BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

In the Matter of:	)	
STANDARD FOR THE DISPOSAL OF COAL COMBUSTION RESIDUALS IN SURFACE IMPOUNDMENTS: PROPOSED NEW 35 ILL. ADMIN. CODE 845	)	PCB 2020-019 (Rulemaking - Land)

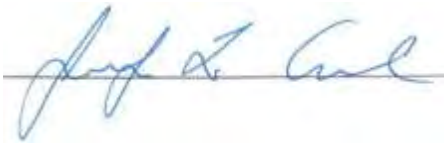
NOTICE OF ELECTRONIC FILING

To: Attached Service List

PLEASE TAKE NOTICE that on September 28, 2020, I electronically filed with the Clerk of the Illinois Pollution Control Board ("Board") the **ENVIRONMENTAL LAW & POLICY CENTER, PRAIRIE RIVERS NETWORK, AND SIERRA CLUB'S INDEX OF EXHIBITS AND EXHIBITS FOR THE SECOND HEARING**, copies of which are served on you along with this notice.

Dated: September 28, 2020

Respectfully Submitted,



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ENVIRONMENTAL LAW & POLICY CENTER, PRAIRIE RIVERS NETWORK, AND SIERRA CLUB'S INDEX OF EXHIBITS AND EXHIBITS FOR THE SECOND HEARING

1. Consent Order, *North Carolina ex rel. North Carolina Dep't. of Envtl. Division of Water Resources v. Roanoke River Basin Ass'n.*, Case No. 13-CVS-11032 (Feb. 5, 2020).
2. NCDEQ, *DEQ Orders Duke Energy to Excavate Coal Ash at Six Remaining Sites* (Apr. 1, 2019)
3. Order, *Verified Pet. Southern Indiana Gas & Elec. Co. re "Brown County Pond"*, IURC, Cause No. 45280 (May 13, 2020).
4. Consent Order, *Tennessee ex rel. Slatery v. Tenn. Valley Auth.,* Davidson Cty. Chancery, Tenn., Case No. 15-23-IV (June 13, 2019).
5. S.B 1355, 2019 Gen. Assemb. (Va. 2019).
6. H.R. 443, 2020 Gen. Assemb. (Va, 2020).
7. Prairie Rivers Network et al., *Cap and Run: Toxic Coal Ash Left Behind by Big Polluters Threatens Illinois Water* (Nov. 2018).
8. European Chemicals Agency (ECHA), *Evaluation Under REACH: Progress Report 2017* (Feb.2018).
9. EPA, *Human and Ecological Risk Assessment of Coal Combustion Residuals (Final)*, Ch. 3 (Dec. 2014) (Excerpt).

Respectfully Submitted,

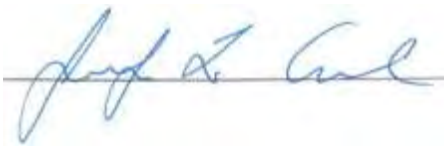

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Exhibit 1

STATE OF NORTH CAROLINA

COUNTY OF WAKE

IN THE GENERAL COURT OF JUSTICE
SUPERIOR COURT DIVISION
13 CVS 11032

STATE OF NORTH CAROLINA ex rel. NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY, DIVISION OF WATER RESOURCES,
Plaintiff,
ROANOKE RIVER BASIN ASSOCIATION, SIERRA CLUB, WATERKEEPER ALLIANCE, CAPE FEAR RIVER WATCH, INC., NEUSE RIVERKEEPER FOUNDATION, AND WINYAH RIVERS FOUNDATION,
Plaintiff-Intervenors,
v.
DUKE ENERGY PROGRESS, LLC,
Defendant.

CONSENT ORDER

FILED
2020 FEB -5 P 2:41

COUNTY OF MECKLENBURG

13 CVS 14661

STATE OF NORTH CAROLINA ex rel. NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY, DIVISION OF WATER RESOURCES,
Plaintiff,
CATAWBA RIVERKEEPER FOUNDATION, INC., APPALACHIAN VOICES, YADKIN RIVERKEEPER, MOUNTAINTRUE, DAN RIVER BASIN ASSOCIATION, ROANOKE RIVER BASIN ASSOCIATION, SOUTHERN ALLIANCE FOR CLEAN ENERGY, AND WATERKEEPER ALLIANCE,
Plaintiff-Intervenors,
v.
DUKE ENERGY CAROLINAS, LLC,
Defendant.

CONSENT ORDER

CONSENT ORDER

Plaintiff, the State of North Carolina ex rel. North Carolina Department of Environmental Quality ("DEQ"), Division of Water Resources, Plaintiff-Intervenors, Roanoke River Basin Association, Sierra Club, Catawba Riverkeeper Foundation, Inc., Appalachian Voices, MountainTrue, and Waterkeeper Alliance ("Community Groups"), and Defendants, Duke Energy Carolinas LLC and Duke Energy Progress LLC ("Duke Energy") (collectively the "Parties"), hereby consent to the entry of this Consent Order in order to resolve the matters in controversy between them.

The Honorable Paul Ridgeway, Senior Resident Superior Court Judge, is presiding over these matters pursuant to designation under Rule 2.1 of the General Rules of Practice. The Court makes, and the Parties hereby stipulate to, the following findings of fact and conclusions of law.

Findings of Fact and Conclusions of Law

1. These actions were brought by the State of North Carolina upon the relation of the Secretary of DEQ, the State agency established pursuant to N.C. Gen. Stat. § 143B-279.1 *et seq.*, and vested with the statutory authority to enforce the State's environmental protection laws, including laws enacted to protect the water quality of the State. The Division of Water Resources ("DWR") is a division within DEQ and all actions taken by DWR are necessarily actions of DEQ.
2. This Court has jurisdiction over this action for injunctive relief for claims of existing or threatened violations of the laws, rules, and regulations governing the protection of the State's water resources pursuant to N.C. Gen. Stat. §§ 7A-245 and 143-215.6C.
3. Venue is proper in Wake County for 13 CVS 11032 and Mecklenburg County for 13 CVS 14661 under N.C. Gen. Stat. §§ 1-79 and 143-215.6C.

4. Defendant, Duke Energy Carolinas, LLC ("Duke Energy Carolinas"), is a corporation organized and existing under the laws of the State of North Carolina. Duke Energy Carolinas owns, operates, or has operated the coal-fired steam station facilities[1] addressed by DEQ's Mecklenburg County Complaint, Case No. 13 CVS 14661, and this Order at the following locations: the Allen Steam Station ("Allen") in Gaston County, Buck Steam Station ("Buck") in Rowan County,[2] Cliffside Steam Station (now referred to as the Rogers Energy Complex) ("Cliffside/Rogers") in Rutherford County and Cleveland County, the Belews Creek Steam Station ("Belews Creek") in Stokes County, and the Marshall Steam Station ("Marshall") in Catawba County.[3]

5. Defendant Duke Energy Progress, LLC ("Duke Energy Progress"), is a corporation organized and existing under the laws of the State of North Carolina. Duke Energy Progress owns or operates coal-fired steam station facilities addressed by DEQ's Wake County Complaint, Case No. 13 CVS 11032, and this Order at the following locations: Mayo Steam Electric Generating Plant ("Mayo") in Person County and the Roxboro Steam Electric Generating Plant ("Roxboro") in Person County.[4]

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[1] The facilities listed in Paragraphs 4 and 5 may be referred to singularly as "Facility" and collectively as "Facilities."

[2] Buck has been selected by Duke Energy Carolinas, LLC as a beneficiation site pursuant to N.C. Gen. Stat. § 130A-309.216(a). On December 16, 2016, the Community Groups dismissed their Complaint in Intervention with prejudice as to Buck. As set forth below, this Consent Order resolves the claims raised in DEQ's Complaint as to Buck.

[3] In the Mecklenburg County Complaint, 13 CVS 14661, the Dan River Combined Cycle Station is also included. Complaint at 2, ¶ 3. The Dan River Combined Cycle Station was addressed by a prior order of the Court, and is not at issue in this Consent Judgment. Order Granting Motions for Partial Summary Judgment, 13 CVS 14661 & 11032 (June 1, 2016) (the "Four Plant Order").

[4] In the Wake County Complaint, 13 CVS 11032, the Cape Fear Steam Electric Generating Plant, H.F. Lee Steam Electric Plant, Weatherspoon Steam Electric Plant and L.V. Sutton Electric Plant were also included. Complaint at 2, ¶ 3. These facilities were addressed by prior orders of the Court and are not at issue in this Order.

6. Plaintiff-Intervenors, the "Community Groups," are non-profit public interest organizations whose mission and interests include advocating for the protection of water quality for the health, protection, and enjoyment of their members. The Community Groups were allowed to intervene in these actions with no objection from DEQ. The Community Groups have stipulated that they assert no additional causes of action in these proceedings beyond those asserted by DEQ.

7. DEQ filed these civil enforcement actions in August of 2013. As set forth in the Complaints, DEQ sought mandatory injunctions requiring Duke Energy to assess and abate what it alleged were threatened or claimed violations of North Carolina's groundwater rules, found at Title 15A, Subchapter 2L of the North Carolina Administrative Code (the "2L groundwater rules"), threatened or claimed violations of North Carolina's water pollution laws set forth at N.C. Gen. Stat. § 143-215.1, and threatened or claimed violations of National Pollutant Discharge Elimination System ("NPDES") permits at the above-referenced facilities ("Facilities") caused by the coal combustion residuals ("CCR") surface impoundments, and to seek through mandatory injunctive relief compliance with these laws, regulations, and rules.

8. In 2018 and 2019, DEQ issued NPDES permits (or, in the case of Marshall, a major modification of an NPDES permit) for each of the Facilities except Roxboro. For Roxboro, the NPDES permit is currently out for public comment. The NPDES permits set effluent limits on the discharge of wastewater. Constructed seeps—engineered features on or within the dam structures (such as toe drains or filter blankets) to collect seepage—are incorporated as permitted outfalls in these NPDES permits with monitoring and effluent limits.

9. In 2018, the Environmental Management Commission ("EMC") approved a Special Order by Consent ("SOC") for each of the Facilities. The SOCs require accelerated decanting—removal of free water from the surface of the CCR impoundments—in a manner that protects surface water quality. Decanting is expected to substantially reduce or eliminate seepage flows of wastewater from CCR impoundments to non-constructed or non-engineered seeps.

10. Subsequent to the filing of these actions, the General Assembly enacted Session Law 2014-122, which became effective on September 20, 2014. Part II of Session Law 2014-122 provided for the "Comprehensive Management of Coal Combustion Residuals" and added new Part 2I to Article 9 of Chapter 130A of the North Carolina General Statutes, which may be cited as the "Coal Ash Management Act of 2014" ("CAMA").

11. In July of 2016 CAMA was amended by House Bill 630, Session Law 2016-95. Pursuant to this amendment, on November 13, 2018, after Duke Energy established permanent water supplies to certain households and rectified deficiencies noted in dam safety orders, DEQ classified the CCR impoundments at the above-referenced Facilities as "low risk."

12. Pursuant to the provisions of CAMA and at the election of DEQ, low risk impoundments may be closed by excavation, by capping in place largely in compliance with the State rules for municipal solid waste landfills, or by closing in compliance with the federal CCR Rule. N.C. Gen. Stat. § 130A-309.214(a)(3).

13. The CCR impoundments[5] at each of the Facilities are as follows:

a. At Allen, there are two CCR impoundments, the Retired Ash Basin and the Active Ash Basin. The Retired Ash Basin is approximately 123 acres and contains approximately 6,100,000 tons of coal ash and the Active Ash Basin is approximately 170 acres and contains approximately 10,480,000 tons of coal ash.[6] The Retired Ash Basin and the Active Ash Basin are CCR impoundments as defined by CAMA, N.C. Gen. Stat. § 130A-309.201(6), and the Federal CCR Rule 40 CFR Parts 257 and 261. For illustration purposes only, these CCR impoundments are depicted on **Exhibit A**.

b. At Belews Creek, there is one CCR impoundment, the Ash Basin. The Ash Basin is approximately 270 acres and contains approximately 11,970,000 tons of coal ash. The Ash Basin is a CCR impoundment as defined by CAMA, N.C. Gen. Stat. § 130A-309.201(6), and the Federal CCR Rule 40 CFR Parts 257 and 261. For illustration purposes only, this CCR impoundment is depicted on **Exhibit B.**

c. At Buck, there are three CCR impoundments, Basin 1, Additional Primary Pond/Basin ("Basin 1"); Basin 2, Primary Pond/Basin ("Basin 2"); and Basin 3, Secondary Pond/Basin ("Basin 3"). There is also one ash stack. Basin 1 is

[5] CCR impoundments are defined in CAMA, N.C. Gen. Stat. § 130A-309.201(6).

[6] Note that the tonnage of coal ash includes only the coal ash contained within the CCR impoundments and not coal ash in landfills or structural fills. Duke Energy Carolinas and Duke Energy Progress, on the one hand, and DEQ and the Community Groups on the other, have a dispute as to whether coal ash under a lawfully permitted landfill is regulated by CAMA. At Allen, the Retired Ash Basin Landfill and subgrade is 25 acres and contains approximately 1,740,000 tons of coal ash. There are approximately 1,392,000 tons of coal ash beneath the Retired Ash Basin Landfill, and approximately 991,000 tons of coal ash in the area designated as the "DORS" area.

approximately 71 acres and contains 3,550,000 tons of coal ash. The ash stack is adjacent to and partially above Basin 1, encompasses approximately 14 acres, and contains approximately 263,000 tons of coal ash. Basins 2 and 3 are separated by a divider dike built over ash, encompass approximately 57.5 acres and 21.5 acres, respectively, and contain approximately 1,998,000 and 864,000 tons of coal ash, respectively. Basin 1 and the ash stack are contained within one waste boundary, while Basin 2 and Basin 3 are contained in another waste boundary. For illustration purposes only, these CCR impoundments are depicted on **Exhibit C**.

d. At Cliffside/Rogers there are two CCR impoundments, the Unit 5 Inactive Ash Basin and the Active Ash Basin.[7] The Unit 5 Inactive Ash Basin is approximately 46 acres and contains approximately 2,350,000 tons of coal ash and the Active Ash Basin is approximately 86 acres and contains approximately 5,240,000 tons of coal ash. The Unit 5 Inactive Ash Basin and the Active Ash Basin are CCR impoundments as defined by CAMA, N.C. Gen. Stat. § 130A-309.201(6), and the Federal CCR Rule 40 CFR Parts 257 and 261. For illustration purposes only, these CCR impoundments are depicted on **Exhibit D.**

e. At Marshall, there is one CCR impoundment, the Ash Basin. The Ash Basin is approximately 360 acres and contains approximately 17,650,000 tons of coal ash.[8] The Ash Basin is a CCR impoundment as defined by CAMA, N.C. Gen.

[7] The Units 1-4 Ash Basin was fully excavated and closed in February 2018.
[8] Note that the tonnage of coal ash includes only the coal ash contained within the impoundments and not coal ash in landfills or structural fills. Duke Energy Carolinas and Duke Energy Progress

Stat. § 130A-309.201(6), and the Federal CCR Rule 40 CFR Parts 257 and 261. For illustration purposes only, this CCR impoundment is depicted on **Exhibit E**.

f. At Mayo, there is one CCR impoundment, the Ash Basin. The Ash Basin is approximately 153 acres and contains approximately 6,630,000 tons of coal ash. The Ash Basin is a CCR impoundment as defined by CAMA, N.C. Gen. Stat. § 130A-309.201(6), and the Federal CCR Rule 40 CFR Parts 257 and 261. For illustration purposes only, this CCR impoundment is depicted on **Exhibit F**.

g. At Roxboro, there are two CCR impoundments, the East Ash Basin and the West Ash Basin. The West Ash Basin is approximately 225 acres and contains approximately 12,970,000 tons of coal ash and the East Ash Basin is approximately 71 acres and contains approximately 7,100,000 tons of coal ash.[9]

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on the one hand, and DEQ and the Community Groups on the other, have a dispute as to whether coal ash under a lawfully permitted landfill is regulated by CAMA. At Marshall, the Structural Fill beneath solar panels contains approximately 6,490,000 tons of coal ash. The subgrade fill beneath Industrial Landfill ("ILF") Cells 1 and 2 contains approximately 460,000 tons of coal ash. The subgrade fill beneath ILF Cells 3 and 4, contains approximately 409,000 tons of coals ash. The Old Ash Fill (1804 Phase I Landfill) contains approximately 626,000 tons of coal ash. The Retired Landfill (1804 Phase II Landfill) contains approximately 4,870,000 tons of coal ash. The ILF (Permit 18-12) contains approximately 2,050,000 tons of coal ash. The Marshall ILF continues to receive production ash and these tonnages represent the approximate tonnages as of December 31, 2019.

[9] Note that the tonnage of coal ash includes only the coal ash contained within the CCR impoundments and not coal ash in landfills or structural fills. Duke Energy Carolinas and Duke Energy Progress on the one hand, and DEQ and the Community Groups on the other, have a dispute as to whether coal ash under a lawfully permitted landfill is regulated by CAMA. For Roxboro, the Roxboro Landfill contains approximately 6,818,000 tons of coal ash in one portion of the landfill and an additional 7,635,000 tons of coal ash in a separate portion of that landfill. The Roxboro Landfill continues to receive production ash and these tonnages represent the approximate tonnages as of December 31, 2019.

The East Ash Basin and the West Ash Basin are CCR impoundments as defined by CAMA, N.C. Gen. Stat. § 130A-309.201(6), and the Federal CCR Rule 40 CFR Parts 257 and 261. For illustration purposes only, these CCR impoundments are depicted on **Exhibit G**.

14. On April 1, 2019, DEQ issued Coal Combustion Residuals Surface Impoundment Closure Determinations ("Closure Determinations"), pursuant to its authority under CAMA, electing and ordering excavation of the coal combustion residuals from the CCR impoundments as the method of closure in compliance with CAMA at six of the above-referenced Facilities: Allen, Belews Creek, Cliffside/Rogers, Marshall, Mayo and Roxboro. DEQ's election of this method of closure was based upon its assessment of the required statutory criteria as applied to these Facilities.

15. On April 26, 2019, Duke Energy filed six Petitions for Contested Case Hearing in the North Carolina Office of Administrative Hearings ("OAH") challenging DEQ's Closure Determination for each of these Facilities, and on May 24, 2019 Duke Energy filed six Amended Petitions challenging subsequent DEQ actions related to the Closure Determinations (the "OAH Proceedings"). Duke Energy has filed twelve petitions for judicial review ("PJRs") appealing from two Orders issued in the OAH Proceedings.

16. Certain Plaintiff-Intervenors in these actions—Appalachian Voices, MountainTrue, Catawba Riverkeeper Foundation, Inc., Waterkeeper Alliance, Roanoke River Basin Association, and The Sierra Club—were allowed to intervene as Respondent-Intervenors in the OAH Proceedings.

17. On December 31, 2019, the Parties, desiring to resolve and settle the OAH Proceedings and related PJRs, and to ensure that the CCR impoundments are excavated on an

expedited basis and to remove any uncertainty associated with the litigation, entered into a Settlement Agreement (the "Agreement"), obligating each of the parties to take certain actions.

18. Pursuant to this Agreement, the Parties agreed to submit to the Court this Consent Order incorporating the terms of the Agreement with the exception of certain provisions.

19. For impoundment sources of groundwater contamination at each Facility, the obligations of Duke Energy Carolinas or Duke Energy Progress, as appropriate, are set forth below, including the closure method to be employed for closing the CCR impoundment(s) at each Facility, the requirements for remediating the alleged 2L groundwater violations caused by the CCR impoundment(s) at each Facility, and the requirements for addressing the alleged surface water violations at each Facility.

20. For any alleged 2L groundwater violations caused by sources other than CCR impoundments at any Facility (e.g., on-site landfills, on-site structural fills, or coal piles at certain Facilities), DEQ shall retain the authority to order appropriate corrective action under its administration and implementation of the statutes, rules and regulations under its purview.[10]

21. The counter-obligations of DEQ and the Community Groups are also as set forth below.

[10] For clarity, the Parties understand the Complaints to address only groundwater contamination caused by impoundment sources. Groundwater contamination, if any, caused by non-impoundment sources is not resolved by this Consent Order and, as noted, will be separately addressed through DEQ's administration of the statutes, rules and regulations that it implements. By way of information, DEQ anticipates receiving Comprehensive Site Assessments for non-impoundment sources of groundwater contamination that are not hydrologically connected to impoundment sources on March 31, 2020 for Allen, Belews Creek, Cliffside/Rogers, Mayo and Roxboro, and on July 1, 2021 for Buck.

INJUNCTIVE RELIEF

The Parties stipulate and agree that for the above-referenced Facilities, Duke Energy's compliance with approved Groundwater Corrective Action Plans, NPDES permits, and SOCs, along with the actions required by this Consent Order and through DEQ's administration of the statutes, rules and regulations that it implements, have resolved or will resolve the remaining alleged groundwater violations and surface water violations (i.e., those caused by impoundment sources) set forth in the Complaints filed in these actions.[11] Based upon the foregoing findings of fact and conclusions of law as well as the stipulations of the Parties,[12] **IT IS THEREFORE ORDERED, ADJUDGED, AND DECREED** as follows:

Facility-Specific Obligations of Duke Energy Carolinas

Allen

22. **Closure of CCR Impoundments.** Duke Energy Carolinas shall excavate and remove all coal ash from the Retired Ash Basin and Active Ash Basin, either (1) to lined onsite locations for disposal in a CCR landfill, industrial landfill, or municipal solid waste landfill or (2) for beneficial use for cementitious purposes or another industrial process at least as environmentally protective. If a process other than a cementitious process is to be used, Duke Energy Carolinas shall provide reasonable notice to the Community Groups and DEQ. Duke Energy Carolinas shall remove or permanently close all pipes

[11] The claims regarding facilities at the Cape Fear Steam Electric Generating Plant, H.F. Lee Steam Electric Plant, Weatherspoon Steam Electric Plant and L.V. Sutton Electric Plant in the Wake County Complaint, and the Asheville Steam Station, the Riverbend Steam Station, and the Dan River Steam Station were addressed by prior orders of the Court, and are not at issue in this Order.
[12] Notwithstanding the foregoing, the Parties waive any requirement for formal findings of fact and conclusions of law regarding the allegations set forth in the Complaints filed by Plaintiff or Plaintiff-Intervenors in these actions, and agree that this Consent Order shall be binding upon them and enforceable to the same extent, including by contempt, as if entered by a Superior Court Judge after a hearing on the merits of all matters now pending.

currently running through or beneath the Retired Ash Basin and Active Ash Basin. Duke Energy Carolinas shall thereafter stabilize and close the area where the Retired Ash Basin and Active Ash Basin are located pursuant to applicable law. The total coal ash that will be excavated is estimated to be approximately 16,632,000 tons.

23. **Disposition of Other Coal Ash.** Additionally, Duke Energy Carolinas shall excavate and remove coal ash from the Storage Areas, Structural Fills, and Landfill (each of which is located on the top of the Retired Ash Basin), either (1) to lined onsite locations for disposal in a CCR landfill, industrial landfill, or municipal solid waste landfill or (2) for beneficial use for cementitious purposes or another industrial process at least as environmentally protective. If a process other than a cementitious process is to be used, Duke Energy Carolinas shall provide reasonable notice to the Community Groups and DEQ. Duke Energy Carolinas is not required to excavate the ash required for structural stability around the footers for the transmission towers; that ash shall be covered with a geomembrane layer.

24. **Deadline for Closure.** Duke Energy Carolinas projects that it will require until December 31, 2037, to complete all excavation as required in Paragraphs 22 and 23 and the Parties understand that Duke Energy Carolinas will request variances to meet the deadline imposed by this Consent Order. Duke Energy Carolinas shall complete all excavation required in Paragraphs 22 and 23 by the statutory deadline set forth in CAMA, as amended by House Bill 630, or as may further be amended from time to

time, and subject to any variances granted pursuant to N.C. Gen. Stat. § 130A-309.215, but in any event not later than December 31, 2038.[13]

25. **Groundwater Corrective Action Plan.** On December 31, 2019, Duke Energy Carolinas submitted a proposed Groundwater Corrective Action Plan to DEQ for its review and approval. The Corrective Action Plan includes active remedial measures intended by Duke Energy Carolinas to address any groundwater contamination caused by the Retired Ash Basin and Active Ash Basins as required by N.C. Gen. Stat. § 130A-309.211, the 2L groundwater rules, and any other applicable laws, statutes, or regulations, subject to the provisions of Paragraph 74 and provided that active remedial measures shall not be required to remediate areas within the geographic limitation as specified in Paragraph 75. Upon approval of the proposed Groundwater Corrective Action Plan by DEQ, Duke Energy Carolinas shall implement the plan subject to such modification and amendments approved pursuant to N.C. Gen. Stat. § 130A-309.211(b)(3) and the 2L groundwater rules.[14]

26. **NPDES Permit and Special Order by Consent.** On July 13, 2018, DEQ issued NPDES Permit No. NC0004979 for Allen. On April 18, 2018, the EMC approved SOC S17-009 for Allen, which sets a compliance schedule that requires completion of decanting by June 30, 2020. Duke Energy Carolinas shall comply with the terms of NPDES Permit No. NC0004979 and SOC S17-009 including any future amendments by DEQ or the EMC, respectively, when such an amendment becomes effective (unless

[13] For clarity, this paragraph does not constitute a variance of the CAMA deadline for completion of closure. DEQ will approve or disapprove a request for variance at the appropriate time.

[14] For clarity, this paragraph does not constitute approval of any portion or aspect of the Groundwater Corrective Action Plan. DEQ will approve or disapprove the Groundwater Corrective Action Plan at the appropriate time.

otherwise ordered by the North Carolina Office of Administrative Hearings or a court of competent jurisdiction).

Belews Creek

27. **Closure of CCR Impoundment.** Duke Energy Carolinas shall excavate and remove all coal ash from the Ash Basin except the impoundment coal ash under or within the waste boundary of the Pine Hall Road Landfill either (1) to lined onsite locations for disposal in a CCR landfill, industrial landfill, or municipal solid waste landfill or (2) for beneficial use for cementitious purposes or another industrial process at least as environmentally protective. If a process other than a cementitious process is to be used, Duke Energy Carolinas shall provide reasonable notice to the Community Groups and DEQ. Duke Energy Carolinas shall remove or permanently close all pipes currently running through or beneath the Ash Basin. Duke Energy Carolinas shall thereafter stabilize and close the area where the Ash Basin is located pursuant to applicable law. The total coal ash that will be excavated is estimated to be approximately 11,870,000 tons. The closure plan provides that ash shall remain underneath the Pine Hall Road Landfill, which is capped with a geosynthetic cap and a soil cap and was closed pursuant to Permit No. 8503-INDUS-1984 in 2009. The amount of coal ash underneath the Pine Hall Road Landfill is estimated to be no more than 100,000 tons.[15] An approximate depiction of this excavation is attached as **Exhibit H**. On or before May 4, 2020, Duke Energy Carolinas shall submit either (a) a demonstration that it is able to meet the requirements of Paragraph 30 or (b) if it is not able to make such a

[15] To the extent that any portion of the Pine Hall Road Landfill is not currently covered by a geosynthetic cap, Duke Energy Carolinas shall install such a cap in accordance with the Belews Creek closure plan approved by DEQ.

demonstration, an addendum to the closure plan providing for the full excavation of the impoundment coal ash under or within the waste boundary of the Pine Hall Road Landfill. The closure plan for Belews Creek shall not be deemed complete prior to this submission.

28. **Deadline for Closure.** Duke Energy Carolinas projects that it will require until December 31, 2031, to complete all excavation as required in Paragraph 27, and the Parties understand that Duke Energy Carolinas will request variances to meet the deadline imposed by this Consent Order. Duke Energy Carolinas shall complete all excavation required in Paragraph 27 by the statutory deadline set forth in CAMA, as amended by House Bill 630, or as may further be amended from time to time, and subject to any variances granted pursuant to N.C. Gen. Stat. § 130A-309.215, but in any event not later than December 31, 2034.[16]

29. **Structural Stability, Monitoring, and Sampling.** Duke Energy Carolinas shall stabilize the coal ash under and within the waste boundary of the Pine Hall Road Landfill and within the waste boundary of the Ash Basin with a permanent structure ("stability feature") for purposes of preserving the structural stability through the use of a wall unless a slope is shown to be as appropriate, so as to prevent lateral movement of the coal ash, pursuant to a plan to be submitted for DEQ approval no later than June 30, 2020. Within seven (7) days of completing the stability feature, Duke Energy Carolinas shall notify DEQ. Additionally, pursuant to a plan approved by DEQ, following excavation in the footprint of the former Ash Basin and downgradient of the

[16] For clarity, this paragraph does not constitute a variance of the CAMA deadline for completion of closure. DEQ will approve or disapprove a request for variance at the appropriate time.

Pine Hall Road Landfill, Duke Energy Carolinas shall conduct groundwater monitoring (including the installation of new wells if reasonably necessary) and, upon re-formation of surface water features that demonstrate DEQ-confirmed intermittent or perennial flows (not merely precipitation), surface water sampling. Consistent with the provisions of Paragraph 74, in this plan Duke Energy Carolinas shall propose (1) additional groundwater remedial measures for any coal ash constituent if the data indicate an increasing trend in groundwater concentrations in excess of the standards set forth in 15A NCAC 2L .0202 ("2L groundwater standards") for four (4) consecutive semi-annual sampling events for that constituent, subject to the provisions of Paragraph 75, and (2) surface water treatment if the data shows impact from coal ash constituents above the concentrations in standards set forth in 15A NCAC 2B .0101 *et seq.* ("2B standards") to waters of the State notwithstanding the provisions of Paragraph 75. This plan shall be submitted to DEQ no later than 120 days following completion of the stability feature. If appropriate, the additional monitoring plan will be integrated into the existing site monitoring plan to avoid redundant or conflicting monitoring programs. This paragraph shall not apply if the coal ash under and within the waste boundary of the Pine Hall Road Landfill and within the waste boundary of the Ash Basin is excavated.

30. **Groundwater Corrective Action Plan.** On December 31, 2019, Duke Energy Carolinas submitted a proposed Groundwater Corrective Action Plan to DEQ for its review and approval. The Corrective Action Plan includes active remedial measures intended by Duke Energy Carolinas to address any groundwater contamination caused by the Ash Basin as required by N.C. Gen. Stat. § 130A-309.211, the 2L groundwater

rules, and any other applicable laws, statutes, or regulations, provided that active remedial measures shall not be required to remediate areas within the geographic limitation as specified in Paragraph 75. If the coal ash under and within the waste boundary of the Pine Hall Road Landfill and within the waste boundary of the Ash Basin is not excavated, then at a minimum, Duke Energy Carolinas shall remedy violations that DEQ determines are material violations of the 2L groundwater standards attributable to the Ash Basin at or beyond the geographic limitation as described in Paragraph 75 by December 31, 2029, subject to the provisions of Paragraph 74. Upon approval of the proposed Groundwater Corrective Action Plan by DEQ, Duke Energy Carolinas shall implement the plan subject to such modification and amendments approved pursuant to N.C. Gen. Stat. § 130A-309.211(b)(3) and the 2L groundwater rules.[17]

31. **NPDES Permit and Special Order by Consent.** On March 21, 2019, DEQ issued NPDES Permit No. NC0024406 for Belews Creek. On July 12, 2018, the EMC approved SOC S18-004 for Belews Creek, which sets a compliance schedule that requires completion of decanting by September 30, 2020. Duke Energy Carolinas shall comply with the terms of NPDES Permit No. NC0024406 and SOC S18-004 including any future amendments by DEQ or the EMC, respectively, when such an amendment becomes effective (unless otherwise ordered by the North Carolina Office of Administrative Hearings or a court of competent jurisdiction).

[17] For clarity, this paragraph does not constitute approval of any portion or aspect of the Groundwater Corrective Action Plan. DEQ will approve or disapprove the Groundwater Corrective Action Plan at the appropriate time.

32. **Closure of CCR Impoundments.** Duke Energy Carolinas shall excavate and remove all coal ash from Basins 1, 2, and 3 either (1) to lined onsite locations for disposal in a CCR landfill, industrial landfill, or municipal solid waste landfill or (2) for beneficial use for cementitious purposes. Duke Energy Carolinas shall remove or permanently close all pipes currently running through or beneath Basins 1, 2, and 3. Duke Energy Carolinas shall thereafter stabilize and close the area where Basins 1, 2, and 3 are located pursuant to applicable law. The total coal ash that will be excavated is estimated to be approximately 6,412,000 tons.

33. **Disposition of Other Coal Ash.** Additionally, Duke Energy Carolinas shall excavate and remove coal ash from the ash stack either (1) to lined onsite locations for disposal in a CCR landfill, industrial landfill, or municipal solid waste landfill or (2) for beneficial use for cementitious purposes.

34. **Deadline for Closure.** Duke Energy Carolinas projects that it will require until December 31, 2035, to complete all excavation as required in Paragraphs 32 and 33. Duke Energy Carolinas shall complete all excavation required in Paragraphs 32 and 33 by the statutory deadline set forth in CAMA, as amended by House Bill 630, or as may further be amended from time to time, and subject to any variances granted pursuant to N.C. Gen. Stat. § 130A-309.215, but in any event not later than December 31, 2035.[18]

35. **Groundwater Corrective Action Plan.** Duke Energy Carolinas shall submit a proposed Groundwater Corrective Action Plan to DEQ for its review and approval.

[18] For clarity, this paragraph does not constitute a variance of the CAMA deadline for completion of closure. DEQ will approve or disapprove a request for variance at the appropriate time.

The Corrective Action Plan must include remedial measures designed to address any groundwater contamination as required by N.C. Gen. Stat. § 130A-309.211, the 2L groundwater rules, and any other applicable laws, statutes, or regulations, subject to the provisions of Paragraph 74 and provided that active remedial measures shall not be required to remediate areas within the geographic limitation as specified in Paragraph 75. Upon approval of the proposed Groundwater Corrective Action Plan, Duke Energy Carolinas shall implement the plan subject to such modification and amendment approved pursuant to N.C. Gen. Stat. § 130A-309.211(b)(3) and the 2L groundwater rules.[19]

36. **NPDES Permit and Special Order by Consent.** On September 17, 2018, DEQ issued NPDES Permit No. NC0004774 for Buck. On July 12, 2018, the EMC approved SOC S18-004 for Buck, which sets a compliance schedule that requires completion of decanting by March 31, 2020. Duke Energy Carolinas shall comply with the terms of NPDES Permit No. NC004774 and SOC S18-004 including any future amendments by DEQ or the EMC, respectively, when such an amendment becomes effective (unless otherwise ordered by the North Carolina Office of Administrative Hearings or a court of competent jurisdiction).

37. **Prior Settlement of Buck Unaffected.** Nothing in this Consent Order alters, changes, overrides, or invalidates the separate Settlement Agreement and Release dated December 21, 2016, between Yadkin Riverkeeper, Inc., and Waterkeeper Alliance,

[19] For clarity, this paragraph does not constitute approval of any portion or aspect of the Groundwater Corrective Action Plan. DEQ will approve or disapprove the Groundwater Corrective Action Plan at the appropriate time.

Inc., on the one hand, and Duke Energy Carolinas, on the other, or any provision thereof.

Cliffside/Rogers

38. **Closure of CCR Impoundments.** Duke Energy Carolinas shall excavate and remove all coal ash from the Unit 5 Inactive Ash Basin and Active Ash Basin, either (1) to lined onsite locations for disposal in a CCR landfill, industrial landfill, or municipal solid waste landfill or (2) for beneficial use for cementitious purposes or another industrial process at least as environmentally protective. If a process other than a cementitious process is to be used, Duke Energy Carolinas shall provide reasonable notice to the Community Groups and DEQ. Duke Energy Carolinas shall remove or permanently close all pipes currently running through or beneath the Unit 5 Inactive Ash Basin and Active Ash Basin. Duke Energy Carolinas shall thereafter stabilize and close the area where the Unit 5 Inactive Ash Basin and Active Ash Basin are located pursuant to applicable law. The total coal ash that will be excavated is estimated to be approximately 7,590,000 tons.

39. **Deadline for Closure.** Duke Energy Carolinas projects that it will require until December 31, 2028, to complete all excavation as required in Paragraph 38. Duke Energy Carolinas shall complete all excavation required in Paragraph 38 by the statutory deadline set forth in CAMA, as amended by House Bill 630, or as may further be amended from time to time, but in any event not later than December 31, 2029.

40. **Groundwater Corrective Action Plan.** On December 31, 2019, Duke Energy Carolinas submitted a proposed Groundwater Corrective Action Plan to DEQ for its review and approval. The Corrective Action Plan includes active remedial measures

intended by Duke Energy Carolinas to address any groundwater contamination as required by N.C. Gen. Stat. § 130A-309.211, the 2L groundwater rules, and any other applicable laws, statutes, or regulations, subject to the provisions of Paragraph 74 and provided that active remedial measures shall not be required to remediate areas within the geographic limitation as specified in Paragraph 75. Upon approval of the proposed Groundwater Corrective Action Plan by DEQ, Duke Energy Carolinas shall implement the plan subject to such modification and amendment approved pursuant to N.C. Gen. Stat. § 130A-309.211(b)(3) and the 2L groundwater rules.[20]

41. **NPDES Permit and Special Order by Consent.** On July 13, 2018, DEQ issued NPDES Permit No. NC0005088 for Cliffside/Rogers. On April 18, 2018, the EMC approved SOC S17-009, which sets a compliance schedule that requires completion of decanting by March 31, 2020. Duke Energy Carolinas shall comply with the terms of NPDES Permit No. NC0005088 and SOC S17-009 including any future amendments by DEQ or the EMC, respectively, when such an amendment becomes effective (unless otherwise ordered by the North Carolina Office of Administrative Hearings or a court of competent jurisdiction).

Marshall

42. **Closure of CCR Impoundment.** Duke Energy Carolinas shall excavate and remove all coal ash from the Ash Basin, except the coal ash under or within the waste boundaries of the PV Structural Fill and the 1804 Phase II Landfill, either (1) to lined onsite locations for disposal in a CCR landfill, industrial landfill, or municipal solid

[20] For clarity, this paragraph does not constitute approval of any portion or aspect of the Groundwater Corrective Action Plan. DEQ will approve or disapprove the Groundwater Corrective Action Plan at the appropriate time.

waste landfill or (2) for beneficial use for cementitious purposes or another industrial process at least as environmentally protective. If a process other than a cementitious process is to be used, Duke Energy Carolinas shall provide reasonable notice to the Community Groups and DEQ. Duke Energy Carolinas shall remove or permanently close all pipes currently running through or beneath the Ash Basin. Duke Energy Carolinas shall thereafter stabilize and close the area where the Ash Basin is located pursuant to applicable law. The total coal ash that will be excavated is estimated to be approximately 16,800,000 tons. An approximate depiction of the excavation at Marshall is attached as **Exhibit I**.

43. **Disposition of Other Coal Ash.** Additionally, for the Marshall site, and due to the hydrogeological setting of the 1804 Phase I Landfill (sometime referred to as the "old ash fill") adjacent to the Ash Basin, Duke Energy Carolinas shall excavate and remove approximately 626,000 tons of coal ash from the 1804 Phase I Landfill adjacent to the Ash Basin either (1) to lined onsite locations for disposal in a CCR landfill, industrial landfill, or municipal solid waste landfill or (2) for beneficial use for cementitious purposes or another industrial process at least as environmentally protective. If a process other than a cementitious process is to be used, Duke Energy Carolinas shall provide reasonable notice to the Community Groups and DEQ. Such excavation shall be complete no later than December 31, 2024. An approximate depiction of the excavation at Marshall is attached as **Exhibit I**.

44. **Deadline for Closure.** Duke Energy Carolinas projects that it will require until December 31, 2034, to complete all excavation as required in Paragraph 42, and the Parties understand that Duke Energy Carolinas will request variances to meet the

deadline imposed by this Consent Order. Duke Energy Carolinas shall complete all excavation required in Paragraph 42 by the statutory deadline set forth in CAMA, as amended by House Bill 630, or as may further be amended from time to time, and subject to any variances granted pursuant to N.C. Gen. Stat. § 130A-309.215, but in any event not later than December 31, 2035.[21]

45. **Structural Stability, Monitoring, and Sampling.** The coal ash under and within the waste boundary of the PV Structural Fill and the 1804 Phase II Landfill and within the waste boundary of the Ash Basin shall be stabilized with a permanent structure ("stability feature") for purposes of preserving the structural stability through the use of a wall unless a slope is shown to be as appropriate, so as to prevent lateral movement of the coal ash pursuant to a plan to be submitted for DEQ approval no later than June 30, 2020. Within seven (7) days of completing the stability feature, Duke Energy Carolinas shall notify DEQ. Additionally, pursuant to a plan approved by DEQ, following excavation in the footprint of the former Ash Basin and downgradient of the PV Structural Fill and the 1804 Phase II Landfill, Duke Energy Carolinas shall conduct groundwater monitoring (including the installation of new wells if reasonably necessary) and, upon re-formation of surface water features that demonstrate DEQ-confirmed intermittent or perennial flows (not merely precipitation), surface water sampling. If Duke Energy Carolinas demonstrates to the satisfaction of DEQ that groundwater monitoring in the footprint of the former Ash Basin and downgradient of the PV Structural Fill and the 1804 Phase II Landfill is impracticable, DEQ may require

[21] For clarity, this paragraph does not constitute a variance of the CAMA deadline for completion of closure. DEQ will approve or disapprove a request for variance at the appropriate time.

upgradient or side-gradient monitoring. Consistent with the provisions of Paragraph 74, in this plan Duke Energy Carolinas shall propose (1) additional groundwater remedial measures for any coal ash constituent if the data indicate an increasing trend in groundwater concentrations in excess of the 2L groundwater standards for four (4) consecutive semi-annual sampling events for that constituent, subject to the provisions of Paragraph 75, and (2) surface water treatment if the data shows impact from coal ash constituents above the 2B standards to waters of the State notwithstanding the provisions of Paragraph 75. This plan shall be submitted to DEQ no later than 120 days following completion of the stability feature. If appropriate, the additional monitoring plan will be integrated into the existing site monitoring plan to avoid redundant or conflicting monitoring programs.

46. **Groundwater Corrective Action Plan.** On December 31, 2019, Duke Energy Carolinas submitted a proposed Groundwater Corrective Action Plan to DEQ for its review and approval. The Corrective Action Plan includes active remedial measures intended by Duke Energy Carolinas to address any groundwater contamination as required by N.C. Gen. Stat. § 130A-309.211, the 2L groundwater rules, and any other applicable laws, statutes, or regulations, subject to the provisions of Paragraph 74 and provided that active remedial measures shall not be required to remediate areas within the geographic limitation as specified in Paragraph 75. Upon approval of the proposed Groundwater Corrective Action Plan by DEQ, Duke Energy Carolinas shall implement the plan subject to such modification and amendment approved pursuant to N.C. Gen. Stat. § 130A-309.211(b)(3) and the 2L groundwater rules. In addition, Duke Energy Carolinas shall install a geosynthetic cap over the PV Structural Fill and 1804 Phase II

Landfill by December 31, 2024. At a minimum, Duke Energy Carolinas shall remedy any material violations of the 2L groundwater standards as determined by DEQ that are attributable to the Ash Basin at or beyond the geographic limitation as described in Paragraph 75 by December 31, 2029, subject to the provisions of Paragraph 74.[22]

47. **NPDES Permit and Special Order by Consent.** On April 2, 2018, DEQ issued a major modification of NPDES Permit No. NC0004987 for Marshall. On April 18, 2018, the EMC approved SOC S17-009 for Marshall, which sets a compliance schedule that requires the completion of decanting by March 31, 2021. Duke Energy Carolinas shall comply with the terms of NPDES Permit No. NC0004987 and SOC S17-009 including any future amendments by DEQ or the EMC, respectively, when such an amendment becomes effective (unless otherwise ordered by the North Carolina Office of Administrative Hearings or a court of competent jurisdiction).

Facility-Specific Obligations of Duke Energy Progress

Mayo

48. **Closure of CCR Impoundment.** Duke Energy Progress shall excavate and remove all coal ash from the Ash Basin either (1) to lined onsite locations for disposal in a CCR landfill, industrial landfill, or municipal solid waste landfill or (2) for beneficial use for cementitious purposes or another industrial process at least as environmentally protective. If a process other than a cementitious process is to be used, Duke Energy Progress will provide reasonable notice to the Community Groups and DEQ. Duke

[22] For clarity, this paragraph does not constitute approval of any portion or aspect of the Groundwater Corrective Action Plan. DEQ will approve or disapprove the Groundwater Corrective Action Plan at the appropriate time.

Energy Progress shall remove or permanently close all pipes currently running through or beneath the Ash Basin. Duke Energy Progress will stabilize and close the area where the Ash Basin is located pursuant to applicable law. The total coal ash that will be excavated is estimated to be approximately 6,630,000 tons.

49. **Deadline for Closure.** Duke Energy Progress projects that it will require until December 31, 2028, to complete all excavation as required in Paragraph 48. Duke Energy Progress may request variances to meet the deadline imposed by this Consent Order. Duke Energy Progress shall complete all excavation required in Paragraph 48 by the statutory deadline set forth in CAMA, as amended by House Bill 630, or as may further be amended from time to time, but in any event not later than December 31, 2029.

50. **Groundwater Corrective Action Plan.** On December 31, 2019, Duke Energy Progress submitted a proposed Groundwater Corrective Action Plan to DEQ for its review and approval. The Corrective Action Plan includes remedial measures intended by Duke Energy Progress to address any groundwater contamination as required by N.C. Gen. Stat. § 130A-309.211, the 2L groundwater rules, and any other applicable laws, statutes, or regulations, subject to the provisions of Paragraph 74 and provided that active remedial measures shall not be required to remediate areas within the geographic limitation as specified in Paragraph 75. Upon approval of the proposed Groundwater Corrective Action Plan by DEQ, Duke Energy Progress shall implement

the plan subject to such modification and amendment approved pursuant to N.C. Gen. Stat. § 130A-309.211(b)(3) and the 2L groundwater rules.[23]

51. **NPDES Permit and Special Order by Consent.** On July 13, 2018, DEQ issued NPDES Permit No. NC0038377 for Mayo. On August 15, 2018, the EMC approved SOC S18-005, which sets a compliance schedule that requires the completion of decanting by December 31, 2020. Duke Energy Progress shall comply with the terms of NPDES Permit No. NC0038377 and SOC S18-005 including any future amendments by DEQ or the EMC, respectively, when such an amendment becomes effective (unless otherwise ordered by the North Carolina Office of Administrative Hearings or a court of competent jurisdiction).

Roxboro

52. **Closure of CCR Impoundment.** Duke Energy Progress shall excavate and remove all coal ash from the West Ash Basin (and its extension impoundment area, sometimes referred to as the "Southern Extension Impoundment") and all coal ash from the East Ash Basin (and its extension impoundment area, sometimes referred to as the "Eastern Extension Impoundment") except the coal ash under or within the waste boundary of the Roxboro Landfill, Permit No. 7302-INDUS-1988. The excavated ash shall be either (1) disposed of at lined onsite locations for disposal in a CCR landfill, industrial landfill, or municipal solid waste landfill or (2) used for beneficial use for cementitious purposes or another industrial process at least as environmentally protective. If a process other than a cementitious process is to be used, Duke Energy Progress shall

[23] For clarity, this paragraph does not constitute approval of any portion or aspect of the Groundwater Corrective Action Plan. DEQ will approve or disapprove the Groundwater Corrective Action Plan at the appropriate time.

provide reasonable notice to the Community Groups and DEQ. The scope of excavation of the East Ash Basin is approximately depicted on **Exhibit J** to this Consent Order. Duke Energy Progress shall remove or permanently close all pipes currently running through or beneath the West Ash Basin and East Ash Basin except those associated with the Roxboro Landfill. Duke Energy Progress shall thereafter stabilize and close the area where the West Ash Basin and East Ash Basin are located pursuant to applicable law. The total coal ash that will be excavated is estimated to be approximately 16,860,000 tons. Additionally, Duke Energy Progress shall remove all coal ash fill from the Gypsum Pad area following retirement of the coal-fired generating units at Roxboro.

53. **Disposition of Other Coal Ash.** Duke Energy Progress shall commence closure of the Roxboro Landfill, Permit No. 7302-INDUS-1988, no later than 30 days after the date on which the Roxboro Landfill receives the final receipt of waste utilizing a cap system that meets the requirements of North Carolina and federal law.

54. **Deadline for Closure.** Duke Energy Progress projects that it will require until December 31, 2035, to complete all excavation as required in Paragraph 52, and that the Parties understand that Duke Energy Progress will request variances to meet the deadline imposed by this Consent Order. Duke Energy Progress shall complete all excavation required in Paragraph 52 by the statutory deadline set forth in CAMA, as amended by House Bill 630, or as may further be amended from time to time, and

subject to any variances granted pursuant to N.C. Gen. Stat. § 130A-309.215, but in any event not later than December 31, 2036.[24]

55. **Structural Stability, Monitoring, and Sampling.** The coal ash under and within the waste boundary of the Roxboro Landfill and within the waste boundary of the East Ash Basin shall be stabilized with a permanent structure ("stability feature") for purposes of preserving the structural stability through the use of a wall unless a slope is shown to be as appropriate so as to prevent lateral movement of the coal ash pursuant to a plan to be submitted for DEQ approval no later than June 30, 2020. Within seven (7) days of completing the stability feature, Duke Energy Progress shall notify DEQ. Additionally, pursuant to a plan approved by DEQ, following excavation in the footprint of the former East Ash Basin and downgradient of the Roxboro Landfill, Duke Energy Progress shall conduct groundwater monitoring (including the installation of new wells if reasonably necessary) and, upon re-formation of surface water features that demonstrate DEQ-confirmed intermittent or perennial flows (not merely precipitation), surface water sampling. Consistent with the provisions of Paragraph 74, in this plan Duke Energy Progress shall propose (1) additional groundwater remedial measures for any coal ash constituent if the data indicate an increasing trend in groundwater concentrations in excess of the 2L groundwater standards for four (4) consecutive semi-annual sampling events for that constituent, subject to the provisions of Paragraph 75, and (2) surface water treatment if the data shows impact from coal ash constituents above the 2B standards to waters of the State notwithstanding the

[24] For clarity, this paragraph does not constitute a variance of the CAMA deadline for completion of closure. DEQ will approve or disapprove a request for variance at the appropriate time.

provisions of Paragraph 75. This plan shall be submitted to DEQ no later than 120 days following completion of the stability feature. If appropriate, the additional monitoring plan will be integrated into the existing site monitoring plan to avoid redundant or conflicting monitoring programs.

56. **Groundwater Corrective Action Plan.** On December 31, 2019, Duke Energy Progress submitted a proposed Groundwater Corrective Action Plan to DEQ for its review and approval. The Corrective Action Plan includes active remedial measures intended by Duke Energy Progress to address any groundwater contamination as required by N.C. Gen. Stat. § 130A-309.211, the 2L groundwater rules, and any other applicable laws, statutes, or regulations, subject to the provisions of Paragraph 74 and provided that active remedial measures shall not be required to remediate areas within the geographic limitation as specified in Paragraph 75. Upon approval of the proposed Groundwater Corrective Action Plan by DEQ, Duke Energy Carolinas shall implement the plan subject to such modification and amendment approved pursuant to N.C. Gen. Stat. § 130A-309.211(b)(3) and the 2L groundwater rules. At a minimum, Duke Energy Progress shall remedy any material violations of the 2L groundwater standards as determined by DEQ that is attributable to the East Ash Basin at or beyond the geographical limitation described in Paragraph 75 by December 31, 2029, subject to the provisions of Paragraph 74.[25]

57. **Progress Towards Groundwater Remediation.** Subject to the provisions of this Consent Order regarding substantial compliance in Paragraph 74, no later than June 30,

[25] For clarity, this paragraph does not constitute approval of any portion or aspect of the Groundwater Corrective Action Plan. DEQ will approve or disapprove the Groundwater Corrective Action Plan at the appropriate time.

2020, Duke Energy Progress shall submit a report for approval by DEQ analyzing the progress required by June 30, 2023 and by June 30, 2026 to achieve compliance with 2L groundwater standards by December 31, 2029 at or beyond the geographic limitation described in Paragraph 75 around the East Ash Basin. Subject to the provisions of this Consent Order regarding substantial compliance in Paragraph 74, no later than September 30, 2023 and September 30, 2026, Duke Energy Progress shall submit reports demonstrating sufficient progress toward the goal of achieving compliance with the 2L groundwater standards. If DEQ determines that sufficient progress has not been made towards achieving this goal, Duke Energy Progress shall implement additional remedial measures as required by DEQ.

58. **NPDES Permit and Special Order by Consent.** On January 18, 2020, DEQ provided public notice of draft NPDES Permit No. NC0003425 for Roxboro. On August 15, 2018, the EMC approved SOC S18-005 for Roxboro, which sets a compliance schedule that requires the completion of decanting by June 30, 2020. Duke Energy Progress shall comply with the terms of the NPDES Permit No. NC0003425 as issued following public comment and SOC S18-005 including any future amendments by DEQ or the EMC, respectively, when such an amendment becomes effective (unless otherwise ordered by the North Carolina Office of Administrative Hearings or a court of competent jurisdiction).

Additional Obligations of Duke Energy Carolinas and Duke Energy Progress

59. **Submission of Closure Plans.** On December 31, 2019, Duke Energy Carolinas and Duke Energy Progress submitted to DEQ one closure plan for each CCR impoundment

pursuant to N.C. Gen. Stat. § 130A-309.214(a) for each of the above-referenced Facilities.

60. **Notice to Community Groups**. During the implementation of the Groundwater Corrective Action Plans and any monitoring required by the terms of this Consent Order, Duke Energy Carolinas and Duke Energy Progress shall provide concurrent copies to the Community Groups of annual reports required under Paragraph 84 of this Consent Order, coal ash excavation reports and groundwater monitoring data (including spreadsheets) for the Facilities as these are provided to DEQ. This may occur through U.S. Mail or electronic means to the person designated in Paragraph 80.

Obligations of DEQ

61. **Review of Closure Plans.** DEQ shall review proposed closure plans and provide for public participation consistent with N.C. Gen. Stat. § 130A-309.214(b). DEQ may request the submittal of additional information pursuant to N.C. Gen. Stat. § 130A-309.214(c). After receiving public comment, DEQ shall approve or disapprove the proposed closure plans pursuant to N.C. Gen. Stat. § 130A-309.214(c). DEQ will not disapprove a proposed closure plan on the basis of the closure methodology employed, to the extent that such methodology is consistent with this Consent Order.

62. **Timely Review.** In accordance with applicable law, DEQ shall conduct an expeditious review and act expeditiously on all applications by Duke Energy Carolinas and Duke Energy Progress for permits necessary to undertake the actions required under this Consent Order as required by N.C. Gen. Stat. § 130A-309.203.

63. **Review of Variance Requests.** DEQ acknowledges that the deadline for closure is a deadline for which the Secretary is authorized to grant a variance provided that the requirements of N.C. Gen. Stat. § 130A-309.215 are satisfied. DEQ acknowledges that an extension of time required to complete excavation ordered by DEQ and mandated by the terms of this Consent Order may be a valid basis for seeking a variance from CAMA deadlines, including requests for variance under Paragraph 66 below for purposes of beneficiation. DEQ will approve or disapprove a request for variance at the appropriate time.

64. **CCR Rule Deadlines.** DEQ agrees to cooperate with (including as appropriate to support) and not oppose Duke Energy Carolinas's or Duke Energy Progress's efforts to extend the deadlines imposed by the federal CCR rule in court or before an administrative body to the extent that such an extension is necessary for Duke Energy Carolinas or Duke Energy Progress to meet its obligations under this Consent Order.

65. **Further Excavation**. For CCR impoundments, structural fills, and landfills identified in this Consent Order, DEQ shall not require additional excavation for CCR-impacted groundwater at Allen, Belews Creek, Buck, Cliffside/Rogers, Marshall, Mayo, and Roxboro unless DEQ determines (1) there are material violations of the 2L groundwater standards or this Consent Order within the meaning of Paragraph 74 and (2) these material violations cannot reasonably be remedied by active remediation.

Obligations of the Community Groups

66. **CAMA Variance Requests.** The Community Groups will not oppose requests for variances made by Duke Energy Carolinas or Duke Energy Progress as to the closure

deadlines set forth in CAMA in court or before an administrative body, provided that there are no requests to extend such deadlines past December 31, 2034 for the basins at Belews Creek, December 31, 2035 for the basins at Marshall or Buck, December 31, 2036 for the basins at Roxboro, and December 31, 2038 for the basins at Allen.

67. **Closure Plans and Corrective Action Plans.** The Community Groups will not challenge in court or before an administrative body DEQ's approval of Duke Energy Carolinas's and Duke Energy Progress's closure plans, Corrective Action Plans (including application of a Restricted Designation), Corrective Action Plan implementation, landfill construction or operation permits, components or terms of NPDES permits or modifications to NPDES permits to the extent these components or terms are reasonably necessary for the obligations imposed by this Consent Order (including, for example, NPDES permits or modifications relating to decanting and dewatering), stormwater permits, dam removal authorizations, or post-closure monitoring plans for Allen, Belews Creek, Buck, Cliffside/Rogers, Marshall, Mayo, and Roxboro, or such other permits as required by this Consent Order, provided those closure plans and Corrective Action Plans conform with the terms of this Consent Order.

68. **CCR Rule Deadlines.** The Community Groups will not oppose Duke Energy Carolinas's or Duke Energy Progress's efforts in court or in an administrative proceeding to extend the deadlines imposed by the federal CCR rule to the extent that such an extension is necessary to meet the obligations under this Consent Order. If appropriate, the Community Groups will support such requests.

69. **Deadlines for Coal Ash Recycling.** The Community Groups will not oppose in court or before an administrative body, extensions to the CAMA closure dates as may be requested for the purposes of completing beneficiation at Buck, Cape Fear, and HF Lee, through December 31, 2035. For purposes of this paragraph only, Cape Fear River Watch, Inc., Waterkeeper Alliance, Sound Rivers, and Winyah Rivers Foundation (together "additional community groups"), DEQ, and Duke Energy Progress consent to amending the Order Granting Motion for Partial Summary Judgment entered on April 4, 2016 and amended on June 9, 2017, with respect to Paragraph 19 (H.F. Lee) and Paragraph 34 (Cape Fear). The signatures of these additional community groups on this Consent Order shall apply only to the provisions of this paragraph. The Motion seeking an amendment to the Order Granting Motion for Partial Summary Judgment shall be filed separately from this Consent Order.

Further Obligations

70. **Closure Method**. The terms of this Consent Order satisfy the closure method requirements of N.C. Gen. Stat. § 130A-309.214 for Duke Energy Carolinas and Duke Energy Progress at the Facilities. In the event of inconsistency between this Consent Order and the closure method ordered in DEQ's April 1 Closure Determinations, the terms of this Consent Order shall control.[26]

71. **Consent Order and Settlement Agreement.** The Court takes judicial notice that the Parties entered into a Settlement Agreement on December 31, 2019. Nothing in this

[26] For clarity, this paragraph does not constitute approval of the closure plan. DEQ will approve or disapprove the closure plan at the appropriate time.

