River and Blockhouse Run. Limestone is moved from the pile into a ball mill for crushing prior to being transported for use in the JBRs.

Calcium sulfite is byproduct of the FGD system which can be oxidized and refined to become saleable gypsum. Saleable gypsum at Cardinal is stored in the gypsum dome and transported using a conveyor belt system to barges on the Ohio River for shipping off site.

Unsaleable gypsum is sent to Cardinal's landfill. At the time of the inspection, Cardinal was reclaiming saleable gypsum from its landfill and transporting it via truck to the gypsum dome.

FIELD ACTIVITIES SUMMARY

NEIC conducted and led the field inspection from August 14-18, 2023, at the Cardinal Power Plant located in Brilliant, Ohio. NEIC inspectors, along with regional EPA inspectors, arrived at the facility at approximately 10 a.m. on August 14, 2023, at which time credentials were presented to facility contacts listed in **Table 2** of this report. NEIC conducted an opening conference that explained the purpose and scope of the inspection.

During the inspection, NEIC inspectors reviewed discharge monitoring reports (DMRs), laboratory sampling data, production records, process flow diagrams, the storm water pollution prevention plan and BMPs, and self-reported noncompliance notifications. Inspectors also interviewed personnel at the facility.

In addition, NEIC inspectors conducted a walk-through inspection of the facility and observed the process areas, treatment systems, internal monitoring locations and outfalls, as well as the coal, limestone and gypsum handling and material storage areas.

NEIC took photographs around the facility, the outfalls, and the material storage areas throughout the property. A photo log is contained in **Appendix D**. After completing the inspection, NEIC, regional EPA inspectors and facility representatives had a closing conference and discussed initial observations. NEIC inspectors departed the facility at approximately 12 p.m. on August 18, 2023.

INVESTIGATION OBSERVATIONS

NEIC made the observations detailed below during the Clean Water Act compliance inspection. NEIC and Region 5 field team members discussed all observations with facility representatives during the closeout meeting, unless otherwise noted in the observation description.

These observations are not final compliance determinations. EPA Region 5 will make the final compliance determinations based on its review of this report and other technical, regulatory, and facility information.

Observation 1
Observation Summary: Storm water associated with industrial activity discharges from the Cardinal facility from numerous locations along the bank of the Ohio River through unpermitted outfalls (unauthorized discharge).
Citation: CWA § 301(a): <i>except as in compliance with this section and sections 302, 306, 307, 318, 402 and 404 of this Act, the discharge of any pollutant by any person shall be unlawful.</i> 40 Code of Federal Regulations (CFR) § 122.1(b)(1): <i>The NPDES program requires permits for the discharge of “pollutants” from any “point source” into “waters of the United States.”</i> 40 CFR § 122.2: <i>Pollutant: means dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials (except those regulated under the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 et seq.)), heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water. It does not mean: (a) Sewage from vessels; or (b) Water, gas, or other material which is injected into a well to facilitate production of oil or gas, or water derived in association with oil and gas production and disposed of in a well, if the well used either to facilitate production or for disposal purposes is approved by authority of the State in which the well is located, and if the State determines that the injection or disposal will not result in the degradation of ground or surface water resources.</i> 40 CFR § 122.2: <i>Point source means any discernible, confined, and discrete conveyance, including but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel or other floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural storm water runoff.</i> 40 CFR § 120.2: <i>Waters of the United States means: (1) Jurisdictional waters. For purposes of the Clean Water Act, 33 U.S.C. 1251 et seq. and its implementing regulations, subject to the exclusions in paragraph (2) of this section, the term “waters of the United States” means: (i) The territorial seas, and waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including waters which are subject to the</i>

Observation 1

ebb and flow of the tide; (ii) Tributaries; (iii) Lakes and ponds, and impoundments of jurisdictional waters; and (iv) Adjacent wetlands.

CWA Section 402(p): Municipal and Industrial Storm water Discharges. —

(1) General Rule. --Prior to October 1, 1994, the Administrator or the State (in the case of a permit program approved under section 402 of this Act) shall not require a permit under this section for discharges composed entirely of storm water.

(2) Exceptions. --Paragraph (1) shall not apply with respect to the following storm water discharges: (A) A discharge with respect to which a permit has been issued under this section before the date of the enactment of this subsection. (B) A discharge associated with industrial activity.

40 CFR § 122.26(b)(14): *Storm water discharge associated with industrial activity means the discharge from any conveyance that is used for collecting and conveying storm water and that is directly related to manufacturing, processing or raw materials storage areas at an industrial plant. The term does not include discharges from facilities or activities excluded from the NPDES program under this part 122. For the categories of industries identified in this section, the term includes, but is not limited to, storm water discharges from industrial plant yards; immediate access roads and rail lines used or traveled by carriers of raw materials, manufactured products, waste material, or by-products used or created by the facility; material handling sites; refuse sites; sites used for the application or disposal of process waste waters (as defined at part 401 of this chapter); sites used for the storage and maintenance of material handling equipment; sites used for residual treatment, storage, or disposal; shipping and receiving areas; manufacturing buildings; storage areas (including tank farms) for raw materials, and intermediate and final products; and areas where industrial activity has taken place in the past and significant materials remain and are exposed to storm water. For the purposes of this paragraph, material handling activities include storage, loading and unloading, transportation, or conveyance of any raw material, intermediate product, final product, by-product or waste product. The term excludes areas located on plant lands separate from the plant's industrial activities, such as office buildings and accompanying parking lots as long as the drainage from the excluded areas is not mixed with storm water drained from the above described areas. Industrial facilities (including industrial facilities that are federally, State, or municipally owned or operated that meet the description of the facilities listed in paragraphs (b)(14)(i) through (xi) of this section) include those facilities designated under the provisions of paragraph (a)(1)(v) of this section. The following categories of facilities are considered to be engaging in "industrial activity" for purposes of paragraph (b)(14):*

40 CFR § 122.26(b)(14)(vii): *Steam electric power generating facilities, including coal handling sites;*

Observation 1

Evidence:

Appendix E: 2023 Permit renewal application for National Pollutant Discharge Elimination System Permit No. OH00012581

Appendix F: Storm Water Pollution Prevention Plan (SWPPP), Revision 9, dated January 2022

Appendix D: Field Photo Log

Appendix A: Cardinal NPDES Permit OIB00009AE

Description of Observation: Cardinal reports in its 2023 NPDES permit renewal application that it is classified under SIC code 4911 (electric services), a facility which engages in the generation, transmission, and/or distribution of electric energy for sale (**Appendix E**). Cardinal generates electric energy at the Brilliant, Ohio facility through the operation of coal burning steam electric power generating facilities. NEIC observed that the facility includes on-site activities that are not included in Cardinal's SWPPP (**Appendix F**), but from which storm water associated with industrial activity has the potential to discharge into the Ohio River, these areas include:

- Coal barge unloading (**Appendix D**, photos RIMG3167.JPG - RIMG3176.JPG);
- Limestone raw materials storage (**Appendix D**, photo RIMG3153.JPG);
- Gypsum barge loading (**Appendix D**, photos RIMG3151.JPG and RIMG3152.JPG);
- Sewage treatment plant filter media storage (**Appendix A**, photo RIMG3177.JPG);
- Equipment storage (**Appendix D**, photo RIMG3154.JPG and RIMG3155.JPG);
- Vehicle and equipment fueling stations (**Appendix D**, photo RIMG3156.JPG);
- Storage of hazardous and/or non-hazardous containers (**Appendix D**, photos RIMG3148.JPG - RIMG3150.JPG); and

Cardinal is authorized in the NPDES permit (**Appendix A**) to discharge industrial storm water from outfalls 011, 012, and 014. Industrial storm water outfalls 010, 013, 015, 016, 017, and 018 have all been rerouted as follows:

- Outfall 010 has been rerouted to the north coal yard runoff pond.
- Outfall 013 has been rerouted to the Bottom Ash Pond and is no longer listed in the permit.
- Outfall 015 has been rerouted and is no longer listed in the permit.
- Outfall 016 has been rerouted to the drainage area of Outfall 011.
- Outfall 017 has been removed and the area regraded to promote sheet flow.
- Outfall 018 has been rerouted and is no longer listed in the permit.

No other discharges of storm water associated with industrial activity are authorized in the permit.

Cardinal has two barge-unloading areas for coal on the Ohio River. The two areas include permanent structures located in the river from which coal is offloaded to the facility via an elevated conveyor system. The two barge unloading areas are identified as barge unloading 1 and barge unloading 2. Barge unloading 1 is the further north (more upstream) of the two

Observation 1

coal unloading areas, and its conveyors lead to the north coal pile, while the conveyor for barge unloading 2 leads to the south coal pile.

Neither of the barge unloading areas, which includes the areas immediately around and under the offloading conveyors (east of the paved access road to the river), were included in the NPDES permit (**Appendix A**) or the associated SWPPP (**Appendix F**).

During the inspection, NEIC observed that both coal barge unloading areas contained accumulated coal in and along the river and at various locations under and around the conveyors. No BMPs or good housekeeping practices were identified for these areas in any of the storm water documentation provided by Cardinal. NEIC inspectors did not observe any BMPs or good housekeeping practices that were implemented and maintained in these areas.