Consent Decree is intended to alter, amend, or change any surviving obligations of the Settlement Agreement. The Parties further agree that:

a. Except as set forth in Paragraph 72, below, the only State entity bound by this Consent Order is DEQ.

b. Except as set forth in Paragraph 72, below, the resolution of cases or issues pursuant to this Consent Order shall have no preclusive, *res judicata*, or collateral estoppel effect against the State of North Carolina or any other State entity other than DEQ.

c. Nothing in this Consent Order shall limit the arguments that may be made or conclusions that may be drawn by other State entities in any matter or proceeding concerning recovery through rates of costs incurred by Duke Energy.

72. **Release of Claims**. Notwithstanding any other provision of this Consent Order, for the Facilities listed in Paragraphs 4 and 5, this Consent Order releases and resolves the civil claims for injunctive relief set forth or which could have been set forth by Plaintiff against Duke Energy Progress and Duke Energy Carolinas in the above-captioned matters for past and continuing alleged violations of the water quality statutes and regulations referenced in the Complaints based on information reasonably known to DEQ at the time of filing of the Consent Order. For clarity, this release does not apply to any alleged groundwater violations referenced in Paragraph 20.

73. **No Limitation of Authority for Unknown or Future Endangerment**. Plaintiff retains all legal and equitable remedies to address any imminent and substantial endangerment to the public health or welfare or the environment that is presently unknown or which may arise in the future as a result of activities at the Facilities

whether related to the violations addressed in this Consent Order or otherwise. The Parties reserve all legal and equitable remedies available to enforce the provisions of this Consent Order, including requesting the Court to exercise its contempt powers.

74. **Substantial Compliance.** For any term of this Consent Order that requires compliance with the 2L groundwater standards, neither Duke Energy Carolinas nor Duke Energy Progress will be deemed to be in violation of any such term of this Consent Order and shall not be subject to civil penalties or enforcement action by DEQ at a Facility covered by this Consent Order so long as Duke Energy Carolinas or Duke Energy Progress, as applicable, has used best efforts (as described in Paragraph 77) to implement the Corrective Action Plan and post-closure monitoring and care plan unless DEQ determines that there are multiple and material deviations from such standards at or beyond the geographic limitation set forth in Paragraph 75.

75. **Geographic Limitation**. Active remediation will not be required in the area within 500 feet of the waste boundary of each CCR impoundment as shown on the most recent NPDES permit for each of the Facilities (except that if a property boundary or body of water is located closer than 500 feet to the waste boundary, that property boundary or body of water shall define the geographic limits for active remediation) ("geographic limitation"), provided that, subject to the provisions of Paragraph 74, coal ash constituents outside the geographic limitation described in this paragraph do not increase beyond the 2L groundwater standards post-closure. DEQ will not assess a civil penalty or pursue an enforcement action for any exceedances of the 2L groundwater standards within the geographical limitation so long as Duke Energy Carolinas or Duke Energy Progress, as applicable, is making best efforts (as defined by

Paragraph 77) to implement the approved Corrective Action Plan and closure plan as determined by DEQ. The Corrective Action Plans may be periodically updated as required by DEQ if the groundwater cleanup fails to meet projected targets.

76. **No Admission.** No Party admits wrongdoing or liability related to matters covered in this Consent Order.

77. **Force Majeure.** It will not be a violation of this Consent Order if performance of any of the obligations contained in any paragraph is delayed by an extraordinary event that is beyond the control of Duke Energy Carolinas or Duke Energy Progress, as applicable, or any entity controlled by Duke Energy Carolinas or Duke Energy Progress, as applicable, or their contractors, despite best efforts to fulfill the obligation. Such causes are war, civil unrest, act of God, or act of a governmental or regulatory body delaying performance or making performance impossible including any appeal or decision remanding, overturning, modifying, or otherwise acting (or failing to act) on a permit or similar permission or action that prevents or delays an action needed for the performance of any of the work contemplated under this Consent Order such that it prevents or substantially interferes with Duke Energy Carolinas's or Duke Energy Progress's performance within the time frames specified herein. Duke Energy Carolinas or Duke Energy Progress, as applicable, shall bear the burden of proving by a preponderance of the evidence the existence of such circumstances. Such circumstances do not include the financial inability to complete the work, increased cost of performance, or changes in business or economic circumstances.

a. To qualify as a force majeure under this Consent Order, the failure of a permitting authority to issue a necessary permit in a timely fashion which prevents Duke

Energy Carolinas or Duke Energy Progress from meeting the requirements in this Consent Order must be beyond the control of Duke Energy Carolinas or Duke Energy Progress, as applicable, and Duke Energy Carolinas or Duke Energy Progress must have taken all steps available to obtain the necessary permit, including but not limited to submitting a complete permit application, responding to requests for additional information by the permitting authority in a timely fashion, and accepting lawful permit terms and conditions after expeditiously exhausting any legal rights to appeal those terms and conditions imposed by the permitting authority.

b. The requirement that Duke Energy Carolinas and Duke Energy Progress use "best efforts" in this Consent Order includes using commercially reasonable efforts to anticipate any event that delays obligations and to address the event in a commercially reasonable manner as it is occurring or following the event such that delay is minimized to the greatest extent possible.

c. Duke Energy Carolinas or Duke Energy Progress, as applicable, shall notify the Court, DEQ, and the Community Groups in writing within ten (10) days of knowledge of the event which causes or may cause delay, describing in detail the anticipated length of the delay, the precise cause or causes of the delay, the measures taken and to be taken by Duke Energy Progress or Duke Energy Carolinas to prevent or minimize the delay, and a timetable by which those measures will be implemented. Failure to comply with the notice requirements constitutes a waiver of any defense to a failure to comply with the terms and conditions of this Order.

The Parties may, in advance of the actual occurrence of an event causing delay, move the Court for a determination as to whether the event will excuse the delay.

78. **Obligations of the Defendants.** Duke Energy Progress and Duke Energy Carolinas shall be responsible for carrying out their respective obligations of the Consent Order until relieved by the Court.

79. **No Limitation on Administrative Process and Judgment.** DEQ is a governmental agency with statutory rights or obligations, and must abide by all applicable procedural and substantive laws and regulations in the exercise of such authority during the implementation of the provisions in this Consent Order. No provision in this Consent Order shall diminish, modify, or otherwise affect the statutory or regulatory authority of DEQ. For any provision in this Consent Order where DEQ makes a determination on a matter, nothing in this Consent Order waives any rights of a Party under the North Carolina Administrative Procedure Act (including the right to appeal, if any), nor does a determination by DEQ on a matter prohibit a challenge to that determination under the terms of this Consent Order, where appropriate. Nothing in this Consent Order shall limit the opportunity for the Community Groups to participate in any administrative process to the extent consistent with their commitments in this Consent Order and as set forth in Paragraph 71.

80. **Notice.** Whenever notice is required to be given or a document is required to be sent by one Party to another under the terms of this Consent Order, it shall be provided to all Parties, directed to the individuals at the addresses specified below, unless those individuals or their successors give notice of a change to the other Parties in writing. Notice or submission by electronic mail is acceptable.

a. As to DEQ:

Sheila Holman
Assistant Secretary for the Environment
1601 Mail Service Center
Raleigh, NC 27699-1601
sheila.holman@ncdenr.gov

Cc: William F. Lane
General Counsel
1601 Mail Service Center
Raleigh, NC 27699-1601
Bill.Lane@ncdenr.gov

b. As to Duke Energy:

Kodwo Ghartey-Tagoe
Executive Vice-President and Chief Legal Officer
Duke Energy Corp.
Mail Code DEC48H
550 South Tryon Street
Charlotte, NC 28202
Kodwo.Ghartey-Tagoe@duke-energy.com

c. As to the Community Groups:

Frank S. Holleman III
Senior Attorney
Southern Environmental Law Center
Counsel for Community Groups
601 West Rosemary Street, Suite 220
Chapel Hill, NC 27516-2356
fholleman@selcnc.org

81. **Effective Date.** This Consent Order shall take effect immediately upon entry and shall remain in effect until further order of this Court. The Parties shall comply with the terms of this Consent Order.

82. **Continuing Jurisdiction.** The Court shall retain continuing jurisdiction to enforce the terms and conditions of this Consent Order, to modify this Consent Order, and to resolve disputes arising under this Consent Order. This Consent Order may be

modified, altered, or changed upon application to the Court by written consent of all Parties. Absent consent of all Parties, a Party may seek modification or amendment of this Consent Order only upon a showing of a substantial change of facts and circumstances such that it would no longer be equitable to enforce the terms and conditions of this Consent Order absent such modification or amendment. In the event that any Party seeks such a modification or amendment without the consent of any other Party, all Parties have the right to be heard by the Court. This Consent Order shall remain in force and effect until all obligations and terms have been completed or satisfied. Upon Duke Energy Carolinas and Duke Energy Progress demonstrating completion of all obligations imposed by this Consent Order for each Facility to the satisfaction of Plaintiff and Plaintiff-Intervenors, Plaintiff and Plaintiff-Intervenors shall file appropriate notice and satisfaction documents with the Court.

83. **Compliance**. The parties agree that the actions required by this Consent Order (including costs incurred) are for the purpose of complying with CAMA and coming into compliance with applicable laws, rules, and regulations. For clarity, in ordering methods of closure for the impoundments, DEQ did not seek to impose a fine or penalty. This paragraph relates solely to issues arising under federal tax law.

84. **Reporting.** Duke Energy Carolinas and Duke Energy Progress shall submit annual progress reports to DEQ detailing the work and activities undertaken and completed pursuant to the requirements set forth in this Consent Order. The annual reports are due no later than the thirtieth (30th) day of January for the duration of this Consent Order.

85. **Enforcement.** The full power of the Court, including the contempt provisions of Article 2, Chapter 5A of the North Carolina General Statutes, shall be available to enforce this Consent Order. In no event shall any Party be entitled to monetary damages for breach of this Consent Order. In addition, no action under this Consent Order shall be brought or maintained until: (a) the non-breaching Party provides written notice to the breaching Party which explains with particularity the nature of the claimed breach, and (b) within thirty (30) days after receipt of said notice, the breaching Party fails to cure the claimed breach or, in the case of a claimed breach which cannot be reasonably remedied within a thirty (30) day period, the breaching Party fails to commence to cure the claimed breach within such thirty (30) day period, and thereafter diligently complete the activities reasonably necessary to remedy the claimed breach.

86. **Signature**. This Consent Order may be signed by the Court out-of-court, out-of-term, and out-of-county, and by the Parties in counterparts.

CONSENTED TO BY:

THE NORTH CAROLINA DEPARTMENT OF ENVIRONMENTAL QUALITY

By: _____ Date: January 30, 2020
Michael Regan
Secretary

By: _____ Date: 01/30/2020
Francisco Benzoni, as to form only
Special Deputy Attorney General

DUKE ENERGY CAROLINAS, LLC

By: Kodwo Ghartey-Tagoe Date: January 31, 2020

Kodwo Ghartey-Tagoe
Executive Vice-President, Chief Legal Officer
DUKE ENERGY CAROLINAS, LLC and Authorized
Designated Official for DUKE ENERGY CAROLINAS, LLC

DUKE ENERGY PROGRESS, LLC

By: Kodwo Ghartey-Tagoe Date: January 31, 2020

Kodwo Ghartey-Tagoe
Executive Vice-President, Chief Legal Officer
DUKE ENERGY PROGRESS, LLC and Authorized
Designated Official for DUKE ENERGY PROGRESS, LLC

THE COMMUNITY GROUPS:

APPALACHIAN VOICES

By: _____ Date: 1/31/2020
Frank S. Holleman III
Senior Attorney
Southern Environmental Law Center
Counsel for the Community Groups

MOUNTAINTRUE

By: _____ Date: 1/31/2020
Frank S. Holleman III
Senior Attorney
Southern Environmental Law Center
Counsel for the Community Groups

THE CATAWBA RIVERKEEPER FOUNDATION

By: _____ Date: 1/31/2020
Frank S. Holleman III
Senior Attorney
Southern Environmental Law Center
Counsel for the Community Groups

THE SIERRA CLUB

By: _____ Date: 1/31/2020
Frank S. Holleman III
Senior Attorney
Southern Environmental Law Center
Counsel for the Community Groups

WINYAH RIVERS FOUNDATION, INC.

By: _____ Date: 1/31/2020
Frank S. Holleman III
Senior Attorney
Southern Environmental Law Center
Counsel for the Community Groups

THE COMMUNITY GROUPS:

THE WATERKEEPER ALLIANCE

By: _____ Date: 1/31/2020
Frank S. Holleman III
Senior Attorney
Southern Environmental Law Center
Counsel for the Community Groups

THE ROANOKE RIVER BASIN ASSOCIATION

By: _____ Date: 1/31/2020
Frank S. Holleman III
Senior Attorney
Southern Environmental Law Center
Counsel for the Community Groups

CAPE FEAR RIVER WATCH, INC.

By: _____ Date: 1/31/2020
Frank S. Holleman III
Senior Attorney
Southern Environmental Law Center
Counsel for the Community Groups

NEUSE RIVER FOUNDATION/SOUND RIVERS, INC.

By: _____ Date: 1/31/2020
Frank S. Holleman III
Senior Attorney
Southern Environmental Law Center
Counsel for the Community Groups

IT IS HEREBY ORDERED.

This 5 day of February, 2020.

The Honorable Paul C. Ridgeway
Senior Resident Superior Court Judge

Exhibit 2

DEQ Orders Duke Energy to Excavate Coal Ash at Six Remaining Sites

Proposed Excavation Closure Plans due to DEQ for Approval on August 1, 2019

Raleigh

Apr 1, 2019

Today, N.C. Department of Environmental Quality (DEQ) ordered Duke Energy Progress, LLC to excavate all remaining coal ash impoundments in North Carolina. After conducting a rigorous scientific review of Duke Energy's proposals for Allen, Belews, Cliffside/Rogers, Marshall, Mayo and Roxboro facilities, and conducting public listening sessions in impacted communities, DEQ has determined excavation of all six sites is the only closure option that meets the requirements of Coal Ash Management Act to best protect public health. The coal ash must be disposed of in a lined landfill.

"DEQ rigorously reviewed the proposals, and the science points us clearly to excavation as the only way to protect public health and the environment," said DEQ Secretary Michael S. Regan. "Today's action sends another clear message that protecting public health and natural resources is a top priority of the Cooper Administration."

Duke Energy must submit final excavation closure plans to DEQ by August 1, 2019. In those plans, Duke must propose where excavated coal ash will reside and estimate how long that process will take. By law, DEQ must reject any plan that does not protect public health and the environment.

Site	Decision	Justification

Site	Decision	Justification
Allen Active Ash Basin	Movement of coal ash to a new or existing lined landfill	DEQ determined that excavation of coal ash is more environmentally protective than leaving the material in the impoundment
Allen Retired Ash Basin	Movement of coal ash to a new or existing lined landfill	DEQ determined that excavation of coal ash is more environmentally protective than leaving the material in the impoundment
Belews Creek	Movement of coal ash to a new or existing lined landfill	DEQ determined that excavation of coal ash is more environmentally protective than leaving the material in the impoundment
Cliffside/Rogers Active Ash Basin	Movement of coal ash to a new or existing lined landfill	DEQ determined that excavation of coal ash is more environmentally protective than leaving the material in the impoundment
Cliffside/Rogers Unit 5 Ash Basin	Movement of coal ash to a new or existing lined landfill	DEQ determined that excavation of coal ash is more environmentally protective than leaving the material in the impoundment
Marshall	Movement of coal ash to a new or existing lined landfill	DEQ determined that excavation of coal ash is more environmentally protective than leaving the material in the impoundment

Site	Decision	Justification
Mayo	Movement of coal ash to a new or existing lined landfill	DEQ determined that excavation of coal ash is more environmentally protective than leaving the material in the impoundment
Roxboro East Ash Basin	Movement of coal ash to a new or existing lined landfill	DEQ determined that excavation of coal ash is more environmentally protective than leaving the material in the impoundment
Roxboro West Ash Basin	Movement of coal ash to a new or existing lined landfill	DEQ determined that excavation of coal ash is more environmentally protective than leaving the material in the impoundment

Coal Ash Closure Next Steps

By August 1, 2019 Duke Energy is required to submit final closure plans consistent with the detailed requirements of the Coal Ash Management Act (CAMA) and based on the election made by DEQ on April 1, 2019 to excavate all remaining sites. Duke Energy will have the opportunity to propose beneficiation options (such as recycling) as well as full excavation in that proposal.

CAMA requires DEQ to review any Closure Plan for consistency with detailed requirements in CAMA and reject any proposed Closure Plan that DEQ finds does not meet these requirements. DEQ must find that a Closure Plan is protective of public health, safety, welfare, the environment and natural resources before a plan can be approved. By October 1, 2019 (within 60 days of receipt of a proposed Closure Plan), DEQ will conduct a public meeting in the county or counties in which the site is located, with at least a 30-day notice prior to meeting. By December 1, 2019 Duke Energy is required to submit corrective action plans for addressing groundwater contamination from the impoundments at all six sites.

For the full DEQ analysis and orders to excavate issued today, as well as the comments made earlier this year on Duke Energy's proposed closure options and related documents, https://deq.nc.gov/coalashexcavation (https://deq.nc.gov/coalashexcavation)

# # #

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Exhibit 3

ORIGINAL

Commissioner	Yes	No	Not Participating
Huston	✓		
Freeman	✓		
Krevda	✓		
Ober	✓		
Ziegner	✓		

STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

VERIFIED PETITION OF SOUTHERN INDIANA GAS AND ELECTRIC COMPANY d/b/a VECTREN ENERGY DELIVERY OF INDIANA, INC. ("VECTREN SOUTH") FOR: (1) ISSUANCE OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR A COMPLIANCE PROJECT TO MEET FEDERALLY MANDATED REQUIREMENTS TO CLOSE ITS A. B. BROWN POND (THE "BROWN POND COMPLIANCE PROJECT"); (2) AUTHORITY TO TIMELY RECOVER 80% OF THE APPROVED FEDERALLY MANDATED COSTS INCURRED DURING CONSTRUCTION AND OPERATION OF THE BROWN POND COMPLIANCE PROJECT INCLUDING POST-IN SERVICE CARRYING CHARGES (BOTH DEBT AND EQUITY) ("PISCC') AND DEFERRED DEPRECIATION THROUGH VECTREN SOUTH'S ENVIRONMENTAL COST ADJUSTMENT MECHANISM; (3) AUTHORITY TO DEFER FOR RECOVERY IN VECTREN SOUTH'S ENSUING GENERAL RATE CASE 20% OF SUCH APPROVED FEDERALLY MANDATED COSTS; AND (4) IN THE ALTERNATIVE, APPROVAL TO INCLUDE THE BROWN POND COMPLIANCE PROJECT IN RATE BASE PURSUANT TO IC 8-1-2-23.	)	CAUSE NO. 45280
	)	APPROVED: MAY 13 2020

ORDER OF THE COMMISSION

Presiding Officers:
Stefanie N. Krevda, Commissioner
Brad J. Pope, Administrative Law Judge

On August 14, 2019, Southern Indiana Gas and Electric Company d/b/a Vectren Energy Delivery of Indiana, Inc., a CenterPoint Energy Company ("Petitioner" or "Vectren South") filed its Verified Petition with the Indiana Utility Regulatory Commission ("Commission") seeking: (1) a Certificate of Public Convenience and Necessity ("CPCN") pursuant to Ind. Code ch. 8-1-8.4 for the compliance project to close the Brown Ash Pond in compliance with the Environmental Protection Agency's ("EPA") Coal Combustion Residual ("CCR") rule (the "Brown Pond Compliance Project" or "Project"); (2) authority to timely recover 80% of the approved federally mandated costs incurred during construction and operation of the Project, including post-in-service carrying costs ("PISCC"), both debt and equity, and deferred depreciation expense associated with the Project through Petitioner's environmental cost adjustment ("ECA") mechanism; and (3)

authority to defer for recovery in Petitioner's ensuing general rate case 20% of such approved federally mandated costs.

On August 15, 2019, Petitioner filed the direct testimony and attachments of the following witnesses in support of its Verified Petition:

- Wayne D. Games, Vice President Power Generation Operations, for Petitioner;
- Angila M. Retherford, Vice President, Environmental and Corporate Responsibility, for Petitioner;
- Jay D. Mokotoff, Senior Engineer Group Manager, Civil and Environmental Engineering, AECOM Technical Services, Inc. ("AECOM");
- Claire Schmit, Principal Process Engineer, AECOM;
- David M. Bowler, Director, Accounting, for Petitioner; and
- J. Cas Swiz, Director, Rates and Regulatory Portfolio Management, for Petitioner.

On October 4, 2019, Petitioner filed a Notice of Substitution of Witness indicating that Mr. Keith Benton, Senior Project Engineer, AECOM is being substituted for and is adopting the direct testimony previously filed by Vectren South witness Claire Schmit.

Also on August 15, 2019, Petitioner filed a Motion for Protection of Confidential and Proprietary Information ("Motion"). In the Motion, Petitioner indicated certain information ("Confidential Information") that it intended to submit in this matter contains trade secrets as that term is defined under Ind. Code § 24-2-3-2. The Presiding Officers granted the Motion by docket entry dated September 10, 2019, and Petitioner submitted the Confidential Information on September 11, 2019.

On September 19, 2019, Citizens Action Coalition of Indiana, Inc. ("CAC") filed a Petition to Intervene, which was granted by docket entry dated September 30, 2019.

On December 19, 2019, Petitioner and the Indiana Office of Utility Consumer Counselor ("OUCC") jointly submitted a Stipulation and Settlement Agreement resolving all matters raised in this proceeding as among Petitioner and OUCC (the "December Settlement Agreement"). Petitioner also filed the supplemental testimony of David M. Bowler, Director, Accounting, for Petitioner, in support of the December Settlement Agreement. In addition, the OUCC filed the Settlement Testimony of Cynthia M. Armstrong, Senior Utility Analyst, Electric Division, for the OUCC, in support of the December Settlement Agreement.

On January 10, 2020, Petitioner, the OUCC, and CAC (collectively, the "Settling Parties") jointly submitted a Stipulation and Settlement Agreement pursuant to which CAC joined in the December Settlement Agreement and the Settling Parties agreed to additional terms pertaining to the Brown Ash Pond Compliance Project (the "Joint Settlement Agreement"), thereby resolving all matters raised in this proceeding as among the Settling Parties. Petitioner also filed supplemental testimony of Angila M. Retherford in support of the Joint Settlement Agreement.

On February 11, 2020, the Presiding Officers issued a docket entry requesting updates of certain information related to the settlements. On February 13, 2020, Petitioner filed its Second Motion for Protection of Confidential and Proprietary Information ("Second Motion"), seeking

confidential treatment for certain information related to Petitioner's response to the February 11, 2020 Docket Entry (also referred to as "Confidential Information"). The Second Motion was granted that same day, and Petitioner filed its Response on February 14, 2020.

The Commission held an Evidentiary Hearing in this Cause on February 18, 2020, at 9:30 a.m. in Room 222 of the PNC Center, 101 West Washington Street, Indianapolis, Indiana. Petitioner, the OUCC, and CAC appeared at and participated in the hearing, and their respective evidence was admitted into the record without objection.

Based on the applicable law and the evidence presented, the Commission now finds:

1. Notice and Commission Jurisdiction. Notice of the Evidentiary Hearing in this Cause was given and published by the Commission as required by law. Petitioner is a "public utility" as defined in Ind. Code § 8-1-2-1(a) and an "energy utility" as defined in Ind. Code § 8-1-8.4-3. Petitioner is subject to the jurisdiction of this Commission in the manner and to the extent provided by Indiana law. Pursuant to Ind. Code ch. 8-1-8.4, Petitioner may apply to the Commission for CPCNs and recovery of federally mandated costs. Accordingly, the Commission has jurisdiction over Petitioner and the subject matter of this proceeding.

2. Petitioner's Characteristics. Vectren South is a public utility incorporated under the laws of the State of Indiana with its principal office at One Vectren Square, Evansville, Indiana. Petitioner is engaged in rendering electric utility service to the public and owns, operates, manages, and controls, among other things, plants, property, equipment, and facilities that are used and useful for the production, storage, transmission, distribution, delivery, and furnishing of electric utility service to approximately 145,000 customers in southwestern Indiana.

3. Relief Requested. Petitioner requests: (1) a finding that public convenience and necessity will be served by the proposed Project; (2) granting Petitioner a CPCN for the Project pursuant to Ind. Code ch. 8-1-8.4; (3) a finding that the Project constitutes a compliance project that will allow Petitioner to comply directly or indirectly with "federally mandated requirements" under Ind. Code § 8-1-8.4-5 and a finding that the associated costs are "federally mandated costs" under Ind. Code § 8-1-8.4-4 and therefore eligible for cost recovery set forth in Ind. Code § 8-1-8.4-7; (4) making the required findings under each of the factors set forth in Ind. Code § 8-1-8.4-6(b); (5) authorizing Petitioner to timely recover 80% of the stipulated federally mandated costs incurred during construction and operation of the Project, including PISCC, both debt and equity, and deferred depreciation expense associated with the Project through Petitioner's ECA mechanism; (6) authorizing Petitioner to defer for recovery in Petitioner's ensuing general rate case 20% of such approved federally mandated costs until such costs are reflected in Petitioner's retail electric rates pursuant to Ind. Code § 8-1-8.4-7(c)(2); (7) authorizing Petitioner to accrue PISCC, both debt and equity, related to the Project after its in-service date using the overall cost of capital approved in Petitioner's TDSIC cases; (8) authorizing Petitioner to defer depreciation and operation and maintenance ("O&M) expenses relating to the Project until such expenses are recovered through either a rate adjustment mechanism or in base rates; and (9) approving depreciation rates for the Project.

4. **Petitioner's Case-in-Chief.** Wayne Games, Petitioner's Vice President Power Generation Operations, described the Brown Ash Pond, the evaluation that led to the selection of Closure by Removal ("CBR") for the Project, the overall benefits of the Project and its estimated cost, and how that compliance cost compares to other pond closure options. Mr. Games also provided support for the request that the Commission issue Petitioner a CPCN for the Project.

Mr. Games testified the Brown Ash Pond was placed in service in 1979 and remains in use. He explained that while all bottom ash produced by the Brown plant is deposited in the Brown Ash Pond, since 2009, most of the dry ash produced by the plant has been provided to a manufacturer for beneficial reuse. He explained that Petitioner's consistent supply of local Indiana coal coupled with its operating practices and procedures has allowed Petitioner to ship over 1.4 million tons of fly ash for reuse, all of which has met acceptable specifications and never been rejected. Mr. Games testified the manufacturer has not paid Petitioner for the fly ash and that providing it for beneficial reuse has benefited both Petitioner and its customers by providing a more environmentally friendly solution, avoiding costs for disposal, extending the life of the Brown and F.B. Culley ash ponds, and eliminating the expense of excavating ash and transporting it to other locations for disposal.

Mr. Games testified the CCR Rule requires that the Brown Ash Pond be closed, explaining Petitioner must cease ash disposal by October 2020 and commence closure of the Brown Ash Pond within six months of cessation of disposal as discussed in greater detail in the testimony of Petitioner's witness Angila Retherford. Mr. Games explained challenges associated with closing the Brown Ash Pond include the ravine's irregular shape and varying depth of up to 70 feet deep; the very fine and saturated nature of the ash material causing it to be unstable, absent dewatering; and the fact the Ash Pond continues to accept water from higher groundwater around the edges. Mr. Games then described the selection process for identifying AECOM as the engineering firm to assist Petitioner in evaluating its compliance options as well as the work performed by AECOM related to CCR compliance, such as its assessing the structural stability of the ponds to continue to accept CCR material and development of alternative plans for closing the Brown Ash Pond. Mr. Games explained while internally evaluating Petitioner's compliance options for the Brown Ash Pond under the CCR Rule, an entity approached Petitioner expressing interest in the reuse of the ash, yielding another opportunity for Petitioner to explore.

Next, Mr. Games described the compliance options presented by AECOM. First, he described the Cap (or Close) in Place ("CIP") option, explaining it requires dewatering the pond, leaving the CCR material in place, constructing a synthetic membrane cap, installing a system to drain all surface water away from the cap, adding topsoil, and establishing a vegetative cover. Mr. Games testified the CIP option requires long-term groundwater monitoring and cap maintenance. Next, he described two CBR options, which involve dewatering the pond and removing the CCR material for disposal or beneficial reuse. Mr. Games testified while the CIP approach, at first, would appear to be less expensive than the CBR approaches, there are multiple reasons to select CBR over CIP. First, as further explained by Ms. Retherford, he testified that the Indiana Department of Environmental Management ("IDEM") has been unwilling to approve a CIP approach where significant amounts of ash remain in contact with groundwater and other states are moving to require CBR. He added if required to remove the ash from the groundwater under a CIP approach, Petitioner's upfront costs for CIP would no longer be lower. Mr. Games

continued by explaining the CIP (even if a viable option), poses risk for future groundwater contamination and associated remediation due to CCR material being left in the closed pond. Mr. Games stated that the CBR options, on the other hand, remove the requirement for 30 years of groundwater monitoring, mitigate groundwater issues, and eliminate the potential future requirement for CCR material to be excavated and placed in a lined landfill because of future regulations, more stringent groundwater standards, and/or changes in interpretations of existing regulations or standards.

With respect to the CBR options, Mr. Games explained the advantages for selecting beneficial reuse of CCR material over disposal in a landfill include eliminating the requirement to design and permit a new landfill since the one at Brown is nearly out of space and cannot accommodate the ash from the Project, as well as eliminate the ongoing expense of monitoring and maintaining a landfill in future years. He added that an off-site landfill would dramatically increase compliance costs further. Mr. Games explained if the majority or all of CCR material can be beneficially reused, the liability associated with the CCR material would be removed from the site, greatly increasing certainty and reducing risk to Petitioner and customers over time.

Mr. Games testified that in order to comply with the CCR Regulations and complete a closure of the Brown Ash Pond, the Project contains three major components: (1) building infrastructure to transport and load ash material to the barges on the Ohio River; (2) excavation and blending of the ash to acceptable specifications for reuse; and (3) encapsulating non-conforming CCR material with an impermeable cap that meets EPA and IDEM requirements.

Mr. Games explained that Petitioner entered into a confidential agreement (the "CBR Project Agreement") with an Ash Reuser to excavate CCR material from the Brown Ash Pond and deliver acceptable material (ponded ash) to the Ash Reuser by loading it on a barge at the Brown loading facility on the Ohio River. Mr. Games confirmed the Ash Reuser will pay Petitioner for the Brown fly ash it accepts and that the Ash Reuser agreed to accept a specified minimum required amount of ash each year, which will ensure timely removal of the ash material from the Brown Ash Pond. Mr. Games confirmed the CBR Project Agreement also contains security provisions to protect Petitioner financially in the case of default by the Ash Reuser. He continued by explaining the Ash Reuser accepts ownership once the material is on the barge and transports it to its manufacturing site. Mr. Games described acceptable material is defined as material that meets or exceeds the CBR Project Agreement quality specifications, or non-conforming material that is off-spec but accepted by the Ash Reuser prior to its loading on a barge for shipment. Mr. Games testified Petitioner will test the ash quality in an on-site laboratory and will oversee blending of the ash as necessary to meet the specifications.

To effectuate the Project, Mr. Games explained Petitioner entered in to a confidential agreement with AECOM as the Engineering, Procurement, and Construction Management ("EPCM") entity. He testified that Petitioner selected AECOM based on its impressive expertise and the initial compliance work AECOM completed on Petitioner's behalf. Per Mr. Games, the scope of work for AECOM services includes: (1) engineering and design; (2) procurement; (3) project management and controls; (4) construction and construction management; (5) technical support during construction and start-up; (6) operator training; and (7) proper disposal of non-conforming material.

Regarding infrastructure investments, Mr. Games explained the Ash Reuser, and not Petitioner, is responsible for any infrastructure investments required at the Ash Reuser's manufacturing facility. He testified that Petitioner will need to make several infrastructure investments to move the ash from the Brown Ash Pond to the barges on the Ohio River, such as dewatering the ash to a moisture content level specified in the CBR Project Agreement; constructing an above-ground conveyor system to move the ponded ash one mile to the existing tube conveyor; and modifying the current dry handling barge loading system to allow for handling of ponded ash. Mr. Games explained the EPCM Agreement provides that AECOM will design, procure, and install the infrastructure required to convey and then handle or load the ponded ash on the barge, and then turn over the infrastructure equipment to Petitioner to own, operate, and maintain while AECOM excavates the ash pond by removing the ponded material from the Brown Ash Pond and loading conforming material into the new conveying system. Mr. Games testified the estimated cost for the infrastructure construction and dry ash handling modifications is $47 million in 2018 dollars. He explained that AECOM provided the estimate and will execute the construction project, as the EPCM entity, for that target price. Mr. Games added, however, that the cost of obtaining permits, clearing trees, and providing electrical feed, along with Petitioner's overhead and allowance for funds used during construction ("AFUDC"), must be added to the estimate to arrive at the total cost.

While the terms of the agreement are confidential, Mr. Games explained the EPCM Agreement offers Petitioner cost risk protections. He explained the agreement allows AECOM to pass actual project costs on to Petitioner with a predetermined profit margin. Mr. Games testified a fixed price alternative was not viable given uncertainties related to volume, quantity, and quality of ash as well as project duration due to the unpredictable amount to be accepted annually by the Ash Reuser. Mr. Games added, however, that AECOM agreed to a Performance Cost Model with a Target Price that includes sharing in cost-savings and protections for cost overruns to mitigate Petitioner's cost risk and incentivize AECOM to minimize costs. Specifically, Mr. Games explained the performance components of the project related to infrastructure, excavation, and blending build up to a target price that includes a cost of work estimate, contractor's fees and contingency. Per Mr. Games, specific benefits to the Performance Cost Model include the avoidance of contingencies associated with a fixed price; the incentive for AECOM to blend and ship as much as possible to the Ash Reuser thereby maximizing revenue received by Petitioner and minimizing the amount of non-conforming ash to be encapsulated; and the incentive for AECOM to identify cost reduction opportunities and control costs thereby avoiding loss of profit margin and forfeit fees. Mr. Games confirmed Petitioner has used a Performance Cost Model with a Target Price in the past, citing both large power plant projects where scope is difficult to define and the Brown dam stabilizing project, the latter of which came in below the target price resulting in shared savings.

Mr. Games then testified regarding the capital and O&M costs for the Project. He indicated Table 1 to his testimony (Petitioner's Exhibit No. 1) provided the estimated total capital and O&M costs, which represents the federally mandated costs, totaling $164,539,000, adjusted for inflation. Mr. Games explained the ash will be supplied over several years and will generate revenue from the Ash Reuser that will be used to offset Project costs. Mr. Games presented a comparison of those total costs to total project costs adjusted for inflation of the CIP option ($137,509,000) and the CBR and Landfill option ($225,526,351). He explained that because the CIP option assumes

that ash would be left in contact with groundwater, it is not a viable option because IDEM has been unwilling to permit such an approach. He also noted that the CIP option has the risks of future groundwater contamination and associated remediation obligations due to CCR material being left in the closed pond. He noted the costs of CIP compare very differently to the total federally mandated costs of the Project when consideration is given to the fact that a portion of the cost will be offset by payments from the Ash Reuser.

Regarding the estimated 1.25 million tons of ponded material that may not be able to be blended to meet Ash Reuser contract specifications or be accepted by the Ash Reuser, Mr. Games explained that as Ms. Retherford testified, Petitioner is in discussions with IDEM to allow placement of CCR material in the current Brown landfill, which if approved and provided space is available, will be Petitioner's first option. If not approved or space is not available, the excavated CCR material will be placed in an area within the footprint of the Brown Ash Pond that is a minimum of five feet above the uppermost aquifer, encapsulated, and covered with an impermeable cap that prevents water infiltration.

Angila Retherford, Petitioner's Vice President of Environmental and Corporate Sustainability, testified regarding the CCR Rule, how the CCR Rule applies to the Brown Ash Pond, and Petitioner's planned closure and remediation of the Brown Ash Pond to achieve compliance with the CCR Rule. In addition, Ms. Retherford's testimony provided support for the request for the Commission to issue Petitioner a CPCN for the Compliance Project. Ms. Retherford described the requirements under the CCR Rule to continue to use an existing ash pond beyond October 2020. She described Petitioner's Ash Ponds and current ash handling practices. She then explained that the closure of the Brown Ash Pond was triggered under the CCR Rule for not only violating the location restrictions enumerated in the CCR Rule but also due to detection of lithium and molybdenum in groundwater above acceptable levels. She explained that removing ash from the pond means Vectren South will be removing all ash out of the groundwater and capping any remaining non-spec ash (i.e., ash that cannot be recycled) under an impermeable cap. In addition to describing IDEM's authority under the CCR Rule, Ms. Retherford explained how the costs associated with the closure of the Brown Ash Pond qualify as federally mandated costs. Specifically, Ms. Retherford testified the CCR Rule requiring closure satisfies the requirements of a federally mandated requirement in Ind. Code § 8-1-8.4-5 because it is a requirement imposed on Petitioner by the federal government in connection with the Resource Conservation and Recovery Act ("RCRA") by virtue of being an energy utility that generates electricity. She added the Project is directly related to Petitioner's compliance with applicable federally mandated requirements. As such, the costs associated with closure of the Brown Ash Pond qualify as federally mandated costs.

Ms. Retherford also testified as to whether the Project would extend the life of an existing utility facility. She explained while the compliance project will not extend the overall life of the nearby Brown Generating Station, the CCR Rule applies regardless of when coal generation ceases at that site. Ms. Retherford explained that remediation of the Brown Ash Pond to achieve compliance with the CCR Rule allows Petitioner to retain a compliant brownfield generation site that can continue to be used in the future.

David M. Bowler, Petitioner's Director of Accounting, testified regarding the accounting and ratemaking treatment for the Project pursuant to the Federal Mandate Statute. Mr. Bowler

noted that the Brown plant depreciation rates never contemplated a cost of removal associated with the ash pond since the rates were set prior to adoption of CCR regulations, and thus no funds have been collected for pond closure activities. He described the capital and O&M costs of the Project, as well as the cash proceeds from potential insurance recoveries and the Ash Reuser that would be used to offset O&M costs. Relying on the Federal Mandate Statute, he discussed the manner in which eligible Project costs would be recovered over time, including the treatment of construction work in progress and AFUDC. He noted that once capital investments were placed in-service, the accumulated depreciation would be included as a reduction to gross plant. He also explained that until such time as investments are included for recovery in rates, they would be eligible for PISCC.

Mr. Bowler described the method for calculation of depreciation expense as well as the cost of capital that would be used for this investment. He presented Vectren South's proposal to use a depreciation rate of 7.69%, representing a 13-year life, coincident with the life of the Project. He stated a smaller ash impoundment to be constructed toward the end of the Project would obtain a 3.33% depreciation rate, representing a 30-year life, which coincides with the length of time the impoundment must be operated and managed pursuant to regulatory guidelines discussed by Ms. Retherford. Regarding the cost of capital, Mr. Bowler testified that, as was approved in Cause No. 45052, the weighted average cost of capital ("WACC") proposed to be utilized in the ECA is the most recent approved WACC from Petitioner's TDSIC mechanism (Cause No. 44910). Based on the terms of the Federal Mandate Statute, Mr. Bowler described how 20% of the Project investment would be deferred until Petitioner's next base rate proceeding. He also covered the recovery of O&M costs related to the Project. Finally, Mr. Bowler reviewed how the revenue requirement for the Project would be calculated for purposes of recovery in the ECA mechanism. He attached illustrative ECA schedules to his testimony to demonstrate how the ECA filings would be prepared to reflect inclusion of the Project. He also discussed the proposed adjustment to Vectren South's authorized return amount used in its Fuel Adjustment Clause net operating income earnings tests under Ind. Code §§ 8-1-2-42(d) and -42.3 because of the proposed ECA, consistent with the Federal Mandate Statute.

J. Cas Swiz, Petitioner's Director, Rates and Regulatory Portfolio Management, testified regarding use of the ECA to recover Project costs pursuant to the Federal Mandate Statute. He explained that consistent with the Federal Mandate Statute, 80% of the Project costs will be recovered via the ECA mechanism, with the remaining 20% deferred and recovered in a future base rate case. Mr. Swiz described how the revenue requirement related to the Project will be calculated for purposes of ECA filings, and he discussed the illustrative ECA schedules that will be submitted to the Commission once costs have been incurred. He provided the cost allocation percentages that will be applied in the ECA and discussed the timing of annual ECA filings. Mr. Swiz presented a revised ECA tariff to be used once the Project is approved and proposed that the tariff be approved. He concluded by providing a schedule of projected bill impacts resulting from recovery of Project costs.

Jay D. Mokotoff, Senior Engineer Group Manager, Civil and Environmental Engineering at AECOM, and Mr. Keith Benton, Senior Project Engineer in the Process Development and Consulting Department of the Process Technologies Organization of AECOM, testified about the process of option development and the evaluation and engineering work completed by AECOM related to closure of the Brown Ash Pond consistent with applicable federal and state regulations.

Mr. Mokotoff described AECOM's qualification and experience related to CCR projects. He defined AECOM's role in evaluating closure options for the Brown Ash Pond. He described the ABB Evaluation of Options for Pond Closure Report (the "Report") with a description of the various options and how those options were compared and evaluated. He then described the work performed by AECOM in order to prepare the Report including the development of option concepts and the application of design and regulatory criteria to each option. He then explained how the two main options, CIP and CBR, were further analyzed by evaluating alternatives related to the six main components of the closure process: Pond Closure, Excavation, Dewatering, Handling, Processing, and Storage. He then described how each of these options were analyzed including the formulation of conceptual engineering designs.

Mr. Mokotoff testified as to how the Report documents the analysis process and that CBR with Beneficial Reuse was ultimately selected. He described the CBR with Beneficial Reuse process including stormwater control and how the ash material will be loaded onto barges on the Ohio River. Lastly, he testified as to how the public convenience and necessity will be served by the chosen approach. Specifically, he testified that CBR with Beneficial Reuse represents the preferred alternative in terms of compliance, risk, and cost and how it provides the best approach for this site in terms of balancing upfront project cost, cost certainty, and long-term risk.

Mr. Keith Benton adopted the prefiled testimony of Claire Schmit, Principal Process Engineer at AECOM, and described the preparation of the Report, specifically the elements related to the infrastructure to support CBR with Beneficial Reuse, including loading, storage, handling, and transport of CCR materials. He then provided an overview of the Report including the description of a separate study to determine the market value of the reclaimed ponded ash and an evaluation of the infrastructure required for a CBR option in which the CCR material is transported off-site for beneficial reuse. He described the process used for evaluating CCR pond closure and infrastructure options including, but not limited to, the development and comparison of estimates of the capital cost of the infrastructure equipment, anticipated operating cost, anticipated revenue from ash reclaimed for beneficial use, and total project duration for each option.

Mr. Benton's testimony described Section 4 of the Report, which defines the phases of the closure process including how the CCR material will be processed and then transported to the upgraded barge loading system. The processed ponded ash will then transfer onto river barges for transport to the third party for beneficial reuse. He explained what other options were considered and how AECOM evaluated the cost of each alternative as part of its analysis. He described how AECOM prepared the capital cost estimates for the selected pond closure and infrastructure options with a specific discussion of the bidding process. He also explained how AECOM developed lifecycle cost estimates for the pond closure and ash handling systems. He stated that lifecycle costs are a combination of utility costs, O&M costs, replacement parts, and for the CIP option, post-closure maintenance.

Mr. Benton then testified regarding the design basis for the cost estimates for the pond closure and ash handling systems including the costs (services, equipment, construction, lifecycle, fee, and contingency) included in the cost estimates. He stated that the estimate set forth in the Report was accurate within a range of -20% to +30%, and the final project costs (as provided in

Mr. Games' testimony) should have an accuracy range of -10% to +20%. Mr. Benton concluded by stating that AECOM supports Petitioner's conclusions with respect to the selection of CBR with Beneficial Reuse.

5. **Settlement Agreements.** After the filing of Petitioner's case-in-chief and before the submissions of any responsive testimony, two Settlement Agreements were submitted to the Commission supporting the proposed Project and resolving all issues in the proceeding. Initially, the OUCC and Petitioner entered into the December Settlement Agreement, and subsequently CAC, the OUCC, and Petitioner entered into the Joint Settlement Agreement wherein CAC also joined in the December Settlement Agreement. The two Settlement Agreements provide for approval of the relief requested in this proceeding by Petitioner and add additional customer safeguards that the Settlement Parties agreed upon after good faith negotiations. The terms of the two Settlement Agreements comprise the complete agreement of the Settling Parties and will be considered together and referred to hereafter as the Settlement Agreements. The key provisions are set forth below.

A. **Agreement that a CPCN Should Be Granted for the Project.** The Settling Parties have entered into the Settlement Agreements in which they agreed that the Commission should grant Petitioner a CPCN pursuant to Ind. Code ch. 8-1-8.4 for the Project in order to close the Brown Ash Pond in compliance with CCR regulations, as described in Petitioner's case-in-chief.

B. **Recovery of Federally Mandated Costs.** The Settling Parties agree that the Commission should find that the Project constitutes a compliance project that will allow Petitioner to comply with "federally mandated requirements" under Ind. Code § 8-1-8.4-5 and that the associated costs, as modified herein, are "federally mandated costs" under Ind. Code § 8-1-8.4-4 and therefore eligible for cost recovery set forth in Ind. Code § 8-1-8.4-7. The Settling Parties agree that the total estimated federally mandated costs of $156,200,000 are reasonable and should be approved. This agreed-upon amount reflects the Settling Parties' agreement that, in light of Ind. Code § 8-1-8.4-7(c)(3) and without waiver of the rights provided to the parties thereunder, Petitioner shall remove the contingency of $8.33 million from the federally mandated costs.

C. **Agreement on a Project Cost Credit Based upon Cash Proceeds Received by Petitioner.** The Settling Parties agree that the total federally mandated costs will be offset by total cash proceeds to be received from the Ash Reuser ("Ash Payments" in Table 1 of Petitioner's Exhibit No. 1-C, p. 20) and insurance proceeds (Petitioner's Exhibit No. 5, p. 6, lines 1-5) and that these proceeds will be at least $25 million. These cash proceeds will be used to offset incurred O&M costs to excavate and convey the ash to the loading facility.

D. **Agreement for Timely Cost Recovery through ECA Mechanism.** The Settling Parties agree that the Commission should grant Petitioner's request to timely recover 80% of the approved federally mandated costs incurred during construction and after placement in service and operation of the Project, including PISCC, both debt and equity, and deferred depreciation expense associated with the Project through Petitioner's ECA mechanism, as described in Petitioner's Exhibit No. 5, p. 6.

E. Agreement Regarding Treatment of Cost of Removal. The Settling Parties agree that the costs of removal associated with retirements of existing or future capital assets in connection with the Project are not reflected in the total projected federally mandated costs and they will not be reflected in the ECA mechanism in future proceedings. The Settling Parties agree that such costs of removal, if incurred, will be addressed in future general base rate cases to the extent of their effect on net original cost rate base. In the event the Project results in a retirement of existing assets, Petitioner will offset the incremental depreciation expense included in the revenue requirement calculation with the impact of the retired assets, as stated in Petitioner's Exhibit No. 5, p. 8.

F. Agreement to Deferral Authority. The Settling Parties agree the Commission should grant Petitioner's request to defer 20% of the approved federally mandated costs until such costs are reflected in Petitioner's retail electric rates pursuant to Ind. Code § 8-1-8.4-7(c)(2), as presented in Petitioner's Exhibit No. 5, p. 6.

G. Agreement on Other Accounting and Ratemaking Treatment. The Settling Parties agree that the Commission should grant Petitioner's requested accounting and ratemaking treatment.

H. Agreement on Preservation of Rights Regarding Effect of Environmental Liability on Rates. The Settling Parties agree in the event Petitioner is held liable for damages or made subject to enforcement action with respect to the handling of the ash from the Brown Ash Pond, the Settling Parties reserve their respective positions with respect to any request for rate recovery related thereto and preserve their rights to defend such positions in future proceedings.

I. Agreement to Submit Plans and Notice Regarding Dewatering. The Settling Parties agree that, prior to commencing dewatering of the Brown Ash Pond, for purposes of closing the Brown Ash Pond, Petitioner shall submit the dewatering plans to IDEM for approval. Petitioner shall provide a copy of the dewatering plans and the notice to IDEM of the commencement of dewatering to the Settling Parties.

J. Agreement on Closure Activities. The Settling Parties agree that, prior to commencing any closure-in-place of CCR at the Brown Ash Pond, Petitioner shall submit and receive IDEM approval of a closure plan for the Brown Ash Pond pursuant to applicable IDEM regulations. Petitioner shall include a revised Fugitive Dust Plan for the Brown Ash Pond as part of the closure plan application. The full closure plan for the Brown Ash Pond shall be made publicly available.

K. Agreement to Worker Protections. The Settling Parties agree that Petitioner shall work with its contractors to include worker protection provisions in the revised Fugitive Dust Plan submitted as part of Petitioner's closure plan for the Ash Pond. Those worker protection provisions should include protections for workers engaged in the removal of CCR from the Brown Ash Pond, onsite processing of the CCR, and conveying of the CCR from the Brown Ash Pond to any barge that will transport it to off-site locations.

L. Additional Terms. The Settling Parties agree that the Settlement Agreements are a complete, interrelated package and should be accepted or rejected in their entirety without modifications or conditions that may be unacceptable to any Settling Party. If not approved in their entirety, the Settlement Agreements shall be null and void to the extent a Settling Party issues notice within 15 business days of the date of the Final Order in this proceeding that the modifications made by the Commission are unacceptable.

6. Evidence Supporting the Settlement Agreement.

A. Petitioner's Testimony in Support of the Settlement Agreement. Mr. Bowler testified in support of the December Settlement Agreement with the OUCC, which was later joined by the CAC. He explained that the Settlement Agreement supports the relief requested regarding the Project, including agreement that a CPCN pursuant to the Federal Mandate Statute should be granted, and that the Settlement Agreement adds certain customer safeguards that further support a finding that the Project is in the public interest. Mr. Bowler described the following customer protections set forth in the Settlement Agreement: (1) removal of a contingency of over $8 million from the Project costs, thereby reducing the approved federally mandated costs to $156,200,000; (2) setting a $25 million minimum offset of Project O&M costs based on projected cash proceeds to be received from both the Ash Reuser and insurance policies; and (3) to the extent Petitioner is found liable for damages or faces an enforcement action related to handling of fly ash, the parties reserve their rights as to any request for recovery of such costs. Mr. Bowler noted that the Settlement Agreement also clarifies how costs of removal will be handled once existing assets are retired. He stated that the Settlement Agreement represents a negotiated compromise that produces a fair and balanced outcome and asked the Commission to issue an order approving the terms of the Settlement Agreement in its entirety.

Ms. Retherford testified in support of the Joint Settlement Agreement and explained the conditions related to Petitioner's dewatering plans, closure plans, fugitive dust plan, and worker protections with respect to fugitive dust. She testified that Petitioner's commitment to provide copies to the OUCC and CAC of the dewatering plans and the notice to IDEM regarding commencement of dewatering activities does not change Vectren South's obligations under applicable regulations or its communications with IDEM. However, it does allow the other parties to remain aware of Petitioner's interactions with IDEM related to dewatering at the Project.

Ms. Retherford further testified as to conditions imposed with respect to Petitioner's closure plan under the Joint Settlement Agreement. She explained that Vectren South will submit and receive IDEM approval of its closure plan for the Brown Ash Pond, pursuant to applicable IDEM regulations, prior to commencing any CIP for materials that do not meet the specifications for reuse by the Ash Reuser. Additionally, she explained that Petitioner commits to provide the revised Fugitive Dust Plan (as required under the CCR Rule) as part of its closure plan application to IDEM and to make the full closure plan publicly available.

She also testified that the worker protections Vectren South has committed to include in the closure plan to be submitted to IDEM are already contemplated in the anticipated contractor and subcontractor agreements to be utilized to complete the Project. She concluded by stating that the Joint Settlement Agreement is in the public interest due in part to the fact that it provides a

reasonable resolution without the time and expense that would be incurred in connection with litigation.

B. The OUCC's Testimony in Support of the Settlement Agreement. Cynthia M. Armstrong, Senior Utility Analyst, Electric Division testified in support of the December Settlement Agreement. Ms. Armstrong summarized the primary components of the December Settlement Agreement, explaining that it is in the public interest for many reasons. First, she stated that the Settlement Agreement mitigates the impact on consumers of potential cost overruns by removing the contingency Vectren South originally proposed in its application for a Federally Mandated CPCN. She explained that under Ind. Code § 8-1-8.4-7(c)(3), actual costs that exceed the projected federally mandated costs of the approved compliance project by more than 25% require specific justification by the energy utility and specific approval by the Commission before being authorized in the next general rate case filed by the energy utility with the Commission. She concluded that a utility does not have to receive specific Commission approval for cost overruns until the project costs exceed 25% of the approved amount, so the Federally Mandated Requirements statute naturally allows a utility a reasonable level of contingency for a federally mandated project.

Second, she testified that the Settlement Agreement further mitigates the rate impact of the project on ratepayers by offsetting O&M costs with the cash proceeds received from the ash re-user and insurance proceeds. She also noted that if the Brown Ash Pond Compliance Project results in a retirement of existing assets, Vectren South will offset the incremental depreciation expense included in the revenue requirement calculation for the ECA with the impact of the retired assets.

Third, Ms. Armstrong stated the Settlement Agreement allows for the closure of the Brown Ash Pond in a manner that is more protective of public health and the environment (i.e., CBR) than the complete closure in-place of the pond. She explained that by removing the ash and allowing it to be beneficially re-used in a manner that will encapsulate it, Vectren South is minimizing the likelihood that dangerous constituents within the ash will leak into local groundwater supplies. She testified that beneficially re-using the ash also mitigates Vectren South's future liability associated with remediation and decreases costs that could potentially be passed onto ratepayers. She noted that the OUCC does not necessarily agree that such remediation costs are appropriate to pass onto ratepayers, but stated that the project minimized the risk of a future conflict between Vectren South and the OUCC on additional remediation costs.

Finally, she stated that public policy supports the Settlement Agreement. She explained that by collaborating to resolve the issues in this proceeding, the Settlement Agreement also serves the public interest by avoiding contentious and costly litigation. She affirmed that the Settlement Agreement provides ratepayer benefits and a reasonable compromise among the Settling Parties and recommended its approval.

Ms. Armstrong also addressed the OUCC's opposition to recovery under the Federal Mandate Statute in other cases before the Commission and explained the OUCC's differing position in this case. She testified that after reviewing Vectren South's CCR Compliance Plan, the OUCC found Vectren South put forth an approvable plan that met the requirements of Ind. Code § 8-1-8.4-6(b). She stated that Vectren South developed an innovative plan for dealing with its

legacy ash waste and that it was clear to the OUCC that Vectren South investigated reasonable alternatives to closing the ash pond in a manner that mitigated the costs passed onto ratepayers. She noted that although that a CCR Compliance Plan similar to Vectren South's may not be possible for other utilities to implement, a utility should show that it reasonably considered and investigated the possibility of re-using its ash when submitting an application for rate recovery before the Commission. She further explained that Vectren South appears to be taking all actions possible to further reduce the costs of closure beyond selling the ash for re-use by actively pursuing compensation under its insurance policies and providing an offset to costs recovered in the ECA tracker to account for the retirement of the ash ponds.

7. **Commission Discussion and Findings.**

A. Overview of the Brown Ash Pond and Vectren South's CCR Compliance Analysis. In 1978, the Brown Ash Pond was commissioned in order to dispose of CCR material including fly ash, bottom ash, and scrubber byproduct from Vectren South's nearby A. B. Brown Generating Station in Posey County, Indiana. The unlined Brown Ash Pond was created by constructing an earthen dam across an existing valley and remains in operation today. In 2005, a second earthen dam was constructed across the middle of the pond on top of the existing ash to increase the storage capacity. This created upper and lower pools that together comprise the Brown Ash Pond. The lower pool, which is approximately 57 acres, holds process water for the A. B. Brown Generating Station, while the upper pool, which is approximately 107 acres, continues to collect fly ash and bottom ash. In total, both ponds can hold approximately 5.9 million cubic yards or 6.2 million tons of CCR material.

Pursuant to the CCR Rule, Vectren South commenced groundwater monitoring at the Brown site in June 2016. Vectren South published the results of that testing on its website as required by the CCR Rule. The groundwater monitoring results indicated statistically significant groundwater impacts above acceptable levels, which triggered closure under the CCR Rule. The CCR Rule requires that Vectren South cease disposal of ash in the Brown Ash Pond by October 2020 and commence closure activities within six months thereafter, or April 2021.

In order to achieve the CCR Rule compliance objectives, Vectren South selected AECOM as the engineering firm to assist in evaluating its CCR compliance options, assessing the structural stability of the ponds to continue accepting CCR material, and developing alternative plans for the potential closure of the Brown Ash Pond. During Vectren South's internal compliance evaluation for the Brown Ash Pond, an entity expressed interest in the reuse of the ash. After extensive consideration of its compliance options as documented in the AECOM Report, Vectren South ultimately selected CBR with Beneficial Reuse and executed a contract with the Ash Reuser.

B. Consideration of Settlement Agreements. In previous Orders, we have discussed our policy with respect to settlements:

> Indiana law strongly favors settlement as a means of resolving contested proceedings. *See, e.g., Manns v. State Department of Highways,* (1989), Ind., 541 N.E.2d 929, 932; *Klebes v. Forest Lake Corp.,* (1993), Ind. App. 607 N.E.2d 978, 982; *Harding v. State,* (1992), Ind. App., 603 N.E.2d 176, 179. A settlement

> agreement "may be adopted as a resolution on the merits if [the Commission] makes an independent finding, supported by substantial evidence on the record as a whole, that the proposal will establish 'just and reasonable' rates." *Mobil Oil Corp. v. FPC,* (1974), 417 U.S. 283, 314.

Indianapolis Power & Light Co., Cause No. 39936, p. 7 (IURC 9/24/95); *see also Commission Investigation of Northern Ind. Pub. Serv. Co.,* Cause No. 41746, p. 23 (IURC 9/23/02). This policy is consistent with expressions to the same effect by the Supreme Court of Indiana. *See, e.g., Mendenhall v. Skinner & Broadbent Co.,* 728 N.E.2d 140, 145 (Ind. 2000) ("The policy of the law generally is to discourage litigation and encourage negotiation and settlement of disputes"); *In re Assignment of Courtrooms, Judge's Offices and Other Facilities of St. Joseph Superior Court,* 715 N.E.2d 372, 376 (Ind. 1999) ("Without question, state judicial policy strongly favors settlement of disputes over litigation").

Nevertheless, pursuant to the Commission's procedural rules and prior determinations by this Commission, a settlement agreement will not be approved by the Commission unless it is supported by probative evidence. 170 Ind. Admin. Code 1-1.1-17. Settlements presented to the Commission are not ordinary contracts between private parties. *U.S. Gypsum, Inc. v. Indiana Gas Co.,* 73 5 N.E.2d 790, 803 (Ind. 2000). Any settlement agreement approved by the Commission "loses its status as a strictly private contract and takes on a public interest gloss." *Id.* (quoting *Citizens Action Coalition v. PSI Energy, Inc.,* 664 N.E.2d 401, 406 (Ind. Ct. App. 1996)). Thus, the Commission "may not accept a settlement merely because the private parties are satisfied; rather [the Commission] must consider whether the public interest will be served by accepting the settlement." *Citizens Action Coalition,* 664 N.E.2d at 406. Furthermore, a Commission decision, ruling or order must be supported by specific findings of fact and sufficient evidence. *U.S. Gypsum,* 735 N.E.2d at 795 (citing *Citizens Action Coalition v. Public Service Co.,* 582 N.E.2d 330, 331 (Ind. 1991)). Therefore, before the Commission can approve the Settlement Agreement, we must determine whether the evidence in this Cause sufficiently supports the conclusion that the Settlement Agreements are reasonable, just, and consistent with the purpose of the governing statutory provisions, and that such agreements serve the public interest.

In this case, the Commission has before it a considerable body of evidence with which to judge the reasonableness of the terms of the Settlement Agreements, including the Settling Parties' agreement that the Commission should grant Petitioner a CPCN pursuant to Ind. Code ch. 8-1-8.4 for the Project. We are also mindful that settlements represent the product of negotiations, and modifications to the terms can result in nullification of the entire settlement.

As we will discuss below, the record includes substantial evidence supporting each element of the Federal Mandate Statute. The evidence also supports the Settling Parties' agreement that the Project constitutes a compliance project that will allow Petitioner to comply directly or indirectly with "federally mandated requirements" under Ind. Code § 8-1-8.4-5 and that the associated costs, as modified herein, are "federally mandated costs" under Ind. Code § 8-1-8.4-4 and, therefore, eligible for cost recovery as set forth in Ind. Code § 8-1-8.4-7.

C. Certificate of Public Convenience and Necessity. Before approving the Settlement Agreements, and thus granting Petitioner a CPCN under Ind. Code ch. 8-1-8.4, we

must: (1) find that public convenience and necessity will be served by the proposed Project; (2) approve the projected costs associated with the Compliance Project; and (3) make a finding on each of the factors in Ind. Code § 8-1-8.4-6(b). Those factors include:

> (A) A description of the federally mandated requirements that the energy utility seeks to comply with through the proposed compliance project.
>
> (B) A description of the projected federally mandated costs associated with the proposed compliance project.
>
> (C) A description of how the proposed compliance project allows the energy utility to comply with the federally mandated requirements described by the energy utility under clause (A).
>
> (D) Evaluation of alternative plans that demonstrate that the proposed compliance project is reasonable and necessary.
>
> (E) Information as to whether the proposed compliance project will extend the useful life of an existing energy utility facility and, if so, the value of that extension.

Ind. Code § 8-1-8.4-6(b)(1).

i. Federally Mandated Requirements and Petitioner's Compliance with the Mandate. Ind. Code § 8-1-8.4-5 defines a federally mandated requirement to include a "requirement that the commission determines is imposed on an energy utility by the federal government in connection with . . . [a]ny other law, order, or regulation administered or issued by the United States Environmental Protection Agency[.]" EPA promulgated the CCR Rule under RCRA, which is one of the federal mandates explicitly listed in Ind. Code § 8-1-8.4-5. As discussed by Ms. Retherford, the CCR Rule requires groundwater testing at the Brown Ash Pond. The testing results indicated statistically significant groundwater impacts above acceptable levels, which triggered the mandate that Vectren South commence closure of the Brown Ash Pond. As such, the Project is being undertaken to comply with these federally mandated requirements under Ind. Code § 8-1-8.4-5.

Mr. Games and Ms. Retherford both explained how the proposed Project allows Petitioner to comply with the CCR Rule. Additionally, the Settling Parties agree that the proposed Project is reasonable and necessary to meet a federally mandated requirement. Based on the evidence presented, we find that Petitioner's Project will allow it to comply with EPA's CCR Rule, which is a "federally mandated requirement" under Ind. Code § 8-1-8.4-5.

ii. Federally Mandated Project Costs. Ind. Code § 8-1-8.4-4 defines federally mandated costs, in part, as "costs that an energy utility incurs in connection with a compliance project, including capital, operating, maintenance, depreciation, tax, or financing costs." Based on Petitioner's direct testimony, the Project has a total cost of $164,539,000. Under the Settlement Agreements, Petitioner agreed to remove a contingency cost, thereby reducing the total federally mandated cost to $156,200,000. The Settling Parties agree that this cost estimate constitutes a reasonable estimate of the costs for the Project. Under the Settlement Agreements, Petitioner has agreed to a minimum amount of cash proceeds from the Ash Reuser and insurance

policy recoveries of $25 million to offset the O&M Project Costs to be recovered. Actual recoveries in excess of this minimum will also be applied to offset O&M costs.

Petitioner explained in detail the unique aspects of the Project whereby beneficial reuse of the excavated ash results in the ash being safely removed from the pond and transported off site to the Ash Reuser. Project costs are offset by the proceeds from the Ash Reuser and the insurance recoveries to the point that the Project costs are comparable to the estimated total inflated CIP project cost of $137.5 million. We recognize the economic and environmental advantages of the CBR approach to achieving CCR compliance. The record sets forth the many benefits of CBR with Beneficial Reuse in this particular circumstance compared to a CIP project, including long-term mitigation of risk to the extent a CIP approach would expose Petitioner to future additional remediation requirements at the pond.

The evidence sufficiently describes the projected federally mandated costs and expenses associated with the Project and demonstrates that Petitioner used sufficient rigor to develop its estimates, including the testimony of AECOM, an expert engineering firm that frequently engages in such remediation projects. The Commission agrees that the stipulated eligible project cost of $156,200,000 represents a reasonable estimate of the federally mandated costs for the Project. We further commend Vectren South for identifying a beneficial re-use of its CCR material and finalizing its agreement with the Ash Reuser in order to offset overall project costs. While each CCR project has its own unique challenges, we encourage all jurisdictional utilities facing similar CCR Rule compliance obligations to explore potential beneficial re-use and other cost mitigation options. Therefore, we approve the stipulated project cost as federally mandated costs and expenses associated with the Project.

iii. Alternative Plans. Through its partnership with AECOM, Vectren South presented detailed and comprehensive options for closing the Brown Ash Pond in compliance with the CCR Rule. The two general approaches that Vectren South evaluated are CIP and CBR. As detailed in the AECOM Report and Mr. Mokotoff's direct testimony, these two options were analyzed by evaluating engineering alternatives related to the six main components of the closure process: pond closure, excavation, dewatering, handling, processing, and storage. As such, the alternative evaluation included the following scenarios:

1. Pond Closure Options
    a. Closure-in-Place (CIP)
    b. Closure-by-Removal (CBR)
    c. Partial Removal Option 1: 50% CBR / 50% CIP
    d. Partial Removal Option 2: 75% CBR / 25% CIP
2. Excavation
    a. Hydraulic Dredging
    b. Drag Line
    c. Conventional
3. Dewatering Options
    a. Gravity Dewatering
    b. Positive Dewatering
    c. Combination of Gravity and Positive Dewatering

4. Handling Options
    a. Trucking
    b. Conveyor
5. Processing Options
    a. Screening
    b. Blending
    c. Drying
6. Storage Options
    a. Eurosilo
    b. Dome Structure

AECOM reviewed each scenario by using experience based on similar pond closure and infrastructure projects, by conducting research specific to the various possible technologies, and by discussing the potential options with construction contractors and equipment vendors. In addition, AECOM observed current CCR handling operations at the Brown Ash Pond and at ash ponds and CCR landfills owned by other electric utilities to gain further insight into what might be the most appropriate and effective CCR management methods for the Brown Ash Pond. AECOM then developed conceptual engineering designs to approximately a 60% of final level of detail for each of the pond closure options.

The CIP option involves dewatering the pond, leaving the CCR material in place, constructing a synthetic membrane cap, installing a system to drain all surface water away from the cap, adding topsoil, and establishing a vegetative cover. As such, the CIP option requires long-term groundwater monitoring and ongoing cap maintenance. Alternatively, the CBR option entails dewatering the pond and removing the CCR material for disposal or beneficial reuse.

Initially, the CIP approach appeared to be less expensive and resource intensive than the CBR approaches. In his direct testimony, Mr. Games presented the estimated total federally mandated costs for CBR with Beneficial Reuse at $164,539,000, adjusted for inflation. However, based on the Settling Parties' agreement, this projected cost estimate was offset by: 1.) removing the inflated contingency of $8.33 million; and 2.) applying cash proceeds from the Ash Reuser and insurance proceeds of at least $25 million. Applying the $25 million offset to the total federally mandated costs of $156,200,000 agreed to by the Settling Parties results in at most $131,200,000 for CBR with Beneficial Reuse compared to AECOM's estimates of $137,509,000 for the CIP option and $225,526,351 for the CBR and Landfill option.

Additionally, Vectren South identified multiple reasons to select CBR over CIP prior to negotiating these cost reductions. First, IDEM has been unwilling to approve a CIP approach where significant amounts of ash remain in contact with groundwater, and other states are starting to require CBR. Second, if required to remove ash from groundwater under a CIP approach, the upfront costs would no longer be lower. Third, the CIP poses risk for future groundwater contamination and associated remediation due to CCR material being left in the closed pond. The CBR options, on the other hand, remove the requirement for 30 years of groundwater monitoring and mitigate groundwater issues. The CBR options also avoid the potential scenario wherein CCR material is required to be excavated and placed in a lined landfill as a result of future regulations. Given these considerations as detailed in AECOM's comprehensive engineering analysis and the

evidence of record, we find that Petitioner properly considered alternative plans for compliance with the CCR Rule and that the Project as presented is reasonable and necessary.

iv. Useful Life of the Facilities. In her testimony, Ms. Retherford explained that the Project will extend the useful life of the existing A.B. Brown Generating Station, which is a brownfield site with infrastructure to be used for existing and possible future generation resources. We find that the Project will benefit the continued and future use of the Brown site as a location for generation resources.

v. Conclusion. The evidence presented demonstrates that the proposed Project will allow Petitioner to comply with the requirements of the CCR Rule. As discussed above, we have made a finding on each of the factors described in Ind. Code § 8-1-8.4-6(b), and we have approved the projected federally mandated costs associated with this Compliance Project. Therefore, we find that public convenience and necessity will be served by the Project, and we approve the proposed Project and issue Petitioner a CPCN for the Project under Ind. Code § 8-1-8.4-7(b), consistent with the Settlement Agreements negotiated by the Settling Parties.

D. Cost Recovery. Ind. Code § 8-1-8.4-7(c) states:

> If the commission approves under subsection (b) a proposed compliance project, including approval of the projected federally mandated costs associated with the compliance project, the following apply:
>
> (1) Eighty percent (80%) of the approved federally mandated costs shall be recovered by the energy utility through a periodic retail rate adjustment mechanism that allows the timely recovery of the approved federally mandated costs. The commission shall adjust the energy utility's authorized net operating income to reflect any approved earnings for purposes of IC 8-1-2-42(d)(3) and IC 8-1-2-42(g)(3).
>
> (2) Twenty percent (20%) of the approved federally mandated costs, including depreciation, allowance for funds used during construction, and post in service carrying costs, based on the overall cost of capital most recently approved by the commission, shall be deferred and recovered by the energy utility as part of the next general rate case filed by the energy utility with the commission.
>
> (3) Actual costs that exceed the projected federally mandated costs of the approved compliance project by more than twenty-five percent (25%) shall require specific justification by the energy utility and specific approval by the commission before being authorized in the next general rate case filed by the energy utility with the commission.

Pursuant to the Settlement Agreements, the Settling Parties have agreed that Petitioner should be authorized to: (1) recover 80% of the federally mandated costs for the Project, including PISCC, both debt and equity using the overall cost of capital approved in Petitioner's TDSIC cases, and deferred depreciation expense associated with the Project, through Petitioner's ECA Rider; (2) defer 20% of the federally mandated costs for the Project for subsequent recovery in a base rate case; and (3) defer depreciation and O&M expenses relating to the Project until such expenses

are recovered through either a rate adjustment mechanism or in base rates, all as described in Petitioner's Exhibit No. 5, p. 6. The Settling Parties further agreed that Vectren South's requested accounting and ratemaking treatment should be granted except as expressly modified in the Settlement Agreements (as we have described above). The Settling Parties' agreement on the total federally mandated costs is without waiver of the rights provided to the parties under Ind. Code § 8-1-8.4-7(c)(3). The Settling Parties further agree that in the event the Project results in a retirement of existing assets, Vectren South will offset the incremental depreciation expense included in the revenue requirement calculation with the impact of the retired assets.

We find that the stipulated accounting and ratemaking treatment set forth in the Settlement Agreements as described above are reasonable and are hereby approved. Additionally, we find the proposed ECA tariff changes described by Mr. Cas Swiz are reasonable and are approved.

8. Conclusion. The evidence presented provides substantive support demonstrating that the Settlement Agreements are reasonable and in the public interest. We find the Settlement Agreements contain reasonable customer safeguards in terms of the project costs to be recovered and represent a reasonable resolution of the issues. Based on the evidence presented, we find that the Settlement Agreements should be approved in their entirety. Petitioner is authorized to proceed with the Project, which it has demonstrated is reasonable and necessary for compliance with the CCR Rule.

The Settling Parties agree that the Settlement Agreements should not be used as precedent in any other proceeding or for any other purpose, except to the extent necessary to implement or enforce their terms. Consequently, with regard to future citation of the Settlement Agreements, we find our approval herein should be construed in a manner consistent with our finding in *Richmond Power & Light*, Cause No. 40434, 1997 WL 34880849, at *7-8 (IURC March 19, 1997).

We commend Vectren South for developing an innovative plan for addressing its legacy ash waste at the Brown Ash Pond. We likewise agree with the OUCC and CAC that Vectren South investigated reasonable alternatives to closing the pond in a manner that mitigated the costs passed onto ratepayers and diminished the potential of future liability. While we recognize that each ash pond subject to the CCR Rule has unique geographic, structural, and environmental characteristics, jurisdictional utilities should show that they reasonably examined all realistic closure options and pursued all avenues to reduce costs to ratepayers when submitting an application for rate recovery before the Commission. We also recognize CAC's efforts in securing worker safety provisions for workers engaged in the removal, onsite processing, and conveying of CCR material from the Brown Ash Pond without attributing additional costs to ratepayers.

9. Confidential Information. Petitioner filed motions for protective order on August 15, 2019, and February 13, 2020, all of which were supported by affidavits showing documents to be submitted to the Commission were trade secret information within the scope of Ind. Code §§ 5-14-3-4(a)(4) and (9) and Ind. Code § 24-2-3-2. The Presiding Officers issued docket entries finding all of the information described in the motions to be preliminarily confidential, after which such information was submitted under seal. We find all such information is confidential pursuant to Ind. Code § 5-14-3-4 and Ind. Code § 24-2-3-2, is exempt from public access and disclosure by Indiana

law and shall be held confidential and protected from public access and disclosure by the Commission.

IT IS THEREFORE ORDERED BY THE INDIANA UTILITY REGULATORY COMMISSION that:

1. The Settlement Agreements attached hereto are approved in their entirety as set forth above.

2. Petitioner is issued a Certificate of Public Convenience and Necessity for the Project pursuant to Ind. Code §§ 8-1-8.4-6 and -7. This Order constitutes the Certificate.

3. Petitioner is authorized to timely recover 80% of the stipulated federally mandated costs incurred during construction and operation of the Project, including post-in-service carrying costs, both debt and equity, and deferred depreciation expense associated with the Project through Petitioner's ECA mechanism. Petitioner's authorized return amount utilized in its Fuel Adjustment Clause net operating income earnings tests under Ind. Code § 8-1-2-42(d) and Ind. Code § 8-1-2-42.3 shall be adjusted accordingly.

4. Petitioner is authorized to defer for recovery 20% of such approved federally mandated costs until such costs are reflected in Petitioner's retail electric rates pursuant to Ind. Code § 8-1-8.4-7(c)(2).

5. Petitioner is authorized to accrue post-in-service carrying costs, both debt and equity, related to the Project after its in-service date using the overall cost of capital approved in Petitioner's TDSIC cases.

6. Petitioner is authorized to defer depreciation and operating and maintenance expenses relating to the Project until such expenses are recovered through either a rate adjustment mechanism or in base rates.

7. Petitioner is authorized to utilize the depreciation rates set forth in Petitioner's Exhibit No. 5, p. 8 with respect to the Project.

8. Petitioner is authorized to revise its ECA Rider tariffs as shown in Petitioner's Exhibit No. 6, Attachment JCS-2.

9. Petitioner shall file with the Commission as a compliance filing under this Cause its dewatering plans upon submission to IDEM.

10. The Commission's approval of Petitioner's request in this Cause is contingent on IDEM's final approval of the Project.

11. The Confidential Information is deemed confidential under Ind. Code §§ 8-1-2-29 and 5-14-3-4, is exempt from public access and disclosure by Indiana law, and shall be held confidential and protected from public access and disclosure by the Commission.

12. This Order shall be effective on and after the date of its approval.

HUSTON, FREEMAN, KREVDA, OBER, AND ZIEGNER CONCUR:

APPROVED: MAY 13 2020

I hereby certify that the above is a true and correct copy of the Order as approved.

Mary M. Becerra

Mary M. Becerra
Secretary of the Commission

STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

VERIFIED PETITION OF SOUTHERN INDIANA GAS AND ELECTRIC COMPANY d/b/a VECTREN ENERGY DELIVERY OF INDIANA, INC. ("VECTREN SOUTH") FOR (1) ISSUANCE OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR A COMPLIANCE PROJECT TO MEET FEDERALLY MANDATED REQUIREMENTS TO CLOSE ITS A. B. BROWN POND (THE "BROWN POND COMPLIANCE PROJECT"); (2) AUTHORITY TO TIMELY RECOVER 80% OF THE APPROVED FEDERALLY MANDATED COSTS INCURRED DURING CONSTRUCTION AND OPERATION OF THE BROWN POND COMPLIANCE PROJECT INCLUDING POST-IN SERVICE CARRYING CHARGES (BOTH DEBT AND EQUITY) ("PISCC") AND DEFERRED DEPRECIATION THROUGH VECTREN SOUTH'S ENVIRONMENTAL COST ADJUSTMENT MECHANISM; (3) AUTHORITY TO DEFER FOR RECOVERY IN VECTREN SOUTH'S ENSUING GENERAL RATE CASE 20% OF SUCH APPROVED FEDERALLY MANDATED COSTS; AND (4) IN THE ALTERNATIVE, APPROVAL TO INCLUDE THE BROWN POND COMPLIANCE PROJECT IN RATE BASE PURSUANT TO IC 8-1-2-23.	)	CAUSE NO. 45280

STIPULATION AND SETTLEMENT AGREEMENT

This Stipulation and Settlement Agreement (the "Settlement Agreement") is entered into by and among Southern Indiana Gas and Electric Company d/b/a Vectren Energy Delivery of Indiana, Inc. ("Vectren South" or the "Company") and the Indiana Office of Utility Consumer Counselor ("OUCC"). Vectren South and the OUCC are collectively referred to herein as the "Settling Parties." The Settling Parties, solely for

purposes of compromise and settlement, stipulate and agree that the terms and conditions set forth in this Settlement Agreement represent a fair, just and reasonable resolution of all matters raised in this proceeding, subject to their incorporation by the Indiana Utility Regulatory Commission ("Commission") into a final, non-appealable order without modification or further condition that is unacceptable to any Settling Party. The Settling Parties agree that this Settlement Agreement resolves all disputes, claims and issues arising from the Commission proceeding currently pending in Cause No. 45280 as between the Settling Parties. The Settling Parties agree that Vectren South's requested relief in this Cause should be granted in its entirety except as expressly modified herein.

1. Certificate of Public Convenience and Necessity. The Settling Parties agree the Commission should find that public convenience and necessity will be served by the compliance project to close the Brown Ash Pond in compliance with the Environmental Protection Agency's ("EPA") Coal Combustion Residual ("CCR") rule (the "Brown Ash Pond Compliance Project") and grant Vectren South a certificate of public convenience and necessity ("CPCN") pursuant to Ind. Code ch. 8-1-8.4 for the Brown Ash Pond Compliance Project.

2. Federally Mandated Costs. The Settling Parties agree that, in light of Ind. Code 8-1-8.4-7(c)(3) and without waiver of the rights provided to the parties thereunder, Vectren South shall remove the inflated contingency of $8.33 million ($7.49 million prior to inflation)[1] from the total federally mandated costs. As a result, the Settling Parties agree that the total projected (inflated) federally mandated costs of $156,200,000 are reasonable and should be approved. The Settling Parties agree that the Commission

[1] Petitioner's Exhibit No. 1, p. 22, lines 2-7.

should find that the Brown Ash Pond Compliance Project constitutes a compliance project that will allow Vectren South to comply directly or indirectly with "federally mandated requirements" under Ind. Code § 8-1-8.4-5 and that the associated costs, as modified herein, are "federally mandated costs" under Ind. Code § 8-1-8.4-4 and therefore eligible for cost recovery set forth in Ind. Code § 8-1-8.4-7.

3. Credit for Cash Proceeds and Insurance Proceeds. The Settling Parties agree that total federally mandated costs will be offset by total cash proceeds to be received from the ash reuser ("Ash Payments" in Table 1 of Petitioner's Exhibit No. 1, p. 20) plus total insurance proceeds to be received (Petitioner's Exhibit No. 5, p. 5, lines 1-5) of at least $25 million. These cash proceeds will be used to offset incurred operations and maintenance ("O&M") Costs to excavate and convey the ash to the loading facility, as described in Vectren South's direct testimony.

4. Timely Recovery Through ECA Mechanism. The Settling Parties agree that Vectren South should be authorized to timely recover 80% of the approved federally mandated costs incurred during construction and after placement in service and operation of the Brown Pond Compliance Project, including post-in-service carrying costs, both debt and equity, and deferred depreciation expense associated with the Brown Ash Pond Compliance Project through Vectren South's Environmental Cost Adjustment ("ECA") mechanism, as described in Petitioner's Exhibit No. 5, p. 6.

5. Cost of Removal. The Settling Parties agree that the costs of removal associated with retirements of existing or future capital assets in connection with the Brown Ash Pond Compliance Project are not reflected in the total projected federally mandated costs and they will not be reflected in the ECA mechanism in future

proceedings. Such costs of removal, if incurred, will be addressed in future general base rate cases to the extent of their effect on net original cost rate base. In the event the Brown Ash Pond Compliance Project results in a retirement of existing assets, Vectren South will offset the incremental depreciation expense included in the revenue requirement calculation with the impact of the retired assets. (Petitioner's Exhibit No. 5, p. 8.)

6. Deferral Authority. The Settling Parties agree that Vectren South should be authorized to defer 20% of the approved federally mandated costs until such costs are reflected in Vectren South's retail electric rates pursuant to Ind. Code § 8-1-8.4-7(c)(2), as presented in Petitioner's Exhibit No. 5, p. 6.

7. Other Accounting and Ratemaking Treatment. The Settling Parties agree that the Commission should grant Vectren South's requested accounting and ratemaking treatment except as expressly modified herein.

8. Preservation of Rights Regarding Effect of Environmental Liability on Rates. In the event Vectren South is held liable for damages or made subject to enforcement action with respect to the handling of the ash from the Brown Ash Pond, the Settling Parties reserve their respective positions with respect to rate recovery related thereto and preserve their rights to defend such positions in future proceedings.

9. Scope and Effect of Settlement.

a. Neither the making of this Settlement Agreement nor any of its provisions shall constitute in any respect an admission by any Settling Party in this or any other litigation or proceeding. Neither the making of this Settlement Agreement, nor the provisions thereof, nor the entry by the Commission of

a Final Order approving this Settlement Agreement, shall establish any principles or legal precedent applicable to Commission proceedings other than those resolved herein.

b. This Settlement Agreement shall not constitute nor be cited as precedent by any person or deemed an admission by any Settling Party in any other proceeding except as necessary to enforce its terms before the Commission, or any tribunal of competent jurisdiction. This Settlement Agreement is solely the result of compromise in the settlement process and, except as provided herein, is without prejudice to and shall not constitute a waiver of any position that any of the Settling Parties may take with respect to any or all of the issues resolved herein in any future regulatory or other proceedings.

c. The Settling Parties' entry into this Settlement Agreement shall not be construed as a limitation on any position they may take or relief they may seek in other pending or future Commission proceedings not specifically addressed in this Settlement Agreement.

10. Authority to Enter Settlement. The undersigned have represented and agreed that they are fully authorized to execute this Settlement Agreement on behalf of their designated clients, and their successors and assigns, who will be bound thereby, subject to the agreement of the Settling Parties on the provisions contained herein.

11. Privileged Settlement Communications. The communications and discussions during the negotiations and conferences have been conducted based on the explicit understanding that said communications and discussions are or relate to offers of

settlement and therefore are privileged. All prior drafts of this Settlement Agreement and any settlement proposals and counterproposals also are or relate to offers of settlement and are privileged.

12. Conditions of Settlement. This Settlement Agreement is conditioned upon and subject to Commission acceptance and approval of its terms in their entirety, without any change or condition that is unacceptable to any Settling Party.

13. Evidence in Support of Settlement. Vectren South and the OUCC shall offer supplemental testimony supporting the Commission's approval of this Settlement Agreement and will request that the Commission issue a Final Order incorporating the agreed proposed language of the Settling Parties and accepting and approving the same in accordance with its terms without any modification. Such supportive testimony will be agreed-upon by the Settling Parties and offered into evidence without objection by any Settling Party. The Settling Parties hereby waive cross-examination of each other's witnesses.

14. Commission Approval. The Settling Parties will support this Settlement Agreement before the Commission and request that the Commission accept and approve the Settlement Agreement. This Settlement Agreement is a complete, interrelated package and is not severable, and shall be accepted or rejected in its entirety without modification or further condition(s) that may be unacceptable to any Settling Party. If the Commission does not approve the Settlement Agreement in its entirety, the Settlement Agreement shall be null and void and deemed withdrawn, upon notice in writing by any Settling Party within fifteen (15) business days after the date of the Final Order that any modifications made by the Commission are unacceptable to it. In the event the Settlement

Agreement is withdrawn, the Settling Parties will request that an Attorneys' Conference be convened to establish a procedural schedule for the continued litigation of this proceeding.

15. Proposed Order. The Settling Parties will work together to prepare an agreed upon proposed order to be submitted in this Cause. The Settling Parties will request Commission acceptance and approval of this Settlement Agreement in its entirety, without any change or condition that is unacceptable to any party to this Settlement Agreement.

16. Publicity. The Settling Parties also will work cooperatively on news releases or other announcements to the public about this Settlement Agreement.

17. Waiver of Opposition. The Settling Parties shall not appeal or seek rehearing, reconsideration or a stay of any Final Order entered by the Commission approving the Settlement Agreement in its entirety without changes or condition(s) unacceptable to any Settling Party (or related orders to the extent such orders are specifically and exclusively implementing the provisions hereof) and shall not oppose this Settlement Agreement in the event of any appeal or a request for rehearing, reconsideration or a stay by any person not a party hereto.

Accepted and Agreed on this 19th day of December, 2019.

(signature page follows)

Southern Indiana Gas and Electric Company
d/b/a Vectren Energy Delivery of Indiana, Inc.

By: _____

Indiana Office of Utility Consumer Counselor

By: _____

DMS 15900098v1

STATE OF INDIANA

INDIANA UTILITY REGULATORY COMMISSION

VERIFIED PETITION OF SOUTHERN INDIANA GAS AND ELECTRIC COMPANY d/b/a VECTREN ENERGY DELIVERY OF INDIANA, INC. ("VECTREN SOUTH") FOR (1) ISSUANCE OF A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR A COMPLIANCE PROJECT TO MEET FEDERALLY MANDATED REQUIREMENTS TO CLOSE ITS A. B. BROWN POND (THE "BROWN POND COMPLIANCE PROJECT"); (2) AUTHORITY TO TIMELY RECOVER 80% OF THE APPROVED FEDERALLY MANDATED COSTS INCURRED DURING CONSTRUCTION AND OPERATION OF THE BROWN POND COMPLIANCE PROJECT INCLUDING POST-IN SERVICE CARRYING CHARGES (BOTH DEBT AND EQUITY) ("PISCC") AND DEFERRED DEPRECIATION THROUGH VECTREN SOUTH'S ENVIRONMENTAL COST ADJUSTMENT MECHANISM; (3) AUTHORITY TO DEFER FOR RECOVERY IN VECTREN SOUTH'S ENSUING GENERAL RATE CASE 20% OF SUCH APPROVED FEDERALLY MANDATED COSTS; AND (4) IN THE ALTERNATIVE, APPROVAL TO INCLUDE THE BROWN POND COMPLIANCE PROJECT IN RATE BASE PURSUANT TO IC 8-1-2-23.	FILED January 10, 2020 INDIANA UTILITY REGULATORY COMMISSION CAUSE NO. 45280

STIPULATION AND SETTLEMENT AGREEMENT

This Stipulation and Settlement Agreement (the "Settlement Agreement") is entered into by and among Southern Indiana Gas and Electric Company d/b/a Vectren Energy Delivery of Indiana, Inc. ("Vectren South" or the "Company"), the Indiana Office of Utility Consumer Counselor ("OUCC") and the Citizens Action Coalition of Indiana, Inc. ("CAC"). Vectren South, the OUCC and the CAC are collectively referred to herein as the

"Settling Parties." The Settling Parties, solely for purposes of compromise and settlement, stipulate and agree that the terms and conditions set forth in this Settlement Agreement represent a fair, just and reasonable resolution of concerns raised by the CAC related to the compliance project to close the Brown Ash Pond in compliance with the Environmental Protection Agency's ("EPA") Coal Combustion Residual ("CCR") rule (the "Brown Ash Pond Compliance Project"), subject to their incorporation by the Indiana Utility Regulatory Commission ("Commission") into a final, non-appealable order without modification or further condition that is unacceptable to any Settling Party. The Settling Parties agree that this Settlement Agreement resolves all disputes, claims and issues arising from the Commission proceeding currently pending in Cause No. 45280 as between the Settling Parties. The Settling Parties agree that Vectren South's requested relief in this Cause should be granted in its entirety subject to the conditions stated herein.

1. Stipulation and Settlement Agreement between Vectren South and OUCC dated December 19, 2019. CAC agrees with and joins the Stipulation and Settlement Agreement between Vectren South and the OUCC dated December 19, 2019 (the "December 19 Settlement Agreement"), subject to the additional conditions stated in this Settlement Agreement.

2. Submission of Plans and Notice Regarding Dewatering. The Settling Parties agree that, prior to commencing dewatering of the Brown Ash Pond, for purposes of closing the Brown Ash Pond, Vectren South shall submit the dewatering plans to the Indiana Department of Environmental Management ("IDEM") for approval. Vectren shall provide a copy of the dewatering plans and shall also provide the notice to IDEM of the commencement of dewatering to the Settling Parties.

3. Closure Activities. The Settling Parties agree that, prior to commencing any closure-in-place of CCR at the Brown Ash Pond, Vectren South shall submit, and receive IDEM approval of, a closure plan for the Brown Ash Pond pursuant to applicable IDEM regulations. Vectren South shall include a revised Fugitive Dust Plan for the Brown Ash Pond as part of that closure plan application. The full closure plan for the Brown Ash Pond shall be made publicly available.

4. Worker Protections. The Settling Parties agree that Vectren South shall work with its contractors to include worker protection provisions in the revised Fugitive Dust Plan submitted as part of Vectren South's closure plan for the Ash Pond. Those worker protection provisions should include protections for workers engaged in the removal of CCR from the Brown Ash Pond, onsite processing of the CCR, and conveying of the CCR from the Brown Ash Pond to any barge that will transport it to off-site locations.

5. Scope and Effect of Settlement.

a. Neither the making of this Settlement Agreement nor any of its provisions shall constitute in any respect an admission by any Settling Party in this or any other litigation or proceeding. Neither the making of this Settlement Agreement, nor the provisions thereof, nor the entry by the Commission of a Final Order approving this Settlement Agreement, shall establish any principles or legal precedent applicable to Commission proceedings other than those resolved herein.

b. This Settlement Agreement shall not constitute nor be cited as precedent by any person or deemed an admission by any Settling Party in any other proceeding except as necessary to enforce its terms before the

Commission, or any tribunal of competent jurisdiction. This Settlement Agreement is solely the result of compromise in the settlement process and, except as provided herein, is without prejudice to and shall not constitute a waiver of any position that any of the Settling Parties may take with respect to any or all of the issues resolved herein in any future regulatory or other proceedings.

c. The Settling Parties' entry into this Settlement Agreement shall not be construed as a limitation on any position they may take or relief they may seek in other pending or future Commission proceedings not specifically addressed in this Settlement Agreement or the December 19 Settlement Agreement.

6. Authority to Enter Settlement. The undersigned have represented and agreed that they are fully authorized to execute this Settlement Agreement on behalf of their designated clients, and their successors and assigns, who will be bound thereby, subject to the agreement of the Settling Parties on the provisions contained herein.

7. Privileged Settlement Communications. The communications and discussions during the negotiations and conferences have been conducted based on the explicit understanding that said communications and discussions are or relate to offers of settlement and therefore are privileged. All prior drafts of this Settlement Agreement and any settlement proposals and counterproposals also are or relate to offers of settlement and are privileged.

8. Conditions of Settlement. This Settlement Agreement is conditioned upon and subject to Commission acceptance and approval of its terms in their entirety, without any change or condition that is unacceptable to any Settling Party.

9. Evidence in Support of Settlement. Vectren South shall offer supplemental testimony supporting the Commission's approval of this Settlement Agreement and will request that the Commission issue a Final Order incorporating the agreed proposed language of the Settling Parties and accepting and approving the same in accordance with its terms without any modification. Such supportive testimony will be agreed-upon by the Settling Parties and offered into evidence without objection by any Settling Party. The Settling Parties hereby waive cross-examination of each other's witnesses.

10. Commission Approval. The Settling Parties will support this Settlement Agreement before the Commission and request that the Commission accept and approve the Settlement Agreement. The terms of this Settlement Agreement constitute an interrelated package and are not severable, and shall be accepted or rejected in their entirety without modification or further condition(s) that may be unacceptable to any Settling Party. If the Commission does not approve this Settlement Agreement in its entirety, this Settlement Agreement shall be null and void and deemed withdrawn, upon notice in writing by any Settling Party within fifteen (15) business days after the date of the Final Order that any modifications made by the Commission are unacceptable to it. In the event this Settlement Agreement is withdrawn, the Settling Parties will request that an Attorneys' Conference be convened to establish a procedural schedule for the continued litigation of this proceeding.

11. Proposed Order. The Settling Parties will work together to prepare an agreed upon proposed order to be submitted in this Cause. The Settling Parties will request Commission acceptance and approval of this Settlement Agreement and the December 19 Settlement Agreement in their entirety, without any change or condition that is unacceptable to any party to this Settlement Agreement.

12. Publicity. The Settling Parties also will work cooperatively on news releases or other announcements to the public about this Settlement Agreement.

13. Waiver of Opposition. The Settling Parties shall not appeal or seek rehearing, reconsideration or a stay of any Final Order entered by the Commission approving this Settlement Agreement in its entirety without changes or condition(s) unacceptable to any Settling Party (or related orders to the extent such orders are specifically and exclusively implementing the provisions hereof) and shall not oppose this Settlement Agreement in the event of any appeal or a request for rehearing, reconsideration or a stay by any person not a party hereto.

Accepted and Agreed on this 9th day of January, 2020.

(signature page follows)

Southern Indiana Gas and Electric Company
d/b/a Vectren Energy Delivery of Indiana, Inc.

By: _____

Citizens Action Coalition of Indiana, Inc.

By: _____
Kerwin L. Olson, Executive Director

Indiana Office of Utility Consumer Counselor

By: Lorraine Hitz-Bradley

Exhibit 4

IN THE CHANCERY COURT FOR THE STATE OF TENNESSEE
TWENTIETH JUDICIAL DISTRICT, DAVIDSON COUNTY

STATE OF TENNESSEE ex rel. HERBERT H. SLATERY III, in his official capacity as the Attorney General and Reporter of Tennessee and ROBERT J. MARTINEAU, JR., Commissioner of the Tennessee Department of Environment and Conservation,	)	
Plaintiffs,	)	
and	)	
TENNESSEE CLEAN WATER NETWORK and TENNESSEE SCENIC RIVERS ASSOCIATION,	)	**No. 15-23-IV**
Plaintiff-Intervenors,	)	
v.	)	
TENNESSEE VALLEY AUTHORITY,	)	
Defendant.	)	

CONSENT ORDER

It appears to the Court, as evidenced by the signatures of counsel for all parties affixed below, that the parties have compromised and settled all matters in dispute between and among them with respect to Plaintiffs' Verified Amended Complaint and Plaintiff-Intervenors' Complaint in Intervention. The parties have agreed to resolution of this lawsuit through entry of this Consent Order.

IT IS THEREFORE ORDERED, ADJUDGED, AND DECREED that:

1. Defendant Tennessee Valley Authority (Defendant) will complete and submit to Plaintiff Tennessee Department of Environment and Conservation (TDEC) for approval the Final Environmental Assessment Report (EAR) for its facility located at 1499 Steam Plant Road, Gallatin, Sumner County, Tennessee 37066, known as the TVA Gallatin Fossil Plant (GAF). The Final EAR shall be prepared and the underlying investigative work shall be completed consistent with the standards of Paragraphs 2 and 3 of the Agreed Temporary Injunction Between the State of Tennessee and Tennessee Valley Authority, entered on January 21, 2016. The Final EAR shall be submitted within 60 days of TDEC's determination of completion of the ongoing environmental investigation.

2. The Ash Pond Complex: Defendant will close the following units at the GAF (collectively referred to for the purposes of this Consent Order as the Ash Pond Complex) by removing the coal combustion residuals (CCR) and remediating the area consistent with the applicable provisions of the Tennessee Solid Waste Disposal Act, Tenn. Code Ann. §§ 68-211-101 to 68-211-124, and its implementing rules and regulations (closure by removal):

- Ash Pond A
- Ash Pond E
- Middle Pond A
- Bottom Ash Pond
- Stilling Ponds B, C, and D

a. Defendant will develop and submit to TDEC for approval a plan for the removal and ultimate disposition of all material excavated from the Ash Pond Complex. Closure by removal of the Ash Pond Complex will be completed in accordance with all applicable Tennessee law and under TDEC oversight. Contamination or discharges resulting from Defendant's compliance with this Consent Order

and/or directly associated with the excavation and removal of CCR from the Ash Pond Complex, including but not limited to drop-outs that may occur during the excavation effort despite Defendant's best efforts to prevent or limit such occurrences, shall not be deemed non-compliance with this Consent Order. In the event of such an occurrence, Defendant shall immediately notify TDEC and timely submit a corrective action plan for consideration and approval.

b. TDEC's approval of such plan for removal shall serve as any approval that may be required pursuant to Tenn. Code Ann. § 68-211-106(j) associated with excavation and removal of CCR from within the Ash Pond Complex.

c. Defendant's plan may propose, either exclusively or in some combination, beneficially reusing the excavated material in a recycling process for encapsulated beneficial use, placement of the excavated material into an on-site permitted landfill, or transportation of excavated material off-site for disposal into a permitted landfill.

d. Defendant may submit its plan for removal at any time, but no later than 15 days after the later of (1) TDEC's approval of the Final EAR or (2) publication of the Record of Decision for TVA's Environmental Impact Statement for the Gallatin Surface Impoundment Closure and Restoration Project. Defendant's plan shall be submitted to TDEC by no later than September 30, 2020.

e. Defendant will provide a copy of its proposed plan for removal to Plaintiff-Intervenors Tennessee Clean Water Network and Tennessee Scenic Rivers Association (the Citizens Groups) at the same time it submits its proposal to

TDEC for review. The Citizens Groups will have 30 days to provide comments on Defendant's proposal to TDEC. The Citizens Groups will also provide a copy of their comments to Defendant.

f. The plan for removal shall include a schedule for the completion of closure by removal. Defendant will complete closure by removal of the Ash Pond Complex within 20 years of TDEC's final approval of Defendant's plan for removal.

g. Defendant may request and TDEC may grant extensions of time for closure of the Ash Pond Complex as approved by TDEC for good cause shown. TDEC may deem any delays in its processing of Defendant's permit applications submitted in conjunction with Defendant's plan for closure by removal, and/or any delays caused by challenges to permitting actions taken by regulators (including TDEC) on permit applications, as good cause sufficient to grant an extension of time. TDEC shall use best efforts to expedite the processing of Defendant's applications for permits associated with a lateral expansion of the on-site North Rail Loop landfill.

h. Following the removal of CCR material from Stilling Ponds B, C, and D, Defendant may submit a plan for continued use of Stilling Ponds B, C, and D for stormwater management at the GAF to TDEC for consideration and approval.

i. Prior to the commencement of removal, Defendant will develop and submit to TDEC for approval a plan for continued monitoring of discharge locations

during the closure process, including identified outfalls, groundwater monitoring wells, and discharge locations in the Cumberland River identified through the ongoing environmental investigation pursuant to the parties' Agreed Temporary Injunction. Samples will be analyzed for CCR parameters listed in 40 CFR Part 257, Appendices III and IV along with additional parameters required by the state groundwater monitoring program (copper, nickel, silver, vanadium, and zinc). Monitoring shall begin no later than 30 days after TDEC's approval of the monitoring plan.

j. Within 60 days of TDEC's approval of the plan for removal, Defendant will complete and submit to TDEC for approval a Corrective Action/Risk Assessment (CARA) Plan for groundwater contamination at the Ash Pond Complex. The CARA Plan shall specify all actions Defendant proposes, the basis for those actions, and shall include a schedule of activities to be completed by Defendant.

k. Defendant will provide a copy of its proposed CARA Plan to the Citizens Groups at the same time it submits its proposal to TDEC for review. The Citizens Groups will have 30 days to provide comments on Defendant's proposal to TDEC. The Citizens Groups will also provide a copy of their comments to Defendant.

l. Defendant and TDEC shall discuss the draft CARA Plan and any changes TDEC may determine are necessary for tentative approval of the plan. Following completion of the Public Involvement process set forth in Paragraph

4 of this Consent Order, TDEC shall decide to either accept or reject the CARA Plan. Should TDEC disapprove the CARA Plan, TDEC shall provide comments identifying the deficiencies. Defendant shall correct the deficiencies and resubmit the CARA Plan to TDEC for final approval.

m. Defendant shall implement the corrective action and remediation of groundwater contamination no later than 30 days after TDEC's approval of the CARA Plan.

3. The Non-Registered Site #83-1324: The parties agree that resolution of issues regarding investigation and remediation of Non-Registered Site #83-1324 (the NRS) will be governed by the attached administrative order issued by TDEC.

4. Defendant shall provide Public Notice of its proposed CARA Plan. The Public Notice shall contain a summary of the proposed plan and it shall be published in a manner specified by TDEC. The Public shall have a minimum of 30 days to comment on the proposed plan; and, if any comments are received, Defendant shall have 30 days to provide TDEC with responses to the comments. After consideration of all Public comments and Defendant's responses, TDEC will approve, request modifications, or reject the proposed CARA Plan.

5. This Consent Order is in addition to Defendant's obligations under the CCR Rule or other applicable federal laws. As required by the CCR Rule, Defendant shall notify TDEC when it posts CCR-related documents on its CCR Rule public website. TDEC in its discretion may request that Defendant provide it electronic or paper copies of specific documents. The Department shall have 60 days to review CCR Rule related plans, demonstrations, and assessments, after they are placed on Defendant's public CCR Rule website. If TDEC does not

inform TVA that it has comments on a plan, demonstration, or assessment within this 60-day period, Defendant may proceed with such plan, demonstration, or assessment. If TDEC informs Defendant that it has comments, the parties shall meet to discuss those comments within 30 days. Thereafter, Defendant shall appropriately modify its plans, demonstrations, or assessments to respond to TDEC's final comments and resubmit the plan, demonstration, or assessment to TDEC. Thirty days thereafter, unless informed otherwise by TDEC, Defendant may proceed with such plan, demonstration, or assessment. TDEC's review and comment on a CCR Rule plan, demonstration, or assessment shall not be deemed its approval of actions required under this Consent Order; however, Defendant may assume the risk of implementing a CCR Rule plan, demonstration, or assessment.

6. Defendant shall pay all reasonable costs associated with TDEC's oversight of the implementation of the Consent Order. These costs may include, but are not limited to, mileage, lab expense, salary, benefit, and administrative costs for TDEC's employees and other state employees actively employed in oversight of work under this order (including preparation for and attendance at meetings), at the current State overhead rate. Oversight costs also include expenditures for separate office space and related expenses, services contracted for by TDEC that facilitate or support TDEC's oversight under this order, including, but not limited to, the review of documents submitted by Defendant to TDEC as required by the CCR Rule. TDEC shall provide Defendant with periodic statements reflecting oversight costs incurred. Within 60 days of the receipt of each such statement, Defendant shall pay the amount invoiced to TDEC.

7. Absent good cause, failure to comply with any deadline set by TDEC pursuant to this Consent Order except as provided in Paragraph 2.g. shall be a violation of the order.

8. Plaintiffs and Defendant shall designate two individuals to serve as the primary technical and compliance points of contact for implementation of the Consent Order, in writing, sent to the other parties. The Citizens Groups shall designate two individuals to serve as the primary points of contact for submission of documents and written communications as detailed in Paragraph 2. Whenever written notice is required to be given or a document is required to be sent by one party to another, it shall be sent by both electronic and U.S. Mail and directed to the individuals identified in accordance with this Paragraph. Any party may change a designated point of contact at any time by informing the other parties of the change in writing.

9. The Court shall retain jurisdiction over the enforcement of this Consent Order. If Plaintiffs or the Citizens Groups seek to effectuate and enforce the terms and conditions of this Consent Order or the parties seek to resolve disputes arising hereunder as may be necessary or appropriate for the execution of this Consent Order, then the parties may seek to reopen this case for the express purpose of effectuating and enforcing the Consent Order or resolving disputes regarding execution of the Consent Order by filing the appropriate motion.

10. This Consent Order is a result of a compromise of disputed claims and shall never at any time or for any purpose be considered as an admission of liability or responsibility of any party with respect to any matters asserted in or pertaining to the subject lawsuit. The parties recognize, and the Court by entering the order finds, that the Consent Order has been negotiated in good faith and will avoid litigation among the parties and that this Consent Order is fair, reasonable, and in the public interest.

11. This Consent Order constitutes a final judgment of the Court, except that the Court retains jurisdiction over the enforcement of the order as set forth in Paragraph 9. Defendant shall

pay all court costs, and each party shall bear its own discretionary costs and fees.

IT IS SO ORDERED.

Entered this the _____ day of _____, 2019.

HONORABLE RUSSELL T. PERKINS
CHANCELLOR

Respectfully submitted,

HERBERT H. SLATERY III
Attorney General and Reporter

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Counsel for Defendant

CERTIFICATE OF SERVICE

I hereby certify that a true and exact copy of the foregoing Consent Order has been forwarded via electronic mail and first-class mail, postage prepaid, on this the 13th day of June, 2019, to:

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Exhibit 5

CHAPTER 651

An Act to allow closure of certain coal combustion residuals impoundments.

[S 1355]

Approved March 19, 2019

Be it enacted by the General Assembly of Virginia:

1. *§ 1. A. For the purposes of this section only:*

"Carrying cost" means the cost associated with financing expenditures incurred but not yet recovered from the electric utility's customers, and shall be calculated by applying the electric utility's weighted average cost of debt and equity capital, as determined by the State Corporation Commission, with no additional margin or profit, to any unrecovered balances.

"CCR landfill" means an area of land or an excavation that receives CCR and is not a surface impoundment, underground injection well, salt dome formation, salt bed formation, underground or surface coal mine, or cave and that is owned or operated by an electric utility.

"CCR surface impoundment" means a natural topographic depression, man-made excavation, or diked area that (i) is designed to hold an accumulation of CCR and liquids; (ii) treats, stores, or disposes of CCR; and (iii) is owned or operated by an electric utility.

"CCR unit" means any CCR landfill, CCR surface impoundment, lateral expansion of a CCR unit, or combination of two or more such units that is owned by an electric utility. Notwithstanding the provisions of 40 C.F.R. Part 257, "CCR unit" also includes any CCR below the unit boundary of the CCR landfill or CCR surface impoundment.

"Coal combustion residuals" or "CCR" means fly ash, bottom ash, boiler slag, and flue gas desulfurization materials generated from burning coal for the purpose of generating electricity by an electric utility.

"Encapsulated beneficial use" means a beneficial use of CCR that binds the CCR into a solid matrix and minimizes its mobilization into the surrounding environment.

The above definitions shall be interpreted in a manner consistent with 40 C.F.R. Part 257, except as expressly provided herein.

B. The owner or operator of any CCR unit located within the Chesapeake Bay watershed at the Bremo Power Station, Chesapeake Energy Center, Chesterfield Power Station, and Possum Point Power Station that ceased accepting CCR prior to July 1, 2019, shall complete closure of such unit by (i) removing all of the CCR in accordance with applicable standards established by Virginia Solid Waste Management Regulations (9VAC20-81) and (ii) either (a) beneficially reusing all such CCR in a recycling process for encapsulated beneficial use or (b) disposing of the CCR in a permitted landfill on the property upon which the CCR unit is located, adjacent to the property upon which the CCR unit is located, or off of the property on which the CCR unit is located, that includes, at a minimum, a composite liner and leachate collection system that meets or exceeds the federal Criteria for Municipal Solid Waste Landfills pursuant to 40 C.F.R. Part 258. The owner or operator shall beneficially reuse a total of no less than 6.8 million cubic yards in aggregate of such removed CCR from no fewer than two of the sites listed in this subsection where CCR is located.

C. The owner or operator shall complete the closure of any such CCR unit required by this section no later than 15 years after initiating the closure process at that CCR unit. During the closure process, the owner or operator shall, at its expense, offer to provide a connection to a municipal water supply, or where such connection is not feasible provide water testing, for any residence within one-half mile of the CCR unit.

D. Where closure pursuant to this section requires that CCR or CCR that has been beneficially reused be removed off-site, the owner or operator shall develop a transportation plan in consultation with any county, city, or town in which the CCR units are located and any county, city, or town within two miles of the CCR units that minimizes the impact of any transport of CCR on adjacent property owners and surrounding communities. The transportation plan shall include (i) alternative transportation options to be utilized, including rail and barge transport, if feasible, in combination with other transportation methods necessary to meet the closure timeframe established in subsection C, and (ii) plans for any transportation by truck, including the frequency of truck travel, the route of truck travel, and measures to control noise, traffic impact, safety, and fugitive dust caused by such truck travel. Once such transportation plan is completed, the owner or operator shall post it on a publicly accessible website. The owner or operator shall provide notice of the availability of the plan to the Department and the chief administrative officers of the consulting localities and shall publish such notice once in a newspaper of general circulation in such locality.

E. The owner or operator of any CCR unit subject to the provisions of subsection B shall accept and

review proposals to beneficially reuse any CCR that are not subject to an existing contractual agreement to remove CCR pursuant to the provisions of subsection B every four years beginning July 1, 2022. Any entity submitting such a proposal shall provide information from which the owner or operator can determine (i) the amount of CCR that will be utilized for encapsulated beneficial use; (ii) the cost of such beneficial reuse of such CCR; and (iii) the guaranteed timeframe in which the CCR will be utilized.

F. In conducting closure activities described in subsection B, the owner or operator shall (i) identify options for utilizing local workers, (ii) consult with the Commonwealth's Chief Workforce Development Officer on opportunities to advance the Commonwealth's workforce goals, including furtherance of apprenticeship and other workforce training programs to develop the local workforce, and (iii) give priority to the hiring of local workers.

G. No later than October 1, 2022, and no less frequently than every two years thereafter until closure of all of its CCR units is complete, the owner or operator of any CCR unit subject to the provisions of subsection B shall compile the following two reports:

1. A report describing the owner's or operator's closure plan for all such CCR units; the closure progress to date, both per unit and in total; a detailed accounting of the amounts of CCR that have been and are expected to be beneficially reused from such units, both per unit and in total; a detailed accounting of the amounts of CCR that have been and are expected to be landfilled from such units, both per unit and in total; a detailed accounting of the utilization of transportation options and a transportation plan as required by subsection D; and a discussion of groundwater and surface water monitoring results and any measures taken to address such results as closure is being completed.

2. A report that contains the proposals and analysis for proposals required by subsection E.

The owner or operator shall post each such report on a publicly accessible website and shall submit each such report to the Governor, the Secretary of Natural Resources, the Chairman of the Senate Committee on Agriculture, Conservation and Natural Resources, the Chairman of the House Committee on Agriculture, Chesapeake and Natural Resources, the Chairman of the Senate Committee on Commerce and Labor, the Chairman of the House Committee on Commerce and Labor, and the Director.

H. All costs associated with closure of a CCR unit in accordance with this section shall be recoverable through a rate adjustment clause authorized by the State Corporation Commission (the Commission) under the provisions of subdivision A 5 e of § 56-585.1 of the Code of Virginia, provided that (i) when determining the reasonableness of such costs the Commission shall not consider closure in place of the CCR unit as an option; (ii) the annual revenue requirement recoverable through a rate adjustment clause authorized under this act, exclusive of any other rate adjustment clauses approved by the Commission under the provisions of subdivision A 5 e of § 56-585.1 of the Code of Virginia, shall not exceed $225 million on a Virginia jurisdictional basis for the Commonwealth in any 12-month period, provided that any under-recovery amount of revenue requirements incurred in excess of $225 million in a given 12-month period, limited to the under-recovery amount and the carrying cost, shall be deferred and recovered through the rate adjustment clause over up to three succeeding 12-month periods without regard to this limitation, and with the length of the amortization period being determined by the Commission; (iii) costs may begin accruing on July 1, 2019, but no approved rate adjustment clause charges shall be included in customer bills until July 1, 2021; (iv) any such costs shall be allocated to all customers of the utility in the Commonwealth as a non-bypassable charge, irrespective of the generation supplier of any such customer; and (v) any such costs that are allocated to the utility's system customers outside of the Commonwealth that are not actually recovered from such customers shall be included for cost recovery from jurisdictional customers in the Commonwealth through the rate adjustment clause.

I. Any electric public utility subject to the requirements of this section may, without regard for whether it has petitioned for any rate adjustment clause pursuant to subdivision A 5 e of § 56-585.1 of the Code of Virginia, petition the Commission for approval of a plan for CCR unit closure at any or all of its CCR unit sites listed in subsection B. Any such plan shall take into account site-specific conditions and shall include proposals to beneficially reuse no less than 6.8 million cubic yards of CCR in aggregate from no fewer than two of the sites listed in subsection B. The Commission shall issue its final order with regard to any such petition within six months of its filing, and in doing so shall determine whether the utility's plan for CCR unit closure, and the projected costs associated therewith, are reasonable and prudent, taking into account that closure in place of any CCR unit is not to be considered as an option. The Commission shall not consider plans that do not comply with subsection B of this act.

§ 2. Nothing in this act shall be construed to require additional beneficial reuse of CCR at any active coal-fired electric generation facility if such additional beneficial reuse results in a net increase in truck traffic on the public roads of the locality in which the facility is located as compared to such traffic during calendar year 2018.

§ 3. The Commonwealth shall not authorize any cost recovery by an owner or operator subject to the provisions of this act for any fines or civil penalties resulting from violations of federal and state law or

regulation.

Exhibit 6

CHAPTER 563

An Act to amend the Code of Virginia by adding a section numbered 10.1-1402.04, relating to closure of certain coal combustion residuals impoundments; Giles and Russell Counties.

[H 443]

Approved March 31, 2020

Be it enacted by the General Assembly of Virginia:

1. That the Code of Virginia is amended by adding a section numbered 10.1-1402.04 as follows:

§ 10.1-1402.04. Closure of certain coal combustion residuals units; Giles and Russell Counties.

A. For the purposes of this section:

"Carrying cost" means the cost associated with financing expenditures incurred but not yet recovered from the electric utility's customers and shall be calculated by applying the electric utility's weighted average cost of debt and equity capital, as determined by the State Corporation Commission, with no additional margin or profit, to any unrecovered balances.

"CCR landfill" means an area of land or an excavation that receives CCR and is not a surface impoundment, underground injection well, salt dome formation, salt bed formation, underground or surface coal mine, or cave and that is owned or operated by an electric utility.

"CCR surface impoundment" means a natural topographic depression, man-made excavation, or diked area that (i) is designed to hold an accumulation of CCR and liquids; (ii) treats, stores, or disposes of CCR; and (iii) is owned or operated by an electric utility.

"CCR unit" means any CCR landfill, CCR surface impoundment, lateral expansion of a CCR unit, or combination of two or more such units that is owned by an electric utility. Notwithstanding the provisions of 40 C.F.R. Part 257, "CCR unit" also includes any CCR below the unit boundary of the CCR landfill or CCR surface impoundment.

"Coal combustion residuals" or "CCR" means fly ash, bottom ash, boiler slag, and flue gas desulfurization materials generated from burning coal for the purpose of generating electricity by an electric utility.

"Commission" means the State Corporation Commission.

"Encapsulated beneficial use" means a beneficial use of CCR that binds the CCR into a solid matrix and minimizes its mobilization into the surrounding environment.

The definitions in this subsection shall be interpreted in a manner consistent with 40 C.F.R. Part 257, except as expressly provided in this section.

B. The owner or operator of any CCR unit located in Giles County or Russell County at the Glen Lyn Plant and the Clinch River Plant shall, if all CCR units at such plant ceased receiving CCR and submitted notification of completion of a final cap to the Department prior to January 1, 2019, complete post-closure care and any required corrective action of such unit. If all CCR units at such plant have not submitted notification of completion of a final cap to the Department prior to January 1, 2019, the owner or operator shall close all CCR units at such plant by (i) removing all of the CCR in accordance with applicable standards established by Virginia Solid Waste Management Regulations (9VAC20-81) and (ii) either (a) beneficially reusing all such CCR in a recycling process for encapsulated beneficial use or (b) disposing of the CCR in a permitted landfill on the property upon which the CCR unit is located, adjacent to the property upon which the CCR unit is located, or off of the property on which the CCR unit is located, that includes, at a minimum, a composite liner and leachate collection system that meets or exceeds the federal Criteria for Municipal Solid Waste Landfills pursuant to 40 C.F.R. Part 258. The owner or operator shall beneficially reuse CCR removed from its CCR unit if beneficial use of such removed CCR is anticipated to reduce costs incurred under this section.

C. The owner or operator shall complete the closure of any such CCR unit required by this section no later than 15 years after initiating the excavation process at that CCR unit. During the closure process, the owner or operator shall, at its expense, offer to provide a connection to a municipal water supply, or where such connection is not feasible provide water testing, for any residence within one-half mile of the CCR unit.

D. Where closure pursuant to this section requires that CCR that has been beneficially reused be removed off-site, the owner or operator shall develop a transportation plan in consultation with any county, city, or town in which the CCR units are located and any county, city, or town within two miles of the CCR units that minimizes the impact of any transport of CCR on adjacent property owners and surrounding communities. The transportation plan shall include (i) alternative transportation options to be utilized, including rail and barge transport, if feasible, in combination with other transportation methods necessary to meet the closure timeframe established in subsection C and (ii) plans for any transportation by truck, including the frequency of truck travel, the route of truck travel, and measures

to control noise, traffic impact, safety, and fugitive dust caused by such truck travel. Once such transportation plan is completed, the owner or operator shall post it on a publicly accessible website. The owner or operator shall provide notice of the availability of the plan to the Department and the chief administrative officers of the consulting localities and shall publish such notice once in a newspaper of general circulation in such locality.