*For example, spilled coal had accumulated under barge unloading area 1 along the river's shoreline (**Appendix D**, photos RIMG3170.JPG and RIMG3171.JPG). There was also coal that had accumulated under barge unloading 1 on the east side of the facility's paved access road and within the facility's fence line that had standing water that had accumulated (**Appendix D**, photo RIMG3172.JPG). NEIC inspectors observed that the flow pathways from this accumulated water went both under a tank and through the white siding on the barge unloading 1 elevated conveyor structure (**Appendix D**, photo RIMG3173.JPG). The runoff path under the tank and through the white siding went outside of the facility's fence line and to a concrete basin along the shore of the river. The basin had accumulated water at the time of the inspection (**Appendix D**, photo RIMG3169.JPG). From the concrete basin, storm water would flow via an eroded channel into the Ohio River. This concrete basin appears to also receive flow from a large gravel area along the east side of the facility's access road just north of the barge unloading 1 area from which an eroded pathway was observed that led to the concrete basin (**Appendix D**, photo RIMG3168.JPG). NEIC inspectors observed small coal piles in the gravel area (**Appendix D**, photo RIMG3167.JPG) and along the eroded pathway to the concrete basin.*

The area around coal barge unloading 1 appears to discharge storm water associated with an industrial activity, as outlined in 40 CFR § 122.26(b)(14) and 40 CFR § 122.26(b)(14)(iii), through an unpermitted outfall.

*NIEC observed conditions at barge unloading 2 that were like those observed at barge unloading 1, with coal that had accumulated around and below the barge unloading area conveyor and along the river's shoreline. NEIC was unable to walk the shoreline below the barge unloading 2 area, but from a bridge that led to the barge unloading structure in the river, significantly more coal, including large piles, were observed to have accumulated along the bank of the river and below the conveyor (**Appendix D**, photos RIMG3174.JPG and RIMG3176.JPG). Additionally, coal had accumulated on the bridge, including along the sides where drainage holes for the bridge were open to the shoreline below (**Appendix D**, photo RIMG3175.JPG).*

Observation 1

The area around barge unloading 2 appears to discharge storm water associated with an industrial activity, as outlined in 40 CFR § 122.26(b)(14) and 40 CFR § 122.26(b)(14)(iii), through an unpermitted outfall.

NEIC inspectors observed that the area under the gypsum barge loading conveyor had accumulated gypsum at what was identified by facility representatives as the gypsum barge loading belt tray chute loadout area. Cardinal representatives indicated that the loadout area was where gypsum that had accumulated in the barge loading conveyor system was removed via a chute to a ground level area surrounded by large concrete blocks (**Appendix D**, photo RIMG3152.JPG). This area was not included as part of Cardinal's SWPPP (**Appendix F**). NEIC inspectors observed that there were several eroded pathways, from both inside and outside of the concrete block loadout area, that contained spilled gypsum, and that led through the facility's chain link fence towards the Ohio river (**Appendix D**, photo RIMG3151.JPG).

The area around the gypsum barge loading belt tray chute loadout area appears to discharge storm water associated with an industrial activity, as outlined in 40 CFR § 122.26(b)(14) and 40 CFR § 122.26(b)(14)(iii), through an unpermitted outfall.

Cardinal has a large limestone storage pile at the northeast corner of the facility which is at the confluence of Blockhouse Hollow Run and the Ohio River. The limestone pile was uncovered (**Appendix D**, photo RIMG3153.JPG) and was not included in Cardinal's SWPPP (**Appendix F**).

The area around the limestone pile appears to discharge storm water associated with an industrial activity, as outlined in 40 CFR § 122.26(b)(14) and 40 CFR § 122.26(b)(14)(iii), through an unpermitted outfall.

NEIC inspectors observed sewage treatment plant filter media that was being stored uncovered at the unit 3 sewage treatment plant along the facility's fence line that is adjacent to the Ohio River (**Appendix D**, photo RIMG3177.JPG). The area's grade and the location of the filter media piles was such that storm water that run off the piles would flow through the fence line and down the bank towards and into the Ohio River. The unit 3 sewage treatment plant was not included in Cardinal's SWPPP (**Appendix F**).

The area around the filter media piles appears to discharge storm water associated with an industrial activity, as outlined in 40 CFR § 122.26(b)(14) and 40 CFR § 122.26(b)(14)(iii), through an unpermitted outfall.

Equipment was being stored on the northeast side of units 1 and 2, along the facility's fence line which is adjacent to the Ohio River. NEIC inspectors observed that various equipment was stored in open areas uncovered in this area, such as old equipment and a tote of diesel exhaust fluid with an attached pump (**Appendix D**, photo RIMG3154.JPG and RIMG3155.JPG). A separate fueling station was located adjacent to the equipment storage area (**Appendix D**, photo RIMG3156.JPG). Cardinal's SWPPP did not include either of these areas (**Appendix F**).

Observation 1

The area around the equipment storage or fueling station appears to discharge storm water associated with an industrial activity, as outlined in 40 CFR § 122.26(b)(14) and 40 CFR § 122.26(b)(14)(iii), through an unpermitted outfall.

NEIC inspectors observed that there were two areas near the bottom ash pond where 55-gallon drums were sitting. The drums contained materials, but since the “non-hazardous waste” labels on all drums were not filled out, it is not known what the drums contained. Facility representatives indicated that they believed that the drums contained drill cuttings. One set of the 55-gallon drums was located along the facility’s fence line, where, if spilled, the contents would flow to the Ohio River. (**Appendix D**, photos RIMG3148.JPG - RIMG3150.JPG). These areas were not included in Cardinal’s SWPPP (**Appendix F**).

Observation 2

Observation Summary: Cardinal’s SWPPP was inadequate and did not correctly represent the activities on site.

Citation:***NPDES permit OIB00009*AE******Part IV. Storm Water Control Measures and Pollution Prevention Programs******J. Contents of SWPPP. The plan shall include, at a minimum, the following items:***

2. Description of Potential Pollutant Sources. You shall document at your facility where industrial materials or activities are exposed to storm water and from which allowable non-storm water discharges are released. Industrial materials or activities, include, but are not limited to: material handling equipment or activities; industrial machinery; raw materials; industrial production and processes; and intermediate products, by-products, final product or waste product. For each area identified, the description shall include, at a minimum:

a. Site Description. Your SWPPP shall include:***i. A description of the industrial activities at your facility;***

ii. A general location map (e.g. U.S. Geologic Survey (USGS) quadrangle map) with enough detail to identify the location of your facility and all receiving waters for your storm water discharges.

iii. A site map showing:

- The size of the property in acres;***
- The location and extent of significant structures and impervious surfaces;***
- Directions of storm water flow (use arrows);***
- Locations of all existing structural control measures;***
- Locations of all receiving waters in the immediate vicinity of your facility;***
- Locations of all storm water conveyances including ditches, pipes and swales;***

Observation 2

- *Locations of potential pollutant sources identified under Part IV J. 2.b;*
- *Locations where significant spills or leaks identified under Part IV J. 2.b. have occurred;*
- *Locations of all storm water monitoring points;*
- *Locations of storm water inlets and outfalls, with a unique identification code for each outfall (e.g. Outfall 001, Outfall 002, etc), indicating any outfalls that are considered substantially identical to another outfall, and an approximate outline of the areas draining to each outfall;*
- *Municipal separate storm sewer systems, where your storm water discharges to them;*
- *Locations and descriptions of all non-storm water discharges identified under Part IV. C.10;*
- *Locations of the following activities where such activities are exposed to precipitation:*
 - *Fueling stations;*
 - *Vehicle and equipment maintenance and/or cleaning areas;*
 - *Loading/unloading areas;*
 - *Immediate access roads and rail lines used or traveled by carriers of raw materials, manufactured products, waste material, or by-products used or created by the facility;*
 - *Transfer areas for substances in bulk;*
 - *Machinery; and*
- *Locations and sources of run-on to your site from adjacent property that contains significant quantities of pollutants.*

b. Inventory of Exposed Materials. This includes a list of industrial activities exposed to storm water (e.g., material storage; equipment fueling, maintenance, and cleaning; cutting steel beams). This also includes a list of the pollutant(s) or pollutant constituents (e.g, crankcase oil, zinc, sulfuric acid, and cleaning solvents) associated with each identified activity. The pollutant list shall include all significant materials that have been handled, treated, stored, or disposed, and that have been exposed to storm water in the three years prior to the data you prepare of amend your SWPPP.

3. Description of Control Measures. You shall document the location and type of control measures you have installed and implemented at your site to achieve the control measures/best management practices (BMPs) in Part IV.C, and where applicable, in Part IV.K. You shall describe how you addressed the control measure selection and design considerations in Part IV.B. This documentation shall describe how the control measures at your site address both the pollutant sources identified in Part IV.J.2 and any storm water run-on that commingles with any discharges covered under this permit.