E. The owner or operator of any CCR unit subject to the provisions of subsection B shall accept and review proposals for the encapsulated beneficial use of CCR pursuant to the provisions of subsection B every four years beginning July 1, 2023. Any entity submitting such a proposal shall provide information from which the owner or operator can determine (i) the amount of CCR that will be utilized for encapsulated beneficial use; (ii) the cost of the proposed beneficial use of such CCR; and (iii) the guaranteed timeframe in which the CCR will be utilized.

F. In conducting closure activities described in subsection B, the owner or operator shall (i) identify options for utilizing local workers; (ii) consult with the Commonwealth's Chief Workforce Development Officer on opportunities to advance the Commonwealth's workforce goals, including furtherance of apprenticeship and other workforce training programs to develop the local workforce; and (iii) give priority to the hiring of local workers.

G. No later than October 1, 2023, and no less frequently than every two years thereafter until closure of or corrective action at all of its CCR units is complete, the owner or operator of any CCR unit subject to the provisions of subsection B shall compile the following two reports:

1. A report describing the owner's or operator's closure plan for all such CCR units; the closure progress to date, both per unit and in total; a detailed accounting of the amounts of CCR that have been and are expected to be beneficially reused from such units, both per unit and in total; a detailed accounting of the amounts of CCR that have been and are expected to be landfilled from such units, both per unit and in total; a detailed accounting of the utilization of transportation options and a transportation plan as required by subsection D; and a discussion of groundwater and surface water monitoring results and any corrective actions or other measures taken to address such results as closure is being completed.

2. A report that contains the proposals and analysis for proposals required by subsection E.

The owner or operator shall post each such report on a publicly accessible website and shall submit each such report to the Governor, the Secretary of Natural Resources, the Chairman of the Senate Committee on Agriculture, Conservation and Natural Resources, the Chairman of the House Committee on Agriculture, Chesapeake and Natural Resources, the Chairman of the Senate Committee on Commerce and Labor, the Chairman of the House Committee on Labor and Commerce, and the Director.

H. All costs associated with closure by removal of a CCR unit or encapsulated beneficial use of CCR material in accordance with subsection B shall be recoverable through a rate adjustment clause authorized by the Commission under the provisions of subdivision A 5 e of § 56-585.1, provided that (i) when determining the reasonableness of such costs the Commission shall not consider closure in place of the CCR unit as an option; (ii) the annual revenue requirement recoverable through a rate adjustment clause authorized under this section, exclusive of any other rate adjustment clauses approved by the Commission under the provisions of subdivision A 5 e of § 56-585.1, shall not exceed $40 million on a Virginia jurisdictional basis for the Commonwealth in any 12-month period, provided that any under-recovery amount of revenue requirements incurred in excess of $40 million in a given 12-month period, limited to the under-recovery amount and the carrying cost, shall be deferred and recovered through the rate adjustment clause over up to three succeeding 12-month periods without regard to this limitation, and with the length of the amortization period being determined by the Commission; (iii) costs may begin accruing on July 1, 2020, but no approved rate adjustment clause charges shall be included in customer bills until July 1, 2022; (iv) any such costs shall be allocated to all customers of the utility in the Commonwealth as a non-bypassable charge, irrespective of the generation supplier of any such customer; and (v) any such costs that are allocated to the utility's system customers outside of the Commonwealth that are not actually recovered from such customers shall be included for cost recovery from jurisdictional customers in the Commonwealth through the rate adjustment clause.

I. Any electric public utility subject to the requirements of this section may, without regard for whether it has petitioned for any rate adjustment clause pursuant to subdivision A 5 e of § 56-585.1, petition the Commission for approval of a plan for CCR unit closure at any or all of its CCR unit sites listed in subsection B. Any such plan shall take into account site-specific conditions and shall include proposals to beneficially reuse CCR from the sites if beneficial use is anticipated to reduce the costs allocated to customers. The Commission shall issue its final order with regard to any such petition within six months of its filing, and in doing so shall determine whether the utility's plan for CCR unit closure, and the projected costs associated therewith, are reasonable and prudent, taking into account that closure in place of any CCR unit is not to be considered as an option. The Commission shall not consider plans that do not comply with subsection B.

J. Nothing in this section shall be construed to require additional beneficial reuse of CCR at any active coal-fired electric generation facility if such additional beneficial reuse results in a net increase

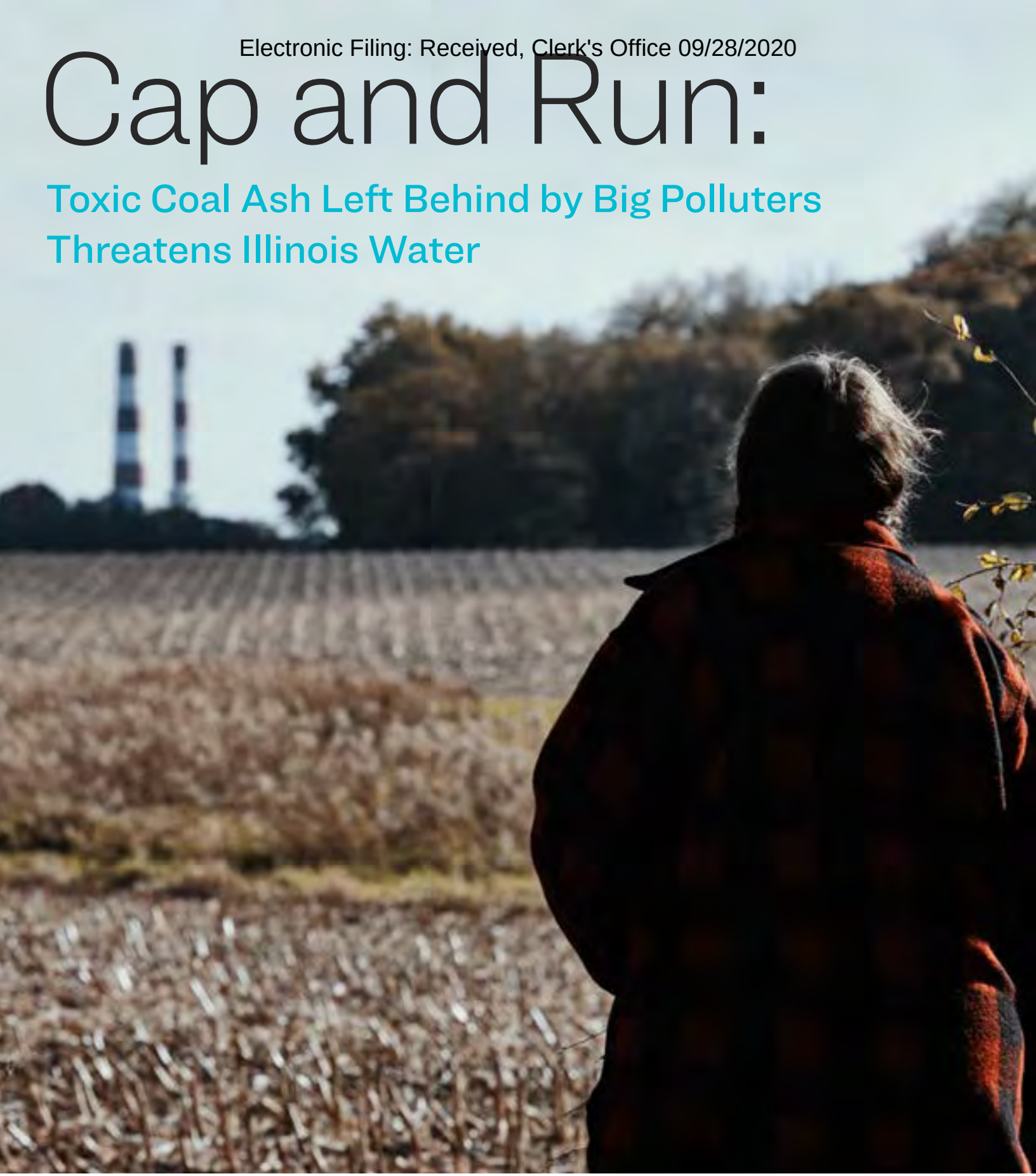
in truck traffic on the public roads of the locality in which the facility is located as compared with such traffic during calendar year 2019.

K. The Commonwealth shall not authorize any cost recovery by an owner or operator subject to the provisions of this section for any fines or civil penalties resulting from violations of federal and state law or regulation.

Exhibit 7

Cap and Run:

Toxic Coal Ash Left Behind by Big Polluters Threatens Illinois Water



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CONTENTS

EXECUTIVE SUMMARY

Illinois' coal-fired power plants, after decades of unsafe disposal of coal ash, have severely polluted the underlying groundwater. For the first time in 2018, utilities were forced to publicly report groundwater monitoring data on their websites because of new transparency requirements imposed by 2015 federal coal ash regulations. The Environmental Integrity Project (EIP), Earthjustice, Prairie Rivers Network, and Sierra Club, examined that data and determined that about 90 percent (22 of 24) of Illinois' reporting coal-fired power plants have contaminated groundwater with unsafe levels of one or more toxic pollutants.

These findings place Illinois at a crossroads: Will the State address the widespread pollution of its aquifers, and protect drinking water and nearby lakes and rivers, or will it continue to allow this toxic contamination to flow in perpetuity? Illinois began developing rules to protect against pollution from coal ash ponds in 2013, but those unfinished rules have sat abandoned for years, allowing pollution from those toxic ponds to continue to flow into rivers, lakes, and groundwater all around the State. Illinois must not wait any longer. It must take immediate action to protect families and waters from these dangerous dumps.

For decades, coal plant owners in Illinois operated disposed of millions of tons of toxic coal ash, primarily in unlined ponds, with little regulatory oversight by the Illinois Environmental Protection Agency (Illinois EPA) or the U.S. Environmental Protection Agency (EPA). Coal ash contains a brew of hazardous pollutants such as arsenic, boron, cadmium, chromium, lead, radium, selenium and more, which can severely harm human health, fish and wildlife. The levels of multiple toxic pollutants found at Illinois plants exceed levels that are safe for human consumption.

The contamination revealed by the groundwater data is severe. The data, released earlier this year pursuant to a 2015 EPA regulation known as the "coal ash rule," show:

- At NRG-subsidiary Midwest Generation's Waukegan Plant, on the shore of Lake Michigan, arsenic exceeds safe levels in groundwater monitoring wells by over two thousand times, boron is more than eleven times EPA's health threshold and more than sixteen times Illinois' drinking water standard, and chromium exceeds safe levels by more than four hundred and eighty times. Lithium, molybdenum, and sulfate also exceed safe levels many times over.

- At the Lincoln Stone Quarry on the banks of the Des Plaines River in Joliet – into which Midwest Generation dumped coal ash from its now-gas-fueled Joliet coal plants for decades – arsenic exceeds safe levels in groundwater monitoring wells by over twenty-three times, boron is seven times higher than EPA health thresholds, lithium exceeds safe levels by eight times, and molybdenum exceeds safe levels by eighteen times. Sulfate also exceeds safe levels, at fifty percent over EPA's health threshold.
- At Vistra subsidiary Dynegy's Hennepin coal plant, in the floodplain of the Illinois River downstream of Starved Rock State Park, arsenic and boron are more than three times higher than safe levels, and lithium reaches levels up to twelve times higher than what is safe. Other pollutants present at unsafe levels include cobalt, molybdenum, and selenium.
- At Dynegy's E.D. Edwards coal plant, located on the Illinois River just south of Peoria, arsenic in groundwater monitoring wells reaches nearly ten times safe levels, lead concentrations are eighteen times US EPA's drinking water standard, lithium is more than twenty times higher than safe levels, and cobalt is forty times higher than safe levels.
- At Midwest Generation's Powerton plant on the Illinois River just downstream of Peoria, arsenic exceeds safe levels by up to fifty times, and boron, cobalt and sulfate are also present at unsafe levels.
- At Dynegy's retired Vermilion coal plant on the Middle Fork of the Vermilion River – Illinois' only National Scenic River – upstream of the City of Danville, where ash-polluted groundwater is visibly seeping through the riverbank into the river, groundwater testing revealed boron at levels more than thirteen times EPA's health threshold and sulfate up to three times the EPA's health threshold.
- At Dynegy's now-shuttered Wood River coal plant, on the banks of the Mississippi River in Alton (Metro-east), arsenic in groundwater wells exceeds safe levels by six times, boron exceeds EPA health thresholds by twenty-three times, molybdenum is nearly nine times safe levels, and sulfate is nearly double EPA's health threshold.
- At Southern Illinois Power Cooperative's Marion plant, on the shores of Lake of Egypt in far-southern Marion, thallium (formerly used as rat poison) is up to one hundred and fifty times safe levels, and cobalt is seventy times higher than safe levels. Other pollutants present at unsafe concentrations include arsenic boron, lithium, and selenium.

Illinois' problems, however, extend far beyond the current contamination of groundwater at the power plant sites. Dynegy and Midwest Generation, LLC, which own the majority of the contaminated sites in the State, intend to close dozens of polluting ponds by leaving much of the coal ash in place (see Attachment A). Because these ash ponds are located close to lakes and rivers and are likely to continue to be inundated by groundwater, their contamination plumes will continue to flow into the State's waters. In addition, nearby many drinking water wells have not been tested or publicly posted, and it is possible that contamination may flow to communities who draw their drinking water from the affected aquifers and rivers.

The environmental impacts of contaminated groundwater come on top of the pollution that comes from permitted wastewater discharges at the same facilities. According to the most recent Clean Water Act permit applications on file with Illinois EPA, Illinois coal plants dump millions of pounds of pollution into lakes, rivers and streams each year, including over 300,000 pounds of aluminum, 600 pounds of arsenic, nearly 300,000 pounds of boron, over 200 pounds of cadmium, over 15,000 pounds of manganese, roughly 1,500 pounds of selenium, roughly 500,000 pounds of nitrogen, and nearly 40 million pounds of sulfate. These discharges bypass groundwater and go straight into surface water. The pollution discussed in this report migrates through groundwater, but often ends up in the same place. In the end, the two sources combine to create a massive load of toxic metals that harm aquatic life, make Illinois fish less safe to eat, and generally degrade Illinois' precious waterways.

As a result of the 2015 coal ash rule's monitoring and reporting requirements, we now know the severity of the coal plants' pollution of Illinois groundwater. Once groundwater is polluted, it is extremely difficult to stop the contamination unless the source of pollution is removed.

Currently, the owners of coal ash dumps in Illinois plan to leave much of that toxic coal ash in place. In the rare cases where they plan to excavate ash, the plan is often to add that ash to another neighboring coal ash dump that will be left in place. In short, in most cases, dangerous coal ash will be left where it now sits, continuing to pollute Illinois' waters for decades or centuries to come.

Our report presents a snapshot of the significant problem facing Illinois residents. Protection of the state's rivers, lakes and drinking water sources is within reach, if prudent steps are taken now by the State of Illinois to require companies to dig up coal ash dumped in unlined pits, clean up waters already polluted by coal ash, and strengthen safeguards against continued contamination from other coal ash dumps. This report includes specific recommendations to protect Illinois' waters. If the recommended actions are not taken, harm to Illinois' water resources will continue, and coal ash contamination will endanger the state's aquatic ecosystems and potentially the health of its residents for generations to come.

ASSESSMENT OF GROUNDWATER CONTAMINATION

KEY TAKEAWAYS

The Environmental Integrity Project and Earthjustice analyzed groundwater monitoring data from Illinois coal plants that became publicly available in March 2018 pursuant to the EPA's federal coal ash rule (also known as the coal combustion residuals rule or Coal Ash Rule).[1] Vistra subsidiary Dynegy, Inc., or NRG subsidiary Midwest Generation, LLC own most coal plants in Illinois. Dynegy and Midwest Generation provided groundwater data in a form that was difficult to understand, and consequently the data required technical and legal analysis that the groups recently completed. Groundwater data available for several coal plants not previously subject to the coal ash rule were also evaluated in this report.

We found unsafe groundwater contamination at **twenty-two of the twenty-four**[2] coal plants with available data. Each of the eighteen plants has unsafe levels of one or more of the following pollutants:

- **Arsenic,** which causes multiple types of cancer, neurological damage, and other health effects;
- **Boron,** which poses developmental risks to humans, such as low birth weight, and can result in stunted growth and plant toxicity in aquatic ecosystems;
- **Cadmium,** which can cause kidney and bone damage, is likely to cause cancer, and is toxic to aquatic life;
- **Chromium,** which can harm the liver and blood, and, in its hexavalent form, cause stomach cancer;
- **Cobalt,** which harms the heart, blood, thyroid, and other parts of the body;
- **Lead,** which causes severe neurological damage and is also categorized by the U.S. EPA as a "probable" carcinogen;
- **Lithium,** which presents multiple health risks including neurological impacts;
- **Manganese,** which is another known neurotoxin;
- **Molybdenum,** which damages the kidney and liver at high concentrations;
- **Selenium,** which harms fish and other aquatic organisms at very low concentrations and is bioaccumulative, and can also be toxic to humans;
- **Sulfate,** which causes diarrhea, and can lead to dangerous levels of dehydration in young children; and
- **Thallium,** which is associated with, among other things, reproductive and developmental risks.

We do not know the extent to which the tested groundwater is used for drinking, but regardless of use, these levels show that coal ash pollution has led to significant deterioration of the quality of groundwater – a resource that may one day be needed for drinking water if it is not already. Releases of these pollutants to the environment are particularly troublesome, because once they leach into groundwater the harmful pollutants do not go away or degrade over time.

As set forth in further detail below, Dynegy's closure plans for coal ash ponds in Illinois – as well as those for Southern Illinois Power Cooperative and City Water Power & Light – almost entirely entail dewatering and consolidation of coal ash on-site in preexisting ponds, then placement of a cover, or "cap," on top of the waste. Most of those ponds are unlined[3] and, under these closure plans, will remain unlined, leaving the coal ash exposed to groundwater. Further, merely "capping" these ash ponds means that these massive waste repositories will remain near rivers, lakes, streams and other water sources throughout the state – in perpetuity.

Although other ash pond owners, such as NRG-subsidiary Midwest Generation, plan to close many of their ash ponds by "removing" (excavating) the ash contained therein, doing so will only partially address the problem of coal ash at those sites. For many years, coal ash at coal-fired power plants was simply dumped into unregulated pits around the plants, or used as "fill" to flatten ground or build dikes for ash ponds in which more coal ash was dumped. Until those old ash dumps and ash fill are excavated, toxic pollutants in that ash will continue leaching into Illinois' waters indefinitely.

EXPLANATION OF THE GROUNDWATER DATA DISCUSSED IN THIS REPORT

In 2015, the U.S. EPA finalized a regulation known as the "coal ash rule" or "CCR rule"[4] or Coal Ash Rule in this report The coal ash rule establishes design and operating criteria for owners and operators of certain coal ash ponds and coal ash landfills, and requires closure and/or corrective action at units that fail to meet the criteria.

Most of the groundwater data discussed in this report is data that the coal ash rule requires owners of coal ash dumps to gather.[5] The coal ash rule requires groundwater monitoring in two phases. Phase one "detection" monitoring is intended to detect coal ash contamination by looking for early-warning coal ash indicators like boron and sulfate. If detection monitoring finds evidence of contamination, sites must initiate phase two "assessment" monitoring for a longer list of harmful constituents found in coal ash. If assessment monitoring yields further evidence of contamination – in the form of "statistically significant" increases in pollution in "downgradient" wells as compared to "upgradient" or "background" wells – then owners and operators are obligated to take steps to control the source of pollution (the coal ash), remediate groundwater, and in some cases close ash ponds.

An August 2018 decision by the U.S. Court of Appeals for the District of Columbia significantly changed the relationship between groundwater data and unlined coal ash ponds, which make up more than 90% of all ash ponds.[6] The court held that the rule's provisions allowing unlined coal ash ponds to continue operating unless and until monitoring reveals that the pond is polluting the groundwater do not adequately protect public health and the environment. The court sent the rule back to EPA to devise a different mechanism to protect against pollution from unlined ash ponds, leaving little, if any, room for EPA to do anything other than schedule the closure or "retrofit" (via installation of a protective liner)[7] of those unlined ash ponds.

The groundwater data required by the rule suffer from one important limitation, which has to do with the rule's focus on a subset of individual coal ash dumps at each site. In some cases, both detection monitoring and assessment monitoring will fail to show statistically significant downgradient contamination – even if it exists – because the "upgradient" or "background" wells against which downgradient wells are compared are themselves polluted by coal ash. Contamination in upgradient wells often comes from unregulated coal ash dumps, such as long-abandoned coal ash landfills.

In other cases the background well is affected by the regulated coal ash pond or landfill, and is not in fact upgradient at all. This happens when a well is located too close to a unit, and/or when the groundwater flows away from the pond or landfill in all directions (because of groundwater "mounding" or the rise and fall of nearby waterbodies). Sadly, there are instances in Illinois of ash dump owners – including NRG-subsidiary Midwest Generation – intentionally installing "background" wells in ash-contaminated areas, attempting to game the system to ensure that few, if any, statistically significant increases show up in their groundwater monitoring.

The solution to this problem is for Illinois to regulate coal ash contamination at the site level, rather than at the level of individual coal ash ponds or landfills. If groundwater at a coal plant shows coal ash contamination, the owner should be required to clean up that coal ash, regardless of whether the coal ash is in a pond or landfill regulated by

the coal ash rule. Illinois has the authority to go beyond the requirements of the coal ash rule, and should do so. Failure to address all sources of coal ash will fail to restore groundwater quality.

Notwithstanding the limitations of the groundwater data collected for the coal ash rule, the data remain vital to protecting Illinois' waters and all those who depend on them. First, under parts of the coal ash rule still standing after the recent court decision, the groundwater data continue to trigger "corrective action" – i.e., measures to stop further pollution and to clean up pollution that has already occurred – from coal ash landfills and lined coal ash ponds. The rule also requires remediation of groundwater at sites affected by contamination from unlined ponds, even if they are closed in response to the recent court decision. Moreover, the results – though limited and incomplete – give us the most comprehensive glimpse ever available of the vast damage Illinois' many coal ash dumps have done, and continue to do, to our waters. They reveal the urgency and severity of the problem and underscore that Illinois must act now to stop further contamination.

The extent of groundwater polluted by coal ash in Illinois is so great that, despite ash dump owners'

TABLE 1: HEALTH-BASED THRESHOLDS AND GROUNDWATER PROTECTION STANDARDS USED IN THIS REPORT

	Health-based threshold	Illinois' Class I Groundwater Quality Standards[12]	Presumptive groundwater protection standard under coal ash rule[13]
Boron	3 mg/L	2 mg/L	NA
Chloride	NA	200 mg/L	NA
pH	NA	Between 6.5 and 9[14]	NA
Sulfate	500 mg/L	400 mg/L	NA
Total Dissolved Solids (TDS)	NA	1,200 mg/L	NA
Antimony	6 µg/L	6 µg/L	6 µg/L
Arsenic	10 µg/L	10 µg/L	10 µg/L
Barium	2 mg/L	2 mg/L	2 mg/L
Beryllium	4 µg/L	4 µg/L	4 µg/L
Cadmium	5 µg/L	5 µg/L	5 µg/L
Chromium	100 µg/L	100 µg/L	100 µg/L
Cobalt	6 µg/L	1000 µg/L	6 µg/L
Fluoride	4 mg/L	4 mg/L	4 mg/L
Lead	15 µg/L	7.5 µg/L	15 µg/L
Lithium	40 µg/L	NA	40 µg/L
Manganese	0.3 mg/L	0.15 mg/L	NA
Mercury	2 µg/L	2 µg/L	2 µg/L
Molybdenum[15]	100 µg/L	NA	100 µg/L
Selenium	50 µg/L	50 µg/L	50 µg/L
Thallium	2 µg/L	2 µg/L	2 µg/L
Radium 226 and 228 combined	5 pCi/L	NA	5 pCi/L

** NA INDICATES THAT NO STANDARD HAS BEEN SET*

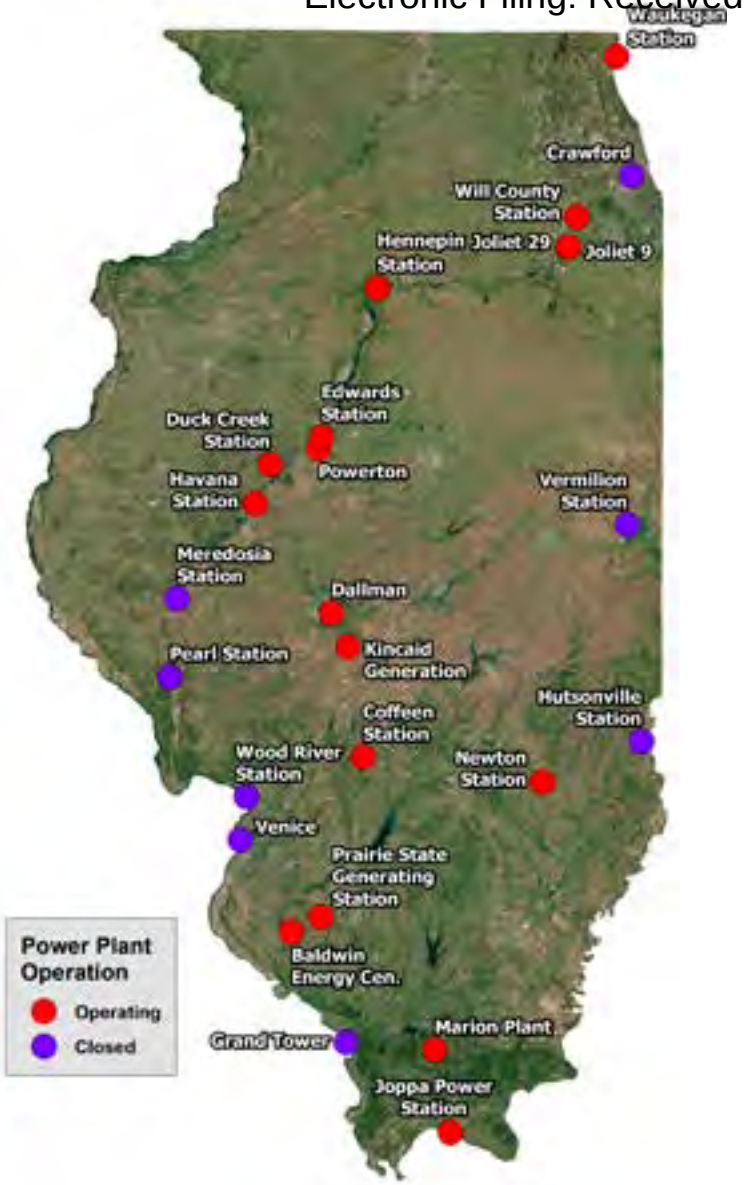


FIGURE 1: COAL ASH DUMPS IN ILLINOIS. RED PINS INDICATE AN ACTIVE COAL-FIRED POWER PLANT AT THE LOCATION; PURPLE PINS INDICATE RETIRED COAL PLANTS

attempts to game the system, assessment monitoring has been triggered at 25 coal ash dumps, including 2 lined ash ponds. That assessment monitoring will likely reveal significantly elevated levels of multiple coal ash pollutants, triggering the coal ash rule's requirement that owners of polluting ash landfills and lined ash ponds clean them up. Dynegy, Midwest Generation, and other owners of such landfills and lined ponds must follow through, quickly and comprehensively, with that cleanup. As for the dozens unlined coal ash ponds in the State, the extensive groundwater pollution revealed by owner companies' own monitoring reports prove that the D.C. Circuit court is right: unlined coal ash ponds pose a serious threat to our waters, and Illinois families need not wait for more monitoring to show that. Rather, Vistra subsidiary Dynegy, NRG subsidiary Midwest Generation, and all other owners of unlined ash ponds in the State should immediately take steps to stop the contamination leaking from those ponds before expanding toxic groundwater plumes become more difficult, or impossible, to manage.

METHODS USED IN THIS REPORT

This report evaluates groundwater data in three ways. First, we compare groundwater data to health-based thresholds in order to determine whether the groundwater is unsafe. This determination includes both up- and downgradient wells because, as discussed above, many purportedly "upgradient" wells are affected by coal ash, either from a neighboring unit (regulated or unregulated), or in some cases from the unit being monitored. The thresholds that we used are shown in Table 1. For the most part, they are equal to EPA's presumptive groundwater protection standards for each pollutant. Boron and sulfate do not have groundwater protection standards under the Coal Ash Rule because they are not part of the assessment monitoring program (yet).[8] For these two pollutants, we used EPA drinking water advisories.[9] Manganese is also not part of the assessment monitoring program, so we used the lifetime health advisory level.[10] We also compare groundwater data to Illinois' Class I groundwater quality standards, which apply to groundwater potentially suitable for drinking.

We consider a pollutant to be present at unsafe levels if the mean value exceeds the relevant health-based threshold.[11]

We also evaluated each detection monitoring pollutant to see whether downgradient concentrations are likely to exceed upgradient concentrations, producing a Statistically Significant Increase (SSI) and triggering assessment monitoring. In some cases, owners acknowledged detection monitoring SSIs, either explicitly or by posting a notice of assessment monitoring. We did not attempt to calculate SSIs – each site has selected its own statistical method and the calculations would have been too onerous – but in order to get a sense of whether an SSI was likely, we compared the mean value of each pollutant in each downgradient well to the maximum upgradient value for the coal ash unit in question. We assume that when a pollutant is, on average, elevated above the maximum upgradient result, then that pollutant is significantly elevated. Monitoring results for detection monitoring pollutants are shown in **Attachment B.**

Finally, we evaluated assessment monitoring pollutants to

get a sense of whether assessment monitoring is likely to find SSIs. Strictly speaking, each owner will be using new data for their assessment monitoring analyses (i.e., data collected after the eight initial samples required by the coal ash rule). But we assume that groundwater quality will not improve significantly between, for example, 2016 and 2018, and that the initial sampling results provide a reliable indicator of current groundwater quality. If upgradient data for a given pollutant are all below that pollutant's groundwater protection standard, then we assume that the pollutant's groundwater protection standard is equal to the presumptive standard shown in Table 1. In this case, any downgradient result greater than the presumptive standard is a likely SSI. If upgradient data tend to exceed the presumptive groundwater standard for a given pollutant, then we assume that the standard for that pollutant will be set at background. In this case, we assume there will be an SSI if a mean downgradient concentration exceeds the upgradient maximum for that coal ash unit. Monitoring results for assessment monitoring pollutants are shown in **Attachment C.**

In addition, where EIP's ashtracker database provides additional information, we summarize the data in **Attachment D** and in the text. The ashtracker data generally predate the Coal Ash Rule, were collected pursuant to state law requirements, and have variable coverage from site to site.

OVERVIEW OF COAL ASH IN ILLINOIS

Coal ash dumps litter the Land of Lincoln from north to south and east to west. There are ash dumps in Waukegan, in the State's farthest northern reaches, all the way down to Joppa, across the Ohio River from Kentucky. Dumps at Vermilion and Hutsonville approach Illinois' eastern border with Indiana, while coal ash dumps at Wood River and Venice menace our neighbors in Missouri in addition to Illinoisans.

These dumps are not local problems; they are harming groundwater, rivers, lakes and streams all across Illinois. As shown in Table 2, of 24 coal-fired power plants with coal ash ponds and landfills,[16] active or retired, in the state, 22 have groundwater that has been contaminated by coal ash.

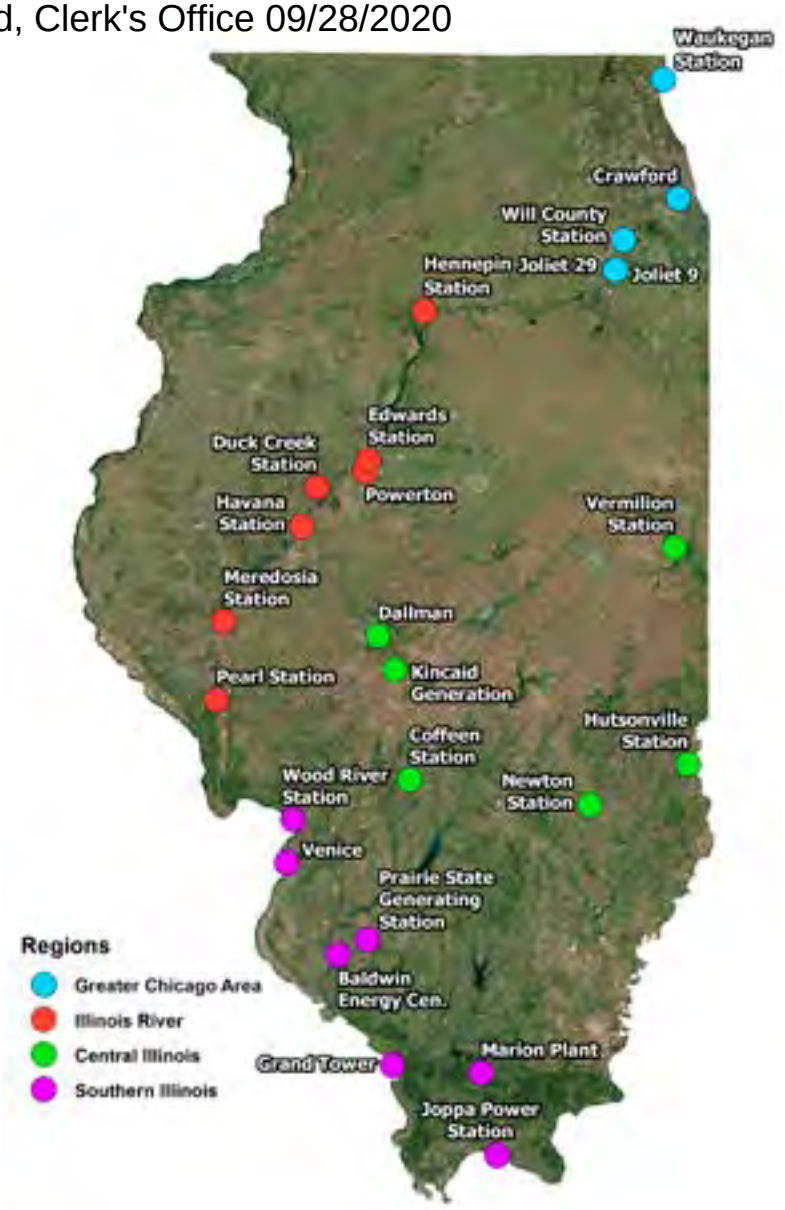


FIGURE 2: COAL ASH SITES IN THIS REPORT HAVE BEEN GROUPED INTO FOUR REGIONS – GREATER CHICAGO AREA, ILLINOIS RIVER, CENTRAL ILLINOIS, AND SOUTHERN ILLINOIS

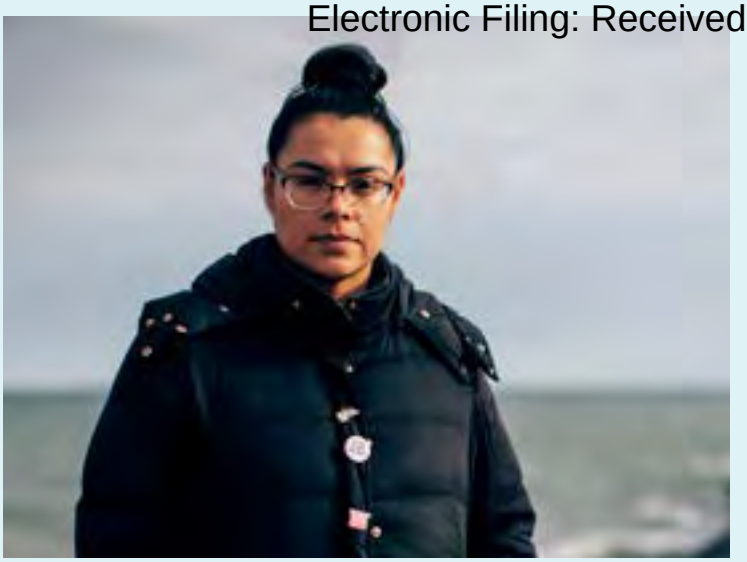
GROUNDWATER CONTAMINATION DATA AND COAL ASH RULE COMPLIANCE BY SITE

As noted above, coal ash contaminates Illinois' waters all across the state. For ease of review, we have divided our analysis of Illinois' coal ash dumps into four regions, depicted below: Greater Chicago Area, Illinois River, Central Illinois, and Southern Illinois.

TABLE 2: COAL ASH DUMPS ACROSS ILLINOIS HAVE RENDERED GROUNDWATER UNSAFE

Site	Pollutants with mean concentrations greater than health-based thresholds in one or more monitoring wells
Baldwin	Arsenic, Boron, Cobalt, Lithium, Manganese, Sulfate
Coffeen	Arsenic, Boron, Cadmium, Cobalt, Lead, Lithium, Manganese, Sulfate,
Crawford*	Cobalt, Manganese, Sulfate[17]
Dallman/Lakeside	Arsenic, Boron, Sulfate
Duck Creek	Arsenic, Boron, Cobalt, Lead, Lithium,
Edwards	Arsenic, Cobalt, Lead, Lithium,
Havana	-
Hennepin	Arsenic, Boron, Cobalt, Lithium, Molybdenum, Selenium
Hutsonville*	Boron, Manganese
Joliet 9	Arsenic, Boron, Lithium, Molybdenum, Sulfate
Joliet 29	Cobalt, Manganese, Sulfate
Joppa	Cobalt, Lead
Kincaid	-
Marion	Arsenic, Boron, Cobalt, Lithium, Selenium, Thallium
Merodosia*	Arsenic, Boron
Newton	Arsenic, Cobalt
Pearl*	Arsenic, Sulfate
Powerton	Arsenic, Boron, Cobalt, Manganese, Sulfate, Thallium
Prairie State	Arsenic, Cobalt, Lead
Venice*	Arsenic, Boron, Manganese, Sulfate
Vermilion*	Boron, Sulfate
Waukegan	Arsenic, Boron, Manganese, Chromium, Lithium, Molybdenum, Sulfate
Will County	Arsenic, Boron, Manganese, Sulfate
Wood River	Arsenic, Boron, Lithium, Molybdenum, Sulfate

**THESE POWER PLANTS WERE CLOSED BEFORE OCTOBER 2015 AND THEREFORE ARE CURRENTLY EXEMPT FROM THE COAL ASH RULE.*



"The state needs to step up and protect our residents, our children, and our waters. What could be more important than that?"

—DULCE ORTIZ, WAUKEGAN

"For the generations to come we want the water to be safe. As young adults in today's society we're going to have to inherit what is left behind."

—GIRL SCOUTS TROOP #6195, SPRINGFIELD

"I'm not interested in party affiliation, I am concerned with leaders who are interested in the quality of life for our children and grandchildren."

—JO LAKOTA, PEORIA

"This is not a partisan issue at all. This is people, caring about their environment"

—GERMAINE LIGHT, DANVILLE

REGION 1: GREATER CHICAGO AREA

Lake Michigan is the water body that has defined Chicago as we know it. Lake Michigan provides drinking water for the city, and gives Chicago its beautiful lakefront, a draw of Chicagoans and tourists alike. The Lake helps support a thriving fishing industry and is home to many species of fish and wildlife. Water from the Lake is pumped into the Chicago Canal and over to the Des Plaines River, where it makes its way down to the Gulf of Mexico. The Des Plaines River provides is more than a shipping corridor, providing recreation and habitat, including the Des Plaines River Canoe & Kayak Marathon.

These water bodies both share a common problem—coal ash. The Waukegan Generation Station is located on the shores of Lake Michigan with two ash ponds, and the Des Plaines River is home to three more power stations—Will County Generation Station and Joliet 9 & 29, all with documented groundwater impacts.

1. WAUKEGAN

NRG subsidiary Midwest Generation owns and operates the 60-year old Waukegan Generating Station in Waukegan, on the shore of Lake Michigan. In addition to two unlined ash ponds, the property has a large, unlined coal ash landfill immediately west of the ash ponds to which the coal ash rule does not apply.[18] One of the wells that Midwest Generation has designated as upgradient, MW-09, is located within the footprint of the onsite ash landfill, and almost certainly shows contamination from the landfill.

WAUKEGAN COAL ASH PONDS

Through contamination from the coal ash landfill and possibly the ash ponds, the groundwater at Waukegan

is unsafe, with dramatically elevated concentrations of multiple coal ash pollutants including arsenic, boron, chromium, lithium, molybdenum, and sulfate. Monitoring at the site has revealed extremely high concentrations of arsenic and chromium in one upgradient well, MW-14, which may be affected by coal ash and other sources of contamination. Arsenic levels in this well are hundreds of times greater than the groundwater standard, and chromium is up to 48 times its standard. Other pollutants are more directly related to coal ash contamination, including boron, lithium, molybdenum, and sulfate, which all exceed safe drinking water levels by large margins.

Additional data from EIP's ashtracker database cover a partially overlapping subset of onsite wells over the 2010-2015 time period. Two of these wells, MW-5 and MW-7, located between the ash landfill and the ash ponds, have the highest onsite concentrations of boron (30-50 mg/L) and sulfate (600-1,200 mg/L). The ashtracker data for Waukegan show unsafe levels of arsenic, boron, manganese, and/or sulfate in multiple wells. See Attachment D.

1.1 Compliance

Even though the purportedly upgradient wells at Waukegan are contaminated, the downgradient wells show elevated concentrations of two detection monitoring pollutants, fluoride and pH, which suggests that the ash ponds are leaking. See Attachment B.

Midwest Generation therefore should be performing assessment monitoring at Waukegan, though it appears that it has not taken that step. Once in assessment monitoring, the groundwater at Waukegan would probably not show any SSIs due to the fact that both up- and downgradient wells have high levels of certain assessment monitoring pollutants.

Yet the site is clearly being contaminated by coal ash, even if much of it is coming from the unregulated coal ash landfill. This highlights an important failure of the coal ash rule. Without addressing older coal ash disposal units, the rule cannot effectively restore groundwater affected by coal ash. Waukegan will only be fully cleaned up if Illinois steps up, on a site-specific basis or through statewide

TABLE 1.1: THE GROUNDWATER AT WAUKEGAN IS UNSAFE FOR DRINKING

Well	Pollutant	Health threshold	Illinois Class I Groundwater Quality Standard	Mean concentration	Maximum concentration
MW-09*	Arsenic (µg/L)	10	10	12.2	60.0
	Boron (mg/L)	3	2	19.3	35.0
	Lithium (µg/L)	40		74.1	94.0
	Molybdenum (µg/L)	100		58	630
MW-11*	Arsenic (µg/L)	10	10	702.2	1,100.0
	Boron (mg/L)	3	2	3.1	5.2
	Lithium (µg/L)	40		44.8	57.0
MW-14*	Arsenic (µg/L)	10	10	5,930	21,000
	Chromium (µg/L)	100	100	1,838	4,800
MW-01	Arsenic (µg/L)	10	10	90.5	150.0
MW-02	Boron (mg/L)	3	2	3.4	4.2
MW-04	Arsenic (µg/L)	10	10	12.1	36.0
MW-16	Arsenic (µg/L)	10	10	11.7	43.0
	Boron (mg/L)	3	2	4.5	9.5
	Lithium (µg/L)	40		42.4	130.0
	Sulfate (mg/L)	500	400	537	990

** UPGRADIENT WELLS*

rulemaking or legislation, to comprehensively address the coal ash contamination problem facing Illinois by regulating both active and inactive coal ash dumps.

1.2 The Closure Plans at Waukegan Are Unlikely to Stop the Contamination

Midwest Generation plans to close both ash ponds at Waukegan by removal. Removal of the ash from those two ponds is an important step towards limiting pollution at the site, but is not sufficient. Unless the ash is removed from the old, unregulated coal ash landfill at the site, that ash will continue to pollute Waukegan's groundwater—and Lake Michigan, the drinking water source for Chicago and many other cities and towns—for centuries to come.

2. WILL COUNTY

Midwest Generation also owns and operates the Will County Generating Station in Romeoville, approximately 20 miles southwest of Chicago. Squeezed between the Des Plaines River and the Chicago Sanitary and Ship Canal, the site has four unlined ash ponds, known as ponds 1N, 1S, 2S, and 3S. Midwest Generation stopped using ponds 1N and 1S around 2010 and claims—we believe incorrectly[19]—that they are not subject to the coal ash rule. Midwest Generation does monitor the groundwater around all four coal ash ponds, but for the coal ash rule only reports the results of the monitoring wells around the site's two active ash ponds, 2S and 3S.

An additional onsite source of contamination is a layer of coal ash between five and twelve feet thick buried in the ground along the eastern side of the ash ponds, partially saturated with groundwater.[20] One of the wells that Midwest Generation defines as upgradient is in fact installed within that fill layer (well MW-6).

Through contamination coming from the coal ash ponds and the coal ash fill at Will County, the groundwater has unsafe levels of several coal ash constituents, including arsenic, boron, and sulfate. Groundwater at the site has arsenic five times safe levels, boron more than twice the health threshold and over three times Illinois' standard, and sulfate one and a half times the health threshold and nearly twice Illinois' standard.

As mentioned above, Table 19.1 only reflects contamination around two of the four onsite ash ponds, 2S and 3S. EIP's ashtracker database includes data for wells around all four ponds, for the 2010-2015 time period. These data show unsafe levels of boron, manganese and sulfate in the groundwater around ponds 1N and 1S. See Attachment D.

2.1 Compliance

Since the wells that Midwest Generation identified as upgradient are affected by coal ash, there is virtually no statistical difference between up- and downgradient sampling results. This means that Midwest Generation probably did not find any SSIs during detection monitoring. This may explain why the site has not progressed to assessment monitoring. If Midwest Generation did conduct assessment monitoring at Will County, it would likely find SSIs for arsenic in wells MW-10 and MW-11, where mean concentrations are greater than the maximum upgradient concentration.

2.2 The Closure Plans at Will County Are Unlikely to Stop Contamination

Midwest Generation plans to close ash ponds 2S and 3S at Will County by removal. Removal of the ash from those two ponds is an important step towards limiting pollution at the site, but is not sufficient. Unless the ash is removed from the two other remaining coal ash ponds—1N and 1S—as well as the ash dumped as fill at

TABLE 2.1: THE GROUNDWATER AT WILL COUNTY GENERATING STATION IS UNSAFE FOR DRINKING

Well	Pollutant	Health threshold	Illinois Class I Groundwater Quality Standard	Mean concentration	Maximum concentration
MW-05*	Boron (mg/L)	3	2	4.3	6.1
	Sulfate (mg/L)	500	400	584	770
MW-06*	Boron (mg/L)	3	2	3.3	3.9
MW-10	Arsenic (µg/L)	10	10	20.2	50.0
	Boron (mg/L)	3	2	3.5	4.3

** UPGRADIENT WELLS*

the site, the remaining coal ash will continue to pollute the groundwater at the Will County site for centuries to come.

3. CRAWFORD

The former Crawford Generating Station in Little Village, Chicago is not subject to the coal ash rule, but EIP's Ashtracker database shows that the groundwater at Crawford is contaminated. Specifically, data from 2010-2012 show unsafe levels of cobalt, manganese, and sulfate in two onsite wells. See Attachment D. Illinois EPA reported in 2017 that the coal ash was "removed" (excavated) from Crawford's coal ash pond prior to Oct. 2015,[21] revealing that removal—the most protective closure option for most coal ash ponds—has been a viable option in Illinois. Groundwater data for Crawford post-closure by removal was not available to the authors of this report at the time of publication.

4. JOLIET 9

NRG subsidiary Midwest Generation operates two power plants on either side of the Des Plaines River in Joliet. The plant on the south side of the river is known as Joliet 9, and the plant on the north side of the River is known as Joliet 29 (see next section). Both were coal-fired power plants; since 2016, they burn natural gas. However, because they burned coal for decades, both have associated coal ash disposal sites. For purposes of the coal ash rule, Joliet 9 is sometimes referred to as the "Lincoln Stone Quarry," which is the name of the site's coal ash disposal unit.

The Lincoln Stone Quarry is, as the name suggests, an old quarry that is now filled with water and coal ash. This site is one of the most contaminated in Illinois, and due to local hydrology, the contamination from the quarry tends to flow south, away from the Des Plaines

TABLE 4.1: THE GROUNDWATER AT JOLIET 9 IS UNSAFE FOR DRINKING

Well	Pollutant	Health threshold	Illinois Class I Groundwater Quality Standard	Mean concentration	Maximum concentration
G30S	Arsenic (µg/L)	10	10	13.7	19.0
	Boron (mg/L)	3	2	6.4	11.0
	Molybdenum (µg/L)	100		291	450
G46S	Boron (mg/L)	3	2	6.3	7.9
	Lithium (µg/L)	40		104.1	130.0
	Molybdenum (µg/L)	100		994	1,800
G47S	Arsenic (µg/L)	10	10	108.0	230.0
	Boron (mg/L)	3	2	12.3	21.0
	Molybdenum (µg/L)	100		894	1,500
	Sulfate (mg/L)	500	400	565	780
G48S	Arsenic (µg/L)	10	10	31.7	46.0
	Boron (mg/L)	3	2	9.1	11.0
	Molybdenum (µg/L)	100		1,007	1,400
R08S	Boron (mg/L)	3	2	7.1	12.0
	Lithium (µg/L)	40		147.0	250.0
	Molybdenum (µg/L)	100		387	640
R32S	Boron (mg/L)	3	2	4.1	8.3
	Lithium (µg/L)	40		79.3	140.0
	Molybdenum (µg/L)	100		606	1,400

JOLIET 9 LINCOLN STONE QUARRY

River and towards residential areas. In order to prevent contamination of residential wells, Midwest Generation has had to install a pump-back system that extracts contaminated groundwater and pumps it back into the quarry.

The groundwater at Joliet 9 is unsafe, with arsenic at concentrations up to twenty-three times safe levels, boron at concentrations seven times the health threshold and more than ten times Illinois' standard, lithium at concentrations more than eight times safe levels, molybdenum at concentrations eighteen times safe levels, and unsafe levels of sulfate.

4.1 Compliance

There is no question that the groundwater near the Lincoln Stone Quarry is being contaminated by coal ash, and Midwest Generation predictably found detection monitoring SSIs and initiated assessment monitoring.

TABLE 4.2: WELLS WITH LIKELY ASSESSMENT MONITORING SSIs AT JOLIET 9

Downgradient well	Pollutants exceeding likely groundwater standard
G20S	Lithium
G30S	Arsenic, Molybdenum
G46S	Lithium, Molybdenum
G47S	Arsenic, Molybdenum
G48S	Arsenic, Molybdenum
R08S	Lithium, Molybdenum
R32S	Lithium, Molybdenum

During assessment monitoring, Midwest Generation already has found SSIs—i.e., statistically significant increases in contamination above groundwater protection standard—for arsenic, lithium and molybdenum.

4.2 The Closure Plan at Joliet 9 is Unlikely to Stop Contamination

Midwest Generation is currently planning to close the quarry by leaving the ash in place. That will do nothing to stop toxic contamination from continuing to flow out of the quarry. The closure plan says nothing about whether, or for how long, the system currently in place to pump contaminated groundwater moving toward residential areas back into the quarry will continue to operate. Even if that pumping system remains in operation, the monitoring results make clear that it is not stopping contamination from moving offsite. In short, unless the coal ash is excavated from the Lincoln Stone Quarry, it will continue to pollute the groundwater both onsite and offsite for centuries to come.

JOLIET 29 COAL ASH PONDS

5. JOLIET 29

Midwest Generation operates the Joliet 29 station on the north side of the Des Plaines River in Joliet. The Joliet 29 property includes three ash ponds and two ash landfills, but the only unit covered by the Coal Ash Rule (according to Midwest Generation) is a single ash pond, Ash Pond 2.[22]

Groundwater monitoring in the four wells around Ash Pond 2 has shown unsafe levels of cobalt in one well (well MW-04), averaging 7.9 µg/L and ranging as high as 16 µg/L. These wells are unlikely to show detection monitoring SSIs, and Midwest Generation has not initiated assessment monitoring at the site.

EIP's Ashtracker database includes more wells (eleven) surrounding all three onsite ash ponds, and covers the 2010-2015 time period (see Attachment D). The additional data show unsafe levels of cobalt in wells MW-8 and MW-9, located near Ash Pond 3. Well MW-9 also has unsafe levels of manganese and sulfate.

There are no groundwater wells near the old, onsite coal ash landfills at Joliet 29, but these units may also be contaminating the groundwater or Des Plaines River. These unregulated old landfills underscore the need for Illinois to take action to investigate the scope and severity of contamination from old coal ash dumps and ensure those old dumps are cleaned up.

REGION 2: ILLINOIS RIVER

Illinois' namesake river is a destination for recreational paddlers and home to abundant wildlife, in addition to being a major conduit for barge traffic. The Illinois River system hosts a relatively high diversity of aquatic species, with approximately 35 mussel species and 115 fish species found in and around its waters. Many of these species require both riverine and floodplain habitat as part of their life cycle. The floodplain is home to many wildlife refuges, which provide a much needed sliver of habitat in a transformed landscape.

The Illinois River has more Illinois power plants on its banks and in its floodplain than any other river in the state. Along the river is Hennepin Power Station, Edwards Plant, Powerton, Duck Creek, Havana, and the closed Meredosia Station and Pearl Station. One of these wildlife areas, the Donnelley Wildlife Area, is directly adjacent to the coal ash at the Hennepin Power Station, and many other wildlife areas are not too far upstream or downstream from coal ash ponds.

6 DUCK CREEK

Vistra subsidiary Dynegy[23] owns and operates the Duck Creek Power Station, located about 25 miles southwest of Peoria and adjacent to the Rice Lake Fish and Wildlife Area. Duck Creek has four ash ponds and an ash landfill. The ash pond located closest to the power plant is a small Bottom Ash Basin. Just north of the plant are two larger, inactive fly ash ponds, Ash Pond 1 and Ash Pond 2. Dynegy has not yet posted any groundwater monitoring data for these ponds. A fourth ash pond, known as the Gypsum Management Facility (GMF) pond, is located

DUCK CREEK LANDFILL AND GMF POND

TABLE 6A: THE GROUNDWATER AT DUCK CREEK IS UNSAFE FOR DRINKING

Well	Pollutant	Health threshold	Illinois Class I Groundwater Quality Standard	Mean concentration	Maximum concentration
BA06*	Boron (mg/L)	3	2	3.0	3.9
	Cobalt (µg/L)	6	1000	17.3	37.0
G06S	Arsenic (µg/L)	10	10	18.8	74.0
	Cobalt (µg/L)	6	1000	35.5	130.0
	Lead (µg/L)	15	7.5	83.5	340.0
	Lithium (µg/L)	40		85.0	410.0
G09S	Cobalt (µg/L)	6	1000	11.3	42.0
	Lead (µg/L)	15	7.5	27.4	100.0

* UPGRADIENT WELL

about one mile north of the other two ponds and has a distinct network of monitoring wells. The Duck Creek coal ash landfill is even further north and it also has a distinct groundwater monitoring network.

The ash ponds at Duck Creek Power Station collectively store over 10 million cubic yards of coal ash. The ponds sit adjacent to the Duck Creek Cooling Water Lake, which drains into the Illinois River.

The groundwater around these disposal areas has unsafe levels of multiple pollutants. Wells downgradient from the coal ash landfill have unsafe levels of arsenic, cobalt, lead, and lithium, in some cases more than twenty times higher than safe levels. One well that Dynegy has identified as

TABLE 6.2: WELLS WITH LIKELY ASSESSMENT MONITORING SSIs AT DUCK CREEK

Downgradient well	Pollutants exceeding likely groundwater standard
GMF POND	
G57S	Antimony
LANDFILL	
G06S	Antimony, Arsenic, Beryllium, Cadmium, Chromium, Cobalt, Lead, Lithium, Radium, Thallium
G09S	Arsenic, Beryllium, Cadmium, Chromium, Cobalt, Lead, Radium
G12S	Antimony, Beryllium, Cadmium, Cobalt, Thallium
G15S	Cobalt

DUCK CREEK BOTTOM ASH POND DETAIL MAP

DUCK CREEK COAL ASH PONDS

upgradient of the bottom ash basin,[24] well AW-06, has unsafe levels of both boron and cobalt. The high boron concentration—nearly twice Illinois' standard—together with relatively high concentrations of sulfate and total dissolved solids, suggest that groundwater at the well has been polluted by coal ash.[25]

6.1 Compliance

Dynegy has not posted notices of assessment monitoring for any of the Duck Creek coal ash units. The available data suggest that Dynegy should have found detection monitoring SSIs for calcium and total dissolved solids at the GMF pond, and for calcium and chloride at the landfill. Once in assessment monitoring, Dynegy will likely find SSIs for multiple pollutants, particularly at the landfill, and will have to take corrective action.

6.2 The Closure Plan for Duck Creek Is Unlikely to Stop Contamination

With the exception of the Bottom Ash Basin, Dynegy intends to close in place all the coal ash ponds at the Duck Creek Power Station. The coal ash in the Bottom Ash Basin, which is much smaller than the other ponds, will be excavated and placed in other ponds at the site. Dynegy has already submitted closure plans for Ash Pond 1 and Ash Pond 2 to the Illinois EPA and is awaiting approval. Capping ash ponds does not stop groundwater from flowing though those ponds, picking up toxic contaminants in the process. Duck Creek's ash ponds put the Illinois River, as well as the aquatic ecosystem of the Rice Lake State Fish and Wildlife Area and those who fish and hunt there, at risk.

7 EDWARDS

Dynegy monitors groundwater around a single unlined ash pond at the Edwards Power Station in Bartonville, just downstream from Peoria and immediately upstream of Pekin. The coal ash pond was built in the floodplain of the Illinois River and the ash in the pond is up to 71 feet thick, at least 10 feet of which is saturated with groundwater.[26]

TABLE 7.1: THE GROUNDWATER AT EDWARDS IS UNSAFE FOR DRINKING

Well	Pollutant	Health threshold	Illinois Class I Groundwater Quality Standard	Mean concentration	Maximum concentration
AW-05	Arsenic (µg/L)	10	10	12.7	29.0
	Cobalt (µg/L)	6	1000	16.5	54.0
	Lithium (µg/L)	40		48.8	120.0
AW-06	Cobalt (µg/L)	6	1000	6.6	19.0
AW-09	Arsenic (µg/L)	10	10	18.2	46.0
	Cobalt (µg/L)	6	1000	28.4	93.0
	Lead (µg/L)	15	7.5	27.4	110.0
	Lithium (µg/L)	40		80.8	260.0
AW-10	Arsenic (µg/L)	10	10	23.2	97.0
	Cobalt (µg/L)	6	1000	42.0	250.0
	Lead (µg/L)	15	7.5	42.8	270.0
	Lithium (µg/L)	40		174.8	850.0
AW-11	Arsenic (µg/L)	10	10	12.5	25.0
	Cobalt (µg/L)	6	1000	20.1	46.0
	Lead (µg/L)	15	7.5	20.9	50.0
	Lithium (µg/L)	40		75.3	140.0

TABLE 7.2: WELLS WITH LIKELY ASH POND GROUNDWATER POLLUTION EXCEEDANCES

Downgradient well	Pollutants exceeding likely groundwater standard
AW-05	Arsenic, Cobalt, Lead, Lithium
AW-06	Arsenic, Cobalt, Lead, Lithium
AW-09	Arsenic, Chromium, Cobalt, Lead, Lithium, Radium
AW-10	Arsenic, Barium, Chromium, Cobalt, Lead, Lithium, Radium, Thallium
AW-11	Arsenic, Barium, Cobalt, Lead, Lithium, Radium

EDWARDS ASH POND

The groundwater at Edwards is unsafe. All of the downgradient monitoring wells at the Edwards ash pond have unsafe levels of arsenic, cobalt, lead, and/or lithium. These wells also show clear evidence that coal ash is the source of the contamination, with elevated levels of boron, sulfate, and other detection monitoring pollutants. Arsenic is present in groundwater at concentrations approaching ten times the safe level; lead is present at concentrations eighteen times EPA's health threshold and thirty-six times Illinois' standard; lithium concentrations exceed twenty times the safe level; and cobalt concentrations exceed 40 times the safe level.