Evidence:

Appendix F: Storm Water Pollution Prevention Plan (SWPPP), Revision 9, dated January 2022

Appendix D: Field Photographs

Appendix A: National Pollutant Discharge Elimination System Permit No. OH00012581

Observation 2

Description of Observation: Cardinal's SWPPP was identified as Revision 9 and was dated November 2022 (**Appendix F**). The SWPPP indicates that it covers the drainage areas for outfall 011, 012, and 014. For these three areas, the SWPPP includes drainage maps, descriptions of the activities for each area, and the BMPs that are to be implemented for each area. Based on the activities that NEIC inspectors observed while on site, Cardinal's SWPPP (**Appendix F**) did not include all areas of the facility where storm water is exposed to industrial activities.

The SWPPP (**Appendix F**) does not include an accurate description of the activities and potential storm water pollutants in the outfall 012 drainage area. There is no reference to the dry fly ash loading area and its exit road. The description of potential pollutants in the SWPPP states that:

"[s]uspended solids could consist of minor amounts of gravel and bottom ash used for snow and ice skid control on roadways that are washed into the catch basins as a result of a storm event. However, the predominant source of suspended solids will be coal fines. Because of this possibility, the catch basins which drain to this outfall are surrounded by both silt fencing and straw bales."

But NEIC inspectors observed that there was accumulated fly ash around the fly ash loading structure and on the exit roadway that was not identified as a potential pollutant source (**Appendix A**, photos RIMG3186 and RIMG3187.JPG).

Cardinal had changed its operations to include dry fly ash handling for unit 3. The dry fly ash is top loaded into trucks inside the dry fly ash structure and then transported to the landfill. The dry fly ash loading for unit 3 is a large structure that is in the drainage basin for outfall 012 as can be seen in a screenshot taken from google maps.

Observation 2



Aerial Overview of Cardinal Power Plant: <https://www.google.com/maps/place/Brilliant,+OH+43913/@40.2434233,-80.6555685,146m/data=!3m1!1e3!4m6!3m5!1s0x883432a4666104b9:0x5bf1178f0f8d7698!8m2!3d40.2647925!4d-80.6261864!16zL20vMDlrMjlz?entry=ttnu>

The NPDES permit (**Appendix A**) requires that the SWPPP include “the location and extent of significant structures and impervious surfaces”, but the SWPPP maps (**Appendix F**) do not include the dry fly ash loading structure or the associated roadways.

The two maps for outfall 014 in Appendix A of the SWPPP, Sheet B, and the google maps aerial image (**Appendix F**) show different storm water flow patterns than what was observed by NEIC inspectors on site. Cardinal representatives indicated, and storm water sampling data also indicate, that outfall 014 does not discharge storm water even after a precipitation or runoff event. The reason for this is unclear since one of the storm drains identified as contributing to outfall 014 was identified as having standing water (**Appendix D**, photo RIMG3157.JPG). NEIC inspectors observed that the unit 1 and 2 sewage treatment plant area is not graded to support storm water flow into the two nearby catch basins. For example, an eroded runoff path was observed on the southwest side of the drainage area (**Appendix D**, photo RIMG3159.JPG).

Additionally, the SWPPP does not accurately identify the control measures for outfalls 011 and 012. Specifically, some of the catch basins for the outfalls included absorbent boom socks and Stormexx filtration devices (**Appendix D**, photo RIMG3185.JPG). These are not identified in the SWPPP, which only indicates that control measures for outfall 011 and 012 catch basins include “filtering devices (i.e. straw bales, silt fencing)”.

Observation 3

Observation Summary: Cardinal did not identify and implement pollutant prevention and/or treatment BMPs to prevent or minimize pollutants in storm water.

Citation:

NPDES permit OIB00009*AE

Part IV. Storm Water Control Measures and Pollution Prevention Programs**A. Control Measures.**

You shall select, design, install, and implement control measures (including best management practices) to address the selection and design considerations in Part IV.B, and meet the control measures/best management practices in Part IV.C and any applicable numeric effluent limits in Part I. The selection, design, installation, and implementation of these control measures shall be in accordance with good engineering practices and manufacturer's specifications. Note that you may deviate from such manufacturer's specifications where you provide justification for such deviation and include documentation of your rationale in the part of your SWPPP that describes your control measures, consistent with Part IV.J.3. If you find that your control measures are not achieving their intended effect of minimizing pollutant discharges, you shall modify these control measures as expeditiously as practicable. Regulated storm water discharges from your facility include storm water run-on that commingles with storm water discharges associated with industrial activity at your facility.

K. Sector-Specific Requirements

You shall comply with the following sector-specific requirements associated with your primary industrial activity and any co-located industrial activities, as defined in Part VI. The sector-specific requirements apply to those areas of your facility where those sector-specific activities occur. These sector-specific requirements are in addition to any requirements specified elsewhere in this permit.