7.1 Compliance

Dynegy has initiated assessment monitoring at Edwards, and is likely to find many SSIs for multiple pollutants:

7.2 The Closure Plan at Edwards is Unlikely to Stop Contamination

Despite clear evidence of contamination, Dynegy is planning to close this ash pond by leaving the ash in place.[27] Since the ash is in constant contact with groundwater, contamination will continue indefinitely after closure, endangering users of that groundwater and the Illinois River in this highly populated area.

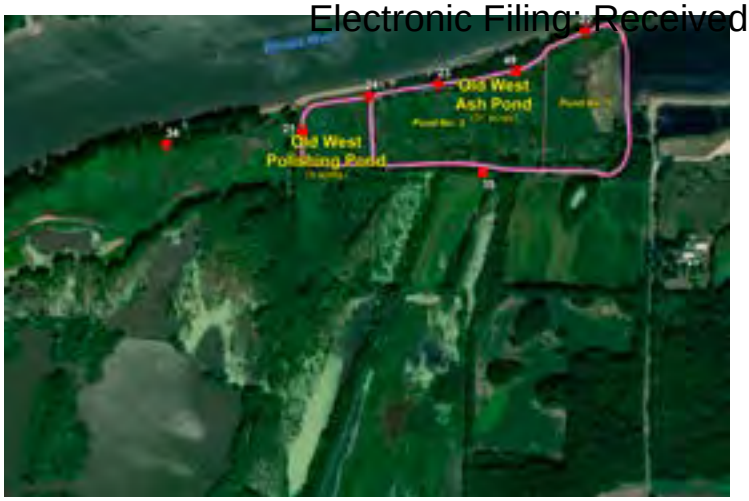
HAVANA COAL ASH POND

8 HAVANA

Dynegy's Havana Power Station in Havana, located on the Illinois River just downstream from the Emiquon Preserve and National Wildlife Refuge, has one regulated, unlined coal ash pond known as the "East Ash Pond." Dynegy is planning to close the pond by leaving the ash in place. The groundwater at Havana does not currently show evidence of being unsafe, as the average concentrations of all measured pollutants are below their respective health-based thresholds. The groundwater does show signs of coal ash impacts, however, with elevated concentrations of boron and/or sulfate in multiple wells, and Dynegy has initiated assessment monitoring at the site. Once in assessment monitoring, Dynegy may find SSIs for cobalt in well HAMW-40 (where cobalt has been measured at up to 11 µg/L, a concentration that exceeds safe levels).

9 HENNEPIN

Dynegy owns and operates the Hennepin Power Station in Hennepin, Illinois, which abuts the Illinois River about 15 miles downstream from Starved Rock State Park. Dynegy is currently monitoring several coal ash dumps at Hennepin pursuant to the coal ash rule, including "Ash Pond 2," the "East Ash Pond," the "Old West Ash Pond and Old West Polishing Pond," and a landfill immediately east of Ash Pond 2. The company has only posted a liner assessment for the East Ash Pond (which is unlined), but the Illinois EPA's record shows that the western ash



HENNEPIN WEST COAL ASH PONDS

HENNEPIN EAST COAL ASH PONDS

TABLE 9.1: THE GROUNDWATER AT HENNEPIN IS UNSAFE FOR DRINKING

Well	Pollutant	Health threshold	Illinois Class I Groundwater Quality Standard	Mean concentration	Maximum concentration
03R	Molybdenum (µg/L)	100		215	266
05R	Lithium (µg/L)	40		55.9	64.8
8*	Cobalt (µg/L)	6		12.0	28.5
08D*	Cobalt (µg/L)	6		13.7	38.5
18S	Boron (mg/L)	3	2	5.3	10.8
	Lithium (µg/L)	40		86.8	130.0
	Molybdenum (µg/L)	100		339	414
	Selenium (µg/L)	50	50	62	117
21	Boron (mg/L)	3	2	4.2	4.6
22	Boron (mg/L)	3	2	5.8	6.7
	Lithium (µg/L)	40		57.4	64.1
	Molybdenum (µg/L)	100		176	206
23	Boron (mg/L)	3	2	7.5	8.5
24	Arsenic (µg/L)	10	10	30.3	34.3
35	Boron (mg/L)	3	2	7.1	11.1
40S	Lithium (µg/L)	40		63.8	71.9
	Molybdenum (µg/L)	100		104	129
48	Lithium (µg/L)	40		43.6	48.9
	Molybdenum (µg/L)	100		108	130

TABLE 9.2: WELLS WITH LIKELY ASSESSMENT MONITORING SSIs AT HENNEPIN

Downgradient well	Pollutants exceeding likely groundwater standard
ASH POND 2	
03R	Molybdenum
18S	Lithium, Molybdenum, Selenium
WEST ASH POND	
22	Lithium, Molybdenum
LANDFILL	
48	Lithium, Molybdenum
05R	Lithium
40S	Lithium, Molybdenum

ponds are also unlined.[28] The west ash ponds sit in the floodplain of the Illinois River. Maps from FEMA show the ash partially underwater in the 100-year flood, and fully inundated in the 500-year flood.

The groundwater at Hennepin is unsafe. Dynegy's monitoring has revealed arsenic and boron in concentrations more than three times safe levels; lithium at concentrations nearly twelve times the safe level, and unsafe levels of cobalt, molybdenum and selenium.

9.1 Compliance

Dynegy has initiated assessment monitoring at all three ash ponds. Once in assessment monitoring, Dynegy is likely to find SSIs for lithium, molybdenum and selenium at Ash Pond 2, and for lithium and molybdenum at the West Ash Pond. The Hennepin landfill should also be in assessment monitoring, as the wells downgradient of the landfill show elevated concentrations of boron, fluoride, and pH. Dynegy has not initiated assessment monitoring at the landfill (or at least it has not posted a notice of assessment monitoring). If and when it does initiate assessment monitoring, it is likely to find SSIs for lithium and molybdenum, which would trigger corrective action.

9.2 The Closure Plans at Hennepin Are Unlikely to Stop Contamination

Dynegy is planning to close everything but the Old West Polishing Pond at Hennepin by leaving the ash in place. Capping in place allows the widespread groundwater contamination to continue indefinitely and maintains the threat that the ash will be inundated in ever-more-frequent flooding.

10 MEREDOSIA

The former Meredosia Generation Station in Meredosia, Illinois, just over 40 miles west of Springfield as the crow flies, has ash ponds that were excluded from regulation under the coal ash rule. There are three unlined coal ash ponds on site. The Fly Ash Pond and Bottom Ash Pond were both in operation until the power station closed in 2011. There is also an "Old Ash Pond" on site,[29] about which there is little publicly available information.

Groundwater monitoring between 2010 and 2016 shows elevated levels of arsenic and boron in multiple wells, both up to twenty times the health based thresholds. Modeling shows that the groundwater flows into the Illinois River, discharging 15,000 lbs of boron and 112 lbs of arsenic into the river annually.[30]

10.1 The Closure Plan at Meredosia is Unlikely to Stop Contamination

Ameren, the owner of the power station, submitted a closure plan to the Illinois EPA in 2016. Their plan, which was approved, was to close their coal ash ponds by excavating the Bottom Ash Pond into Fly Ash Pond, and capping that in place. Ameren began closure of the ponds in February 2018. Closure in place does not stop groundwater from flowing through unlined ash ponds, picking up toxic contamination in the process, and the location of those ash ponds in the floodplain of the Illinois River makes leaving toxic ash there all the more precarious. Illinois must take action to ensure that toxic ash from Meredosia's two unlined impoundment does not threaten Illinois' namesake river.

The former Pearl Generation Station in Pearl, Illinois, just over 50 miles southwest of Springfield as the crow flies, is not subject to the Coal Ash Rule. However, a notice of groundwater violation issued by the Illinois EPA in 2012 shows contaminated groundwater. Specifically, data from 2010 show consistently unsafe levels of boron, manganese and sulfate in several onsite wells. Illinois EPA reported in 2017 that the unlined coal ash impoundment at Pearl was "closed with [a] cover[ ]" before October 2015, but closure by capping does not prevent continued groundwater flow through ash left in unlined impoundments. Groundwater data for Pearl post-closure by cap was not available to the authors of this report at the time of publication.

TABLE 10.1: THE GROUNDWATER AT MEREDOSIA IS UNSAFE FOR DRINKING

Well	Pollutant	Health threshold	Illinois Class I Groundwater Quality Standard	Mean concentration	Maximum concentration
APW-2	Boron (mg/L)	3	2	3.0	3.9
	Manganese (mg/L)	0.3	0.15	0.82	0.99
APW-3	Arsenic (µg/L)	10	10	196	310
	Boron (mg/L)	3	2	30	46
	Manganese (mg/L)	0.3	0.15	0.46	1.2
APW-4	Arsenic (µg/L)	10	10	60	180
	Boron (mg/L)	3	2	3.6	6.3
	Manganese (mg/L)	0.3	0.15	3.0	5.4

11 PEARL

The former Pearl Generation Station in Pearl, Illinois, just over 50 miles southwest of Springfield as the crow flies, is not subject to the Coal Ash Rule. However, a notice of groundwater violation issued by the Illinois EPA in 2012[31] shows contaminated groundwater. Specifically, data from 2010 show consistently unsafe levels of boron, manganese and sulfate in several onsite wells. Illinois EPA reported in 2017 that the unlined coal ash impoundment at Pearl was "closed with [a] cover[]" before October 2015,[32] but closure by capping does not prevent continued groundwater flow through ash left in unlined impoundments. Groundwater data for Pearl post-closure by cap was not available to the authors of this report at the time of publication.

12 POWERTON

Midwest Generation operates the Powerton Generating Station in Pekin. The site has several active and inactive ash ponds, all of which are unlined. For purposes of the coal ash rule, Midwest Generation reports the results of a multi-unit groundwater monitoring network surrounding three of these ash ponds. Coal ash is not limited to the ash ponds at Powerton, however; coal ash has been dumped as "fill" all across the site, up to 24 feet deep, and often below the water table.[33]

Due to some combination of the coal ash ponds and the extensive coal ash fill at the site, the groundwater at Powerton is unsafe. Midwest Generation's monitoring revealed arsenic at concentrations up to fifty times safe levels in addition to unsafe levels of boron, cobalt and sulfate.

Additional data are available on EIP's ashtracker website, covering sixteen wells over the 2010-2017 time period. Several of the contaminated wells from the ashtracker database are not included in Midwest Generation's Coal Ash Rule reporting, including wells MW-6, 7, 13, and 14. The ashtracker data show unsafe levels of arsenic, boron, cobalt, manganese, sulfate, and thallium.
See Attachment D.

12.1 Compliance

There is no doubt that the exceedingly high concentrations of dangerous pollution at Powerton are a result of coal ash. However, in a clear attempt to avoid cleaning up its act and stopping further pollution, Midwest Generation has manipulated the groundwater monitoring at the site. The company inaccurately described four wells as "upgradient," and ignored the one truly upgradient well at the site, in a transparent

POWERTON ASH PONDS

Well	Pollutant	Health threshold	Illinois Class I Groundwater Quality Standard	Mean concentration	Maximum concentration
MW-09*	Boron (mg/L)	3	2	3.2	4.5
MW-10*	Cobalt (µg/L)	6	1000	6.3	8.0
MW-11	Arsenic (µg/L)	10	10	68.6	290.0
MW-12	Arsenic (µg/L)	10	10	173.7	500.0
	Sulfate (mg/L)	500	400	529	650
MW-15	Arsenic (µg/L)	10	10	27.7	130.0
	Sulfate (mg/L)	500	400	740	1,400
MW-17	Arsenic (µg/L)	10	10	228.4	410.0
	Sulfate (mg/L)	500	400	748	960
MW-19*	Boron (mg/L)	3	2	3.7	4.7

** UPGRADIENT WELLS*

effort to obscure the widespread onsite contamination. In 2012, Illinois EPA told Midwest Generation that wells MW-1, MW-9 and MW-10 could not be used as upgradient wells because they are "within an area of impacted groundwater from historical ash-related handling activities."[34] Midwest Generation then installed a new upgradient well, MW-16.[35] Yet, for the groundwater monitoring the company is performing under the coal ash rule, Midwest Generation is ignoring well MW-16 and relying on the three previously rejected, contaminated wells as "upgradient" (along with a new well, MW-19, that also shows clear evidence of coal ash contamination).

Since Midwest Generation is using contaminated wells as upgradient wells, statistical comparisons are less likely to result in findings that coal ash pollution in downgradient wells is "significantly" more than the contamination in upgradient wells, triggering closure. Although Midwest Generation has posted a notice of assessment monitoring stating that its analysis "yielded" SSIs for "several Appendix III constituents across multiple downgradient well locations,"[36] those SSIs are almost certainly fewer than would have been found if Midwest Generation had properly identified uncontaminated upgradient wells. By manipulating their groundwater monitoring, Midwest Generation is attempting to thwart taking responsibility to stop contaminating and clean up Illinois' waters.

When Dynegy begins assessment monitoring at Powerton, it is likely to find SSIs for several dangerous pollutants, including arsenic, cadmium, lithium, molybdenum, radium, and thallium.

TABLE 12.2: WELLS WITH LIKELY ASSESSMENT MONITORING SSIs AT POWERTON

Downgradient well	Pollutants exceeding likely groundwater standard
MW-11	Arsenic
MW-12	Arsenic, Cadmium
MW-15	Arsenic, Lithium
MW-17	Arsenic, Molybdenum, Radium, Thallium

12.2 The Closure Plans at Powerton Are Unlikely to Stop Contamination

Midwest Generation plans to close the Ash Surge Basin and the Bypass basin by removal. It also plans to close the northern portion of a no-longer-used ash pond, the Former Ash Basin, by removal—but that ash simply will be moved to the southern portion of the Former Ash Basin, which the company plans to close in place. Removal of the ash from the Ash Basin, Bypass Basin, and northern portion of the Former Ash Basin is an important step towards limiting pollution at the site, but is far from sufficient. Unless the coal ash is removed from the large southern portion of the Former Ash Basin and from where it was dumped as "fill" all across the site, the groundwater at Powerton—and thus the Illinois River, into which some of that groundwater flows—will continue to be fouled by coal ash pollution for centuries.

REGION 3: CENTRAL ILLINOIS

Central Illinois is home to many man-made lakes, including Lake Springfield, Sangchris Lake, Coffeen Lake, and Newton Lake, among others. These impounded waters and their adjacent land provide recreational opportunities, drawing in boaters, fishers, hunters, campers and folks who enjoy spending time near water. Some also provide drinking water to nearby communities. The waters are also home to a vast array of wildlife.

However, all of these lakes are also home to power plants, built on the edge of the lake for access to cooling water. In some cases, the lake itself was built to provide cooling water for the plant. The coal ash produced at the plants is stored in ash ponds next to the lakes. Coffeen Power Station on Coffeen Lake, Dallman Station on Lake Springfield, Kincaid Generating Station on Sangchris Lake, and Newton Power Station on Newton Lake collectively store over thirty million cubic yards of ash on the banks of their lakes.

The Central Illinois region is also home to Illinois's only National Scenic River, the Middle Fork of the Vermilion River. The Middle Fork is home to 24 State threatened or endangered species and draws multitudes of river enthusiasts who come to enjoy its scenic, meandering flow. The outfitter Kickapoo Adventures puts over 10,000 people on the river in canoes, kayaks and tubes each year. The Vermilion River flows into the Wabash River, which forms a significant portion of the divide between Illinois and Indiana.

These rivers are home to the Vermilion Power Station and Hutsonville Station. The coal ash pits at the Vermilion Power Station sit on the banks of the Middle Fork, continuously seeping contamination into the river. The Hutsonville Station is closed, but the coal ash continues to impact groundwater that flows towards the Wabash River.

13 COFFEEN

The Coffeen Power Station in Coffeen, Illinois, just over 45 miles south of Springfield, has five regulated coal ash dumps including four ash ponds (Ash Pond 1, Ash Pond 2, the "GMF Pond," and the "GMF Recycle Pond"), and a 21-acre ash landfill. Collectively, these dumps store five million cubic yards of coal ash, the size of roughly 1,500 Olympic sized swimming pools. Although Ash Pond 2 ceased to be used and a clay cap was placed over it in

Well	Pollutant	Health threshold	Illinois Class I Groundwater Quality Standard	Mean concentration	Maximum concentration
G215	Arsenic (µg/L)	10	10	29.2	110.0
G279	Sulfate (mg/L)	500	400	591	870
G301	Sulfate (mg/L)	500	400	730	800
G303	Lithium (µg/L)	40		54.3	76.0
	Sulfate (mg/L)	500	400	784	870
G304	Cobalt (µg/L)	6	1000	7.3	14.0
	Sulfate (mg/L)	500	400	1,033	1,100
G307	Cobalt (µg/L)	6	1000	10.0	34.0
	Lead (µg/L)	15	7.5	15.1	68.0
	Sulfate (mg/L)	500	400	1,046	1,300
G401	Arsenic (µg/L)	10	10	20.2	68.0
	Boron (mg/L)	3	2	3.7	4.4
	Cadmium (µg/L)	5	5	5.4	19.0
	Cobalt (µg/L)	6	1000	280.0	360.0
	Lead (µg/L)	15	7.5	30.2	98.0
	Lithium (µg/L)	40		79.4	160.0
	Sulfate (mg/L)	500	400	2,500	3,900
G402	Arsenic (µg/L)	10	10	13.9	27.0
	Boron (mg/L)	3	2	6.4	7.4
	Cobalt (µg/L)	6	1000	11.4	19.0
	Lithium (µg/L)	40		42.3	57.0
	Sulfate (mg/L)	500	400	1,023	1,200
G404	Boron (mg/L)	3	2	3.0	5.8
G405	Boron (mg/L)	3	2	13.3	17.0
	Sulfate (mg/L)	500	400	1,453	1,800

the mid-1980s,[37] it still contains coal ash to a depth of roughly 28 feet and a report from Dynegy indicates that seeps from Ash Pond 2 discharge 11,000 pounds of boron into Coffeen Lake or its tributary each year.[38]

The groundwater at Coffeen is unsafe. Dynegy's groundwater monitoring revealed multiple coal ash pollutants at dangerous concentrations. These include cobalt at up to sixty times the safe level, arsenic at up to eleven times safe levels, and unsafe levels of boron, cadmium, lead, lithium, and sulfate. Dangerous pollution is not new to Coffeen: in 2012, Illinois EPA issued then-owner Ameren a violation notice for groundwater contamination above limits for coal ash pollutants boron, manganese, sulfate and total dissolved solids. Additional groundwater monitoring data from 2010-2012 show

TABLE 13.2: WELLS WITH CCR POLLUTANTS EXCEEDING GROUNDWATER STANDARDS

Downgradient well	Pollutants exceeding likely groundwater standard
ASH POND 1	
G303	Arsenic, Lithium
G304	Cobalt
G307	Arsenic, Chromium, Cobalt, Lead, Lithium
ASH POND 2	
G401	Arsenic, Cadmium, Chromium, Cobalt, Lead, Lithium
G402	Arsenic, Cobalt, Lead, Lithium
G405	Arsenic
GMF GYPSUM STACK POND	
G215	Arsenic

unsafe levels of boron, cobalt, manganese and/or sulfate in separate monitoring wells (see Attachment D).

13.1 Compliance

Dynegy has initiated assessment monitoring at Ash Ponds 1 and 2 and the GMF Recycle Pond. Assessment monitoring is likely to find SSIs for multiple pollutants, as shown in Table 13.2. These SSIs would trigger corrective action, but it is important to note that the only kind of corrective action that would lead to cleaner groundwater is removal of coal ash. Leaving 28 feet of ash in Ash Pond 2, for example, will do nothing to fix the problem.

13.2 The Closure Plans at Coffeen Are Unlikely to Stop Contamination

COFFEEN ASH PONDS AND LANDFILL

Despite the torrent of ongoing coal ash contamination at Coffeen, Dynegy is planning to close all its ash dumps except for the GMF Recycle Pond by leaving the ash in place. Unless Illinois takes action to ensure coal ash is fully removed, the waters near Coffeen will continue to be contaminated indefinitely. Leaving 28 feet of ash in Ash Pond 2, for example, will do nothing to fix the problem.

14 DALLMAN/LAKESIDE

City Water, Light and Power (CWLP) owns and operates an ash dump used for coal ash generated at the Lakeside (retired) and Dallman Power Generating Stations in Springfield. The site includes two unlined ash ponds and a flue gas desulfurization waste[39] landfill.

The coal ash sits along Spaulding Dam, on the opposite side of the dam from Lake Springfield, the drinking water source for the city. Sugar Creek, which receives the dam releases from Lake Springfield, flows northward around the coal ash towards the Sangamon River. The coal ash

TABLE 14.1: THE GROUNDWATER AT DALLMAN/LAKESIDE IS UNSAFE FOR DRINKING

Well	Pollutant	Health threshold	Illinois Class I Groundwater Quality Standard	Mean concentration	Maximum concentration
AP-1	Boron (mg/L)	3	2	18.1	22.5
	Sulfate (mg/L)	500	400	569	664
AP-2	Boron (mg/L)	3	2	4.3	5.0
	Sulfate (mg/L)	500	400	454	711
AP-3	Boron (mg/L)	3	2	17.7	20.1
AW-3	Arsenic µg/L)	10	10	165	231

DALLMAN COAL ASH PONDS AND LANDFILL

ponds—all unlined[40]—and landfill contain over two million cubic yards of coal ash and the whole system is entirely within the floodplain of the Lake and Sugar Creek and would be underwater in the 100-year flood.

There is a serious contamination problem at the site. Boron—a key coal ash indicator pollutant—was found at unsafe levels in three of the four downgradient monitoring wells at the site. The concentrations in two wells are more than six times higher than the 3 mg/L child health advisory for boron, ten times higher the 2 mg/L groundwater standard in Illinois, and roughly 200 times higher than the boron concentrations in the onsite upgradient wells. Concentrations of sulfate, also a major indicator pollutant for coal ash, exceed the health threshold in two wells and are almost double Illinois' standard in one of those wells.

Arsenic concentrations in well AW-3 are twenty times higher than the safe level. For other wells at the site, it's impossible to tell if the arsenic concentrations are above the safe level because the test that CWLP used cannot detect arsenic at levels less than 25 µg/L, which is more than double the health-based threshold of 10 µg/L. It is possible that every single sample taken at CWLP contains arsenic above the safe level, but CWLP's defective monitoring keeps Illinoisans in the dark.

14.1 Compliance

The CWLP ash disposal area is in assessment monitoring. It is possible that CWLP will find SSIs that should then trigger pond corrective action at the site. Because the ash ponds are all unlined, they will need to be closed promptly under a recent order from the D.C. Circuit Court of Appeals.

14.2 The Closure Plans at Dallman/Lakeside Are Unlikely to Stop Contamination

CWLP plans to close its ash ponds in place. Capping the nearly two million tons of ash at the site will allow contamination of groundwater and Sugar Creek, and potentially Lake Springfield to continue indefinitely.

TABLE 15.1: GROUNDWATER AT HUTSONVILLE IS UNSAFE FOR DRINKING

Well	Pollutant	Health threshold	Illinois Class I Groundwater Quality Standard	Mean concentration	Maximum concentration
MW8	Boron (mg/L)	3	2	15.8	18.2
	Manganese (mg/L)	0.3	0.15	2.5	3.4
MW11R	Boron (mg/L)	3	2	2.1	5.3
	Manganese (mg/L)	0.3	0.15	0.23	0.88
MW7D	Manganese (mg/L)	0.3	0.15	0.63	1.0
MW14	Manganese (mg/L)	0.3	0.15	0.87	1.6
MW115S	Manganese (mg/L)	0.3	0.15	0.81	0.89
MW115D	Manganese (mg/L)	0.3	0.15	0.27	0.50
MW121	Manganese (mg/L)	0.3	0.15	0.76	0.94
MW23D*	Manganese (mg/L)	0.3	0.15	-	0.211
MW23S*	Manganese (mg/L)	0.3	0.15	-	0.2

HUTSONVILLE COAL ASH PONDS

KINCAID COAL ASH POND

15 HUTSONVILLE

Ameren's former Hutsonville Power Station, located on the Wabash River immediately across the state border from Indiana, closed in 2011 and was excluded from regulation under the federal coal ash rule. There were once five coal ash ponds at the site. Ash in three of the ponds which have been excavated into the other two ponds, which were both capped and left in place.

Per the Illinois EPA-approved closure plan, Ameren monitors the groundwater quality below the capped coal ash ponds. They also operate a series of pumps to keep contaminated groundwater from leaving the southern boundary of their property. They pump the contaminated groundwater up to the surface and into a trench which dumps into the Wabash River.

Thus far, the cap has not stopped the contamination of groundwater at the site, which flows towards the Wabash River. Boron concentrations in monitoring well MW8 between the river and the ash are almost eight times the Illinois groundwater standard and manganese is sixteen times the standard. Boron concentrations near the groundwater pumps on the southern boundary remain above the groundwater standard as well.

Ameren is also required to monitor their surface water discharge, which include the contaminated groundwater that they pump into the trench and into the Wabash. Iron in the groundwater trench has exceeded surface water quality standards on multiple occasions.

16 KINCAID

Dynegy's Kincaid Power Station, located just over 10 miles southeast of Springfield, has one large (75-acre) ash pond on the shore of Sangchris Lake, a popular fishing destination that the Illinois Department of Natural Resources describes as "an angler's paradise."[41] The ash pond was built in the mid-1960s and is unlined.

Groundwater monitoring data suggest that the pond is leaking, with elevated levels of detection monitoring constituents like boron and sulfate, and Dynegy has initiated assessment monitoring. A downgradient monitoring well shows levels of boron over the federal health standard and nearly double Illinois' groundwater standard of 2 mg/L. Most monitoring results, however, show pollution at safe levels, and the data do not suggest that Dynegy is likely to find SSIs during assessment monitoring.

17 NEWTON

Dynegy's Newton Power Plant includes two ash ponds—only one of which, the "Primary Ash Pond," Dynegy

ASH POND AND LANDFILL

TABLE 17: THE GROUNDWATER AT NEWTON IS UNSAFE FOR DRINKING

Well	Pollutant	Health threshold	Illinois Class I Groundwater Quality Standard	Mean concentration	Maximum concentration
G201*	Arsenic (µg/L)	10	10	32.3	39.0
G48MG*	Arsenic (µg/L)	10	10	65.6	100.0
APW5*	Arsenic (µg/L)	10	10	16.0	21.0
G203	Arsenic (µg/L)	10	10	14.0	16.0
G208	Arsenic (µg/L)	10	10	60.1	69.0
G217D	Arsenic (µg/L)	10	10	52.8	73.0
	Cobalt (µg/L)	6	1000	7.7	36.0
G220	Arsenic (µg/L)	10	10	68.3	82.0
G222	Arsenic (µg/L)	10	10	60.6	130.0
G223	Arsenic (µg/L)	10	10	47.8	62.0
APW8	Arsenic (µg/L)	10	10	14.5	20.0
APW9	Arsenic (µg/L)	10	10	11.3	18.0

*UPGRADIENT WELLS

acknowledges as regulated by the coal ash rule—and one ash landfill ("Landfill 2"), which is physically two split into two landfills.[42] The ash pond, located between the power plant and Newton Lake in east-central Illinois, is roughly 170 acres in size, unlined, and contains up to 49 feet of ash. Newton presently has more coal ash than any other site in Illinois with 22 million cubic yards of coal ash. Landfill 2 is located immediately west of the Primary Ash Pond.

The groundwater near the Newton coal ash dumps appears to contain coal ash contamination, with elevated concentrations of multiple coal ash pollutants in downgradient wells. The groundwater is also unsafe, with high arsenic levels across the site. However, upgradient and downgradient wells show roughly the same arsenic levels, which suggests that the arsenic could be naturally occurring. The only other pollutant present at unsafe levels is cobalt in one well immediately north of both the ash pond and the landfill.

17.1 Compliance

Despite the fact that Dynegy almost certainly found detection monitoring SSIs, it has not initiated assessment monitoring at Newton. If and when Dynegy does conduct assessment monitoring, it may find SSIs that could result in pond closure and/or corrective action. Well G217D, for example, had mean concentrations of cobalt, lead and lithium that exceeded all upgradient results.

17.2 The Closure Plans at Newton are Unlikely to Stop Contamination

Dynegy plans to close the unlined, vast Primary Ash Pond in place. Leaving all that coal ash adjacent to popular fishing destination Newton Lake will do nothing to protect the groundwater or the lake from continuing coal pollution. Rather, it will allow the ash to continue to leach dangerous contaminants into those waters indefinitely.

VERMILION COAL ASH PONDS

18. VERMILION

The Vermilion Power Station closed in 2011 and it was not initially regulated by the Coal Ash Rule.[43] The site is, however, continuously releasing contaminants into the Middle Fork of the Vermilion River, Illinois's only National Scenic River. Dynegy and former owners of the power plant dumped over three million cubic yards of coal ash into three large coal ash ponds on the banks of the river. All three coal ash ponds are unlined.

Limited groundwater testing results at Vermilion indicate that the groundwater at the site is unsafe. Illinois EPA required groundwater testing at the site in 2011 and again between 2017 and 2018. These two snapshots of groundwater data show continuous contamination of the groundwater below the coal ash. In 2011, for example, testing revealed boron at concentrations more than thirteen times the health threshold and twenty times the Illinois groundwater standard, as well as sulfate at concentrations up to three times the health threshold and nearly four times Illinois' groundwater standard. More recent sample results reveal even higher boron concentrations, up to twenty six times the Illinois' groundwater standard, as well as ongoing concentrations of arsenic and sulfate above the safe level.

Groundwater testing at Vermilion also revealed elevated manganese, another coal ash pollutant, at levels over

TABLE 18.1: THE GROUNDWATER AT VERMILION IS UNSAFE FOR DRINKING

Well	Pollutant	Health threshold	Illinois Class I Groundwater Quality Standard	Maximum concentration (2011)	Maximum concentration (2018)
MW-04	Boron (mg/L)	3	2	7.8	6.7
	Manganese (mg/L)	0.3	0.15	1.0	0.75
MW-05	Boron (mg/L)	3	2	22	18
	Manganese (mg/L)	0.3	0.15	0.34	0.47
	Sulfate (mg/L)	500	400	480	291
MW-08R	Arsenic (µg/L)	10	10	6.4	13
	Boron (mg/L)	3	2	40	53
	Manganese (mg/L)	0.3	0.15	0.22	0.42
	Sulfate (mg/L)	500	400	1500	1210
MW-03R	Arsenic (µg/L)	10	10	18	7.7
	Boron (mg/L)	3	2	2.0	5.0
MW-17	Boron (mg/L)	3	2	6.0	5.2
	Manganese (mg/L)	0.3	0.15	0.98	0.60
	Sulfate (mg/L)	500	400	1800	1270
MW-18	Boron (mg/L)	3	2	12	11
	Sulfate (mg/L)	500	400	1300	835
	Manganese (mg/L)	0.3	0.15	1.3	1.6
MW-02	Arsenic (µg/L)	10	10	23	11
MW-34	Arsenic (µg/L)	10	10	26	23
MW-21*	Arsenic (µg/L)	10	10	73	36

** BACKGROUND WELLS*

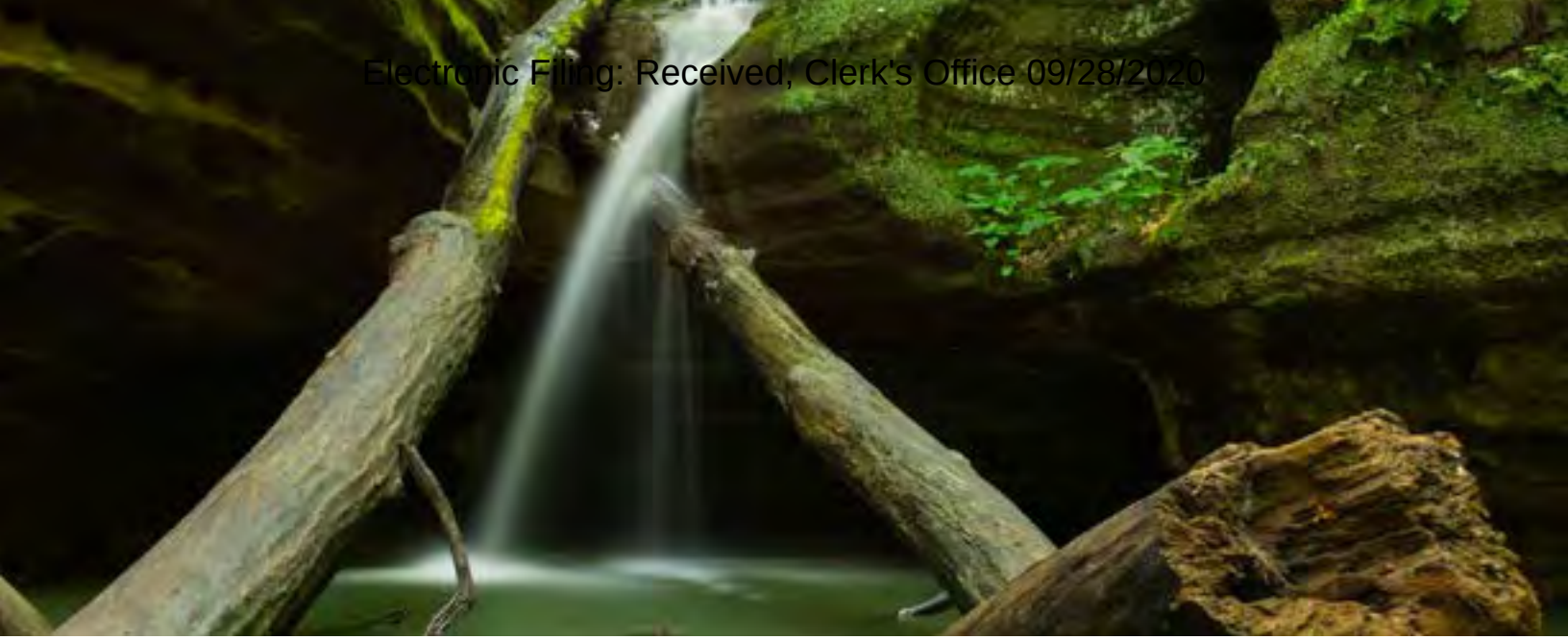
eight times Illinois' groundwater standard in 2011 and over ten times that standard in 2017-2018. The contaminated groundwater is visibly seeping into the Middle Fork. The riverbank nearest the coal ash is stained brightly orange and has an oily sheen. Sampling of those coal ash seeps led Prairie Rivers Network to sue Dynegy for violations of the Clean Water Act, including unlawful discharges of arsenic, barium, boron, chromium, manganese, molybdenum and sulfate.

18.1 Compliance

The Illinois EPA has issued two violation notices to Dynegy for contamination from their coal ash ponds. In 2012, Dynegy received a groundwater quality violation. Dynegy received a second violation notice from Illinois EPA in 2018 for the coal ash-contaminated groundwater seeping into the Middle Fork of the Vermilion River. Illinois EPA and Dynegy have been going back and forth over a closure plan since the 2012 groundwater violation. Thus far, Dynegy has only released plans for closing the ash in place with a cap.

18.2 The Closure Plan at Vermilion Is Unlikely to Stop Contamination

Dynegy is proposing to cap the coal ash ponds and leave them in place. Capping the ash ponds will not stop the pollution of the site's groundwater and the river, and leaves the residents of Vermilion County with the permanent, grave risk that the meandering Middle Fork will erode the earthen dikes and allow the toxic ash to tumble into Illinois' only National Scenic River. Unless Illinois acts now to ensure excavation of that coal ash, the kayakers, tubers, and hikers enjoying the Middle Fork may head elsewhere for fear of contact with the polluted waters or a cascade of toxic ash.



REGION 4: SOUTHERN ILLINOIS

Southern Illinois is home to a myriad of water resources, including the confluence of the Mississippi River and the Ohio River near Cairo, IL. The lesser known Kaskaskia River starts all the way up in Champaign County and cuts across the state to meet the Mississippi over 300 miles away on the southern border of Illinois. The region is also home to multiple manmade lakes, Including the Lake of Egypt near Marion, which provide water supply and recreation opportunities in the region.

The waters of Southern Illinois have numerous coal ash ponds on their shorelines. The mighty rivers that border Illinois have both have coal ash ponds, with four at the Wood River Site on the mighty Mississippi and one large pond plus a landfill at Joppa on the portion of the Ohio River that passes Illinois's border. The Kaskaskia River is quickly becoming the river with the most coal ash, as it has over four coal ash ponds at Baldwin and the rapidly filling coal ash landfill at Prairie State. The Marion Plant on the west shore of the Lake of Egypt has at least unlined one pond with coal ash.

19 BALDWIN

Dynegy owns and operates the Baldwin Energy Complex in southwestern Illinois, just outside its namesake Baldwin, IL. The power plant consists of three coal-fired units, but Dynegy "mothballed" (temporarily shut down) Unit 1 in 2016 and has considered shutting down Unit 3.[44]

Over 13 million cubic yards of coal ash is stored at the site, enough to fill up the Empire State Building ten times. The coal ash ponds at Baldwin abut the Baldwin Cooling Lake Pond, a state fish and wildlife area, and discharges from the pond flow to the Kaskaskia River. Portions of the fly ash ponds sit in the floodplain of the Kaskaskia River. All the ash ponds are unlined.[45]

For purposes of compliance with the Coal Ash Rule, there are two coal ash units at Baldwin, a bottom ash pond and a set of three fly ash ponds—the East Fly Ash Pond, the Old East Fly Ash Pond, and the West Fly Ash Pond—which are considered a single unit. There are also a secondary and tertiary pond mentioned in Dynegy's coal ash rule filings.

The groundwater at Baldwin is unsafe. Dynegy's monitoring data from 2017 shows lithium in multiple wells

TABLE 19.1: THE GROUNDWATER AT BALDWIN IS UNSAFE FOR DRINKING

Well	Pollutant	Health threshold	Illinois Class I Groundwater Quality Standard	Mean concentration	Maximum concentration
MW-304*	Lithium (µg/L)	40		62.3	69.3
MW-356	Lithium (µg/L)	40		50.8	56.3
MW-370	Lithium (µg/L)	40		134.2	178.0
MW-382	Lithium (µg/L)	40		61.3	72.3
MW-375	Lithium (µg/L)	40		57.4	67.9
MW-377	Lithium (µg/L)	40		51.3	57.8
MW-391	Sulfate (mg/L)	500	400	721	758

*UPGRADIENT WELL

BALDWIN COAL ASH PONDS

at concentrations as high as 178 mg/l, nearly four times the safe level. One well also has unsafe levels of sulfate, with concentrations exceeding the health threshold and nearly double Illinois' standard.

Groundwater contamination at Baldwin has been ongoing for years. In 2012, Illinois EPA issued a violation notice for groundwater contamination, alleging violation of limits for boron, antimony, lead, iron, manganese, pH, sulfate, total dissolved solids, nitrate, and chloride. The violation notice remains unresolved. Additional groundwater monitoring data from 2010-2011 show unsafe levels of arsenic, boron, cobalt, manganese, and sulfate (see Attachment D), particularly in areas south and southwest of the ash ponds. The older data appear to be from wells that Dynegy does not sample for compliance with the coal ash rule. The groundwater contamination identified in 2010-2011 may still be a problem.

19.1 Compliance

According to Dynegy, Baldwin's bottom ash and fly ash pond are both in assessment monitoring due to SSIs for Appendix III detection monitoring pollutants, which likely included boron, calcium, chloride, fluoride, sulfate, and total dissolved solids.[46]

Now that Baldwin is in assessment monitoring, Dynegy will have to compare concentrations of pollutants in groundwater at the site with groundwater protection standards established by EPA for each of the Appendix IV pollutants. Based on the available data, it appears that lithium will exceed its groundwater protection standard in one or more wells at the Bottom Ash Pond (see Attachment C).[47]

19.2 The Closure Plan at Baldwin is Unlikely to Stop Contamination

Dynegy plans to cap and leave the coal ash in the coal ash ponds, and it has initiated the closure process with the Illinois EPA. Leaving more than thirteen million cubic yards of coal ash in place at Baldwin will do nothing to stop the leaching of toxic pollution into the groundwater at the site, rendering that groundwater unsafe for centuries to come.

TABLE 19.2: WELLS WITH LIKELY ASSESSMENT MONITORING SSIs

Downgradient well	Pollutants exceeding likely groundwater standard
BOTTOM ASH POND	
MW-370	Lithium

Well	Pollutant	Health threshold	Mean concentration	Maximum concentration
G01D*	Cobalt (µg/L)	6	8.2	13.6
G51D	Cobalt (µg/L)	6	12.6	24.9
G54D	Cobalt (µg/L)	6	17.8	26.8
G107	Cobalt (µg/L)	6	13.6	95.2
	Lead (µg/L)	15	18.9	142.0
G109	Cobalt (µg/L)	6	6.7	40.2

*UPGRADIENT WELLS

20 JOPPA

Dynegy's Joppa Power Station, located on the southern border of Illinois along the Ohio River, has two coal ash dumps that Dynegy recognizes as regulated under the coal ash rule: one unlined ash pond located next to the power plant (the "East Ash Pond") and one relatively new landfill, located about one mile northwest of the plant.[48]

The groundwater near both coal ash units has unsafe levels of cobalt, with concentrations as high as fifteen times the safe level. One well downgradient of the landfill (well G107) also has unsafe levels of lead. Cobalt is elevated in both up- and downgradient wells at the ash pond, but downgradient concentrations are higher than upgradient concentrations, suggesting that cobalt is leaching into the groundwater from the ash pond.

Groundwater monitoring data also shows evidence of coal ash impacts at both the ash pond and the landfill. At both ash dumps, the average concentrations of boron, calcium, chloride, and fluoride in one or more downgradient wells exceeded the highest upgradient reading (see Attachment B). The same is true for total dissolved solids at the landfill. The ash pond results are not surprising, but the landfill, which did not yet contain any ash as of late 2016, is more of a mystery. The results may reflect other, historic contamination, or they may reflect contamination from newly placed ash, but in any case, the data do show coal ash impacts.

20.1 Compliance

Dynegy has only initiated assessment monitoring at the East Ash Pond, but should also conduct assessment monitoring at the landfill. Once in assessment monitoring, both units would show multiple SSIs, triggering corrective action at the landfill.

20.2 The Closure Plan at Joppa Is Unlikely To Stop Contamination

Dynegy is planning to close both units in place. Doing so will allow coal ash pollution of the groundwater to continue indefinitely.

JOPPA COAL ASH POND AND LANDFILL

TABLE 20.2: WELLS WITH LIKELY ASSESSMENT MONITORING SSIs AT JOPPA

Downgradient well	Pollutants exceeding likely groundwater standard
EAST ASH POND	
G51D	Lithium
G52D	Lithium
G54D	Cobalt, Lithium
LANDFILL	
G107	Beryllium, Cobalt
G109	Beryllium

TABLE 21.1: THE GROUNDWATER AT MARION IS UNSAFE FOR DRINKING

Well	Pollutant	Health threshold	Illinois Class I Groundwater Quality Standard	Mean concentration	Maximum concentration
EBG*	Lithium (µg/L)	40		41.4	82.0
EP-02	Cobalt (µg/L)	6	1000	16.8	52.0
EP-03	Cobalt (µg/L)	6	1000	99.8	120.0
EP-04	Arsenic (µg/L)	10	10	42.0	53.0
	Boron (mg/L)	3	2	14.0	23.0
	Cobalt (µg/L)	6	1000	400.0	440.0
	Selenium (µg/L)	50	50	138.8	200.0
	Thallium (µg/L)	2	2	96.4	300.0

21 MARION

The Marion Power Plant is operated by the Southern Illinois Power Cooperative (SIPC) in Marion, Illinois, where it abuts a popular boating and fishing lake, Lake of Egypt. Although the site has one inactive landfill,[49] appears to have multiple impoundments,[50] and has at least one fly ash pond,[51] for purposes of the coal ash rule SIPC is only monitoring a very small, unlined ash pond, one acre in size and eight feet deep, known as the "Emery Pond."[52] The company claims that these ponds do not store coal ash,[53] but US EPA documents identify many of the ponds as ash ponds.[54]

Groundwater at the Marion site is unsafe. SIPC's testing of groundwater underlying the Emery Pondshows unsafe levels of multiple pollutants, including arsenic, boron, cobalt, selenium, lithium and thallium. The data show arsenic at concentrations more than five times safe levels, boron at concentrations nearly eight times the health threshold and just short of twelve times Illinois' standard, cobalt at more than seventy times safe levels, lithium at concentrations more than double safe levels, selenium at concentrations quadruple safe levels, and thallium (formerly used as rat poison) at concentrations up to one hundred and fifty times safe levels. In one monitoring well, EP-04, cobalt and thallium concentrations are, on average, about fifty or sixty times higher than safe levels.

MARION COAL ASH POND

The monitoring results, which compare downgradient to upgradient wells, suggest that the Emery Pond is the source of the contamination.

21.1 Compliance

SIPC found detection monitoring SSIs for boron in every sampling event at three of the downgradient wells (wells EP-01, EP-02 and EP-04) and SSIs for total dissolved solids in every sampling event at all four downgradient wells. SIPC has posted a notice that it will begin

TABLE 21.2: WELLS WITH LIKELY ASSESSMENT MONITORING SSIs AT MARION'S EMERY POND

Downgradient well	Pollutants exceeding likely groundwater standard
EP-01	Cadmium
EP-02	Cobalt
EP-03	Cobalt
EP-04	Arsenic, Cadmium, Cobalt, Lead, Selenium, Thallium

conducting assessment monitoring. When it does, it will find SSIs for multiple pollutants.

The Emery Pond is a small portion of the total Marion property. The condition of groundwater around the rest of the property is largely a mystery. EIP's Ashtracker database has a limited amount of information for nine wells located north and south of the power plant.[55] These data cover the 2010-2011 time period and include just three pollutants—boron, cadmium and sulfate. Although the data do not show long-term exceedances of health-based thresholds, they do show elevated levels of boron, particularly in well S2 at the northern edge of the site, suggesting that coal ash has contaminated more of the site than SIPC's limited documentation indicates. Until SIPC implements a more robust groundwater monitoring program, and in light of the evidence of discussed above, the public should assume that there is contamination across the site.

The mystery of Marion's multiple "ash ponds", which the company claims do not contain coal ash, highlights the need for regulations which track the distribution and reuse of coal ash. A power plant can distribute their ash to other entities which reuse the ash, but this activity is not tracked. If the ponds are indeed empty, the ash could have been put somewhere else, such as in a mine or used as structural fill for roads, but the public has no way of knowing what happened to it.

21.2 The Closure Plan at Marion

SIPC has failed to post a closure plan for the Emery pond, in violation of the coal ash rule, so it is unclear whether SIPC will remove the toxic ash from that pond—or the other ponds on site—or leave it in place, allowing continued contamination for centuries to come.

22 PRAIRIE STATE

The Prairie State Energy Campus is a 1766 megawatt coal plant—the largest in Illinois—near Marissa, Illinois, about 36 miles southeast of St. Louis. Owned and operated by Prairie State Generating Company ("Prairie State"), the facility dumps its coal ash in a massive, 750-acre coal ash landfill known as the "Near Field Facility." The power plant has been in operation for only six years, but the landfill already stores almost twelve million cubic yards of coal ash. Despite operating for a brief time, this is a huge amount of ash, already the second largest in the state

TABLE 22.1: THE GROUNDWATER AT PRAIRIE STATE IS UNSAFE FOR DRINKING

Well	Pollutant	Health threshold	Illinois Class I Groundwater Quality Standard	Mean concentration	Maximum concentration
G02D*	Arsenic (µg/L)	10	10	23.1	26.9
MW203*	Arsenic (µg/L)	10	10	35.9	51.7
G04D	Arsenic (µg/L)	10	10	15.4	18.9
G05D	Arsenic (µg/L)	10	10	35.0	52.0
G06D	Arsenic (µg/L)	10	10	32.1	42.4
G07D	Arsenic (µg/L)	10	10	40.4	46.1
G08D	Arsenic (µg/L)	10	10	33.4	40.2
G09D	Arsenic (µg/L)	10	10	28.3	136.0
	Cobalt (µg/L)	6	1000	20.1	131.0
	Lead (µg/L)	15	7.5	34.1	234.0
G10D	Arsenic (µg/L)	10	10	21.4	27.7
G17D	Cobalt (µg/L)	6	1000	7.2	13.6
G20D	Arsenic (µg/L)	10	10	15.7	17.1
R11D	Arsenic (µg/L)	10	10	21.5	27.9

**UPGRADIENT WELLS*

PRAIRIE STATE COAL ASH LANDFILL

by volume. Prairie State has added nearly three million cubic yards of coal ash each of the past two years. To put number that into perspective, Prairie State is making more coal ash each year than the amount stored at most facilities over their entire multi-decade operating life.

The groundwater around the landfill already is unsafe, with arsenic at concentrations as high as thirteen times safe levels, cobalt at concentrations nearly twenty-two times safe levels, and lead at concentrations as high as fifteen times the health threshold and thirty-one times Illinois' standard. Some or all of the arsenic may be naturally occurring, as it occurs at roughly the same levels in both up- and downgradient wells. The cobalt and lead are probably due to contamination from the landfill. The clearest evidence of contamination is in well G09D, on the southern edge of the landfill near New Marigold Road. This well also has the highest onsite concentrations of the coal ash indicator boron, suggesting that the contamination is being caused by coal ash.

TABLE 22.2: WELLS WITH LIKELY ASSESSMENT MONITORING SSIs AT PRAIRIE STATE

Downgradient well	Pollutants exceeding likely groundwater standard
G09D	Barium, Beryllium, Cadmium, Chromium, Cobalt, Lead, Lithium, Thallium
G17D	Cobalt
G20D	Cobalt
R11D	Cobalt

22.1 Compliance

The landfill should be in assessment monitoring because calcium, chloride, sulfate, and total dissolved solids all appear to be significantly elevated in downgradient wells, but Prairie State has not posted a notice of assessment monitoring. Once in assessment monitoring, Prairie State will likely find several SSIs, particularly in well G09D, which would then trigger corrective action.

23 VENICE

The Venice Station in has not burned coal since the mid-1970s, and it is not regulated by the Coal Ash Rule, but other data suggest that the site's unlined ash ponds continue to contaminate groundwater. EIP's ashtracker website includes sampling results from 2011 that show unsafe levels of arsenic, boron, manganese, and sulfate on the edge of the Mississippi River. The closure plan for the site—the only closure plan made available on Illinois EPA's website[56]—notes that the coal ash is in contact with the groundwater. Illinois EPA reports that the ash ponds were capped.[57] If ash remains in contact with groundwater at the site, toxic contaminants will continue to leach into groundwater indefinitely.

24 WOOD RIVER

Dynegy's retired Wood River Power Plant has at least four coal ash ponds that collectively store over one and a half million cubic yards of coal ash. The ash ponds are located in Alton next to the Mississippi River and Wood River, one of its tributaries. It appears that none of these ash ponds is lined.[58] The Primary Ash Pond contains coal ash, within coal ash, on top of coal ash: it was built on top of ash and its berms are made of ash as well.[59]

WOOD RIVER COAL ASH PONDS

TABLE 24: THE GROUNDWATER AT WOOD RIVER IS UNSAFE FOR DRINKING

Well	Pollutant	Health threshold	Illinois Class I Groundwater Quality Standard	Mean concentration	Maximum concentration
2	Boron (mg/L)	3	2	3.2	4.5
4	Arsenic (µg/L)	10	10	39.3	50.1
25*	Arsenic (µg/L)	10	10	11.7	57.4
	Lithium (µg/L)	40		40.5	65.4
31*	Lithium (µg/L)	40		96.4	171.0
34	Arsenic (µg/L)	10	10	21.2	42.0
38	Boron (mg/L)	3	2	4.5	6.9
39S	Boron (mg/L)	3	2	60.9	69.6
	Molybdenum (µg/L)	100		517	857
	Sulfate (mg/L)	500	400	745	860
40S	Boron (mg/L)	3	2	24.3	27.5
	Molybdenum (µg/L)	100		105	189
	Sulfate (mg/L)	500	400	548	609
41	Boron (mg/L)	3	2	8.9	10.6
	Sulfate (mg/L)	500	400	536	620

*UPGRADIENT WELLS

The groundwater at Wood River is unsafe, with dangerously elevated concentrations of arsenic, boron, lithium, molybdenum, and sulfate. Groundwater testing has revealed arsenic at concentrations nearly six times safe levels, boron at concentrations as high as twenty-three times the health threshold and nearly thirty five times Illinois' groundwater standard, molybdenum at concentrations nearly nine times safe levels, and sulfate at concentrations seventy-two percent over the health threshold and more than double Illinois' standard.

24.1 Compliance

The high boron and sulfate concentrations are a clear fingerprint of coal ash contamination, and Dynegy has initiated assessment monitoring around all four ash ponds. In assessment monitoring, Dynegy is likely to find SSIs for molybdenum in multiple wells around the Primary East Ash Pond.

24.2 The Closure Plan at Wood River Is Unlikely to Stop Contamination

Dynegy is planning to close all ash ponds in place. They submitted a closure plan to the Illinois EPA in 2016, and are seeking changes to their NPDES permit to discharge water that they will pump out of the ponds to close them. Dynegy's plan will do not stop the ongoing flow of dangerous contamination into groundwater and the Wood River.

ENVIRONMENTAL JUSTICE AT ILLINOIS' COAL ASH SITES

Nationwide, the burden of coal ash pollution is carried disproportionately by communities of color and low-income communities. This is also true at many coal plants in Illinois, where populations of people of color are higher than the state average at a quarter of coal ash sites and populations of low-income residents are equal to or higher than the state average at nearly eighty percent (19 of the 24) sites.

At 18 of the 19 plants with average or above-average low-income populations, groundwater contamination will likely persist after closure of the ash ponds because those ponds will be closed in place or because saturated ash will remain at the site. Those include Baldwin, Coffeen, Dallman, Duck Creek, Edwards, Havana, Hennepin, Hutsonville, Joppa, Kincaid, Joliet 29, Joliet 9/Lincoln Stone Quarry, Meredosia, Pearl, Powerton, Waukegan, Wood River and Venice.

TABLE 3: DEMOGRAPHIC ESTIMATE WITHIN THREE MILES OF ILLINOIS COAL ASH DUMPS[60]

Estimate of Proportion of Population within 3 miles	Minority Population	Low Income Population
Baldwin	2%	**32%**
Coffeen	11%	**46%**
Crawford	**92%**	**59%**
Dallman	34%	**38%**
Duck Creek	2%	**34%**
Edwards	4%	**33%**
Havana	3%	**48%**
Hennepin	**54%**	**49%**
Hutsonville	2%	**31%**
Joliet 29	**53%**	**37%**
Joppa Steam	9%	**43%**
Kincaid	8%	**34%**
Joliet 9/Lincoln Stone Quarry	**59%**	**41%**
Marion	9%	20%
Meredosia	1%	**49%**
Newton	0%	16%
Pearl	1%	**46%**
Powerton	8%	**34%**
Prairie State	1%	9%
Waukegan	**79%**	**51%**
Will County	32%	21%
Woodriver	14%	**45%**
Venice	**82%**	**66%**
Vermilion	5%	24%
Illinois State Average	38%	31%

BOLDED TEXT PERCENTAGES INDICATE VALUES ABOVE THE STATE AVERAGE.

CONCLUSION AND RECOMMENDATIONS

Illinois' groundwater has been severely harmed by coal ash pollution, and the water remains at risk. If coal ash remains in contact with groundwater and timely cleanups are not completed, contamination will continue to endanger sources of drinking water as well as nearby lakes and rivers. This pollution disproportionately impacts low income communities. The widespread nature of the pollution threatens to harm the quality of life for all Illinoisans who value clean water and healthy rivers and lakes.

Via a revived coal ash rulemaking, legislation, or some combination of both, Illinois must address the problem of coal ash contamination now, before it does greater damage to our communities and waters. Illinois must accomplish the following:

- Put in place standards that permanently stop the pollution from all ash dumps in the state, whether operating or abandoned.
- Prohibit the dumping or burying of coal ash in places where it remains in contact with groundwater. Require dry handling and disposal of coal ash. The only way to prevent contamination from coal ash is to keep the coal ash contained and dry.
- Ensure the public an opportunity to participate meaningfully in permitting decisions and all other evaluations of compliance with required safeguards at these dumps, starting before a dump is built and continuing throughout operation, closure, and even after the dump is closed. Coal ash dumps are too dangerous for decisions about them to be made behind closed doors.
- Ensure that the public has access to information about what happens to coal ash generated or stored in Illinois.
- Hold polluters accountable for the toxic messes they have made. Require owners of coal ash dumps to set aside money for cleanup and rehabilitation of the lands and waters fouled by ash dumps. Illinois residents must not be left holding the bag.
- Illinois has an opportunity to protect its water resources by administering an effective state permit program. The goals of its program must be crystal clear — to protect both the health of Illinois residents and the quality of their water. The quality of Illinois' safeguards will determine the quality of its water. Lack of adequate rules will result in continuing and worsening water contamination. The problems identified in this report need real solutions and firm resolve on the part of state leaders and citizens to demand an end to the pollution of Illinois water by leaking toxic coal ash dumps.

ENDNOTES

1 U.S. EPA Administrator published the Disposal of Coal Combustion Residuals from Electric Utilities final rule in the Federal Register on April 17, 2015. This rule finalized national regulations to provide a comprehensive set of requirements for the safe disposal of coal ash from coal-fired power plants. See https://www.federalregister.gov/documents/2015/04/17/2015-00257/hazardous-and-solid-waste-management-system-disposal-of-coal-combustion-residuals-from-electric.

2 There are twenty five sites in Illinois. Groundwater data for Grand Tower was not available to the authors of the report at this time.

3 The coal ash rule defines ash impoundments (or ponds) as unlined if they cannot meet the rule's liner design standards. For existing impoundments, the design standards require a very low conductivity "composite liner" made up of clay plus a geomembrane (plastic) liner, or an "alternative compositve liner" with similarly low conductivity. 40 C.F.R. § 257.71; Util. Solid Waste Activities Grp. v. Envtl. Prot. Agency, 901 F.3d 414, 432 (D.C. Cir. 2018) (vacating provision considering solely clay-lined impoundments to be lined). New impoundments and landfills must have a composite liner, with a lower component equivalent to the prescribed clay liner and an upper, geomembrane component. 40 C.F.R §§257.70, 257.72. Owners of coal ash units are required to certify that their liner meets the rule's design criteria. If a liner does not meet the prescribed criteria, or if an owner fails to certify the liner, then the rule defines that ash pond as "unlined."