2. Additional Control Measures/Best Management Practices (BMPs). The following good housekeeping measures are required in addition to Part IV.C.2:

k. Ash Loading Areas. Reduce or control the tracking of ash and residue from ash loading areas. Clear the ash building floor and immediately adjacent roadways of spillage, debris, and excess water before departure of each loaded vehicle.

Evidence:

Appendix D: Field Photographs

Appendix G: Quarterly Storm Water Sampling Data for Quarter 3, 2022 to Quarter 2, 2023

Appendix H: Industrial Storm Water Fact Sheet Series, Sector O

Appendix F: Storm Water Pollution Prevention Plan (SWPPP), Revision 9, dated January 2022

Observation 3

Description of Observation: NEIC inspectors observed multiple areas of industrial activity that were not covered by the SWPPP (**Appendix F**) and that did not appear to have any BMPs that were being implemented. These areas included the limestone storage pile, gypsum barge loading area, coal barge unloading areas, outdoor equipment storage areas, the unit 3 sewage treatment plant, and the landfill exit roadway.

The fly ash loading area is part of the outfall 012 drainage area that is covered by the SWPPP, but no BMPs or good housekeeping practices related the fly ash loading operations were documented in the SWPPP. NEIC inspectors observed that the fly ash loading area contained accumulated fly ash both outside of the north side of the loading structure (**Appendix D**, photo RIMG3186.JPG) and on the truck exit road (**Appendix D**, photo RIMG3187.JPG).

NEIC inspectors observed that at a catch basin in the outfall 011 drainage area a pipe was cut through and bypassed the silt fencing. Silt fencing is an identified BMP for preventing pollutants from making it to the catch basin and outfall (**Appendix D**, photo RIMG3182.JPG).

Based on the quarterly analytical and visual sampling results and the state of the BMPs during the inspection, it does not appear that the installed control measures are operating in a manner that would prevent or minimize the contamination of storm water. For example, NEIC observed that a catch basin on the north side of outfall 011 had accumulated coal inside of the basin (**Appendix D**, photo RIMG3181.JPG). Cardinal's quarterly storm water sampling documentation for quarter 3 of 2022, quarter 4 of 2022, quarter 1 of 2023, and quarter 2 of 2023, included visual and analytical results (**Appendix G**). The visual inspection results showed storm water that had a dark color or dark particles for outfall 011 in Quarter 3 of 2022 and Quarter 1 of 2023, and Quarter 4 of 2022 and Quarter 1 of 2023 for outfall 012. The documentation did not include any information about the probable sources of any observed storm water contamination.

NEIC inspectors observed that in the outfall 014 drainage area there was a roll-off container that was uncovered and had accumulated materials. The roll-off was located on the corner of the drainage basin, along a chain link fence that had accumulated trash/debris. (**Appendix D**, photo RIMG3158.JPG). EPA's Industrial Storm Water Fact Sheet Series, Sector O: Steam Electric Power Generating Facilities, Including Coal Handling Areas (**Appendix H**) indicates that:

"[g]ood housekeeping practices must include a schedule for regular pickup and disposal of garbage and waste materials and routine inspections of drums, tanks, and containers for leaks and structural conditions. Practices also include containing and covering garbage, waste materials, and debris."

This roll-off container can be seen in the google maps aerial photo dated "2/14/2017" in the SWPPP (**Appendix F**).

Observation 4

Observation Summary: Cardinal did not have complete records demonstrating that it properly conducted routine storm water inspections.

Citation:

NPDES permit OH0012581

Part IV. Storm Water Control Measures and Pollution Prevention Programs**E. Inspections**

Beginning on the effective date of this permit, you shall conduct the inspections in Part IV.E.1, Part

IV.E.2, and Part IV.E.3 at your facility.

1. Routine Facility Inspections. Conduct routine facility inspections of all areas of the facility where industrial materials or activities are exposed to storm water, and of all storm water control measures used to comply with Part IV. Items A-C conditions contained in this permit. Routine facility inspections shall be conducted at least quarterly (i.e., once each calendar quarter) although in many instances, more frequent inspection (e.g., monthly) may be appropriate for some types of equipment, processes, and control measures or areas of the facility with significant activities and materials exposed to storm water. Perform these inspections during periods when the facility is in operation. You shall specify the relevant inspection schedules in your SWPPP document as required in Part IV. Items A-C. These routine inspections shall be performed by qualified personnel (for definition see VI - Definitions) with at least one member of your storm water pollution prevention team participating.

At least once each calendar year, the routine facility inspection shall be conducted during a period when a storm water discharge is occurring.

You shall document the findings of each routine facility inspection performed and maintain this documentation onsite with your SWPPP. You are not required to submit your routine facility inspection findings to Ohio EPA, unless specifically requested to do so. At a minimum, your documentation of each routine facility inspection shall include:

- a. The inspection date and time;*
- b. The name(s) and signature(s) of the inspector(s);*
- c. Weather information and a description of any discharges occurring at the time of the inspection;*
- d. Any previously unidentified discharges of pollutants from the site;*
- e. Any control measures needing maintenance or repairs;*
- f. Any failed control measures that need replacement;*
- g. Any incidents of noncompliance observed; and*
- h. Any additional control measures needed to comply with the permit requirements.*

Any corrective action required as a result of a routine facility inspection shall be performed consistent with Part IV.D of this permit.

Evidence:

Appendix A: Cardinal NPDES Permit OIB00009AE

Appendix F: Storm Water Pollution Prevention Plan (SWPPP), Revision 9, dated January 2022

Appendix I: Monthly Routine Inspections Table

Observation 4

Description of Observation:

Cardinal's NPDES permit (**Appendix A**) requires:

"routine facility inspections of all areas of the facility where industrial materials or activities are exposed to storm water, and of all storm water control measures". Cardinal identifies in their SWPPP that "[p]lant personnel deemed qualified to conduct inspections and site compliance evaluations are the Plant Environmental Coordinator, Chief Chemist, Plant Chemist, and Senior Technicians. A report form including results of inspections and tracking/follow-up procedures has been established as part of this SWPPP. A copy of the form is included in Appendix B. Records of inspections shall be kept in the centrally located plant environmental files."

Appendix B in the SWPPP is titled "source list and forms", but there are no inspection report forms (**Appendix F**).

In response to NEICs request for documentation of quarterly inspection records, Cardinal provided a routine facility inspection table (**Appendix I**). The document is identified as "SPCC inspections" and only includes one of the storm water routine inspection documentation requirements as directed in Cardinal's NPDES permit (**Appendix D**), which is a date and time for when the inspection was conducted.

Observation 5

Observation Summary: Cardinal is not accurately calculating flow at outfall 001 and thus is not calculating Total Mercury properly with the equation provided in the NPDES permit.

Citation:

Part I, A. - FINAL EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. During the period beginning on the effective date of this permit modification and lasting until the expiration date, the permittee is authorized to discharge in accordance with the following limitations and monitoring requirements from outfall 01B00009001. See Part II, OTHER REQUIREMENTS, for locations of effluent sampling.

Table - Final Outfall - 001 - Final

50092 - Mercury, Total (Low Level) - ng/l - - - - - 1/Month Calculated

h. Report the mercury concentration at 01B00009001 per a flow weighted calculation utilizing the monthly average 601 monitored Hg concentration, the median 801 Hg concentration based on the previous calendar year and respective flow rates of 601 and 001:

$$\text{Conc001} = \frac{(\text{Q001}-\text{Q601}) \times \text{Conc 801} + \text{Q601} \times \text{Conc 601}}{\text{Q001}}$$

Concentrations are to be expressed in ng/L Q= Flow values are to be identical units.

Observation 5**Evidence:**

Appendix A: Cardinal NPDES Permit OIB00009AE

Appendix J: Outfall Flow Measurements

Description of Observation:

Cardinal is required to monitor flow and report a flow weighted value for the concentration of mercury at outfall 001. The discharge from outfall 001 consists of the once-through non-contact cooling water and the treated effluent from the FGD WWTP which is monitored at internal monitoring station 601. The flow-weighted calculation is referenced in the citation above and in the NPDES permit **Appendix A**.

Cardinal calculates and reports flow at outfall 001 by using the pump run time for the non-contact cooling water (**Appendix J** - Outfall Flow Measurements). The pump run time for the non-contact cooling water does not include the total flow of outfall 001 because Cardinal does not add in the flow contributed by internal monitoring station 601, the effluent from the FGD WWTP.

Cardinal uses the equation outlined in the permit and cited above to calculate and report the total mercury concentration. Cardinal uses the flow and concentration at monitoring station 601 in the equation. The equation subtracts out the flow of station 601, which was not added into the calculation for total flow at outfall 001, thus incorrectly removing a value and lowering the total calculated flow.

Cardinal is not accurately calculating flow at outfall 001 and, thus, is not calculating Total Mercury properly with the equation provided in the NPDES permit.

Observation 6

Observation Summary: Monitoring at station number 801 is not clearly defined in the NPDES permit and could not be verified for compliance.