4 40 C.F.R. Part 257. "CCR" is an acronym for coal combustion residuals, another way of saying coal ash.

5 This report also discusses groundwater data not collected for compliance with the federal coal ash rule in several instances. For some ash dumps located at power plants closed before the coal ash rule took effect, such as Crawford, Hutsonville, Meredosia, Venice, and Vermilion, no groundwater monitoring was performed to comply with the rule. Thus, the only data available for those sites is older and often includes fewer, or different, pollutants, but it nonetheless helps to illuminate the extent and nature of coal ash pollution of Illinois' groundwater. For certain coal ash dumps that are covered by the rule, groundwater monitoring mandated by the State has been broader and more longstanding than the data collected for the rule, and presenting it here provides a more complete picture of the extent and severity of coal ash contamination at those sites.

6 This figure includes existing clay-lined ponds, which were originally defined as lined, but must now be considered unlined in light of the recent D.C. Circuit decision. See supra, n. 2.

7 The court's decision also made clear that ash ponds underlain with clay do not qualify as "lined" ash ponds – so are to be treated as all other unlined ash ponds under the rule – and that ash ponds at power plants that shut down before October 2015 must be regulated as well. See Util. Solid Waste Activities Grp., 901 F.3d at 432-34.

8 EPA proposed adding boron to Appendix IV (assessment monitoring), recognizing that boron is one of the leading risk drivers associated with coal ash contamination, but has not yet acted on that proposal. 83 Fed. Reg. 11584 (Mar. 15, 2018).

9 U.S. EPA, 2018 Edition of the Drinking Water Standards and Health advisories Tables. https://www.epa.gov/sites/production/files/2018-03/documents/dwtable2018.pdf.

10 Id.

11 EIP's Ashtracker website uses a different approach, and considers groundwater to be unsafe if it exceeds a health-based threshold at least once. We are using mean values in order to emphasize the pollutants that are most likely to present long-term, unambiguous health threats.

12 Under Illinois law, "Class I" groundwater is "potable resource groundwater," that is, groundwater "generally fit for human consumption in accordance with accepted water supply principles and practices." See 35 Ill. Admin. Code §§ 620.110, 620.210. Illinois bars contamination in Class I groundwater above groundwater quality standards. Id. at §§§ 620.405, 620.410(a).

13 The groundwater standard for each pollutant is either this presumptive standard or the site-specific background value, whichever is greater.

14 Except due to "natural causes." 35 Ill. Admin. Code § 620.410(e).

15 EIP's Ashtracker website uses a different health-based threshold for molybdenum, 40 µg/L, which is EPA's lifetime health advisory for this pollutant. 100 µg/L is the EPA Regional Screening Level for molybdenum. Both are health-based and scientifically sound. We chose to use 100 µg/L for this report because it is consistent with the new groundwater protection standard under the Coal Ash Rule.

16 Groundwater data for Grand Tower, which is closed but has coal ash, was not available or not reviewed for this report. Groundwater at these sites may be contaminated by coal ash.

17 Data from 2012. The coal ash pond at Crawford has since been closed by removed of the ash. We don't have access to more current groundwater monitoring.

18 See, e.g., ENSR, Phase II Environmental Site Assessment for the Waukegan Generating Station (Nov. 1998) (showing the "former slag / fly ash storage area").

19 Ponds 1N and 1S still contain coal ash and are open to precipitation, so they continue to impound both coal ash and water. This renders them "inactive surface impoundments," regulated as all other unlined ash ponds under the coal ash rule.

20 See Patrick Engineering, Hydrogeologic Assessment Report for the Will County Generating Station (Feb. 2011) (showing "coal ash" and "coal cinders" in the boring logs for wells MW-1, MW-2, MW-3, MW-4, and MW-6).

21 See PCB No. R.14-10, In the Matter of: Coal Combustion Waste (CCW)) Surface Impoundments at Power Generating Facilities: Proposed New 35 ILL. ADM. CODE 841, "Illinois EPA's Response to Questions Posed by the Board," dated Mar. 6, 2017, available at https://pcb.illinois.gov/documents/dsweb/Get/Document-94651, at 5.

22 See, e.g., ENSR Consulting, Phase II Environmental Site Assessment for the Joliet #29 Generating Station, Fig. 3 (Dec. 1998) (showing "ash landfills" on the southwest and northeast corners of the property, and Ash Ponds 1, 2 and 3 in the center of the property). Midwest Generation stopped using Ash Ponds 1 and 3 before the effective date of the CCR rule.

23 Dynegy was purchased by Vistra in 2018.

24 https://www.dynegy.com/sites/default/files/ccr/Illinois/Duck-Creek/Doc_636553247031163492.pdf.

25 The well appears to be located adjacent to a rail loop. At one point there was an ash pond known as the "recycle pond" within that rail loop. See https://www.dynegy.com/sites/default/files/ccr/Illinois/Duck-Creek/Doc_636143690223126300.pdf; see also https://archive.epa.gov/epawaste/nonhaz/industrial/special/fossil/web/pdf/ameren_dc_final.pdf. The recycle pond now appears to be dry. If any coal ash was left in place when the recycle pond was closed, then it, or any other coal ash buried within the rail loop, may still be contaminating groundwater.

26 https://www.dynegy.com/sites/default/files/ccr/Illinois/Edwards/Doc_636143704112885028.pdf; https://www.dynegy.com/sites/default/files/ccr/Illinois/Edwards/Doc_636227709066835873.pdf (showing groundwater elevations in onsite piezometers at 441-451 feet, and a minimum coal ash elevation – presumably reflecting the top of the coal ash at its lowest point – of 433 feet).

27 https://www.dynegy.com/sites/default/files/ccr/Illinois/Edwards/Doc_636143705858212097.pdf.

28 See https://pcb.illinois.gov/documents/dsweb/Get/Document-94651 See page 27 in the PDF. Moreover, because Dynegy did not post liner documentation for the west ash ponds, they are, for purposes of the coal ash rule, unlined. See 40 C.F.R. § 257.71(a)(3)(ii).

29 Closure Plan, Fly Ash Pond and Bottom Ash Pond, Meredosia Power Station 2016 PDF Page 5 https://drive.google.com/a/prairierivers.org/file/d/0B_Ym107ZAK2NYjdDbGxkdzFESGk/view?usp=sharing

30 Hydrogeologic Assessment Report, Fly Ash Pond and Bottom Ash Pond, Meredosia Power Station 2016 PDF Page 195 https://drive.google.com/a/prairierivers.org/file/d/0B_Ym107ZAK2NYlV3TjNyUkxUaEk/view?usp=sharing

31 Violation Notice: Prairie Power Inc, Pearl Station. December 6, 2102

32 https://drive.google.com/file/d/1Cl2YpBDNhawJgmaiAPrzfFWJ-z4hhD4t/view

33 See, e.g., ENSR, Phase II Environmental Site Assessment for the Powerton Generating Station (Dec. 7, 1998) (including nine boring logs that show "coal/slag," "slag/coal," or "slag" up to sixteen feet deep; slag is a form of coal ash); see also Patrick Engineering, Hydrogeologic Assessment Report for the Powerton Generating Station (Feb. 2011) (including seven boring logs that show "coal cinders" up to 24.5 feet deep).

34 Letter from Richard R. Gnat, KPRG, to Lynn Dunaway, Illinois EPA, re: Midwest Generation, LLC, Powerton Generating Station; ID No. 6282, Compliance Commitment Agreement - ELUC/GMZ (Sept. 11, 2013).

35 Id.

36 See http://3659839d00eefa48ab17-3929cea8f28e01ec3cb6bbf40cac69f0.r20.cf1.rackcdn.com/POW_ASB_GMV.pdf, dated August 22, 2018.

37 https://www.dynegy.com/sites/default/files/ccr/Illinois/Coffeen/Doc_636143663485517226.pdf.

38 Hydrogeologic Site Characterization Report, Ash Pond 2, Coffeen Power Station. Report Page 3-5, PDF Page 24 12.5 kg/day + 1.6 kg/day is 11,000 lbs per year. https://drive.google.com/a/prairierivers.org/file/d/0B_Ym107ZAK2NOGx4M1kycElzZnM/view?usp=sharing.

39 Flue gas desulfurization waste, also known as "scrubber sludge," is coal ash generated by air pollution control devices ("scrubbers") that remove sulfur dioxide from flue gas.

40 https://www.cwlp.com/CCRPDFHandler.ashx?imgID=11.

41 See https://www.dnr.illinois.gov/Parks/Pages/SangchrisLake.aspx..

42 Dynegy's coal ash rule documentation reveals a second ash pond, the "secondary pond," just south of the primary ash pond. See Dynegy, History of Construction for the primary ash pond, https://www.dynegy.com/sites/default/files/ccr/Illinois/Newton/Doc_636143831378739281.pdf?ts=636638162005858242, at pdf p.7 (noting that the "Operation and Maintenance Manual for Primary and Secondary Ash Ponds" is included as Appendix D). The company's documentation further shows that the landfill is, in fact, two separate small landfills. See https://www.dynegy.com/sites/default/files/ccr/Illinois/Newton/Doc_636553253095628297.pdf?ts=636638162373053587, at pdf p. 38. Still, the name of "Landfill 2" suggests that there are or were other landfills at Newton.

43 As noted above, the D.C. Circuit Court decision in August 2018 directed EPA to regulate "inactive" ash ponds at "inactive" – i.e., retired – power plant sites, such as Vermilion. EPA has not yet issued a revised coal ash rule to regulate those old ash ponds.

44 http://www.randolphcountyheraldtribune.com/news/20161012/dynegy-delays-mothballing-unit-1-at-baldwin

45 Dynegy confirmed in its coal ash rule filings that both the Bottom Ash Pond and the West Fly Ash Pond are not lined. The company did not post any liner certifications for the East Fly Ash Pond or the Old East Fly Ash Pond, so those are considered unlined under the coal ash rule.

46 As shown in detail in Attachment B, all of these pollutants had mean concentrations in one or more downgradient wells that exceeded the highest upgradient result.

47 For example, lithium concentrations in downgradient well MW-370 average 134 µg/L, more than three times higher than the presumptive groundwater standard of 40 µg/L and roughly twice as high as any upgradient results.

48 As of late 2016, the landfill had not received any coal ash. See CCR Landfill Closure and Post-closure Plan (Oct. 2016), https://www.dynegy.com/sites/default/files/ccr/Illinois/Joppa/Doc_636143824305423754.pdf.

49 http://sipower.org/p/Landfill_Closure_Notification.pdf.

50 See aerial photograph and groundwater wells monitored pursuant to state law on EIP's Ashtracker website: https://ashtracker.org/facility/87/marion-power-plant.

51 An engineering report posted on the SIPC website refers to "the plant's south fly ash pond." See Clarida and Ziegler Engineering Co., Engineering Report for Coal Combustion Residual Surface Impoundment Emery Pond at 1 (Oct. 17, 2016), http://sipower.org/m/pdfs/Engineering_Report_H_H_Capacity_Assessments_October_2016.pdf.

52 Clarida and Ziegler Engineering Co., Engineering Report for Coal Combustion Residual Surface Impoundment Emery Pond (Oct. 17, 2016), http://sipower.org/m/pdfs/Engineering_Report_H_H_Capacity_Assessments_October_2016.pdf.

53 Comments by Southern Illinois Power Company to the Illinois Pollution Control Board https://pcb.illinois.gov/documents/dsweb/Get/Document-94665.

54 https://archive.epa.gov/epawaste/nonhaz/industrial/special/fossil/web/pdf/sipc_marion_final.pdf.

55 https://ashtracker.org/facility/87/marion-power-plant.

56 AmerenUE Venice Station Ash Pond https://www2.illinois.gov/epa/topics/water-quality/watershed-management/ash-impoundment/Pages/amerenue-venica-station.aspx..

57 See PCB No. R.14-10, In the Matter of: Coal Combustion Waste (CCW)) Surface Impoundments at Power Generating Facilities: Proposed New 35 ILL. ADM. CODE 841, "Illinois EPA's Response to Questions Posed by the Board," dated Mar. 6, 2017, available at https://pcb.illinois.gov/documents/dsweb/Get/Document-94651, at 5.

58 Dynegy has not posted required certifications concerning ash pond liners at Wood River, so for purposes of the coal ash rule, all ash ponds at the site are considered unlined.

59 See History of Construction, Wood River, at pp. 3-4, available at https://www.dynegy.com/sites/default/files/ccr/Illinois/Wood-River/Doc_636143835538464427.pdf.

60 EPA, EJSCREEN (retrieved Oct. 2018), www.epa.gov/ejscreen

Exhibit 8

ECHA
EUROPEAN CHEMICALS AGENCY

Evaluation under REACH: Progress Report 2017

10 years of experience

Disclaimer

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FOREWORD

Dear reader,

This is ECHA's tenth report on progress in evaluation under REACH – and for me the first one as ECHA's Executive Director. I am thrilled to continue the important work assigned to our Agency under this very challenging legislation. This includes the core tasks on evaluating dossiers and substances under REACH, the area where ECHA has been given significant powers – and the high responsibility coming with such powers.

Three months from the publication of this report, the 11-year-long transitional period comes to its end: after 31 May 2018, all so-called phase-in substances that are manufactured or imported in the EU in amounts of more than 1 tonne per year must have been registered. This last registration deadline will complete the database on existing substances, and it will also bring a whole new challenge for evaluation. In addition to examining the testing proposals in the last phase-in dossiers, ECHA will have to select at least 5 % of the dossiers for compliance check also from the newly submitted low-tonnage registrations, which may mean over 3000 dossiers. At the same time, the frequent non-compliances found when evaluating higher tonnage (>100 tn/year) dossiers mean that we need to continue to address the inadequate adaptations and waiving statements in those dossiers and to request the missing data. This work forms an essential part of ECHA's Integrated Regulatory Strategy and is key to meeting our ambitious global goal on chemicals management.

The forthcoming Commission communication on the review of REACH will take stock of the overall effectiveness and efficiency of the legislation and its implementation. Dossier and substance evaluation are such a core part of the regulation that we can expect recommendations also regarding their further improvement. I firmly believe that together with the Member States we can indeed further speed up and increase the impact of our joint evaluation work and ensure that the necessary information on substances is being generated, allowing authorities to conclude on whether further regulatory measures are needed.

For the key audience of this report, the REACH registrants, we again bring a set of recommendations. After the phase-in period is over, the focus of registrants needs to turn to ensuring that their dossiers are kept up to date, in terms of tonnages, uses, exposure and hazard information. As this report also briefly describes, a large part of dossiers have not been updated since they were first submitted, which raises questions on the incentives (or lack of them) for complying with obligations regarding updates. ECHA is screening all dossiers and, together with Member States, prioritises those where we have reasons to suspect exposure and hazards not being properly addressed. Take care that your dossier is ready to be scrutinised and is not prioritised because of inaccurate or missing information!

This tenth annual progress report on evaluation is also the last one in its current format. From next year onwards we will merge this report with the annual report on implementing the SVHC Roadmap. This illustrates the learnings of the past 10 years: effective and efficient implementation of REACH needs to continue forcefully and the various processes and actors need to come together to step up the efforts for meeting the ambitious objectives set by the legislator!

Bjorn Hansen

Executive Director

EXECUTIVE SUMMARY

This is ECHA's tenth progress report on evaluation under the REACH Regulation. It summarises 10 years of experience from the evaluation activities carried out so far, and gives a more detailed account of ECHA's evaluation activities in 2017. It also provides recommendations to new and existing registrants deriving from this experience.

Trends in ECHA's evaluation activities since 2008

During the first years of evaluation, from 2008 to 2010, the ECHA Secretariat picked dossiers for compliance check based on random selection, IT screening and manual prioritisation. During these years, 105 dossiers were checked and 12 decisions were adopted. Altogether these decisions addressed compliance deficiencies on 23 information requirements, mainly on physico-chemical properties, screening for reproductive/developmental toxicity and the quality of the chemical safety report. At the same time ECHA, its Member State Committee and the Member States gained important experience on all aspects of the dossier evaluation process and built the capacity and skills necessary for addressing a higher volume of cases.

Over the three years following the first registration deadline of 2010, ECHA focused compliance checks increasingly on dossiers picked up by systematic IT screening. Selected information requirements were addressed in a standardised manner. This led to total of 1 464 targeted[1] and overall checks and 329 adopted decisions, each often containing one or two information requests. The first 5 % target[2] on 2010 dossiers was thereby also met at the end of 2013.

In 2014, ECHA moved to addressing also dossiers from the second phase-in deadline. With the help of improved screening tools, the Agency started selecting dossiers of substances of potential concern, i.e. those substances for which (i) the hazard profile for higher-tier (eco)toxicity information requirements[3,4] indicates a potential concern (or the hazard profile is unclear and needs to be further examined) and (ii) there is significant exposure potential. The focus was put on the key information requirements that could help to clarify if the substance is likely to be carcinogenic, mutagenic and reprotoxic (CMR) and/or (very) persistent, bioaccumulative and toxic (PBT/vPvB). Those information requirements are key in enabling the identification of a substance as being of very high concern. Since 2015, this approach has formed a core part of ECHA's Integrated Regulatory Strategy[5]. Compared to the previous approach, the number of compliance checks and decisions is lower, but the number of information requests has increased to an average of five requests per decision taken in 2017.

Overall, during the 10 years of evaluation, ECHA checked, to various degrees, the compliance of 1 350 (7.33 %) dossiers in the >1000 tn/a tonnage band and 430 (3.79 %) of the dossiers in the 100-1000 tn/a tonnage band. Due to the selection based on screening of suspected data gaps, in the vast majority of the cases (69 % and 77 % respectively), the compliance checks have confirmed one or more non-compliances and resulted in ECHA (draft) decisions.

By the end of 2017, altogether 2 586 information requests were made in the compliance check decisions. Of these requests, 420 (16 %) have targeted substance identification, 178 (7 %) physico-chemical properties, 955 (37 %) human health hazards, 662 (26 %) ecotoxicity and

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[1] For same registration more than one compliance check could have been opened to address different targeted concern scenarios or incompliances.

2 The 5% target is calculated by using number of unique registration dossiers checked for compliance (see Table 1.)

[3] Genotoxicity, repeated-dose toxicity, pre-natal developmental toxicity, reproduction toxicity, carcinogenicity, long-term aquatic toxicity, biodegradation and bioaccumulation.

[4] https://echa.europa.eu/documents/10162/17208/echa_cch_strategy_en.pdf/607b157b-a35d-4d1c-8e62-ce8668324b1a

[5] https://echa.europa.eu/documents/10162/22837330/mb_44_2016_regulatory_strategy_en.pdf/

fate, and 367 (14 %) the quality of the chemical safety reporting. The most common non-compliances related to human health have been found in pre-natal developmental toxicity (first and second species), sub-chronic toxicity (90-day study), *in vitro* studies for gene mutation and/or cytogenicity in mammalian cells and in the *in vitro* gene mutation study in bacteria. For the environmental information requirements, the most commonly found non-compliances have been in the long-term toxicity in fish, identification of degradation products, growth inhibition in the aquatic plants, bioaccumulation and effects in terrestrial organisms. In relation to physico-chemical properties, the partition coefficient, water solubility, vapour pressure and the dissociation constant were the most often requested information requirements in the decisions.

In parallel to the work on compliance checks, ECHA successfully met the two deadlines set in REACH, 2012 and 2016, for the examination of the phase-in substances' testing proposals and issued 806 decisions. The total number of requests made in the testing proposal decisions over the years is 1 588 – 964 (61 %) regarding toxicological testing, 494 (31 %) testing on ecotoxicology and environmental fate, and 130 (8 %) regarding physico-chemical testing. Registrants proposed testing mostly for pre-natal developmental toxicity, the 90-day sub-chronic toxicity study and the long-term toxicity testing on invertebrates.

The first cases in follow-up to dossier evaluation were processed in 2012, and a structured approach was fully established in 2013. Currently, the number of follow-up evaluations carried out annually is between 300 and 350, with approximately 55 % originating from compliance check decisions and 45 % from testing proposal decisions. Since 2013, ECHA has notified the Member States competent authorities and the Commission of 73 cases where substances are possible candidates for harmonised classification and labelling, and flagged 11 cases for substance evaluation. After setting the Integrated Regulatory Strategy to focus on substances of potential concern, ECHA has also considered more systematically whether further regulatory risk management processes are needed based on the follow-up evaluation.

The other main evaluation process, substance evaluation, started effectively with the publication of the Community rolling action plan (CoRAP) in February 2012. ECHA coordinates the work and collaborates with the evaluating Member States throughout the substance evaluation process, aiming to achieve consistent and scientifically robust decisions and to ensure that the necessary information is requested using the most viable route to clarify the concerns and inform regulatory risk management.

Between 2012 and 2017, a total of 221 substances were evaluated by Member States, who considered that 159 (72 %) of these required further information to clarify the suspected concerns; the remaining 62 substances could be concluded on without the need for further information. Of the 159 substances requiring further information to clarify the concern, 147 are currently at the process stage of either further information being requested (decision-making) or newly submitted information being evaluated (follow-up). The remaining 12 substances were concluded on following the submission and evaluation of requested information. Consequently, a total of 74 substances have been concluded on, and in 43 % of these cases the evaluating Member States considered that further regulatory risk management may be needed.

ECHA's evaluation activities in 2017

In line with the Integrated Regulatory Strategy set in 2015, ECHA continued to check the compliance of dossiers for registering substances in amounts of more than 100 tonnes per annum, addressing relevant higher-tier hazard endpoints for substances of potential concern. In addition, ECHA started a pilot focusing on selected groups of priority substances on which registrants are using read-across or grouping approaches for the key endpoints, and initiated informal interaction to more effectively ensure that such a grouping approach is in compliance with the information requirements. In addition, ECHA continued to use other measures – including letter campaigns and sector-specific approaches – to work together with industry to help to increase the overall compliance of the registration dossiers and improve the quality of chemical safety reports.

Outcome of compliance checks

In 2017, 185 (83 %) out of the 222 compliance checks concluded were done on substances of potential concern. ECHA issued 151 new draft decisions addressing non-compliances; the most common information requests were in relation to pre-natal developmental toxicity, mutagenicity/genotoxicity, reproduction toxicity, and long-term aquatic toxicity. In addition, ECHA adopted 139 compliance check decisions. Altogether, 679 standard information requests were made in ECHA decisions, with an average of five information requests per decision. The most common non-compliances addressed in the compliance check decisions were: pre-natal developmental toxicity, mutagenicity/genotoxicity, simulation testing (water, soil and sediment), long-term aquatic toxicity, reproduction toxicity, and repeated dose toxicity. These information requirements enable the identification of a substances of very high concern.

Testing proposal examination

Overall, 58 testing proposal decisions were adopted in 2017, comprising 127 requests for testing. The most common human health-related testing proposals were for pre-natal developmental toxicity and the sub-chronic 90-day toxicity study. On the environmental side, the most frequent information gaps identified by the registrants were on short- and long-term effects on terrestrial organisms and long-term aquatic toxicity. The results of these tests will inform the identification of substances of very high concern, but will also complete the information on the hazards of a substance to enable its safe use.

Follow-up evaluation of compliance check and testing proposal decisions

In 2017, 327 dossier follow-up evaluations were concluded. The outcome of the follow-up evaluations shows that of the endpoints originally identified as being non-compliant with the information requirements or where a testing proposal was submitted, 639 (85 %) are now compliant as a consequence of dossier evaluation. For the remaining 117 (15 %) endpoints, the ECHA Secretariat sent a statement of non-compliance (SONC) for 109 endpoints and launched a new decision-making process according to Article 42(1) for 8 endpoints.

Of the concluded follow-up evaluations, 67 cases were flagged as candidates for further regulatory processes, i.e. classification and labelling, substance evaluation or a new compliance check. As the first decisions based on ECHA’s Integrated Regulatory Strategy’s focus on selected key endpoints were made only in 2015, the first of such cases reached the follow-up stage at the end of 2017.

Progress in substance evaluation

The 2017-2019 CoRAP update, adopted on 21 March 2017, consists of 115 substances, of which 22 were scheduled for evaluation in 2017. Following the common screening round in 2017, ECHA proposed to include 107 substances in the draft CoRAP for 2018-2020 to be evaluated by the Member States.

From the previous round of substance evaluations, the evaluating Member States prepared draft decisions for 27 substances to request further information to clarify suspected concerns. For the remaining 12 substances, the evaluating Member States considered the available information sufficient to conclude on the identified concerns.

The substance evaluation process is shifting more towards follow-up assessment, and the timing depends on the deadlines set in the decisions for the registrants to submit the data. In 2017, 26 substances were at the stage where new information should have been submitted following an initial request for further information. The responsible evaluating Member State competent authorities are currently reviewing the newly submitted information to conclude on its suitability.

ECHA adopted 31 substance evaluation decisions and published 25 substance evaluation conclusions: for 13 substances it was concluded that the risks are sufficiently controlled with existing measures, and for 12 substances it was concluded that EU-wide risk management measures are necessary.

KEY RECOMMENDATIONS TO REGISTRANTS

The following are ECHA's key recommendations to registrants based on the evaluations carried out in 2017. All recommendations and advice are available in chapter 5 of this report and on ECHA's web pages on evaluation[6].

UPDATE YOUR REGISTRATION DOSSIER WITHOUT UNDUE DELAY WHEN RELEVANT NEW INFORMATION IS AVAILABLE

- According to Article 22 of the REACH Regulation, you are responsible for updating your registration with relevant new information on your own initiative and without undue delay and submitting it to ECHA, for example in the following cases:
  - there are changes in your status as registrant;
  - there are changes in the composition of your registered substance;
  - there are changes in the annual or total quantities manufactured or imported, resulting in a change of tonnage band;
  - you have identified new uses or new uses advised against;
  - you have new knowledge of the risks of substance to human health and/or the environment;
  - there are changes in the classification and labelling of the substance;
  - you have updated or amended the chemical safety report or guidance on safe use;
  - you have identifed the need to perform a new test listed in Annex IX or Annex X to the REACH Regulation;
  - there is a change in the access granted to information in your registration.
- The new information may have an impact on the protection of human health and the environment.

JUSTIFY AND DOCUMENT YOUR WEIGHT OF EVIDENCE APPROACH

- If you propose an adaptation based on weight of evidence, the individual lines of evidence and the justification should provide a sufficient confidence level when compared to information expected with the default test. Documentation of the weight-of-evidence adaptation should be transparent and conclusions justified.
- You need to document the quality and relevance of the pieces of evidence, as well as their consistency and completeness, in relation to the standard information requirements.
- You should also address the associated uncertainties and their impact in a way that allows ECHA to assess and verify all the pieces of evidence provided in the technical dossier.

[6] https://echa.europa.eu/regulations/reach/evaluation

PROVIDE ROBUST GROUPING AND READ-ACROSS ARGUMENTS

- Use ECHA's Read-Across Assessment Framework (RAAF[7]) to check the robustness of your read-across adaptation. The RAAF describes the aspects of grouping and read-across justifications that ECHA considers to be crucial for both human health and environmental endpoints.
- In March 2017, a technical document[8] was published on ECHA's website on assessing the complexity of grouping and read-across for multi-constituent and UVCB substances. It describes the additional key issues proposed to be considered when predictions based on grouping and read-across cases involving multi-constituent substances and/or UVCBs are used to adapt standard information requirements.
- Justify the grouping and read-across approach by showing how structural similarity and dissimilarity are connected to the prediction and create a data matrix, allowing side-by-side comparison of properties of the source(s) and target substance(s).

[7] ECHA Read-Across Assessment Framework (RAAF): https://echa.europa.eu/documents/10162/13628/raaf_en.pdf.

[8] Read-Across Assessment Framework (RAAF) - Considerations on multi-constituent substances and UVCBs: https://echa.europa.eu/documents/10162/13630/raaf_uvcb_report_en.pdf/3f79684d-07a5-e439-16c3-d2c8da96a316.

1. THE EVOLUTION OF EVALUATION AND ECHA - 10 YEARS OF EXPERIENCE

This chapter summarises the evolution, progress and achievements of evaluation activities during this 10-year reporting period, including information on the number of registration dossiers submitted to ECHA and their rate of update by industry.

1.1 Objectives of the legislation

The European Chemicals Agency (ECHA) was established in 2007 and the REACH Regulation (hereinafter REACH) entered into force on 1 June 2007. The purpose of REACH is to ensure a high level of protection of human health and the environment, including the promotion of alternative methods for assessment of hazards of substances, as well as the free circulation of substances on the European internal market while enhancing competitiveness and innovation.

REACH is based on the principle that manufacturers, importers and downstream users should ensure that they manufacture, place on the market or use substances that do not adversely affect human health or the environment. Its provisions are underpinned by the precautionary principle.

ECHA and the Member States of the European Union evaluate the information submitted by registrants in their registration dossiers. Dossier and substance evaluation processes are fundamental in REACH to instil confidence registrants meet their legal obligations, to ensure that unnecessary testing on animals is avoided, and to make sure that sufficient information is provided to assess and manage risks related to chemicals. After evaluation, if ECHA or a Member State competent authority considers that further information is needed, a decision requesting the missing information is issued. When the deadline set in an ECHA evaluation decision has passed, a follow-up to dossier or substance evaluation takes place, and if the dossier is found to be non-compliant, national enforcement action is initiated.

1.2 Registrations

Under REACH, there have been two registration deadlines so far, in 2010 and 2013. By the third and last registration deadline on 31 May 2018, substances produced or imported in the European Union in relatively low volumes (1 to 100 tonnes per year), such as speciality chemicals, will also have been registered.

By the end of 2017, 12 242 companies had registered their chemicals and the ECHA registration database contained a total of 67 005 registrations[9] covering 17 143 unique substances. Of these, 2 495 were manufactured in or imported to the EU in quantities of over 1 000 tonnes per year. After the 2018 registration deadline, the REACH database will contain information on all chemical substances that are manufactured and/or imported in the European Union in amounts above one tonne per year. Figure 1 presents the number of initial registrations submitted to ECHA between 2008 and 2017 by tonnage band.

[9] Comprising registrations for phase-in and non phase-in substances as well as notifications made under the previous European chemicals legislation (NONS).

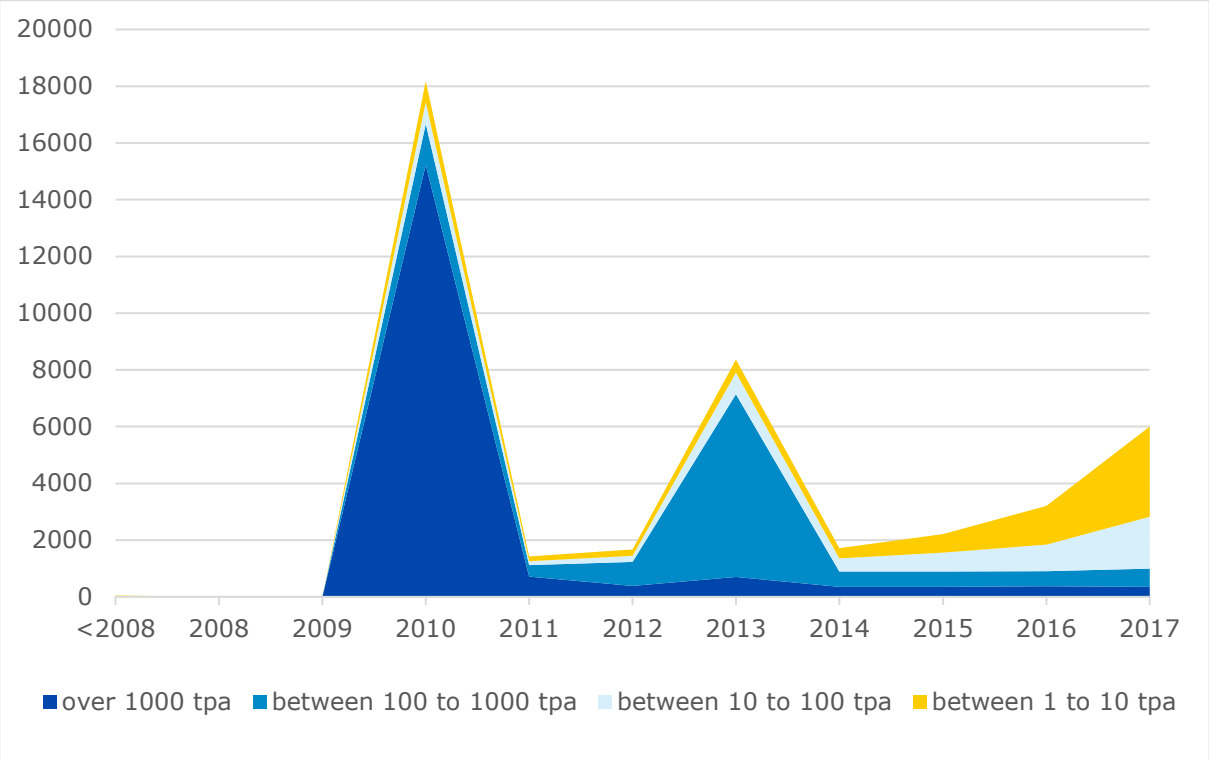


Figure 1: Initial registration dossiers submitted to ECHA in 2008-2017 grouped by tonnage band (excluding information on intermediates and NONS). The total number of initial full registrations in the ECHA database by the end of the 2017 was 56 364.

1.3 Compliance of information and the safe use of chemicals

ECHA's evaluation activities, and compliance checks in particular, are not only a legal duty but also an integral part of ECHA's strategy to improve the availability and quality of the information provided by registrants in their REACH dossiers and to ensure the safe use of chemicals in the European Union. In addition to evaluation activities, ECHA uses a range of tools to try to improve the compliance and quality of data in REACH registrations and to coordinate the development of regulatory measures to manage the risks posed by the registered substances.

1.3.1 Compliance checks

During the first years of REACH implementation, ECHA focused on establishing and building capacity in relation to the main REACH processes. The selection of dossiers for compliance checks was based on IT-screening, manual prioritisation and random selection. From 2011 to 2014, the majority of checks targeted specific parts of dossiers, so-called "areas of concern", such as substance identity, physico-chemical properties or missing environmental and human health information. The focus was on targeting easily identifiable data gaps and addressing them in a standardised manner.

By the end of 2013, ECHA reached the first regulatory milestone by meeting the 5 % target for compliance checks for the dossiers submitted for the 2010 deadline[10] (i.e. dossiers for substances that are manufactured or imported in quantities of 1000 tonnes or more per year). The experience gained from this work gave ECHA better insight into the overall quality of the information in the registration database and influenced the design and implementation of the

[10] https://echa.europa.eu/-/target-met-for-5-percent-compliance-checks-of-the-2010-registration-dossiers

Integrated Regulatory Strategy in 2015, which was developed to meet the United Nations chemicals management goals set by the World Summit on Sustainable Developments (WSSD).

The Integrated Regulatory Strategy brings all the REACH and CLP processes coherently together to achieve the aims of these two regulations. Together with Members States, ECHA has developed a common screening process, which aims to identify the substances that have the greatest potential for negative impact on human health and the environment. The common screening helps reach conclusions on which substances need to have further information submitted about them and may need to go through the compliance check, as well as on cases where there is enough information available to conclude on a concern and the substances can, where necessary, be directly earmarked for substance evaluation or for EU risk management measures. Furthermore, in 2016-2017 the focus on screening has shifted towards addressing groups of substances.

Dossier evaluation is the main tool to require further generation of hazard data when the dossier is not complying with information requirements. Under compliance check, priority is given to substances of potential concern, i.e. those substances where (i) the hazard profile for higher tier (eco)toxicity information requirements[11,12] indicates a potential concern (or the hazard profile is unclear and needs to be further examined) and (ii) where there is significant exposure potential for workers, consumers or the environment. The focus is on the key information requirements that could help to clarify if the substance is likely to be carcinogenic, mutagenic and reprotoxic (CMR) and/or (very) persistent, bioaccumulative and toxic (PBT/vPvB).

The change in strategy and moving from targeted, area-of-concern-based compliance checks towards evaluating the selected substances of potential concern is reflected in the number of concluded cases, adopted ECHA decisions and the information requests made within them. The targeted compliance checks resulted in more decisions, the typical decision containing one or two information requirements. Under the current concern-based approach, the complexity of the evaluation has increased, and also the number of information requests made in one decision has increased to five or more requests per decision in 2017 (see Figure 2). More importantly, the majority of the information requests are now more targeted for higher-tier tests, like pre-natal developmental toxicity, mutagenicity or genotoxicity, reproduction toxicity and long-term aquatic toxicity. As a consequence, the time given to registrants to comply with a decision has increased. It now takes on average two or three years from the date of issue of ECHA decision for registrants to update their dossier with the results of the requested studies. This means that the bulk of the information requested under the new integrated strategy can only be assessed by ECHA from 2019 onwards.

[11] Genotoxicity, repeated-dose toxicity, pre-natal developmental toxicity, reproduction toxicity, carcinogenicity, long-term aquatic toxicity, biodegradation and bioaccumulation.

[12] https://echa.europa.eu/documents/10162/17208/echa_cch_strategy_en.pdf/607b157b-a35d-4d1c-8e62-ce8668324b1a

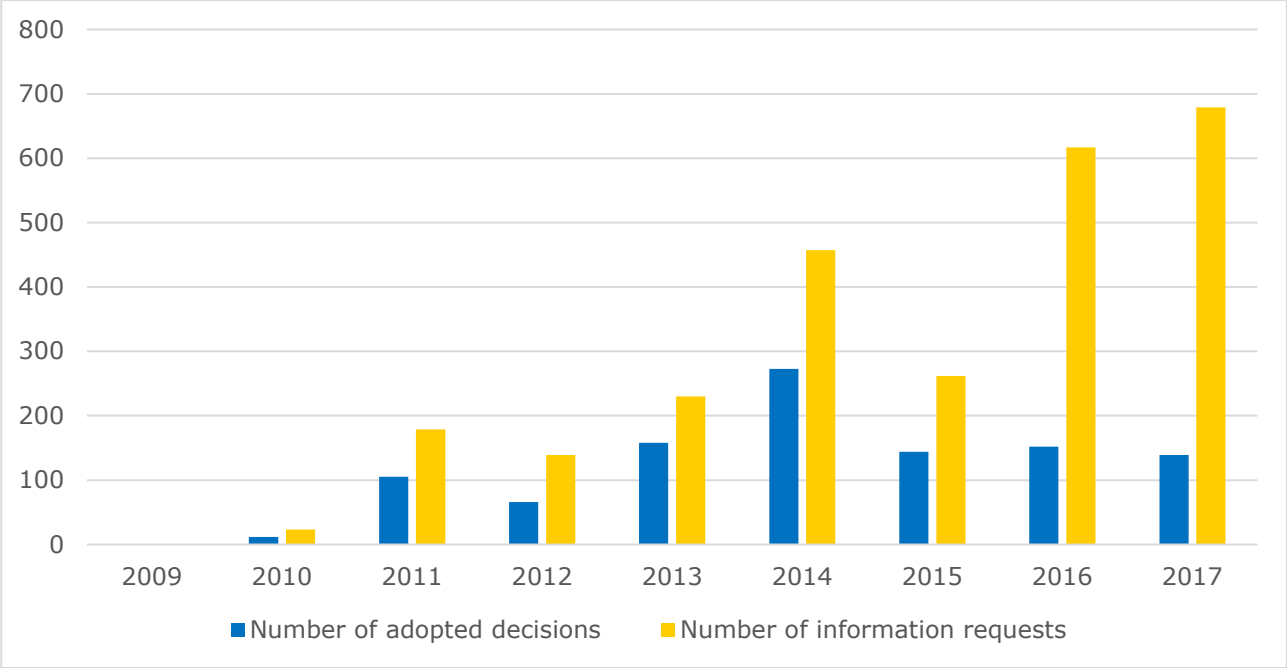


Figure 2: Concluded compliance check decisions by ECHA in 2009-2017 and the number of information requests that they contained.

Figure 3 shows the number of requests made over the years on different groups of information requirements. As explained above, under the current strategy and from 2015 onwards, the number of requests made for human heath and environment-related higher-tier tests have increased, in absolute terms and relative to other requests (e.g. in relation to substance identity), as ECHA started actively selecting and addressing dossiers with substances of potential concern. The total number of requests made in ECHA compliance check decisions by the end of 2017 was 2 582.

Non-compliance in the human health-related information requirements was most common for pre-natal developmental toxicity (first and second species), sub-chronic toxicity (90-day study), *in vitro* studies for gene mutation and/or cytogenicity in mammalian cells, and the *in vitro* gene mutation study in bacteria. For environmental information requirements, data gaps were commonly found in long-term toxicity in fish, identification in degradation products, growth inhibition in aquatic plants, bioaccumulation, and the effects in terrestrial organisms. For physico-chemical properties, the partition coefficient, water solubility, vapour pressure and the dissociation constant were the most often addressed information requirements in the ECHA decisions.

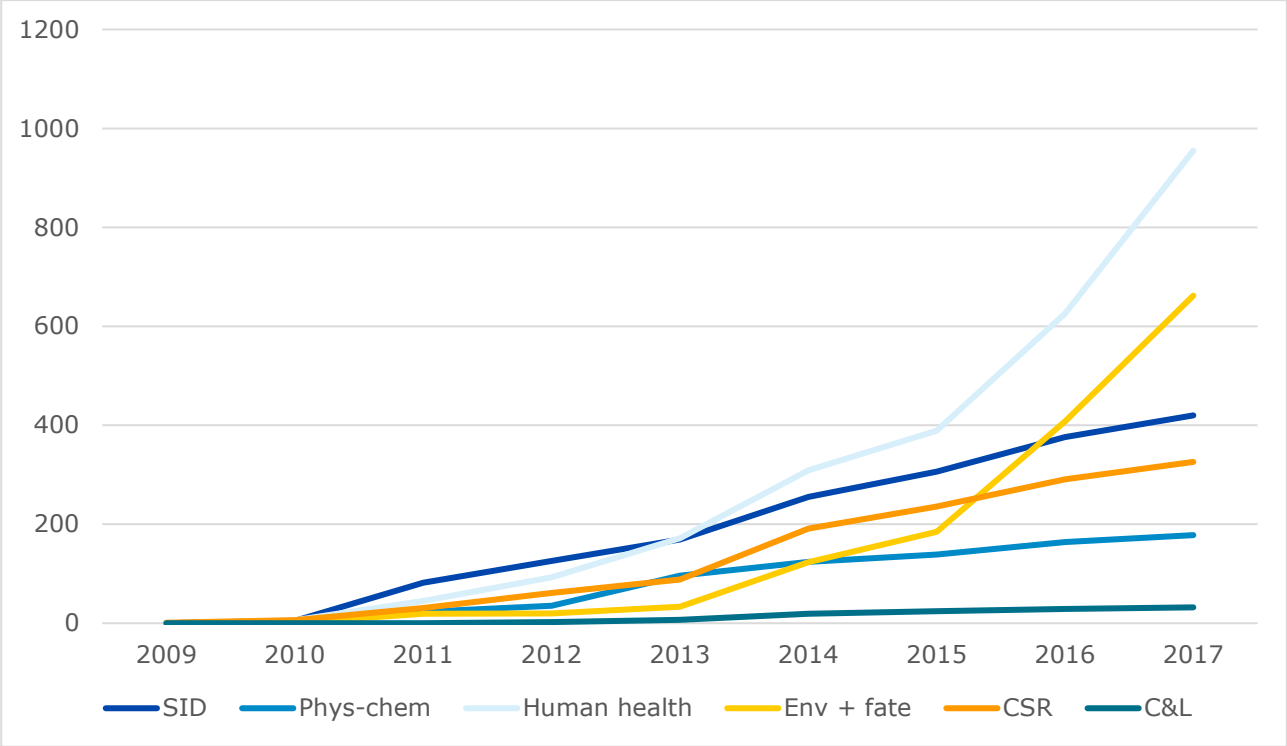


Figure 3: Cumulative number of standard information requests in the adopted compliance check decisions in 2009-2017.

Overall, ECHA has checked, to various degrees, the compliance of 1 350 (7.33 %) dossiers in the >1 000 tn/a tonnage band and 430 (3.79 %) of the dossiers in the 100-1 000 tn/a tonnage band (see Table 1 below). Due to the selection based on screening of suspected data gaps, in the vast majority of the cases (69 % and 77 % respectively), the compliance checks confirmed one or more data gaps and resulted in a ECHA (draft) decision.

Table 1: Number of compliance checks performed by tonnage band.

Tonnage band	Performed unique compliance checks				
	Concluded with DD	Concluded without DD	Total	Registration dossiers*	Percentage of registrations checked for compliance (%)
≥1 000 t/a	934	416	1 350	18 408	7.33
100 to 1 000 t/a	332	98	430	11 342	3.79
10 to 100 t/a	45	26	71	5 714	1.24
1 to 10 t/a	31	70	101	6 929	1.46
Total	**1 342**	**610**	**1 952**	**42 393**	**4.60**

* Number of unique registration dossiers; registrations of intermediates and NONSs excluded from the count.

1.3.2 Testing proposal examinations

A testing proposal needs to be included in the registration dossier if the registrant or downstream user identifies a need to perform a test that belongs to the standard information requirements for substances manufactured or imported in annual quantities of 100 tonnes or more. ECHA examines all testing proposals received. Furthermore, ECHA publishes information on its web pages on all the testing proposals that involve tests on vertebrate animals, and invites third parties to submit scientifically valid information and studies that address the relevant substance and the hazard endpoint that is subject to the testing proposal. ECHA takes

into account all information submitted and based on the information available will accept, reject, modify or ask for additional testing as necessary.

So far, ECHA has successfully met the two deadlines set in REACH (in 2012 and 2016) regarding the examination of phase-in substances' testing proposals. In the case of non-phase-in substances, ECHA examines and prepares a draft decision within 180 days of receiving a registration or downstream user report containing a testing proposal.

Since 2009, ECHA has examined 1 348 testing proposals and has issued 806 decisions (Figure 4). As part of the testing proposal examination, ECHA has launched 1 087 third party consultations and has received 826 pieces of information regarding the testing proposals under consultation.

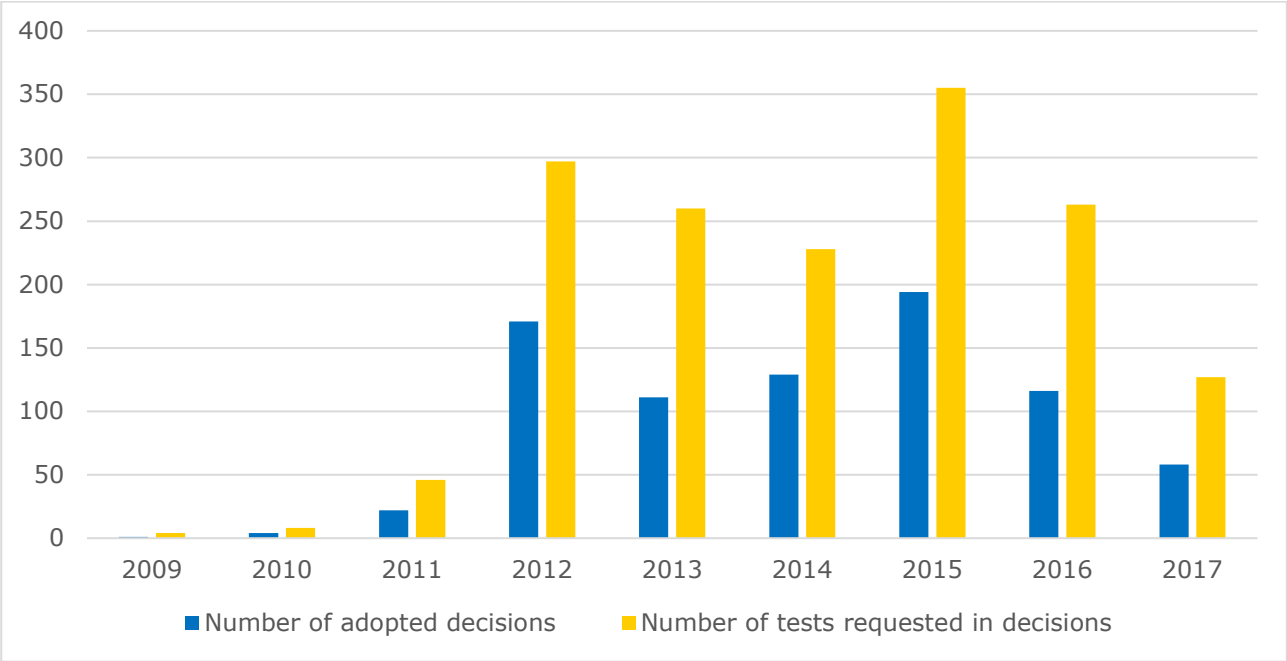


Figure 4: ECHA adopted decisions on testing proposal examinations in 2009-2017.

So far, the most common human health-related testing proposals have been for pre-natal developmental toxicity and the 90-day sub-chronic toxicity study. The most commonly proposed ecotoxicity test has been long-term toxicity testing on invertebrates. Between 2009 and 2017, the most testing proposals were submitted to ECHA to clarify the potential hazards to human health (see Figure 5 below). A total of 1 588 requests were made in the testing proposal decisions, of which 964 (61 %) were toxicological testing requests, 494 (31 %) ecotoxicological and fate testing requests, and 130 (8 %) physico-chemical testing requests.

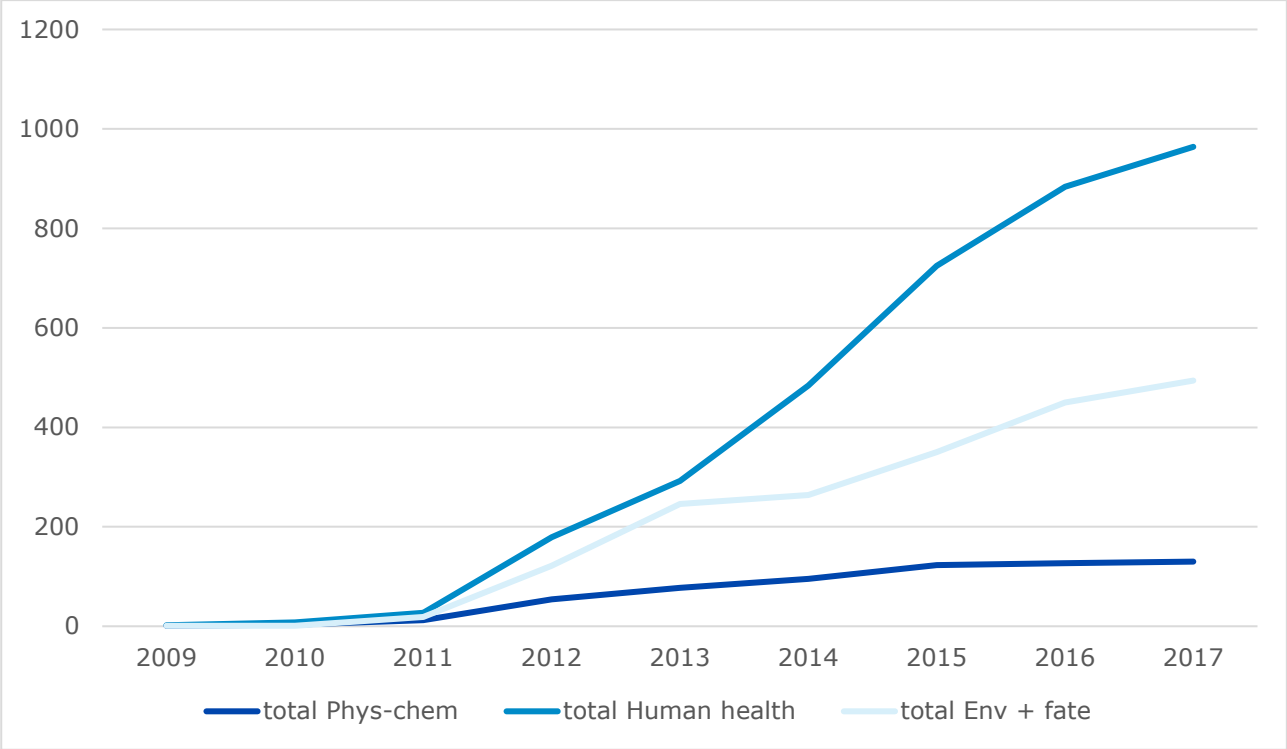


Figure 5: Cumulative number of requests made in adopted testing proposal decisions in 2009-2017 by type of test request.

1.3.3 Follow-up to dossier evaluation

Once the deadline given in the dossier evaluation decision has passed, ECHA will assess the information submitted to ECHA and verify if it complies with the decision. If it does, ECHA notifies the Commission and the Member States competent authorities of the case and the conclusions made on the received information. In the case of non-compliance, national enforcement action will be initiated.

ECHA has been adopting evaluation decisions since 2009 and the first deadlines for registrants to update their dossiers with the requested information expired in 2011. The number of decisions issued increased steadily in the first years and required a systematic approach to follow-up evaluation to be set up, which was fully established in 2013. Since then, the follow-up evaluation process has been developed further, streamlined and adapted to new and refined policies as well as newly introduced IT tools. In cases where registrants have not fulfilled the obligations set in a decision by the given deadline, ECHA has collaborated successfully with the Member States enforcement authorities to execute the decision. The annual average for such cases is around 40, including both compliance checks and testing proposal decisions. Currently, the number of follow-up evaluations carried out annually is 300 to 350 annually, with approximately 55 % originating from compliance checks and 45 % of testing proposal decisions.

In December 2016, ECHA concluded its 1000th follow-up evaluation. Since 2016 and after the Integrated Regulatory Strategy focused on substances of potential concern, ECHA has also considered more systematically if further regulatory risk management processes are needed based on the follow-up evaluation. This approach has led to notifying the Commission and the Member States competent authorities of possible candidates for harmonised classification and labelling, as well as flagging some cases for substance evaluation (see Table 2 below).

Table 2: Outcomes of the follow-up to dossier evaluation, including the flagging for further assessment and the need for regulatory risk management identified. (CCH = compliance check, TP = testing proposal.)

Outcome of the follow-up evaluation		2012	2013	2014	2015	2016	2017	Total
Article 42(2) notification*	TP	0	72	99	111	118	143	543
	CCH	2	77	136	148	201	129	692
Statement of non-compliance**	TP	2	10	27	16	17	21	93
	CCH	8	22	17	26	16	25	114
Non-compliant cases still open (recorded by the year the non-compliance was notified to the Member State authorities)***	TP	0	0	2	2	10	17	31
	CCH	1	2	2	7	8	18	38
Flags for future regulatory actions		**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**Total**
Proposal for harmonised classification and labelling	TP	0	1	10	17	4	19	51
	CCH	0	0	4	1	1	16	22
Candidate for substance evaluation	TP	0	0	4	3	0	1	8
	CCH	0	0	2	0	0	1	3

* Information requirements were complied with by the deadline.
** No information provided or an unacceptable adaptation was provided.
*** No (or no adequate) information was provided by the deadline. ECHA invited MS authorities to consider enforcement actions towards the registrant. The requested information still has not been provided.

1.3.4 Substance evaluation

Substance evaluation aims to verify whether a substance constitutes a risk to human health or the environment from an EU-wide perspective. It contributes to the identification of chemicals of concern requiring further risk management.

In preparation for the start of the substance evaluation process, ECHA organised workshops with, the Member State Committee (MSC) and the Commission to discuss the prioritisation criteria for inclusion of substances in the Community rolling action plan (CoRAP) as well as procedural matters. The first CoRAP was published on 29 February 2012 and contained 36 substances to be evaluated in 2012.

During 2015, a common screening process was developed in collaboration with the Member States to identify substances with the greatest potential for negative impact on human health and the environment. Furthermore, ECHA launched a review of the substance evaluation process to further reduce process time and increase time available for higher-value tasks such as expert input to cases. In addition, the first decisions by the Board of Appeal provided important feedback on the process and the substance evaluation decisions.

To provide further support in considering the best approaches to clarify the concern and any risk management measures, ECHA implemented a more structured approach for interaction with the evaluating Member State competent authorities in 2016.

Between 2012 and 2017, 221 substances were evaluated by Members State competent authorities (MSCAs). The evaluating MSCAs considered that 159 (72 %) of these required further information to clarify the suspected concerns.

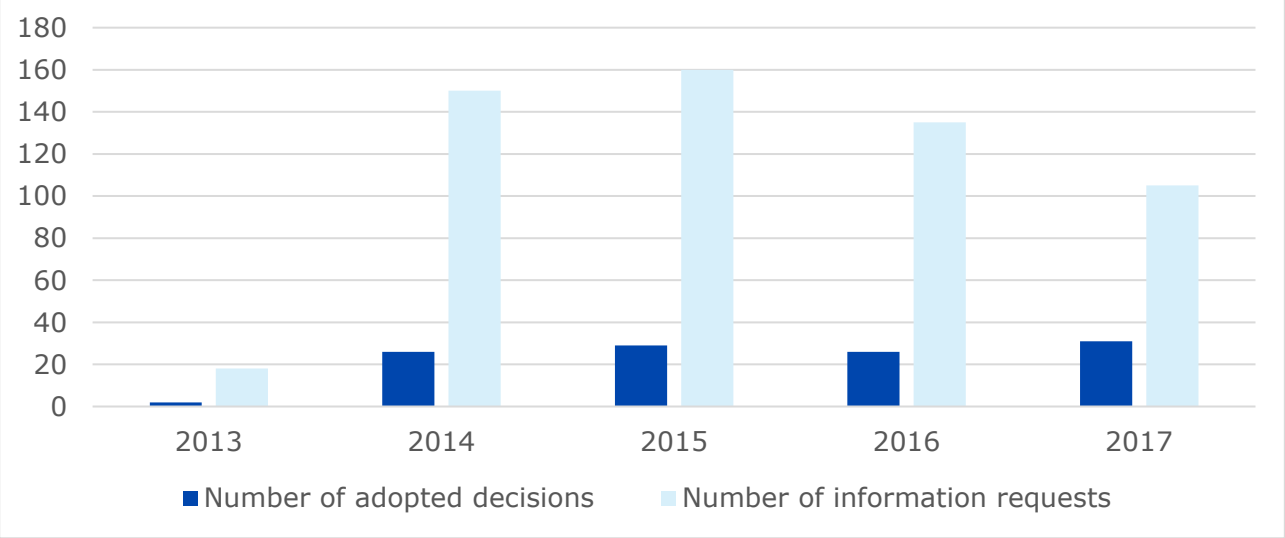


Figure 6: ECHA adopted decisions on substance evaluation in 2013-2017.

For the remaining 62 (28 %) substances, the evaluating MSCAs considered the available information was sufficient to conclude on the concerns and submitted their conclusion documents to ECHA. It is worth noting that the reported number of substance evaluations resulting in a request for further information does not take into account situations where the draft decision was subsequently terminated during the decision-making stages.

An evaluation may conclude that risks are sufficiently under control with the measures already in place (i.e. no further EU-wide regulatory action is proposed). Otherwise, it may lead to the proposal of EU-wide risk management measures, such as restrictions, identification of substances of very high concern, harmonised classification, or other actions outside the scope of REACH.

Figure 7 below summarises the number of substance evaluation conclusions published between 2013 and 2017. These numbers include conclusions made after the evaluation of additional information requested via the decision-making process.