Citation: Cardinal NPDES Permit OIB00009AE

Part I, B. - INTAKE MONITORING REQUIREMENTS

2. Intake Monitoring. During the period beginning on the effective date of this permit modification and lasting until the expiration date, the permittee shall monitor the Intake at Station Number OIB00009801, and report to the Ohio EPA in accordance with the following table. See Part II, OTHER REQUIREMENTS, for the location to monitor the influent.

Table - Intake Monitoring - 801 - Final

Observation 6*Effluent Characteristic Discharge Limitations Monitoring Requirements**Parameter*

50050 - Flow Rate - MGD - - - - - 1/Day 24hr Total All

50092 - Mercury, Total (Low Level) - ng/l - - - - - 1/Month Grab All

51463 - Cycles of Concentration - Cycles - - - - - 1/Day Calculated All

NOTES for Station Number OIB00009801:

a. Mercury Monitoring - See Part II, Item I.

I. The permittee shall use either EPA Method 1631 or EPA Method 245.7 promulgated under 40 CFR 136 to comply with the influent and effluent mercury monitoring requirements of this permit.

OIB00009801 Upstream monitoring station - samples to be collected from a location without the influence of any of the permittee's outfalls.

Evidence:

Appendix A: Cardinal NPDES Permit OIB00009AE

Appendix K: CDP-SOP-LAB cycles of concentration

Description of Observation:

Cardinal is required to monitor at Intake Monitoring station 801. Monitoring station 801 is described in the NPDES permit (**Appendix A**) as:

"OIB00009801 Upstream monitoring station - samples to be collected from a location without the influence of any of the permittee's outfalls."

They are required to monitor for Flow Rate, Total Mercury, and Cycles of concentration.

Flow Rate – It is unclear what flow is to be reported for 801. A clear location or flow meter is not specified in the permit.

Total Mercury – It is unclear where the sample for Total Mercury is to be taken. Cardinal staff stated they collect a sample for Total Mercury at a marina on the Ohio River upstream of the Cardinal Power Plant. The permit specifies:

"OIB00009801 Upstream monitoring station - samples to be collected from a location without the influence of any of the permittee's outfalls."

Cycles of Concentration – The permit does not specify how to calculate the cycles of concentration. Cardinal calculates the cycles of concentration using conductivity data

Observation 6

obtained from the intake cooling water and the conductivity of the cooling tower water from Unit #3 (**Appendix K**).

Monitoring at station number 801 is not clearly defined in the NPDES permit and could not be verified for compliance.

Observation 7

Observation Summary: Cardinal has had numerous reportable non-compliance events since September 2018.

Citation: Cardinal NPDES Permit OIB00009AE

PART III - GENERAL CONDITIONS**12. NONCOMPLIANCE NOTIFICATION****B. Other Permit Violations**

1. The permittee shall report noncompliance that is the result of any unanticipated bypass resulting in an exceedance of any effluent limit in the permit or any upset resulting in an exceedance of any effluent limit in the permit by e-mail or telephone within twenty-four (24) hours of discovery.

2. The permittee shall report noncompliance that is the result of any spill or discharge which may endanger human health or the environment within thirty (30) minutes of discovery by calling the 24-Hour Emergency Hotline toll-free at (800) 282-9378. The permittee shall also report the spill or discharge by e-mail or telephone within twenty-four (24) hours of discovery in accordance with B.1 above.

Evidence:

Appendix A: Cardinal NPDES Permit OIB00009AE

Appendix L: List of Non-Compliance Events

Description of Observation:

Cardinal has had reportable non-compliance events under the NPDES permit (**Appendix A**) since September 2018 as summarized below:

September 2018 - At Outfall 019, Cardinal exceeded the ammonia loading limit of 177 kg/day (Loading value reported 199.811 kg).

February 2019 - Cardinal missed sample collection for Outfall 019 and Outfall 601.

March 2020 - Bypass of partially treated sewage from Unit 3 Sewage Treatment Plant – treated by aerators and clarifiers but bypassed sand filters and UV treatment.

Observation 7

May 2020 - A rupture in the fly ash transport line caused a direct discharge of fly ash transport water into Blockhouse Hollow, bypassing settlement and pH control (CO2 injection) at Fly Ash Reservoir.

February 2022 - Fecal coliform exceeded NPDES limits at Unit 3 Sewage Treatment Plant, Outfall 008.

September 2022 - Outfall 019 exceeds mercury daily and loading limits at Outfall 019

August 2023 - Discharge from U1/U2 STP (Outfall 006) was not disinfected due to malfunctioned UV light.

A table of non-compliance outlined above is contained in **Appendix L**.