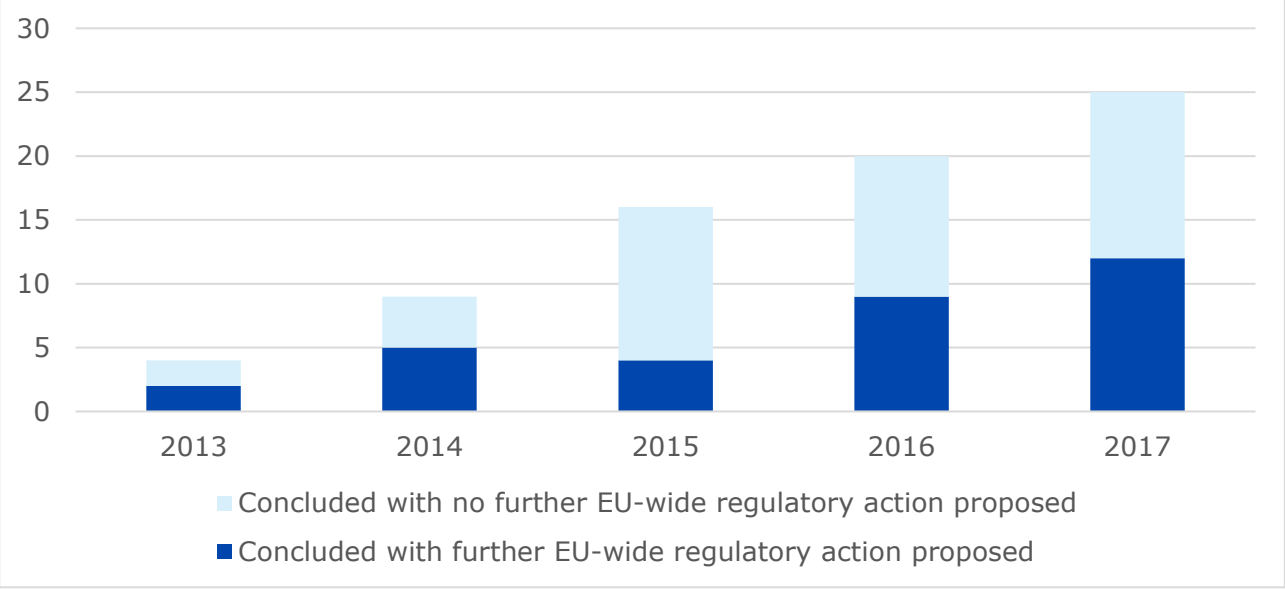


Figure 7: Substance evaluation conclusions published in 2013-2017.

Figure 8 below summarises the number and type of regulatory actions at EU level proposed within all substance evaluation conclusions published between 2013 and 2017. It is worth noting that a conclusion may propose more than one type of regulatory action at EU level.

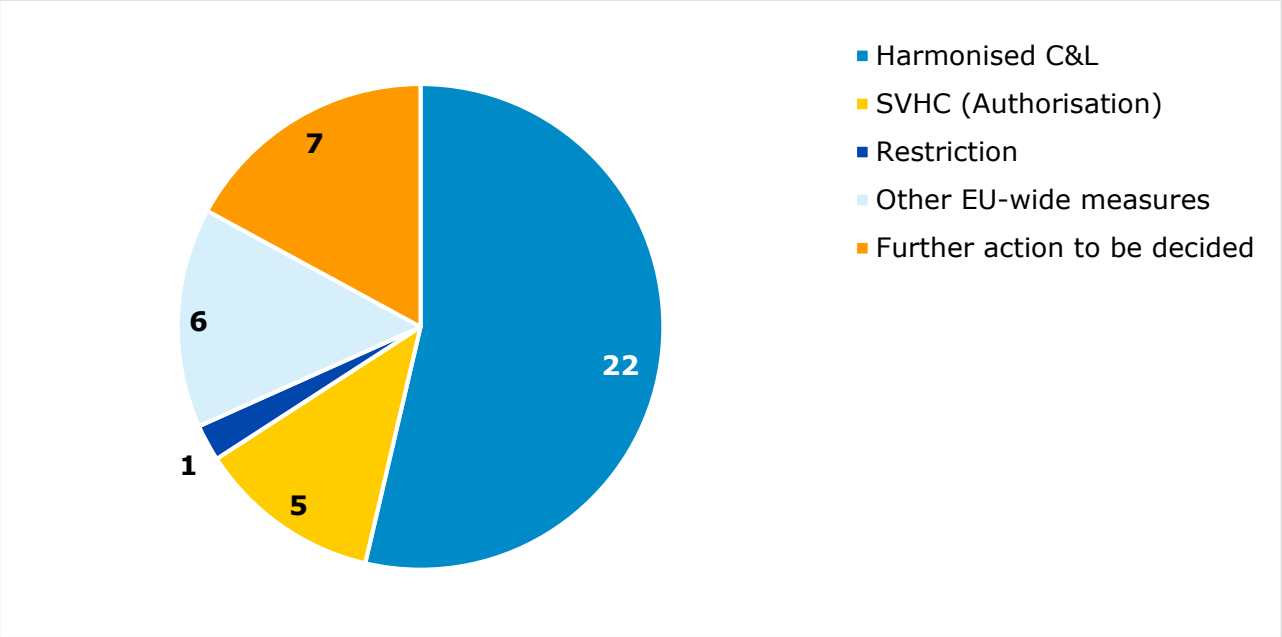


Figure 8: Regulatory actions at EU level proposed within substance evaluation conclusions published in 2013-2017.

1.4 The future of REACH evaluation

ECHA's current two main strategic objectives aim at maximising the availability of high quality information to enable safe manufacture and use of chemicals and at mobilising authorities to use information intelligently to identify and address chemicals of concern. ECHA is working towards these objectives by following its Integrated Regulatory Strategy, in close co-operation with the Member States, using common screening for selecting the dossiers and substances for evaluation and prioritising the substances of potential concern.

During the first ten years of REACH, dossier and substance evaluation have been established as the key processes for generating further information on the substances. The work continues, focusing on substances that have been registered at 100 tonnes or more and on meeting the WSSD goals. A lot of work remains to be done to maximise the availability of high-quality data and ensuring the safe use of chemicals. The focus of the screening and evaluation of dossiers and substances has moved from single substances to groups of substances and in the future ECHA will continue to strengthen this approach. ECHA will continue to improve the efficiency and effectiveness of the processes and to adapt its approaches and practices based on experience, new scientific and technical developments, including alternative methods to animal testing, learnings from litigation cases, and other feedback from its partners and stakeholders.

After the 2018 registration deadline, the new, sometimes complex and previously unknown lower-tonnage substances will bring an interesting and challenging task to ECHA and evaluation: how to identify candidates for risk reduction among the lower-volume substances with limited data available? For the 2018 registration dossiers, a new approach and plan needs to be developed. Grouping of substances is likely to play an even bigger role and due to limited standard information requirements, substance evaluation will most likely be required to request more often for data that is necessary to conclude on the key CMR and PBT properties of substances.

With this and other new challenges ahead, ECHA will continue to seek opportunities to work more closely in collaboration with Member States competent authorities and to rely on their continued investment in risk management and enforcement activities.

2. EVALUATION PROGESS IN 2017

This chapter presents the progress made in dossier and substance evaluation during 2017.

2.1 Summary of evaluation progress in 2017 in numbers

The following is a summary of evaluation progress based on the main outputs in 2017.

Dossier selection

The selection of candidates for compliance check continued to focus on substances of potential concern, in line with ECHA's Integrated Regulatory Strategy. In 2017, 315 dossiers were scrutinised as candidates for compliance check and 218 of them were selected for further processing. The other cases were for the time being not selected for compliance check due to, for example, low priority for further regulatory work or other ongoing processes. Furthermore, compliance check was opened for 25 dossiers which are planned to be subject to new substance evaluations.

New testing proposals were submitted in 104 registration dossiers. In addition, testing proposals for extended one-generation reproductive toxicity studies (EOGRTS) were submitted in 16 dossiers based on the Commission decision on the related previous testing proposal examinations or compliance checks.

Dossier evaluation

222 new compliance checks concluded, resulting in 151 draft decisions. 185 (83 %) of the compliance checks were performed on dossiers of high-priority substances. Of the 151 draft decisions, 138 were on high-priority substances, i.e. on substances of potential concern.

Overall, in all the draft decisions ECHA addressed 787 standard information requests, of which 564 were on higher-tier human health and environment endpoints. The 13 non-priority compliance check draft decisions were either targeted to substance identity or on substances not specifically shortlisted for high priority.

72 testing proposal examinations concluded. ECHA examined 72 testing proposals of which 14 were concluded with no action and 58 with a draft decision. In these drafts, 118 tests were proposed to be requested, of which 71 were tests on human health hazards, 40 on environmental hazards and fate, and 7 on physico-chemical properties.

197 dossier evaluation decisions adopted. ECHA adopted 139 compliance check decisions and 58 decisions on testing proposals, which contained 806 standard information requests in total.

327 dossier evaluation follow-up evaluations were concluded. In these follow-up evaluations, ECHA examined whether the information provided by registrants, in response to decisions adopted by ECHA, complied with REACH requirements. In 272 cases ECHA received the information requested in a compliance check or a testing proposal decision.

Substance evaluation

Community rolling action plan (CoRAP) update 2017-2019. The 2017-2019 CoRAP update was adopted on 21 March 2017, consisting of 115 substances, of which 22 were scheduled for evaluation in 2017.

For CoRAP 2018-2020, ECHA proposed to include 107 substances to be evaluated by Member States. Of these, 26 substances are expected to be evaluated in 2018, 37 in 2019, and 44 in 2020.

39 substance evaluations conducted in 2017. The evaluating Member State competent authorities prepared draft decisions for 27 substances to request further information to clarify suspected concerns. For the other 12 substances, the evaluating MSCAs considered the available information to be sufficient to conclude on the concerns.

31 substance evaluation decisions adopted. ECHA adopted 31 decisions originating from substance evaluation, requesting further information from registrants to verify the suspected concerns.

25 substance evaluation conclusions published, completing the substance evaluation. 13 of these concluded that the risks are sufficiently controlled with existing measures, and 12 concluded that EU-wide risk management measures are necessary.

2.2 Dossier selection and pre-processing

In line with ECHA's Integrated Regulatory Strategy, compliance checks continued to be opened for standard registration dossiers in tonnage bands over 100 tonnes per year which indicate high potential for exposure and have potential non-compliance in one of the eight so-called super endpoints. Moreover, in 2017 the interplay between dossier evaluation and the other REACH and CLP processes was further strengthened by focusing the compliance check selection to substances that have uncertain priority for regulatory risk management due to lacking hazard information as it was then not possible to confirm or refute that the substance is of concern.

Another enhancement was that candidates for compliance check were selected increasingly in groups or pairs of similar substances based on structural similarities and read-across, or in categories applied by the registrants or regulatory bodies. Such grouping was applied both in ECHA's own selection and in the common screening[13]. Groups of substances having uncertain priority for regulatory risk management were processed by ECHA as candidates for compliance check and groups having suspected concerns were directed to common screening. However, later the manual screening also concluded on some of the groups that a compliance check may be needed to be able to confirm or refute a suspected concern. In 2017, the majority of compliance check candidates originated from ECHA's own IT based selection and manual screening of substances having uncertain priority for regulatory risk management (83 %) (see Figure 10 for the breakdown of sources for compliance check candidates).

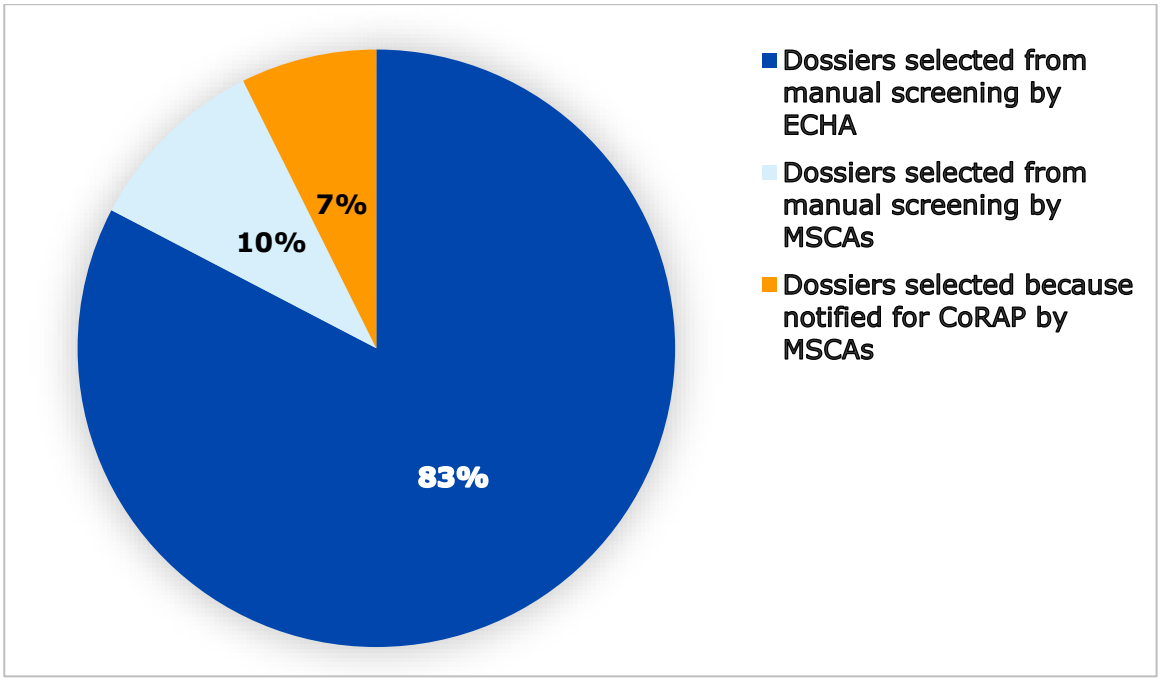


Figure 10: Breakdown of sources for 315 compliance check candidates in 2017.

Before opening a compliance check, ECHA pre-checks the dossier to ensure that the case is relevant and matches the priority criteria laid down in the Integrated Regulatory Strategy. In 2017, 315 dossiers were scrutinised as candidates for compliance check and 212 were selected for further processing. In addition, the dossiers which were planned to be subject to substance evaluation were directly taken for compliance check.

[13] Further information on common screening: https://echa.europa.eu/screening.

After pre-check, 50 candidate dossiers were considered to be of low priority for further regulatory work – three of them based on low potential for exposure only and 47 due to low toxicity or other low priority. An overview of the reasons for early termination of 96 compliance check candidates in 2017 are given in Figure 11. No compliance check will be currently opened for these dossiers, but the need for compliance check may be reconsidered in the future based on new information on, for example, uses and exposure.

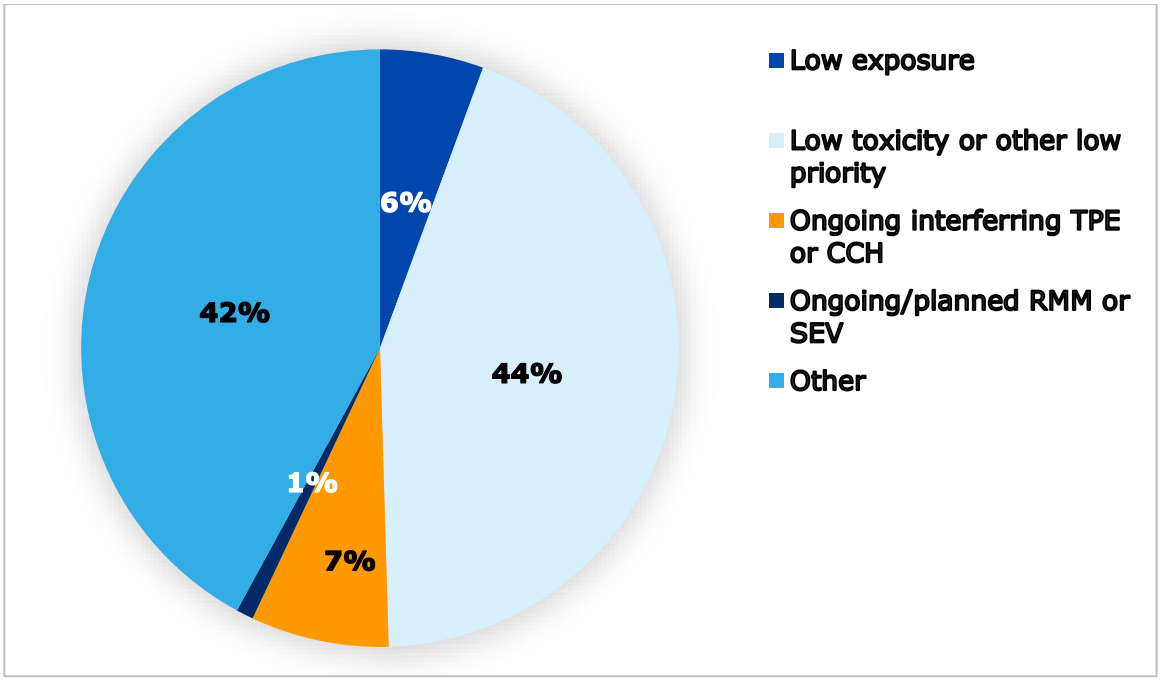
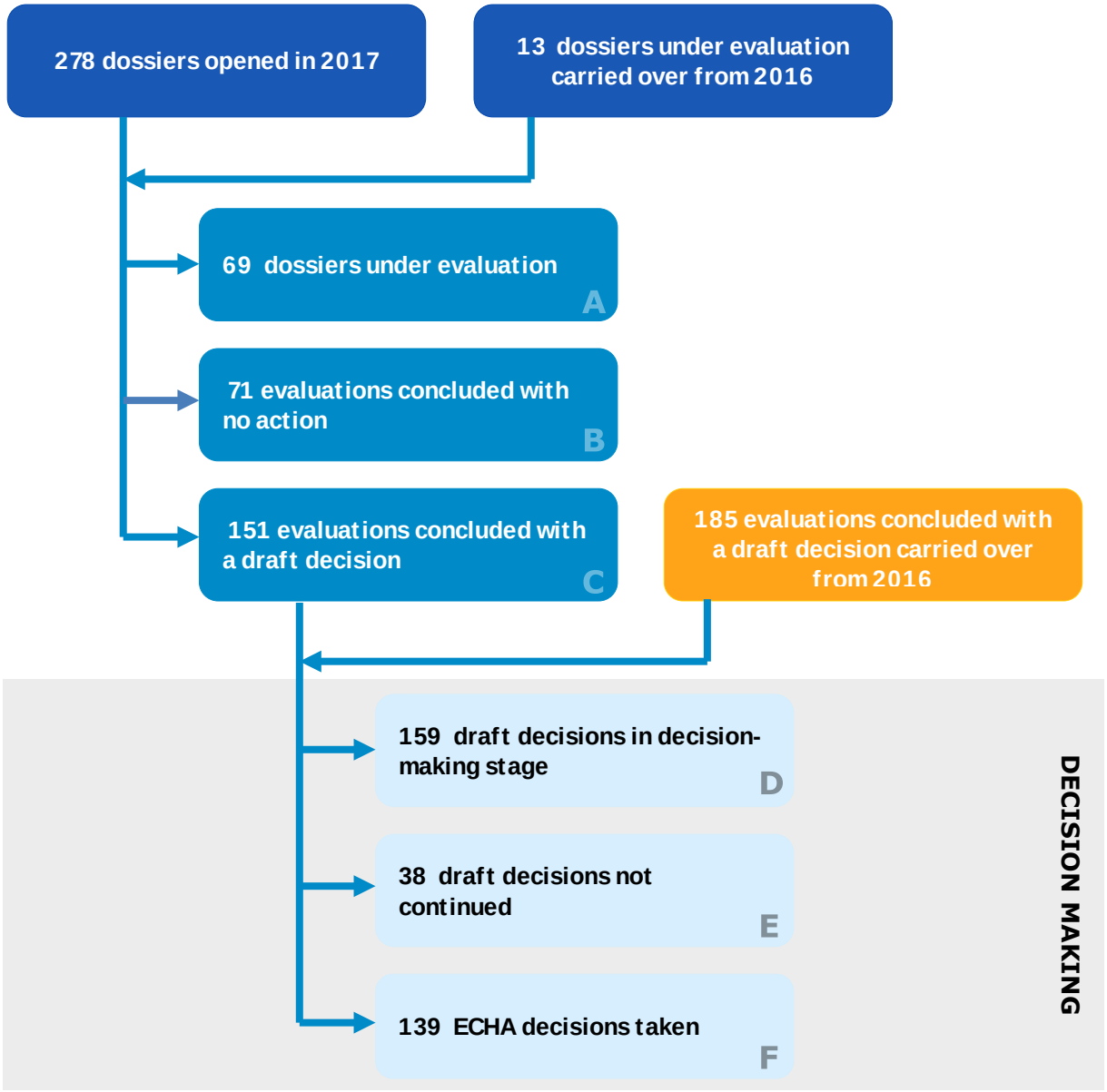


Figure 11: Reasons for early termination of 96 compliance check candidates in 2017. Other reasons include e.g. cease of manufacture, and the substance being a member of a large category to be evaluated later. Note that in a few instances several reasons may apply for the same case – for example, a reason based on human health-related endpoints may be different to one based on environment-related endpoints.

2.3 Compliance checks

2.3.1 Compliance check overall

Figure 9 below presents the overall compliance check process in 2017.



[A] Scientific and legal evaluation stage.
[B] No formal action towards the registrant is deemed necessary.
[C] Formal action to request further information from the registrant is deemed necessary.
[D] Stages of processing the draft decision, including notification of the draft decision to the registrants, notification to the MSCAs, referral to the MSC (when MSCAs submitted proposals for amendment), and referral to the Commission (when unanimous agreement was not reached in the MSC).
[E] Scientifically-relevant data or important administrative changes lead to termination of the ongoing decision-making procedure.
[F] ECHA evaluation decision taken either following a unanimous agreement of the MSC, or where no proposals for amendment of the draft decision were submitted by the MSCAs.

Figure 9: Number and outcome of compliance checks in 2017.

2.3.2 Scientific and legal assessment

In total, ECHA checked 222 dossiers for compliance during 2017. In 151 (68 %) of these, ECHA concluded that the non-compliances found were severe enough to require further action and generation of new information. Consequently, ECHA prepared draft decisions requesting registrants to submit the missing information.

Clarity of the substance identity (SID) information is a prerequisite for ensuring that the dossier complies with the information requirements. If the provided SID information allows ECHA to interpret the scope of the registration, the assessment turns to the REACH information requirements on physico-chemical and hazard data in the technical dossier.

However, if the substance identity information is not clear enough to meaningfully assess the rest of the dossier, ECHA will issue a substance identity-targeted compliance check (draft) decision. In the context of the evaluation process in 2017, substance identity issues were addressed in 36 draft decisions containing also other types of information requirements. In 22 cases, substance identification issues were clarified due to informal calls made to the registrant that resulted in dossier updates where such issues were clarified and solved.

In 71 (32%) of the compliance checks[14], ECHA concluded that the generation of new information was not needed or that requesting it was not proportionate, and therefore no further action was required. Table 3 below summarises the overall compliance check conclusions, grouped by registration tonnage band, made during 2017. This result reflects only indirectly the effectiveness of the screening and selection of dossiers and cannot directly be used to assess the overall rate of compliance of all registration dossiers.

Table 3: Compliance checks concluded in 2017 with a draft decision or without action, by tonnage band.

Tonnage band	Performed CCHs		
	Concluded with DD	Concluded without action	**Total**
≥1 000 t/a	54	34	**88**
100 to 1 000 t/a	86	29	**115**
10 to 100 t/a	9	7	**16**
1 to 10 t/a	2	1	**3**
Total	**151**	**71**	**222**

Focusing on the substances of potential concern

The Integrated Regulatory Strategy is effectively addressing the dossiers and substances of potential concern. Since 2015, compliance checks have been focused on eight key standard information requirements of Annexes IX and X to REACH. These are mutagenicity/genotoxicity, repeated-dose toxicity, pre-natal developmental toxicity, reproduction toxicity, carcinogenicity, long-term aquatic toxicity, biodegradation and bioaccumulation.

These key higher-tier human health and environment endpoints will allow a conclusion to be made on whether the criteria for substances of very high concern are likely to be fulfilled.

Out of the 222 compliance checks concluded in 2017, 185 (83 %) were performed on priority substances, and 138 of these resulted in draft decisions.

[14] B within Figure 9

Overall, in these 138 priority draft decisions ECHA addressed 735 information requests, of which 537 were focused on the eight key standard information requirements of concern (see Table 4). The most common suspected concerns were addressed in the ECHA draft decisions with the following information requests: pre-natal developmental toxicity, mutagenicity/genotoxicity, reproduction toxicity, and long-term aquatic toxicity. These results confirm that the dossiers selected for compliance check in the common screening contain important data. In 2017, ECHA also issued 13 non-priority draft decisions with 62 information requirements, of which 27 were on the key information requirements. On average, in 2017 a draft decision contained over five information requests, of which three to four were for higher-tier tests.

Table 4: Information requests made in the compliance check draft decisions in 2017.

Endpoint	Priority CCH	Non-priority CCH	Total requests
	Number of requests in the 138 draft decisions	Number of requests in the 13 draft decisions	Number of requests in all the 151 draft decisions
Repeated-dose toxicity	65	6	71
Mutagenicity/genotoxicity	97	5	102
Pre-natal developmental toxicity	121	7	128
Reproduction toxicity*	83	7	90
Carcinogenicity	0	0	0
Long-term aquatic toxicity	84	2	86
Biodegradation	66	0	66
Bioaccumulation	21	0	21
Other endpoints	198	35	233
Total	**735**	**62**	**797**

* 35 of these were requests for Annex VIII, 8.7.1 screening studies.

Evaluating groups of substances

In 2017, ECHA started pilots with selected groups of priority substances for which registrants had proposed a read-across and grouping approach for the key endpoints and initiated informal interaction on how to most effectively address such groups of substances and dossiers and to ensure their compliance with information requirements. One such pilot addressed a category of 14 substances. The novelty of the approach was to involve registrants in discussion on shortcomings and data gaps and agree on the testing strategy before formal compliance check was initiated. The draft decision itself is also different from a standard case as it addresses all the substances of the category in one single document. As the decision making of this pilot is still ongoing, it is too early to report on its results. However, ECHA expects that this type of approach could help bring groups of dossiers to compliance faster, potentially using fewer resources and involving fewer vertebrate tests.

2.3.3 Decision making

The decision-making part of dossier evaluation starts when ECHA sends the compliance check draft decisions to registrants for comments. As part of the current process, registrants who received an ECHA compliance check draft decision are also offered the opportunity to informally discuss the scientific rationale behind the draft decision with ECHA during their 30-day commenting period. The opportunity is well received and the registrants frequently use it to discuss with ECHA the reasons behind decisions taken. In addition, during 2017, 65 % of registrants used their right to comment on ECHA draft decisions.

After the registrants' commenting period and after addressing the comments, ECHA refers the draft decision to the Member State competent authorities and they can submit their proposals for amendments (PfAs) to the ECHA decision. When PfAs are submitted, the Member State Committee seeks a unanimous agreement through a written procedure or in plenary meetings. For the latter, registrants can attend the open sessions. In addition, the registrant concerned is always invited to comment on the PfAs within 30 days and the Member State Committee takes those comments into account in the decision making.

If the Member State Committee does not reach a unanimous agreement on the draft decision, ECHA refers the case to the Commission for decision making.

During 2017, ECHA adopted 139 decisions[15] under compliance checks and closed 38 cases[16] after a draft decision. Two draft decisions were referred to the Commission for decision making, both related to the design of the extended one-generation reproductive toxicity study design.

2.3.4 Information requested in ECHA adopted compliance check decisions

Figure 12 below summarises the types of information requested in ECHA's 139 adopted compliance check decisions in 2017. Altogether, ECHA adopted decisions contained 679 standard information reguests, on average 4.9 information requests per decision. The most common incompliances addressed in the 2017 decisions were pre-natal developmental toxicity, mutagenicity/genotoxicity, simulation testing (water, soil and sediment), long-term aquatic toxicity, reproduction toxicity, and repeated-dose toxicity.

[15] F within Figure 9.
[16] E within Figure 9.

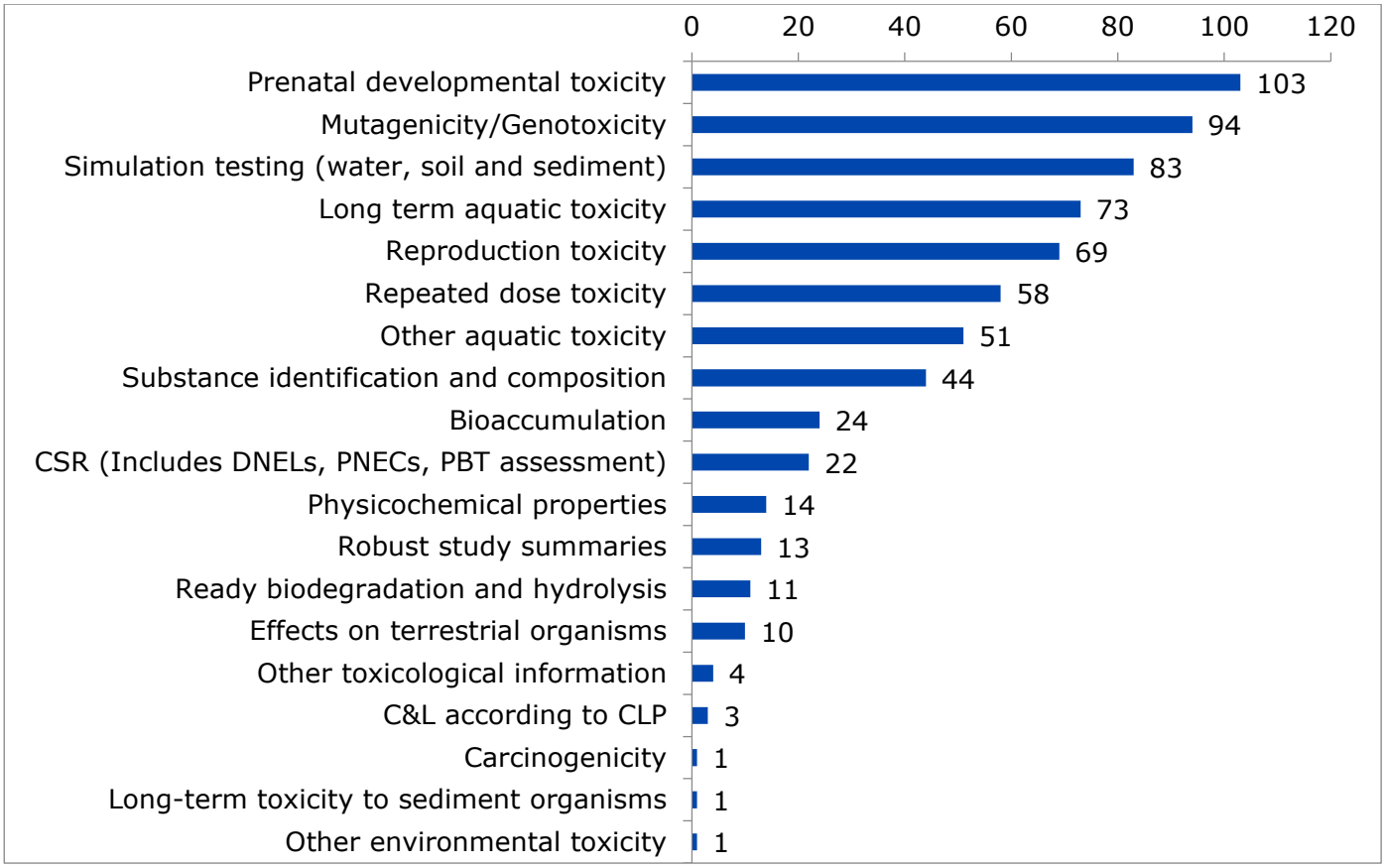


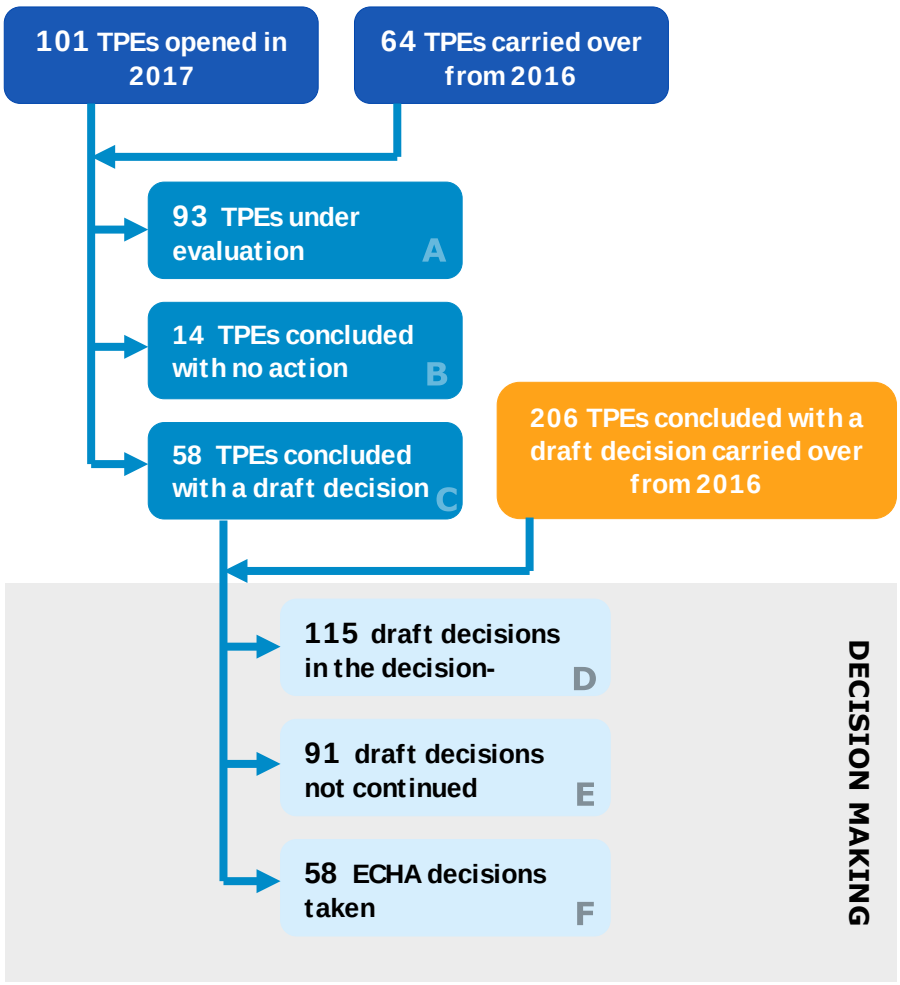
Figure 12: Information requested in the 139 adopted ECHA compliance check decisions in 2017. Altogether, the decisions contained 679 standard information reguests.

2.4 Testing proposals

ECHA examines each testing proposal to make sure that they address the actual information needed and avoid unnecessary testing, particularly when testing involves the use of vertebrate animals.

ECHA prepares a draft decision on each valid testing proposal. The legal text sets a deadline for ECHA to prepare a draft decision for certain types of testing proposals.

Figure 13 below highlights the number and outcome of testing proposal examinations (TPEs) processed during 2016.



[A] Scientific and legal evaluation stage.
[B] Testing proposal is deemed inadmissible by ECHA or is withdrawn by the registrant.
[C] A draft decision on the proposed testing is deemed necessary.
[D] Stages of processing the draft decision including notification of the draft decision to the registrants, notification to the MSCAs, referral to the MSC (when MSCAs submitted proposals for amendment), and referral to the Commission (when unanimous agreement was not reached in the MSC).
[E] Scientifically-relevant data or important administrative changes led to termination of the decision-making procedure. Of the 91 cases 73 were formally closing the cases that the Commission had adopted decisions on.
[F] ECHA testing proposal decision taken either following unanimous agreement of the MSC, or where no proposals for amendment of the draft decision were submitted by the MSCAs.

Figure 13: Number and outcome of testing proposal examinations processed in 2017.

2.4.1 Alternatives to animal testing

Testing on vertebrate animals is the last resort for obtaining missing information on a substance to meet the information requirements of REACH.

ECHA examines each testing proposal to make sure that reliable and adequate data will be produced, and to prevent unnecessary animal testing. Since September 2015, registrants must submit their considerations on alternatives to their testing proposals involving vertebrate animals.

ECHA publishes[17] every testing proposal that involves vertebrate animals. Furthermore, ECHA invites third parties to submit scientifically-valid information or studies addressing the substance and hazard endpoints in question. All valid information is taken into account when ECHA evaluates and prepares its decision on the testing proposal.

The registrants' considerations on alternatives to their proposed vertebrate testing is published as part of the third party consultation or, if the dossiers were submitted after June 2016, in the testing proposal information inside the disseminated dossier.

During 2017, third party consultations were launched for 67 substances. As a response to these consultations, ECHA received eight sets of information.

2.4.2 Testing proposal examination

ECHA concluded a total of 72 testing proposal examinations[18] during 2017. For 58 (81 %) of these[19], ECHA sent draft decisions to the registrants, while in 14 cases (19 %)[20], no further action was necessary because either the registrant withdrew the proposal after ECHA started to examine it, or the testing proposal was not admissible.

Table 5 below lists the type of tests included in the testing proposal draft decisions sent for registrants' comments. Altogether, 118 requests were included in the 58 testing proposal draft decisions that were sent to registrants in 2017. The most common testing proposals, accounting for over half (53 %) of all testing proposals examined, were for: pre-natal developmental toxicity, sub-chronic toxicity study (90-day), pre-natal developmental toxicity study, and extended one-generation reproductive toxicity study.

[17] http://echa.europa.eu/information-on-chemicals/testing-proposals
[18] B+C within Figure 13.
[19] C within Figure 13.
[20] B within Figure 13.

Table 5: List of requests made in the ECHA testing proposal draft decisions during 2017. Altogether 58 testing proposal draft decisions were sent to registrants.

Endpoint	Total
Pre-natal developmental toxicity (Annex IX, 8.7.2)	29
Sub-chronic toxicity study 90-day (Annex IX, 8.6.2)	20
Pre-natal developmental toxicity study (Annex X, 8.7.2)	7
Extended one-generation reproductive toxicity study (Annex X, 8.7.3)	7
Long-term toxicity to aquatic invertebrates (Annex IX, 9.1.5)	7
Effects on soil micro-organisms (Annex IX, 9.4.2)	7
Long-term toxicity to fish (Annex IX, 9.1.6)	6
Short-term toxicity to plants (Annex IX, 9.4.3)	5
Dissociation constant (Annex IX, 7.16)	5
Simulation testing on ultimate degradation in surface water (Annex IX, 9.2.1.2)	4
Short-term toxicity to invertebrates (Annex IX, 9.4.1)	4
Mutagenicity, *in vivo* (Annex IX, 8.4)	3
In vitro gene mutation study in mammalian cells (Annex VIII, 8.4.3)	2
Long-term toxicity to invertebrates (Annex X, 9.4.4)	2
Long-term toxicity to plants (Annex X, 9.4.6)	2
Viscosity (Annex IX, 7.17)	2
In vitro gene mutation study in bacteria (Annex VII, 8.4.1)	1
In vivo mammalian alkaline comet assay (Annex VIII, 8.4)	1
Mutagenicity (Annex X, 8.4)	1
Bioaccumulation in aquatic species (Annex IX, 9.3.2)	1
Long-term toxicity to terrestrial invertebrates (Annex IX, 9.4.4)	1
Long-term toxicity to sediment organisms (Annex X, 9.5.1)	1
Total number of requests	**118**

2.4.3 Decision making

As with the compliance check process, registrants who receive an ECHA draft decision on testing proposals are given the opportunity to not only comment on the draft decision but also to informally discuss the scientific rationale behind the draft decision with ECHA during their 30-day commenting period. During 2017, 45 % of registrants commented on the ECHA draft decision.

After the draft decision is notified to them, the Member State competent authorities can submit their PfAs on the ECHA decision. In 2017, ECHA notified 46 testing proposal draft decisions to Member State competent authorities and received PfAs on 15 (33 %) of them. Eight decisions which received PfAs were agreed during Member State Committee written procedure, another five decisions (33 %) were unanimously agreed and adopted in the Member State Committee meeting, while the deadline to agree on the last two decisions (14 % of the cases with PfAs) falls in early 2018. The other 31 (67 %) testing proposal draft decisions that were notified to Member State competent authorities in 2017 did not receive any PfAs and were adopted without amendment.

In 2017, ECHA adopted 58 decisions[21] under testing proposal examination and closed 91 cases[22] after draft decisions. For the closed cases, 73 draft decisions were ones that had been referred to the Commission for decision making in 2012-2014, and the evaluation process was now closed due to a decision taken by the Commission. Other reasons for closing an examination were dossier updates where the registrants removed their testing proposals (15 cases), manufacture of the substance having been ceased (2 cases), or a wrong submission number having been used (one case).

In the decision, ECHA can accept, modify, request additional testing or reject the testing proposal. Additional testing is requested if there is non-compliance of the testing proposal with Annexes IX, X and XI to REACH and it can relate to either acceptance, modification or rejection of the original testing proposal. Table 6 below summarises the types of testing requested and the TPE decisions adopted during 2017. It is important to note that a decision may contain more than one request.

Table 6: Summary of ECHA testing proposal decisions adopted in 2017.

Endpoint	TPE adopted decisions					
	Accepted under Article 40(3)(a)	Modified under Article 40(3)(b)	Additional testing requested under Article 40(3)(c)	Rejected under Article 40(3)(d)	Original test rejected under Article 40(3)(d) and additional testing requested under Article 40(3)c*	Total number of requests evaluated
Pre-natal developmental toxicity	27		3		8	**38**
Sub-chronic 90-day toxicity	15	2			6	**23**
Effects on terrestrial organisms	12		3		1	**16**
Long-term aquatic toxicity	7		4	1	3	**15**
Extended one-generation study	1	3		2	3	**9**
Mutagenicity/genotoxicity	6			1	2	**9**
Other aquatic toxicity			9			**9**
Simulation tests (water, soil, sediment)	3					**3**
Viscosity	2					**2**
Short-term 28-day toxicity	1					**1**
Bioaccumulation in aquatic species	1					**1**
Dissociation constant	1					**1**
Total	**76**	**5**	**19**	**4**	**23**	**127**

*The combination of rejection and requesting additional testing may be used for example with testing proposals with an analogue test material or when a test different to the one originally proposed is requested.

[21] F within Figure 13.
[22] E within Figure 13.

2.4.4 Information requested

In the 58 testing proposal decisions that were adopted in 2017, a total of 127 requests were made (see Table 6). The most common human health-related testing proposals were pre-natal developmental toxicity and sub-chronic repeated-dose toxicity (90-day). On the environmental side, the effects on terrestrial organisms and the long-term aquatic toxicity were the most frequent data gaps identified by the registrants.

2.5 Follow-up to dossier evaluation

Under Article 42 of REACH, ECHA examines the information provided by registrants in response to evaluation decisions in their dossier updates and considers whether the information complies with REACH requirements. This follow-up evaluation takes place after the deadline specified in the decision has passed. Further information on the follow-up process can be found in the follow-up factsheet[23].

As in previous years, ECHA continued to inform the Member States enforcement authorities with statements of non-compliance (SONCs) following a dossier evaluation decision and to invite them to consider enforcement actions towards the registrants when some or all of the requests in a decision were not complied with. In some cases, a new consultation as per Articles 50 and 51 of REACH was initiated where a registrant submitted – in response to a decision – information which is substantial and new but still not sufficient to meet the initial request.

In general, the collaboration between ECHA and the Member State competent authorities and national enforcement authorities has worked well and the majority of cases has been resolved within a reasonable time frame.

In 2017, ECHA concluded the evaluation process after follow-up evaluation in 272 cases, which are summarised in Table 7. In 31 of these cases, ECHA was able to close the SONC with an Article 42(2) notification following a dossier update by the registrants after the national enforcement authorities had been involved in the case. In addition, ECHA issued 46 new SONCs, of which 35 were not resolved by the end of the year. At the end of 2017, there were 76 unresolved SONCs that had been notified to the Member States authorities since 2012.

[23] https://echa.europa.eu/publications/fact-sheets

Table 7: Number and outcome of follow-up evaluations conducted in 2017.

Decision type	Outcome			
	Information requirements were complied with by the deadline	Information requirements were complied with after involving national enforcement authorities*	Information requirements were not complied with**	Information requirements were not complied with and a new decision was needed***
TPE decisions	131	12	17	5
CCH decisions	110	19	18	3
Total	241	31	35	8

* No (or no adequate) information was provided by the deadline. ECHA invited MSCAs to consider enforcement actions towards the registrant. This lead to a dossier update with sufficient information.
**No (or no adequate) information was provided by the deadline. ECHA invited MSCAs to consider enforcement actions towards the registrant. The requested information still has not been provided.
***New substantial information has been provided but the information requirement was not met.

Table 8 provides a summary of the outcome of the follow-up evaluations performed in 2017, by endpoint or group of endpoints. It is important to note that a follow-up evaluation outcome may contain both compliant and non-compliant endpoints.

Table 8: Number and outcome of the follow-up evaluations conducted in 2017, by endpoint.

Endpoint	Outcome		
	Compliant endpoints after follow-up evaluation*	Compliant endpoints with adaptations (e.g. read-across, weight of evidence)**	Non-compliant endpoints after follow-up evaluation***
Substance identity	121	1	18
Physical/chemical properties	16	2	3
Biodegradation	4	0	3
Bioaccumulation	6	1	3
Other environmental fate/behaviour	3	1	4
Long-term aquatic toxicity	34	10	15
Other ecotoxicological hazard	72	7	18
Mutagenicity/genotoxicity	33	1	9
Carcinogenicity	1	0	1
Repeated-dose toxicity	94	11	15
Pre-natal developmental toxicity	129	13	22
Reproduction toxicity	1	1	0
Other human health hazard	9	6	2
CSR	62	0	4
Total	**585**	**54**	**117**

* Including "full correspondence" and "acceptable with deviations".
** The registrant did not provide the requested data, but an acceptable adaptation instead (regardless of any ECHA's pre-approval in evaluation).
*** No information provided or an unacceptable adaptation was provided. ECHA sent SONC or launched a new decision making to invite the Member States to consider enforcement actions.

The outcome of the 2017 follow-up evaluations shows that 639 (85 %) of the endpoints originally identified (by compliance checks or submission of a testing proposal) as non-compliant with REACH information requirements are now deemed compliant as a consequence of dossier evaluation. For the remaining 117 (15 %) endpoints that were deemed non-compliant, ECHA sent a SONC for 109 endpoints and launched a new decision-making process according to Article 42(1) for 8 endpoints.

Table 9: Conclusions made in 2017 based on the received information leading to possible further regulatory actions.

Endpoint	Outcome		
	Proposed cases as possible candidates for harmonised classification and labelling	Proposed cases as possible candidates for substance evaluation	Proposed cases for opening a new compliance check after follow-up evaluation*
TPE decisions	19	1	20
CCH decisions	16	1	10
Total	**35**	**2**	**30**

* Information requirements were fulfilled for the requested endpoints, but new data indicated concerns for other endpoints.

The information received through the dossier evaluation processes is screened to identify any cases where further regulatory actions may be needed. The number of such substances is expected to increase in the future due to the adopted regulatory strategy to address substances and dossiers with a potential concern. In 2017, 67 cases were flagged as candidates for further regulatory processes, i.e. classification and labelling, substance evaluation, or a new compliance check. However, as the regulatory strategy to focus on selected key endpoints was adopted only in 2015, the first of such cases reached the follow-up stage only towards the end of 2017.

2.6 Substance evaluation

Substance evaluation aims to verify whether a substance constitutes a risk to human health or the environment from an EU-wide perspective. It contributes to the identification of chemicals of concern requiring further risk management.

The evaluation may conclude that the risks are sufficiently under control with the measures already in place. Otherwise, it may lead to the proposal of EU-wide risk management measures, such as restrictions, identification of substances of very high concern, harmonised classification, or other actions outside the scope of REACH.

From the date of publication of the Community rolling action plan (CoRAP) list, the evaluating MSCA has, for those substances to be evaluated in the first year[24], 12 months to conclude whether further information must be requested from the registrants to clarify the concerns. The information requested usually goes beyond the standard information requirements of REACH and may relate to the intrinsic properties of the substance or its exposure.

The view that further information is needed is shared with all the other Member States and ECHA to achieve a general agreement. ECHA takes the decision to request further information, whenever necessary.

Further information on substance evaluation is provided on ECHA's website[25].

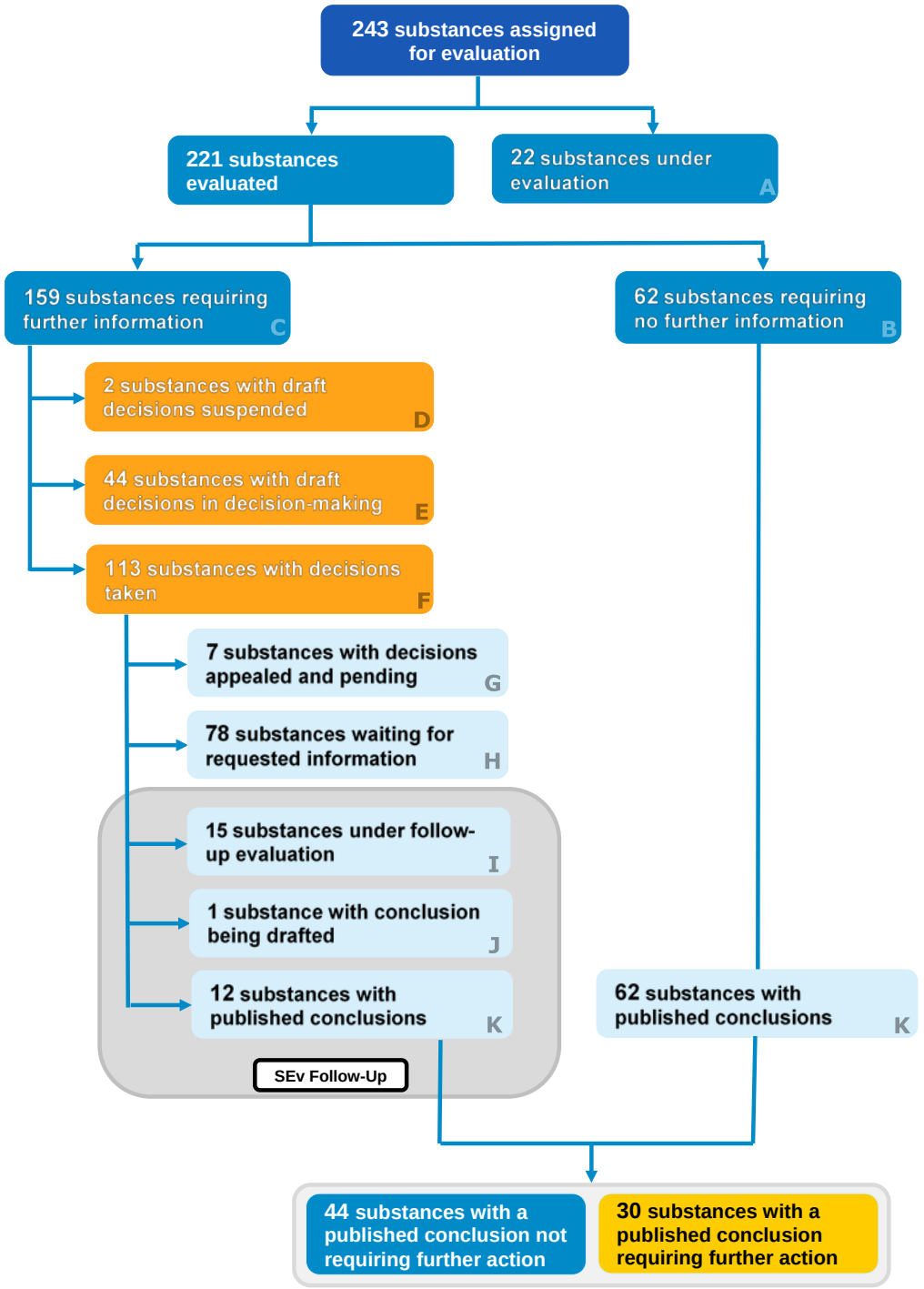
To further improve the effectiveness and efficiency of the substance evaluation process, a workshop on Substance Evaluation within the Integrated Regulatory Strategy was hosted by ECHA during October 2017. The aim of the workshop was to:

[24] The CoRAP covers 3 years, and its rolling nature means that the list of prioritised substances included for evaluation during the second and the third year may change when the updated CoRAP is annually published. In the update of the previous CoRAP, the second year's list becomes the list of the first year and a new list of substances for the third year is added.

[25] https://echa.europa.eu/regulations/reach/evaluation/substance-evaluation

- review the substance evaluation process and its contribution to the Integrated Regulatory Strategy;
- consider ways of amplifying the outcomes and impact of substance evaluation;
- reinforce the collaboration between ECHA, Member State competent authorities and registrants throughout the process;
- ensure efficient interplay with dossier evaluation and other regulatory processes;
- strengthen the follow-up evaluation and conclusion phases as well as the interface with regulatory risk management measures;
- discuss legal issues and learnings from appeals on substance evaluation decisions.

Figure 14 on next page provides an overview of the current status of the 243 substances published within the CoRAP for evaluation between 2012-2017.



[A] Substance is currently being evaluated by the Member State competent authority (MSCA).
[B] Evaluating MSCA can conclude on the suspected risk based on the available information.
[C] A draft decision requesting further information to clarify the concern(s) is deemed necessary.
[D] Substance evaluation is suspended (i.e. no draft decision prepared) pending the outcome of a compliance check that must be performed first.
[E] Stages of processing the draft decision.
[F] ECHA evaluation decision taken.
[G] Decisions appealed before the Board of Appeal of ECHA.
[H] Registrants to submit the requested information, within the timelines specified in the decision.
[I] The evaluating MSCA will examine all new information in the updated registration.
[J] Conclusion documents are drafted and being prepared for publication.
[K] Conclusion documents are published on ECHA's web pages.

Figure 14: Status of all substance evaluations started in 2012-2017 at the end of 2017.

2.6.1 Selection and prioritisation of substances for evaluation

Article 44(1) of REACH provides general criteria for selecting substances for substance evaluation. In cooperation with the Member States, ECHA has refined the risk-based criteria[26], before applying them to identify substances with potential concerns. The selection of substances originates from the common screening that lies at the core of the Integrated Regulatory Strategy. Such substances are screened to see whether they should already be subject to regulatory measures; if not, whether substance evaluation would be effective to clarify the concerns.

Subsequently, ECHA and the Member States identify substances that could be included in the CoRAP. Member States express their interest to evaluate a certain substance so that ECHA can create a draft CoRAP with the substance names and the tentative assessment years. The CoRAP is adopted after consultation among the Member States and the opinion of ECHA's Member State Committee.

The adopted CoRAP update is published on ECHA's website[27]. Its content is also included in the dynamic overview table of all substances[28].

The justification document prepared by the evaluating MSCA describes the scientific grounds of the initial concerns which require further clarification under substance evaluation, and it also informs on possible follow-up actions considered by the evaluating MSCA.

The CoRAP 2017–2019 update[29] was adopted on 21 March 2017 and contained 115 substances. The list contained 22 newly-selected substances and 93 substances carried over from the existing CoRAP. The lower number of selected substances is mainly due to the need to wait for important standard information gaps to be closed under a preceding compliance check. This standard information is considered necessary in deciding what further information should be requested under substance evaluation and, in some cases, it may even be sufficient to draw conclusions on the concern.

ECHA forwarded the draft of the subsequent CoRAP update 2018-2020 to the Member State Committee for opinion seeking on 13 October 2017, and published the draft on 24 October 2017[30]. The draft list contained 107 substances, with 26 substances planned to be evaluated in 2018. The list contained 16 newly-selected substances and 91 substances carried over from the existing CoRAP. Depending on the opinion of the Committee, the number and order of substances may change before the list is adopted. ECHA anticipates the adoption of the CoRAP 2018–2020 update in March 2018. Further information on the CoRAP is provided on ECHA's web pages[31].

To further enhance the effectiveness and efficiency of substance evaluation, ECHA normally performs a compliance check before a substance is evaluated under substance evaluation. These compliance checks support substance evaluation by ensuring that key information requirements for human health and the environment are adequately fulfilled. The interplay

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[26] http://echa.europa.eu/documents/10162/13628/background_doc_criteria_ed_32_2011_en.pdf
[27] https://echa.europa.eu/information-on-chemicals/evaluation/community-rolling-action-plan/corap-list-of-substances
[28] https://echa.europa.eu/information-on-chemicals/evaluation/community-rolling-action-plan/corap-table
[29] https://echa.europa.eu/documents/10162/13628/corap_update_2017-2019_en.pdf/6a394595-a4e5-0e10-ec66-eabdc55ce7f6
[30] https://echa.europa.eu/documents/10162/13628/corap_list_2018-2020_en.pdf/3be44b84-5d72-01fe-f8d7-3a5a9c27951e
[31] https://echa.europa.eu/regulations/reach/evaluation/substance-evaluation/community-rolling-action-plan

between compliance checks and substance evaluation is defined case-by-case, to prevent the substance evaluation process being postponed and consequent delays in identifying regulatory risk management. ECHA and Member State competent authorities maintain close collaboration and communication to ensure that the most appropriate route is taken to address the concerns.

2.6.2 Evaluation by Member State competent authorities

The substance evaluation process assesses all registration dossiers from all registrants specific to the same substance, although other available sources of information may also be considered. The initial reason for selecting a substance for the CoRAP is not limiting the scope of the evaluation.

During the evaluation, the Member State may identify other concerns that need clarification to conclude whether a substance is of concern or not. However, the Member State can focus the evaluation more on specific concerns raised about the substance.

ECHA maintains regular interaction with evaluating MSCAs throughout the intial 12-month evaluation period. This early interaction between ECHA and the evaluating MSCA was introduced to increase efficiency and transparency by:

- providing early support to evaluating MSCAs in considering the best approaches to clarify the concern and any risk management measures;
- following the progress of the evaluating MSCA's evaluation, identifying and resolving potential delays at an early stage;
- providing advice and support to ensure each evaluation is consistent and scientifically robust.

During 2017, early interaction occurred between ECHA and the evaluating MSCAs for the majority of the substances being evaluated.

Additionally, ECHA has developed example text for evaluating MSCAs to use when drafting their requests for further information. This example text provides additional support to the evaluating MSCAs and contributes to ensuring that requests for further information are consistent and transparent. Currently, example text is available for information requests related to mutagenicity, reproductive toxicity, endocrine disruption, and PBT/vPvB.

Prior to the completion of the 12-month evaluation period, the evaluating MSCAs may submit their draft decision for a consistency screening by ECHA. During 2017, ECHA performed consistency screenings on 19 draft decisions for substances allocated for evaluation during 2016. The aim of the consistency screening is to:

- ensure all requests for further information are well reasoned and appropriate for clarification of the concern;
- clarify the link between compliance check and substance evaluation, and identify the most viable route for requesting information that is necessary to clarify the concern(s) and achieve regulatory risk management.

Of the 39 substances allocated for evaluation during 2016, the evaluating MSCAs considered that 27 (69 %) of these required further information to clarify the suspected concerns. For 12 of the substances evaluated during 2016, the evaluating MSCAs considered the available information sufficient to conclude on the concerns and submitted their conclusion documents to ECHA.

For the rest of substances evaluated in 2016, it was considered that a compliance check of the relevant tonnage bands was required before the substance evaluation could proceed. Thus, the substance evaluation process, for making a request for possible further information to clarify

the suspected concern(s, was suspended pending the outcome of ongoing compliance checks.

As soon as information on the standard requirements is available in the dossier updates, the evaluating MSCA will consider it under their continued substance evaluation, and consider whether some other additional information would still be necessary to clarify the remaining concerns regarding those substances.

Furthermore, the evaluating MSCAs started their evaluations of the 22 substances allocated for evaluation in 2017. Finalisation of all draft decisions generated as a result of this evaluation work will be performed in early 2018.

2.6.3 Decision making

In 2017, ECHA sent draft decisions for commenting to 163 registrants of the 27 substances evaluated during 2016 where the evaluating MSCAs considered further information was needed to clarify the suspected concerns.

To further improve the quality of the decisions and ensure a smooth decision-making phase, ECHA offers enhanced support to evaluating MSCAs during decision making. After consideration of the registrants' comments, the evaluating MSCAs may submit their (revised) draft decisions to ECHA for review. In 2017, less than half of the cases were reviewed by ECHA before referral.

This review is as a continuation of the early interaction between ECHA and the evaluating MSCAs that occurs during the initial evaluation stage. The review ensures more efficient and effective handling of substance evaluation draft decisions and provides the evaluating MSCAs with additional support for formulating information requests within the draft decision.

To date, nearly all consulted draft decisions under substance evaluation have received proposals for amendment. When Member State competent authorities or ECHA submit proposals for amendment, the Member State Committee seeks a unanimous agreement through a written procedure or in plenary meetings. For the latter, the registrants can attend the open sessions. The number of decisions agreed through written procedure is increasing. During 2017, the Committee agreed on 24 draft decisions for 24 substances, of which 11 (46 %) were agreed in written procedure.

If the Member State Committee does not reach a unanimous agreement, the case is referred to the Commission. To date, only two decisions under substance evaluation have been referred to the Commission following no unanimous agreement being reached at the Committee. The first decision was referred to the Commission in 2014, which subsequently adopted the decision[32] in 2015. The second was referred to the Commission in 2017 and has not yet been adopted.

Following a consultation of the Member States in November 2017, it was agreed that registrants of certain intermediates would also receive substance evaluation decisions. Consequently, from January 2018, ECHA will send substance evaluation draft decisions also to registrants of transported isolated intermediates, but not registrants of on-site isolated intermediates.

The change in practice gives all registrants an equal possibility to comment substance evaluation decisions. The registrants of transported isolated intermediates may in the comments seek to demonstrate that the concern identified in the draft decision is not relevant to their specific strictly controlled conditions of use, as further substantiated. The evaluating

[32] https://echa.europa.eu/documents/10162/e23a2e0e-d456-48f0-9d24-2fb4bbf49dca

MSCA will take the comments into account.

2.6.4 Information requested

During 2017, ECHA took decisions on 31 of the substances evaluated. Non-confidential versions of 26 of these decisions have been published on ECHA's website and links to them have been included in the dynamic CoRAP list[33]. Non-confidential versions of the remaining four decisions will be published in due course. Table 10 summarises the information requested within the decisions taken during 2017 to clarify hazard-based concerns. A decision may contain more than one request.

Table 10: Information requests to clarify hazard-based concerns within decisions taken during 2017.

Suspected Concern	Types of information requested to clarify the concern	Total requests†
PBT/vPvB	Simulation biodegradation test	16
	Daphnia magna reproduction test	6
	Physico-chemical tests	5
	Aqueous exposure bioaccumulation fish test	5
	Ready biodegradability test	4
	Fish, early-life stage (FELS) toxicity test	3
	Sediment-water *Chironomid* toxicity test	2
	Toxicity of sediment-associated contaminants with freshwater invertebrates	1
	Aquatic toxicity test with bivalves	1
	Freshwater algae and cyanobacteria, growth inhibition test	1
	Sediment-water *Lumbriculus* toxicity test	1
Reproductive toxicity	Extended one-generation reproductive toxicity study	3
	Combined repeated dose toxicity study with reproduction/developmental toxicity screening test	1
Mutagenicity	*In vivo* mammalian alkaline comet assay	3
	Combined mammalian erythrocyte micronucleus test and mammalian alkaline comet assay	3
	Transgenic rodent somatic and germ cell gene mutation assay	3
	In vitro mammalian cell micronucleus test	2
Endocrine disruption	Fish sexual development test	3
	Larval amphibian growth and development assay	1
	H295R steroidogenesis assay	1
Sensitisation	Skin sensitisation local lymph node assay	2

[33] https://echa.europa.eu/information-on-chemicals/evaluation/community-rolling-action-plan/corap-table

Suspected Concern	Types of information requested to clarify the concern	Total requests†
Other hazard-based concerns	Information on composition	7
	Sediment-water *Lumbriculus* toxicity test	1
	Daphnia magna reproduction test	1
	Sediment-water *Chironomid* toxicity test	1
	Sub-chronic 90-day toxicity study	1
	Total	**79**

† For many decisions, an integrated testing strategy (ITS) may be used.

Additionally, in 14 of 31 decisions taken by ECHA in 2017, the evaluating MSCA considered that further information on exposure and/or risk assessment was necessary to clarify the concerns. Some examples of the exposure-based information requests included within the decisions taken during 2017 are:

- clarification and detailed justification for environmental exposure scenarios;
- further information and justification on input parameters used for exposure assessment;
- improved characterisation of the tasks and processes covered in exposure scenarios.

2.6.5 Follow-up evaluation of substance evaluation decisions

Upon receipt of a dossier update containing all information requested in the decision, the evaluating MSCA has 12 months to complete the assessment of the substance.

Once this assessment is complete, the evaluating MSCA uses the available information to decide either to request further information to clarify the concerns, or conclude whether further regulatory actions on the substance are necessary.

In 2017, 26 substances were at the stage where new information should have been submitted following an initial request for further information. The responsible evaluating MSCAs are currently reviewing the newly submitted information to conclude on its suitability. In 2017, for 15 substances the evaluating MSCAs concluded that the newly submitted information was suitable, and the 12-month assessment of the submitted information is ongoing. For 11 substances, a conclusion has been published after follow-up evaluation.

To facilitate the follow-up work, ECHA provides Member State competent authorities with a monthly report on submitted dossier updates for cases where the substance evaluation decision has been issued. Furthermore, in 2017, ECHA implemented a new webform that evaluating MSCAs can use to inform ECHA on whether all requested information was provided by the registrants in their dossier updates.

2.6.6 Concluding substance evaluation

Following a review of the available data and new data (where relevant), if the evaluating MSCA concludes that the use of the substance poses a risk, it may then proceed with follow-up actions to substance evaluation. The following options may address the concern:

- a proposal for harmonised classification;
- a proposal to identify the substance as a substance of very high concern (SVHC);
- a proposal to restrict the substance;
- actions outside the scope of REACH and CLP, e.g. a proposal for EU-wide occupational exposure limits, national measures or voluntary industry actions.

During 2017, 25 conclusion documents originating from substance evaluations performed in

2012–2016 were published within the dynamic CoRAP list[34] on ECHA's website. In 12 of the 25 concluded cases published, the evaluating MSCA concluded that further EU-wide regulatory action is needed.

Table 11 summarises the hazard-based concerns concluded on in 2017 and their outcomes. More than one concern may be indicated for a substance. Regulatory follow-up actions are not needed if the hazard concern is removed or no risk is anticipated due to changes of circumstances, like new risk management measures being in place or cease of certain uses or import/manufacture.

More information on the conclusions on concerns in relation to PBT/vPvB, potential endocrine disruption, carcinogenicity, mutagenicity, and reproductive toxicity under substance evaluation is available within the annual reports for SVHC identification and implementation of REACH risk management measures[35].

Table 11: Hazard-based concerns concluded on in 2017 and their outcomes.

Suspected concern	Concluded regulatory follow-up action at EU level	Total conclusions	Concluded substances by EC/List number
Carcinogenicity	No regulatory follow-up action needed	7	205-483-3 203-631-1 203-777-6 271-231-4 200-817-4 203-726-8 204-617-8
	Harmonised classification and labelling	1	204-820-1
	Concern not clarified*	1	212-783-8
Mutagenicity	No regulatory follow-up action needed	4	203-777-6 271-231-4 204-617-8 204-820-1
	Harmonised classification and labelling	2	203-631-1 200-817-4
	Concern not clarified*	1	212-783-8
Reprotoxicity	No regulatory follow-up action needed	6	448-020-2 205-743-6 203-631-1 210-871-0 203-777-6 203-629-0
	Harmonised classification and labelling	3	204-327-1 200-817-4 272-486-4
	Concern not clarified*	1	212-783-8
PBT/vPvB	No regulatory follow-up action needed	3	203-624-3 604-250-7** 800-353-8
	Concern not clarified*	2	448-020-2 272-486-4

[34] https://echa.europa.eu/information-on-chemicals/evaluation/community-rolling-action-plan/corap-table

[35] https://echa.europa.eu/addressing-chemicals-of-concern/substances-of-potential-concern/svhc-roadmap-to-2020-implementation

Suspected concern	Concluded regulatory follow-up action at EU level	Total conclusions	Concluded substances by EC/List number
Endocrine disruption	No regulatory follow-up action needed	3	204-327-1 200-817-4 201-248-4
	Identification as a SVHC (Authorisation)	1	201-245-8
	Further regulatory action to be decided	1	203-585-2
Sensitisation	No regulatory follow-up action needed	4	205-483-3 200-752-1 219-470-5 210-871-0
	Harmonised classification and labelling	1	204-820-1
Other hazard-based concern	Harmonised classification and labelling	7	200-752-1 203-956-9 210-871-0 203-777-6 405-040-6 204-617-8 204-820-1

* Substance evaluation was terminated due to change of the registration to only intermediate under strictly controlled conditions or inactivation of registration. Consequently, the evaluating MSCAs concluded that the concerns could not be presently clarified and a new assessment should be undertaken in the event of new registrations of the substance in the future.
** Conclusion covers two EC/List numbers (604-250-7 and 415-490-5).

3. Other measures to enhance dossier quality

ECHA also uses measures other than formal decisions to improve dossier quality. Some of them are directly related to REACH processes, such as tools used within the registration process, others are non-regulatory measures aiming to trigger and help registrants to update and to improve their registration dossiers. These measures range from simple phone calls to registrants to collaboration with industry to develop sector-specific guidelines related to, for example, substance identification, to further assist the registrants to comply with REACH requirements.

3.1 Enhanced completeness check

ECHA checks the completeness of the registration dossiers systematically at the submission phase. In accordance with the decision taken by the Management Board[36], ECHA implemented the enhanced completeness check on 21 June 2016 to ensure that submissions contain all the information foreseen by REACH. It applies equally to new registrations and to updates of registrations previously submitted. The updated completeness check also includes additional manual verifications by ECHA staff to ensure that when registrants waive or deviate from the information requirements, they provide justifications foreseen by REACH, and that testing proposals on vertebrate animals are accompanied by justification for why none of the adaptation possibilities under REACH could be used. The manual checks aim to establish a level playing field between registrants who follow the standard information requirements set out in REACH and those who waive or deviate from these requirements, by ensuring that the latter provide justifications with a regulatory relevance.

During 2017, 4 752 registration dossiers (ca. 30 % of all incoming registration dossiers) were stopped for manual verification by ECHA staff of which 1 306 initial dossiers and 3 446 update dossiers (Figure 15). In 25 % of the manually verified dossiers (8 % of the submitted dossiers), registrants were requested to improve the submitted information. In 95 % of these cases, registrants were able to amend the dossiers as requested, and the submissions passed the completeness check at the second attempt. This means that 0.5 % of all submitted dossiers (15 558 dossiers) were rejected at completeness check, consisting of a total of 74 dossiers, of which 22 were for initial submissions.

[36] 36th MB meeting, 16-17 December 2014, Rome - AP 11: Substance identification in registration dossiers – a strategy for improvement (including completeness check) (MB/53/2014), https://echa.europa.eu/documents/10162/13608/mb_m_04_2014_minutes_mb_36_en.pdf/9e7bff2a-ba57-4af4-86ef-783dd685d80e; 38th MB meeting, 17-18 June 2015, Helsinki - AP 11: Improved substance identity check as part of the technical completeness check process (MB/26/2015), https://echa.europa.eu/documents/10162/21844190/mb_m_02_2015_minutes_mb_38_en.pdf/af58238e-c948-4de9-aba1-c8c644888e0c.

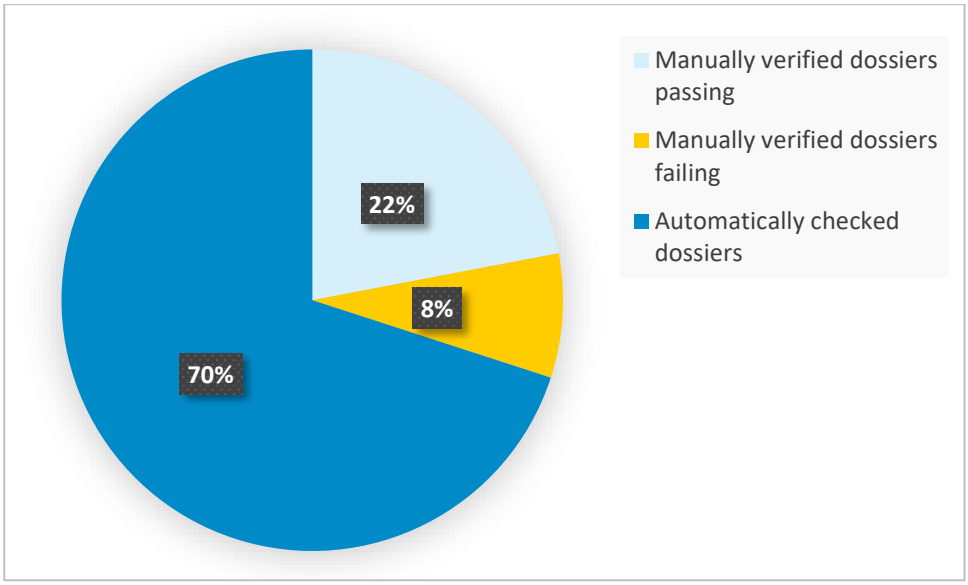

Figure 15: Breakdown between dossiers manually verified and dossiers where registrants were requested to improve the information. In 2017, 15 558 dossiers were submitted – 4 752 dossiers (30 %) were manually verified, out of which 3 541 (22 %) passed and 1 211 dossiers (8 %) failed the manual verification.

Figure 16 below shows the areas of the dossiers that were manual verified in 2017. A total of 4 752 dossiers were manually verified of which 2 182 (46 %) dossiers were checked for substance identity, 2 690 (57 %) dossiers were checked for data waiving, 523 (11 %) dossiers were checked for testing proposals and 48 (1 %) dossiers were checked for chemical safety reports (CSR). Dossiers include both initial and updated submissions with manual verification completed between 1 January 2017 and 31 December 2017.

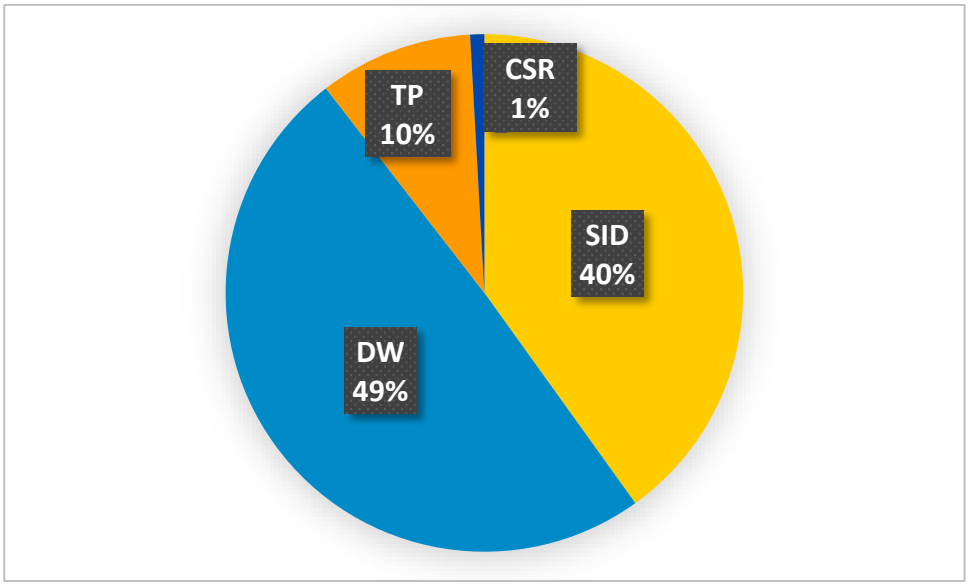

Figure 16: Distribution of verification areas in manually verified dossiers. One dossier may be checked in more than one area and for more than one item. A total of 4 752 dossiers were manually verified. Abbreviations: substance identity (SID); data waiving (DW); testing proposals (TP) and chemical safety report (CSR). Dossiers include both initial and updated submissions with manual verification completed between 1 January 2017 and 31 December 2017.

Impact of the enhanced completeness check
An impact analysis of the enhanced completeness check was undertaken in 2017, taking into account the first year of the enhanced completeness check. A sample of dossiers was further analysed to check the quality improvement of dossiers subject to manual verification. In the majority of the cases, the manual verification process had brought about significant improvements to the level of the information in registration dossiers, having a positive impact on the efficiency of subsequent regulatory processes and, indirectly, on the dossiers compliance. For example, in relation to substance identity, ECHA staff working on this topic were able to identify the substance in a clearer way (through the improvement of the manufacturing process description or UVCB composition breakdown). Similar improvements on data could be seen in the case of waiving of standard information requirements, where invalid justifications for not submitting a study were replaced by experimental data or QSARs.

3.2 Promoting dossier updates

In 2017, ECHA commissioned an external study to gain insight on the drivers, barriers, costs and benefits for updating REACH registration and CLP notification dossiers[37]. The study found that companies lack incentives to update their REACH registrations. Furthermore, the study results suggest that more clarity is needed on how the registration process works and what needs to be updated and by whom, in order for more companies to submit new information on the safe use of their chemicals.

According to Article 22 of REACH, registrants are responsible for updating their registrations with relevant new information on their own initiative and without undue delay and submitting them to ECHA, for example when: there are any changes in a registrant's status; there is any change in the composition of the registered substance; there are changes in the annual or total quantities manufactured or imported; new uses and new uses advised against are identified; there is new knowledge of the risks of substance to human health and/or the environment; there is any change in the classification and labelling of the substance; there is an update or amendment of the CSR or guidance on safe use; the registrant identifies the need to perform new test listed in Annex IX or Annex X to REACH; and if there is any change in the access granted to information in the registration. By the end of 2017, ECHA had received a total of 67 005 registrations. Of these, 68.8 % have never been updated by industry and 33.2 % have been updated at least once. With joint lead dossiers, the update rate is slightly higher than overall: over half (53.8 %) have been updated at least once.

Updates triggered by regulatory activity

Not all the updates are based on the registrants' own initiative to update their dossier. For example, the adopted ECHA dossier and substance evaluation decisions, ECHA's requests to clarify the intermediate status for priority substances, or a decision on harmonised classification and labelling trigger the need for registrant to update their dossier by a given deadline.

To enhance data quantity and quality, in addition to dossier and substance evaluation, ECHA uses also other means to try to trigger dossier updates. Such measures include letter campaigns and the publication of pre-alert lists of substances planned to be addressed under compliance checks, thereby encouraging timely dossier updates or the use of the multiplier effect (e.g. targeting all registrants of the same substance under dossier evaluation). Furthermore, ECHA has also increased transparency by improving the dissemination of information on the registrations on ECHA's website in the form of infocards and brief substance profiles.

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37 https://echa.europa.eu/documents/10162/22931011/study_drivers_and_obstacles_reach_clp_updates_en.pdf/

In order to assess the impact of the other measures to trigger dossier updates, a substance-level analysis was conducted on their effectiveness between 2015 and 2017. The analysis showed that the average update rate was 13.4 % of the substances receiving at least one update each year. However, when a substance was added on a compliance check pre-warning list or included in a letter campaign from manual screening, the update rate increased. Based on the analysis, adding a substance on the pre-warning list on ECHA website made an update approximately 2.5 times more likely to happen, and sending a targeted letter under manual screening made an update 3 times more likely compared with the baseline. This analysis shows that the measures taken have an impact and can help to increase the update activity. However, in this analysis only the update activity was studied and therefore it is not known if these updates actually had an impact on the data quality in the registeration dossiers.

3.3 Substance identification

Informal discussions with registrants

ECHA continued to organise informal discussions with the registrants of dossiers where critical issues concerning the substance identity have been observed. ECHA has received very positive feedback from the registrants for handling problematic dossiers this way. In fact, during the informal discussions, not only are such issues highlighted, but ECHA may provide support for improving dossier quality from the substance identity point of view. The outcome of these informal discussions is usually the update of the dossier, with substance identity issues solved and with no need to send a substance identity-targeted draft decision.

ECHA also continued organising informal discussions with registrants in anticipation of the common screening work conducted in cooperation with Member State competent authorities on substances of potential concern[38]. This approach was initiated in 2016 and resulted at that time in informal discussions with registrants for 17 substances. For 2017, nine substances were selected. These substances are temporarily removed from the shortlist of substances for manual screening until the substance identity information is clarified.

Substance identity profile

In order to facilitate the clarification of the identity and composition of the substance that is intended to be covered in a joint registration, information on the substance identity profile (SIP) is part of the lead registration dossier. Advice on how to define the SIP is available in Appendix III of the Guidance on substance identification and naming under REACH and CLP[39]. Also a set of Questions and Answers on the SIP have been published on ECHA's website[40]. In addition, a new format is now available in IUCLID 6 for structuring the reporting of specific information on the composition of test materials. The availability of such information will provide an important contribution to activities done in the evaluation process.

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[38] Further information on screening is available at: https://echa.europa.eu/addressing-chemicals-of-concern/substances-of-potential-concern/screening. Different outcomes may follow the manual screening work carried out by MSCAs, one of them being the need to request for further information under the evaluation provisions.

[39] Guidance for identification and naming of substances under REACH and CLP: https://echa.europa.eu/documents/10162/23036412/substance_id_en.pdf/ee696bad-49f6-4fec-b8b7-2c3706113c7d.

[40] https://echa.europa.eu/support/qas-support/browse/-/qa/70Qx/view/scope/REACH/Substance+identity+profile?_journalqadisplay_WAR_journalqaportlet_INSTANCE_70Qx_backURL=https%3A%2F%2Fecha.europa.eu%2Fsupport%2Fqas-support%2Fbrowse%3Fp_p_id%3Djournalqadisplay_WAR_journalqaportlet_INSTANCE_70Qx%26p_p_lifecycle%3D0%26p_p_state%3Dnormal%26p_p_mode%3Dview%26p_p_col_id%3Dcolumn-1%26p_p_col_pos%3D2%26p_p_col_count%3D3

Substance identity adaptation

An essential element in the context of the evaluation process is the use of the correct numerical identifiers. In 2017, the service provided by ECHA to facilitate the change of the numerical identifiers remains a well-used solution to correct substance identification mistakes observed during the dossier evaluation process. Many of these requests were initiated due to a compliance check and after the informal discussions with the registrants. ECHA has implemented a new customer-friendly webform and template to facilitate submissions of requests.

In addition, ECHA provides a technical solution for maintaining the correlation with other identifiers relevant for the substance (such as those used for other regulatory purposes, or previously used to identify the substance). Such related identifiers can be added to the field "Other identifier" in section 1.1 of the IUCLID 6 dossier.

Substance identification in the sectoral approach

ECHA has collaborated with specific industrial sectors to develop sector-specific guidelines on substance identification to further assist registrants in complying with the REACH substance identification requirements. In particular, ECHA collaborated with the relevant industry associations – Eurocolour, a sector group of the European Chemical Industry Council (Cefic), and the Inorganic Pigments Consortium – in developing the Guidance for characterising complex inorganic coloured pigments. The Guidance is now published on Eurocolour's website and linked to ECHA's website.[41]

Substance identity defined for joint registration and the test material composition

The first set of lead registrant dossiers updated or submitted after the release of IUCLID 6 in April 2016 are now available in the ECHA registration database. For substance identity, there are two new key records available: the boundary composition record and the test material record. The boundary composition record reports the joint constituent concentration profile. The name and other identifiers defined for the jointly registered substance – under the 'one substance, one registration' principle – are derived from this information. The test material record reports the constituent identities and concentration values of the test material used to generate the jointly reported REACH Annex VII-XI data.

Full use of the reporting options by the registrants will bring transparency to the link between the jointly defined substance identity and the test material used to generate the data to meet the REACH Annex VII-XI standard information requirements in the registration. ECHA is providing support for reporting in the Q&A section of ECHA website.[42] Transparent reporting in these fields will facilitate in particular testing proposal examination and substance evaluation. ECHA encourages all registrants to make full use of the reporting fields available so it is clear what is being registered and how the reported test data has been generated.

3.4 The collaborative approach pilots

The consideration of regulatory actions based on groups of similar substances rather than single substances was endorsed as part of ECHA's Integrated Regulatory Strategy[43] at the CARACAL meeting in March 2017. The assessment of groups of substances requires adaptation of the approach applied to individual substances and is an opportunity for testing new forms of collaboration between ECHA, Member State competent authorities and relevant registrants or industry groups. The expectation is that the assessment work, the generation of further

[41] https://echa.europa.eu/support/substance-identification/sector-specific-support-for-substance-identification/complex-inorganic-pigments
[42] Q&As section: https://echa.europa.eu/support/qas-support/browse; browse by topic "Substance identity profile".
[43] https://echa.europa.eu/documents/10162/22837330/mb_44_2016_regulatory_strategy_en.pdf/

information and the conclusion on risk management actions for groups of related substances can enhance consistency and efficiency in all REACH and CLP processes and have an amplified impact on a wider number of substances.

As indicated in section 2.2.1 above, manual screening in 2017 involved many groups of related substances. Three of the groups for manual screening and two other groups with already ongoing regulatory actions were selected to test an enhanced collaborative approach ("COLLA"). The so-called COLLA pilot projects differ from the regular manual screening by offering registrants an early opportunity to contribute to the clarification of identified concerns and further testing needs. The registrants are able to contribute with additional information and provide proposals on necessary actions to generate missing information and address identified concerns. At the end of the pilot projects, ECHA and the authorities will decide on the necessary further actions on the related substances, or eventually conclude that no further action by authorities is required for the time being for certain substances.

Table 12: The five COLLA groups, initial concern, and the Member States involved in assessment with ECHA.

COLLA group	Initial concern	Lead MS	Contributing MS
EDTA derivatives	Human health, reproduction toxicity	UK	Sweden
Antimony compounds	Human health	Germany	Lithuania
Polyol acrylates	PBT	Germany	Ireland
Substituted diphenylamines	PBT, mutagenicity	France	Slovenia
Subset of organotin compounds	Reproduction toxicity	The Netherlands	Bulgaria and Sweden

The Member State competent authorities involved did a manual screening of all the group members. All related registrants (leads and individuals) as well as industry groups and other accredited stakeholder organisations were contacted. ECHA organised a webinar for the relevant registrants and stakeholders in May 2017, to further explain the COLLA approach. Kick-off meetings of the five pilots were held between mid-June and September with the participation of assessing Member State competent authorities, ECHA and registrants. Within each COLLA group, registrants appreciated this initiative and agreed to provide better information to address issues raised in the manual screening by Member State competent authorities, and to provide a draft testing strategy to clarify concerns found. These testing strategies will be finalised by the end of the five projects in March 2018.

A comprehensive review of the pilot projects and the collaborative approach will be performed in spring 2018. The experience gained so far with screening of groups of related substances shows that moving from screening of single substances to screening of groups takes time, as most actors do not have previous experience. Some re-organisation of the work is also needed. The development of integrated strategies that take into account ongoing and already-planned regulatory actions on similar substances with different timelines is complex but there are already indications of benefits. In all COLLA groups, authorities and registrants have now a better picture of all the ongoing or envisaged regulatory actions. These pilot projects show how actions on individual substances can be magnified to cover the whole group, including future registrations, while ensuring better consistency. Finally, the COLLA projects have also brought together registrants that were otherwise not collaborating.

3.5 Working with sectors

Another way to foster the improvement of dossier data quality and to identify and address substances of concern is to work with industry sectors. As examples of such work, in 2017 ECHA carried out activities with the sectors related to petroleum and coal stream substances (PetCo; see annual report of the SVHC Roadmap for more details on PetCo work), metals, and plastic additives.

Metals sector approach

Eurometaux, with input from ECHA, has started a sector approach that aims to improve the overall chemicals management of metals and metal compounds by creating an overview of the reported hazard, use, exposure and risk management information, starting action to fill data gaps and, based on that, assess where either company or regulatory action might be needed. Meanwhile, also some cross-cutting technical issues and assessment methodologies that have a direct impact on hazard and risk assessment are being further developed (such as read-across and grouping, environmental classification and addressing inorganic UVCBs).

The approach is a voluntary scheme that aims to include as many metals and inorganic industry organisations or consortia as possible. In 2017, a reporting scheme was developed and tested that gives a snapshot of the data available for groups of metals that will allow consortia to set priorities for generating further data and keep track of the progress.

The sector approach will be of help in resolving the main outstanding issues regarding dossier quality and focus on how the chemicals management in the metals sector can be specifically improved in a transparent and more effective way. The metals sector approach is not a substitute for compliance with legal obligations and for regulatory action. ECHA and Member States will continue regulatory actions as necessary.

Plastic additives

A sector approach for plastic additives was started in November 2016 in cooperation with manufacturers of plastic additives (Cefic sector groups, Eurocolour, Eurometaux, BSEF), and compounders and converters of plastics (EuPC and PlasticsEurope). The project aims to foster registration dossiers updates by generating a better understanding on the uses and exposure potential of substances used as plastic additives, to improve the quality and compliance of hazard information and the way chemical safety aspects are covered in registration dossiers, and to facilitate priority setting for regulatory action.

In 2017, ECHA, together with industry, established an overview of substances used as plastic additives. This illustrated how more appropriate use descriptions could be provided in registrations, in particular for article service life. The work so far has also demonstrated that an approach to determine high and low release potential of additives in plastic matrices would be needed, both for industry to develop better exposure estimates as part of their registration dossiers and for authorities to identify substances for regulatory priority setting purposes.

3.6 Letter campaign on shortlisted substances

ECHA uses informal letters to communicate to registrants that their substances are shortlisted for manual screening by Member State competent authorities to confirm or dismiss suspected hazard and exposure concerns. The third letter campaign in 2017 (the previous campaigns were held in 2015 and 2016) addressed 72 substances, considerably fewer than previously.

The lower number of substances addressed by the 2017 campaign is due to the pilot approach of manual screening of groups of related substances. In fact, as also explained in the screening

webinar of 14 February 2017[44], from round four of common screening, some of the shortlisted substances were associated with other registered substances because of structural similarity and presence of read-across or category information. ECHA believed that, by considering related substances, authorities can ensure consistency in their actions and act in a similar way when dealing with substances that pose similar risks. As ECHA and Member State competent authorities were piloting the manual screening of such groups, in 2017 it was decided to address the letters only to the so-called 'group seeds', i.e. the substances identified by the screening algorithms and around which these groups were formed. Hence, members of such groups were not addressed by these informative letters. It was in fact not known how many of these additional substances the Member State competent authorities would have screened. Based on the outcome of this pilot, in 2018 ECHA intends to extend the letter sending to all group members.

Therefore, only registrants of the shortlisted substances identified by the screening algorithms were addressees of this campaign and invited to review their dossiers with regard to the identified potential hazards and their uses and tonnage information. The aim of the campaign was to inform these registrants of the screening process and to trigger updates of dossiers where potential concerns with hazard and exposure information were identified. The response to this campaign was quite positive. Approximately 40 % of shortlisted substances received dossier updates within four months of the letters having been sent. The main reason for updating, as in the previous campaigns, was to include new or updated information on uses and tonnage per use. However, in certain cases, the registrants also updated hazard information with a revision of the human health and environmental endpoint summaries, improved information on the substance identification, and strengthened the justification for certain adaptations from the standard information requirements.

3.7 Intermediate status verification

The activity of verifying the intermediate status of registrations for on-site and transported isolated intermediates continued in 2017. The scope of this activity, initially set to support relevant REACH risk management processes, such as prioritisation of substances of very high concern (SVHCs) for inclusion in the Authorisation List, has been further expanded to support users of substances included in Annex XIV of REACH, in order to assess whether authorisation applies to their processes and to support Member State authorities to assess intermediate uses.

In 2017, ECHA continued to request registrants to provide documentary evidence of the use of their substance as intermediates in their registration dossiers. ECHA also continued working with industry associations in the metals sector to gain common understanding on intermediate uses in complex processes and subsequent authorisation implications, and with Member States (through the Forum for Exchange of Information on Enforcement and National Enforcement Authorities) to clarify how to assess uses as intermediate and strictly controlled conditions. During 2017, ECHA assessed intermediate registration dossiers for five substances. No Article 36 requests were sent in 2017 as information in registration dossiers was sufficient to conclude about intermediate use in the majority of cases. In four cases the companies were contacted directly by ECHA and the registration dossiers were updated.

[44] Link to 2017 webinar on screening: https://echa.europa.eu/-/how-are-substances-screened-and-shortliste-1

3.8 Transparency regarding content and target of ECHA decisions

The information published by ECHA, before or after an evaluation is completed, allow stakeholders to contribute to the evaluation of chemical substances undertaken by ECHA.

Before evaluation starts

Prior to the initiation of the evaluation processes, ECHA publishes the following lists of substances which will be subject to its assessment:

- the list of substances potentially subject to compliance checks is updated several times per year. Although it is only indicative, registrants are advised to check this list regularly[45];
- the substances listed on the Community rolling action plan (CoRAP)[46];
- the list of testing proposal consultations[47]: in relation to testing proposals, and to ensure that information on existing vertebrate tests is best used, ECHA consults third parties on all proposals for tests involving vertebrate animals, as specified in Annexes IX and X under REACH; Subsequently, third parties have 45 days to submit scientifically valid information and studies that address the relevant substance and hazard endpoints.

After evaluation is completed

ECHA publishes the dossier evaluation decisions to ensure transparency and to offer registrants and third parties an opportunity to increase their understanding of the evaluation processes[48]. Similarly ECHA publishes the outcome of the evaluation of a substance by a Member State, including the adopted decision. This allows any third party to understand the reasoning leading to the request for information[49] to verify the suspected concern.

[45] https://echa.europa.eu/regulations/reach/evaluation/compliance-checks
[46] https://echa.europa.eu/information-on-chemicals/evaluation/community-rolling-action-plan/corap-table
[47] https://echa.europa.eu/information-on-chemicals/testing-proposals/current
[48] https://echa.europa.eu/information-on-chemicals/dossier-evaluation-decisions
[49] https://echa.europa.eu/information-on-chemicals/evaluation/community-rolling-action-plan/corap-table

4. EVALUATION RELATED ACTIVITIES

This chapter covers the ongoing evaluation-related activities and projects that support or are direcly linked to the implementation of REACH.

4.1 Non-animal approaches

In 2017, ECHA for the third time reported to the European Commission on how companies use non-animal approaches under REACH[50]. The results of the report showed that most registrants consider and use alternatives to animal testing. One effective way is data sharing: 98 % of the substances are registered jointly. Registrants also make extensive use of existing information and alternative methods before conducting new studies.

The analysis is based on joint and individual registration dossiers submitted to ECHA between 2008 and 2016 for 6 290 substances. Out of these substances, 89 % have at least one data endpoint where an alternative was used instead of a study on animals. The most common alternative method was using information on similar substances, read-across and grouping adaptations, used in 63 % of the analysed substances, followed by combining information from different sources (weight of evidence, 43 %) and computer modelling (QSAR prediction, 34 %).

In November 2017, ECHA published a report, "*Non-animal approaches - Current status of regulatory applicability under the REACH, CLP and Biocidal Product regulations*"[51], which in addition to the current status explored the near future developments of the non-animal approaches. The aim of the report is to further improve the understanding on how the non-animal approaches can be used to meet the legal requirements. The report does not replace ECHA Guidance, which is always the main source of information for the registrants. The main findings of the report show that:

- many of the so-called lower-tier information requirements can now be fulfilled by applying non-animal approaches;
- for higher-tier endpoints, specific non-animal approaches that could directly replace vertebrate animal tests are not yet available and not foreseen within the near or even medium-term future;
- adaptations using grouping and read-across and/or weight of evidence are currently the main approaches to reduce the need for new animal testing;
- information from non-animal approaches may be used as supporting data for grouping and read-across adaptation or as elements in a weight-of-evidence adaptation.

ECHA keeps on its website updated guidance[52] on how to avoid unnessesary testing on animals and use alternatives to animal testing to fulfil REACH registration requirements.

Integrated approaches to testing and assessment

The use of integrated approaches to testing and assessment (IATA) falls in most cases under weight-of-evidence adaptation, unless the components of the IATA strictly correspond to the information requirement. An IATA can nevertheless to be used to structure a weight-of-

[50] https://echa.europa.eu/documents/10162/13639/alternatives_test_animals_2017_en.pdf/075c690d-054c-693a-c921-f8cd8acbe9c3
[51] https://echa.europa.eu/documents/10162/22931011/non_animal_approcches_en.pdf/
[52] https://echa.europa.eu/support/registration/how-to-avoid-unnecessary-testing-on-animals

evidence adaptation[53].

In a defined approach to testing and assessment, data generated by non-animal and animal methods are evaluated by means of a fixed data interpretation procedure. The data interpretation procedure is rule-based in the sense that it is based, for example, on a formula or an algorithm (e.g. decision criteria, rule or set of rules) that do not involve weight-of-evidence determination using expert judgment. The OECD guidance[54] on the reporting of defined approaches to testing and assessment provides templates to enable a structured approach of documentation.

Several examples of IATAs or defined approaches have been published in 2017 or are under discussion by the OECD for skin corrosion or irritation, serious eye damage or eye irritation and skin sensitisation, and other IATAs are being developed for non-genotoxic carcinogenicity. A specific strategy for skin sensitisation assessment under REACH has been developed based on the above OECD guidance documents (see section R.7.3 of ECHA Guidance on Information requirements and chemical safety assessment – Chapter R.7a)[55].

While no defined approaches has been formally approved yet, in April 2017 the OECD approved a project which analyses the predictivity of several preliminary defined approaches for skin sensitisation. If found acceptable, these defined approaches can be used under REACH.

Other scientific work on the non-animal approaches

ECHA is collaborating internationally to develop screening approaches for (de)prioritisation of substances and exploring how non-animal approaches could support regulatory assessments.

Together, *in vitro*, *in chemico*, *in silico*, *-omics* and other techniques and non-animal approaches are also called new approach methodologies (NAMs). Data may be collected also using high-throughput screening (HTS) methods or high-content methods. These methods are analytical techniques that enhance toxicity tests *in vivo* or *in vitro* by adding e.g. new endpoints or parameters, pattern recognition or high-throughput. These methods may be used in screening and (de)prioritisation, suggesting a mode of action (MoA), in identifying endpoints that can be used in developing adverse outcome pathway approaches, as supportive information for grouping and read-across, in integrated approaches such as IATAs, and as elements within weight-of-evidence adaptations.

In 2017, ECHA followed up the international work on NAMs and hosted the second workshop in October 2017 after the workshops on 2016 (in ECHA)[56] and a previous one organised by the United States Environmental Protection Agency (EPA). ECHA's NAM project started a process between the chemical regulatory agencies worldwide to reinforce the principles of cooperation between the OECD member countries, and enhance the use of non-animal approaches for screening and (de)prioritisation, chemical hazard and risk assessment, and for harmonised classification and labelling.

At OECD level, there are currently ongoing discussions on how to integrate the fish embryo acute toxicity (FET) test into the OECD Guidance Document 126 on the threshold approach for

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[53] http://www.oecd.org/chemicalsafety/risk-assessment/iata-integrated-approaches-to-testing-and-assessment.htm#guidancedocument

[54] ENV/JM/MONO(2016)28: https://www.bior.lv/sites/default/files/inline-files/env-jm-mono%282016%2928%5B1%5D.pdf.

[55] https://echa.europa.eu/documents/10162/13632/information_requirements_r7a_en.pdf/e4a2a18f-a2bd-4a04-ac6d-0ea425b2567f

[56] https://echa.europa.eu/view-article/-/journal_content/title/topical-scientific-workshop-new-approach-methodologies-in-regulatory-science

acute fish toxicity. The regulatory use of the FET test has been discussed in ECHA, hosted at the expert workshop co-organised by ECHA and German Environment Agency (May 2017, Helsinki), where research needs and areas for further developments to improve usability of FET for regulatory purposes were identified. Nevertheless, based on current knowledge, ECHA considers that the OECD Test Guideline 236 has a potential for use as part of a weight-of-evidence adaptation, in combination with other information, for the registrant to make a scientific justification to predict acute fish toxicity. Registrants are invited to include available FET data in the weight-of-evidence adaptations in their registrations to gain experience and to build the case studies that might be used as best practice examples. The report from the FET Workshop is available on ECHA's website[57].

4.2 Expert working groups

The expert group on (very) persistent, (very) bioaccumulative and toxic substances

The PBT Expert Group provides informal scientific advice on questions related to the identification of PBT and very persistent, very bioaccumulative (vPvB) properties of chemicals.

During the year, the expert group supported evaluation by providing informal scientific advice for the majority of substances placed on the CoRAP for 2017 due to PBT/vPvB concerns. The discussions within the group focused mainly on the interpretation of the existing data and the most appropriate testing strategy to conclude on the concern. In addition, the group reviewed the data provided in response to substance evaluation decisions for seven substances listed on the CoRAP for 2012-2014.

The expert group on endocrine disruptors

During 2017, the Endocrine Disruptor Expert Group provided advice regarding eight substance cases, all of them on CoRAP. This year was the first time that substance evaluation cases that are in the follow-up evaluation stage were discussed in the expert group. Five out of the six substances in the CoRAP 2017 with endocrine disruption as an initial concern were discussed by the group. The discussions in the expert group have focused mostly on the interpretation of available data, the identification of further information requirements and the most appropriate information generation and testing strategy to conclude on the concern.

The expert group on nanomaterials

The Nanomaterials Expert Group[58] supports the implementation of ECHA's Workplan for Nanomaterials 2016-2018, and provides informal advice on scientific and technical issues regarding the implementation of the REACH, CLP and Biocidal Products regulations in relation to nanomaterials.

In 2017, the group discussed several topics. Some of discussions focused on technical aspects involved in the development and adaptation of OECD test guidelines and guidance documents; these discussions are now framed by the so-called Malta project, an initiative of several EU Member States started in Q3/2017 to intensify the effort to develop or update OECD test guidelines and guidance documents.

4.3 Good laboratory practice

According to Article 13(4) of REACH, ecotoxicological and toxicological tests and analyses must be carried out in compliance with the principles of good laboratory practice (GLP).

ECHA randomly verifies whether a test facility conducting such tests belongs to an OECD GLP

[57] https://echa.europa.eu/documents/10162/13630/fet_workshop_proceedings_en.pdf/a987ccab-5d4a-a226-2a73-994be484ca8d
[58] https://echa.europa.eu/regulations/nanomaterials/nanomaterials-expert-group/

monitoring programme and whether the test facility is GLP-certified for the area of expertise relevant for the particular test. In 2017, ECHA continued random verifications of the GLP compliance of ecotoxicological and toxicological tests for which results were provided in the registration dossiers. In particular, ECHA requested 10 random study audits of different types of studies conducted in test facilities of EU member states. Additionally, ECHA requested one targeted study audit based on the identified concern. So far, three studies were found to be in compliance with the principles of GLP by the GLP monitoring authorities. The remaining study audit reports are pending. ECHA will inform the Member State competent authorities upon receiving the audit reports if necessary.

4.4 Test guideline developments

In vitro methods

ECHA's web pages on testing methods and alternatives were updated to reflect new test methods and testing strategies[59]. The updates concern skin and eye irritation/corrosion, skin sensitisation and genotoxicity.

A new method to cover eye irritation endpoint has been approved by OECD, and included in to the OECD test No. 492. An Integrated Approach on Testing and Assessment (IATA)[60] for the eye effects was approved by OECD. IATA provides advice how to combine *in vitro* and other data in a weight-of-evidence approach.

Also during the year, the OECD approved the new *in vitro* methods for skin sensitisation U-SENS and IL-8 Luc Assay, which are included in OECD test No. 442E. These methods can be used to meet the information requirement on the third key event according to REACH Annex VII, 8.3.1. In addition, OECD has started a project on how to combine specific *in vitro* methods and other data to conclude on skin sensitisation hazard and potency classification. Use of these defined approaches is anticipated to lead in many cases to full replacement of *in vivo* tests.

On 9 October 2017, the OECD released three test guidelines specifically updated to enable the testing of nanomaterials. The OECD test No. 318, Dispersion stability of nanomaterials in simulated environmental media, describes test procedure to gain information on dispersion stability of manufactured nanomaterials in simulated environmental media. The main purpose of this test guideline is to assess the ability of a nanomaterial to attain a colloidal dispersion and to conserve this dispersion under environmentally relevant conditions. The other two tests were revised to study the health effects of nanomaterials. The OECD test No. 412, on subacute inhalation toxicity (28-day study), has been designed to fully characterise test article toxicity by the inhalation route following repeated 28-day exposure time, and to provide data for quantitative inhalation risk assessments. Correspondingly, the OECD test No. 413, on sub-chronic inhalation toxicity (90-day study), characterises the test article toxicity by the inhalation route following repeated 90-day exposure time.

4.5 Extended one-generation reproductive toxicity study

Commission decisions on dossier evaluation cases

During 2017, the Commission processed the 216 draft evaluation decisions referred to it for decision making in years 2011-2014 regarding two-generation reproductive toxicity (information requirements 8.7.3 of REACH Annexes IX and X) on which ECHA's Member State

[59] https://echa.europa.eu/support/oecd-eu-test-guidelines

[60] Guidance Document on an Integrated Approach on Testing and Assessment (IATA) for Serious Eye Damage and Eye Irritation Series on Testing & Assessment No. 263: http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=ENV/JM/MONO(2017)15&doclanguage=en.

Committee could not reach unanimous agreement[61]. In most cases, the Commission decisions requested the registrants to update their registration dossiers with a testing proposal for extended one-generation reproductive toxicity study (EOGRTS) or a valid adaptation within a deadline of 90 days. Registrants who had already submitted a valid testing proposal were not asked to update their dossier again.

The response rate to the Commission decisions was high. For the 98 individual substances, approximately 50 % of registration dossiers were updated with testing proposals for EOGRTS, approximately 40 % with an adaptation, and less than 10 % of the registration dossiers were not updated within the deadline. All read-across categories (a total of 115 registration dossiers bundled in 5 categories) were updated with testing proposals to reflect the new EOGRTS information requirement. ECHA has started to process these cases.

Extension to the assessment of second filial generation (F2) and testing of developmental neuro- and immunotoxicity (DNT and DIT)

For the cases processed under dossier evaluation in 2017, the DNT Cohorts 2A and 2B have been mainly requested based on effects seen in thyroid, central nervous system (brain and spinal cord) and functional observational batteries. Investigations on DIT were triggered by effects seen on thymus and cell counts (eosinophils, leucocytes, lymphocytes), for example. The extension of Cohort 1B to produce the F2 generation for substances with significant consumer and/or professional exposure was mainly requested based on endocrine disrupting mode(s) of action and potential for bioaccumulation.

In 59 % of adopted dossier evaluation decisions the request was for a basic study design, i.e. without any additional cohorts. The second generation was included in 22 % of requests. Furthermore, DNT and/or DIT cohorts were triggered in 25 % of cases. Under substance evaluation, two out of three study requests included all cohorts, whereas in one request only the DIT cohort was triggered.

4.6 Litigation and European Ombudsman cases

Under Article 94 of REACH, an action may be brought before the European Court of Justice against a decision taken by the Board of Appeal or in cases where no appeal lies before the Board.

On 31 December 2017, three evaluation cases were pending before the General Court, one on dossier evaluation, challenging a statement of non-compliance, and two on substance evaluation, addressing various issues, including proportionality and the scope of review by the Board of Appeal.

The Board of Appeal

The Board of Appeal is responsible for deciding on appeals lodged against certain decisions of the Agency taken under REACH and the Biocidal Products Regulation.

During 2017, ten new appeals against ECHA evaluation decisions were announced by the Board of Appeal on its website. Of these cases, six concerned dossier evaluation decisions and four concerned substance evaluation decisions (two of which challenge the same substance evaluation decision).

In 2017, the Board of Appeal closed 11 appeal cases on evaluation. Of these, five concerned

[61] http://ec.europa.eu/environment/chemicals/reach/implementation_en.htm

dossier evaluation decisions and six concerned substance evaluation decisions[62].

Some of these cases concerned the conditions under which ECHA can request further information on nanomaterials under both dossier and substance evaluation, the question whether downstream users can appeal evaluation decisions, and the competence of ECHA to request further information to examine the persistency of a substance under substance evaluation.

At the end of 2017, five dossier evaluation appeals and six substance evaluation appeals were pending.

Further information on the current status of appeal cases and the Board of Appeal's decisions can be obtained from the Board of Appeal's web section[63].

Recent learnings from the decisions of the Board of Appeal are summarised in the following sections.

Nanomaterials

Titanium dioxide case[64] *(dossier evaluation)*

The Board of Appeal found that ECHA did not have the competence to ask nanomaterial-specific information for the substance identification under Section 2 of Annex VI to REACH. It thus annulled the contested decision in so far as it requested this information.

The Board ruled that when defining a substance broadly, registrants must provide toxicological and ecotoxicological information covering both the bulk form and the nanoforms of the substance. It thus considered that rather than requesting more information under Section 2 of Annex VI, ECHA could have performed a compliance check to verify whether the dossier included toxicological and ecotoxicological information addressing all possible forms of the substance as defined by the registrants. Alternatively, the substance evaluation process could have been used in case of a need to clarify a potential concern.

The Board held that neither ECHA nor it are in a position to interpret REACH in such a way as to amend or extend it. If the legislature sees a need for further information on the nanoforms, it would need to amend the REACH Annexes accordingly.

Silicon dioxide/synthetic amorphous silica (SAS)[65] (substance evaluation)

The Board of Appeal considered that being a nanomaterial is on its own insufficient to establish a concern under substance evaluation.

As a follow-up of the Board decisions regarding nanomaterials, ECHA reviewed its strategy[66] for addressing nanomaterials under evaluation processes awaiting for an update of the REACH Annexes which could eventually strengthen the regulatory tools.

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[62] There were, in fact, two appeal cases relating to the same substance evaluation decision, i.e. Cases A-014-2015 and A-015-2015 concerning the substance evaluation of silicon dioxide, also referred to as synthetic amorphous silica (SAS).
[63] http://echa.europa.eu/about-us/who-we-are/board-of-appeal
[64] Decision of 2 March 2017 in Case A-011-2014, Hunstman P&A Ltd and others.
[65] Decisions of 30 June 2017 in Case A-014-2015, Grace GmbH & Co. KG and Advanced Refining Technologies GmbH, and in Case A-015-2015, Evonik Degussa GmbH and others.
[66] https://echa.europa.eu/documents/10162/2792271/mb_57_2017_echa_strategy_nanoforms_en.pdf/

Persistency concern

BENPAT case[67] *(substance evaluation)*

The Board of Appeal upheld the contested decision in so far as the existing data did not demonstrate that the substance would not be persistent in the environment. In that respect, ECHA was also objectively justified in treating substances 7PPD and 77PD differently from the substance in question. However, the Board found that the OECD 309 study would not be suitable to identify the metabolites of the substance and it therefore annulled this aspect of the study request. Such annulment rendered the next study request, namely the OECD 308 sediment simulation study as regards the identity and properties of NER[68], not justified since the two studies together were to assess the possible persistency of the metabolites.

On a procedural aspect, the Board found that the Agency was not required to reach a firm conclusion on the bioaccumulative properties of the substance in order to request further information on persistence. Therefore, it requested that the statement related to bioaccumulative properties to be removed from the contested decision. This case is currently under appeal.

Interface between dossier and substance evaluation

TPBP case[69] *(substance evaluation)*

The Board of Appeal upheld ECHA's decision regarding both requests for a comet assay and for a pre-natal developmental toxicity study in a second species (second species PNDT). Regarding the second species PNDT, the Appellant claimed that ECHA should have requested the test under dossier evaluation. The Board considered that ECHA was entitled to use the substance evaluation procedure to ask for the study since it had demonstrated a potential risk (developmental toxicity) and all the registrants of the substance were at the same tonnage band and therefore treated equally.

On a procedural aspect, the Board confirmed that ECHA is competent to submit proposals for amendment on substance evaluation draft decisions.

Duty to state reasons

In December 2017, the Board of Appeal held that ECHA's dossier evaluation decision requiring vertebrate testing for the substance used exclusively in cosmetics should have explained the Agency's interpretation of the relationship between the REACH Regulation and the Cosmetics Regulation. ECHA should have in the decision referred to the joint ECHA/Commission public statement on this issue and explained how the interpretation set out therein applied to the present case, in order to justify why the requested vertebrate test was warranted[70].

Procedural aspects:

i. locus standi of downstream users

DCBS case[71] *(substance evaluation)*

[67] Decision of 8 September 2017 in Case A-026-2015, Envigo Consulting and DJChem Chemicals.
[68] Non extractable residues
[69] Decision of 13 December 2017 in Case A-023-2015, S.A. Akzo Nobel Chemicals NV and others.
[70] Decision of 12 December 2017 in Case A-013-2016, BASF Personal Care and Nutrition GmbH.
[71] Decision of 30 May 2017 in Case A-022-2015, Manufacture Française des Pneumatiques Michelin.

This appeal was lodged by a downstream user against an evaluation decision on a substance that it incorporates in tyres. The Board of Appeal considered the appeal as inadmissible because the Contested Decision did not impose any direct obligation on downstream users that did not prepare a CSR nor submit a downstream user report to ECHA, nor to a substance information exchange forum's (SIEF) member, member of a SIEF agreement, new consortium member or again to a registrant registering after the adoption of the substance evaluation decision. The Board used this opportunity to clarify the involvement of downstream users under substance evaluation. At the same time, the Board observed that substance evaluation does not extend to downstream users in general, but a request for information (under substance evaluation) may do so in certain cases, for example, confirmed in the case where a downstream user submitted a downstream user report related to a use targeted by the substance evaluation. This suggests that a downstream user might have a standing for challenging a substance evaluation decisions in these limited cases, meaning that a substance evaluation may be targeted towards him.

ii. Admissibility of expert review during appeal proceedings

Silicon dioxide/synthetic amorphous silica (SAS) case[72] *(substance evaluation)*

An expert review, not submitted during the decision-making but at the stage of the appeal proceedings, was found to constitute admissible evidence. The Board of Appeal noted that the Appellants had already announced at the Member States Committee meeting that they were preparing this study, that it was reasonable for the Appellants to commission this study and that the delay in producing this study was justified.

iii. Competence of the Board of Appeal on Community Rolling Action Plan

Silicon dioxide/synthetic amorphous silica (SAS)[73] *(substance evaluation)*

The Board of Appeal confirmed that it has no competence to decide on an appeal against inclusion into the CoRAP.

The European Ombudsman

On 21 July 2017 the European Ombudsman issued her decision[74] in response to a complaint filed by an animal welfare non-governmental organisation concerning a joint statement by the European Commission and ECHA clarifying their understanding of the relationship between the Cosmetics Regulation, which bans animal testing, and REACH, which allows animal testing of chemicals in certain limited circumstances to assess risks to human health and to the environment.

In her decision, the Ombudsman concluded that there was no maladministration by the Commission and ECHA in issuing the joint statement and that the Commission and ECHA were entitled to explain how animal testing data should be used to fulfil the requirements under REACH.

[72] Decision of 30 June 2017 in Case A-015-2015, Evonik Degussa GmbH and others.
[73] Decision of 30 June 2017 in Case A-015-2015, Evonik Degussa GmbH and others.
[74] Decision of 21 July 2017 in Case 1130/2016.

5. RECOMMENDATIONS TO REGISTRANTS

This chapter contains advice to all existing and future registrants under REACH.

The recommendations are based on the most frequent shortcomings observed during dossier and substance evaluation, or their follow-up, and includes also information on the guidance and tools made available to the registrants during the year.

5.1 Report the identity of your substance and representative test material correctly

Report clearly what you have registered

Check that your reported legal entity composition information is within the boundaries of the substance identity profile compositional information as reported in the boundary composition record in the lead registrant dossier. More information can be found in "*Guidance for identification and naming of substances under REACH and CLP*" [75].

Make full use of the available IUCLID reporting fields

Proactively update the lead registrant dossier to make use of the new reporting functionalities for the joint compositional profile and the test material records.

ECHA encourages you to take action to correct substance identification mistakes not only during dossier evaluation but also on your own initiative. More information on how to prepare a registration can be found in the manual "*How to prepare registration and PPORD dossiers*" [76].

Ensure that you can demonstrate you are in the correct joint registration

Check that your compositional information is within the boundaries agreed by your co-registrants and that the jointly reported REACH Annex VII-XI information is relevant for your composition.

A broadly defined substance identity means broad Annex VII-XI reporting

If you and your co-registrants have defined your substance identity broadly, ensure that you also clearly report in your registration file how you have fulfilled your REACH Annex VII-XI information requirements for all that is registered and covered by the registration.

Ensure you can demonstrate the relevance of your test materials

Report the constituent identities and concentration values of each test material and study used to generate your reported REACH Annex VII-XI data in the fields available in the Test Material Record.

Registering nanomaterials? Consult ECHA's Guidance

Consult the available ECHA Guidance on how to address the specific properties of the nanomaterials you register when generating or collecting REACH Annex VII-XI information for your registration file. Make use of the IUCLID 6 reporting fields available in the composition records to document what you have registered and what your REACH Annex VII-XI data refers to[77].

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[75] https://echa.europa.eu/documents/10162/23036412/substance_id_en.pdf/ee696bad-49f6-4fec-b8b7-2c3706113c7d

[76] https://echa.europa.eu/manuals

[77] https://echa.europa.eu/documents/10162/13643/appendix_r14_05-2012_en.pdf/7b2ee1ff-3dc7-4eab-bdc8-6afd8ddf5c8d

5.2 Provide information on GLP compliance of the whole study

When you report results of a toxicocological or ecotoxicological study, identify unambiguously the test facility in which the study was conducted by providing the complete name and address of the facility so that a good laboratory practise (GLP) compliance claim can be verifified.
If parts of a GLP study were not conducted in line with GLP principles, indicate which parts of the study were affected in the remarks field of the GLP compliance section in the IUCLID.

5.3 Make sure your registration dossier is complete

The experience gained so far with the manual verifications on incoming dossiers has enabled ECHA to identify several recommendations for registrants to successfully prepare and submit a registration dossier. ECHA has published an information document on the manual verification that describes the different areas of the manual verification checks and provides useful instructions on how to prepare a complete registration dossier[78]. You should take into account the information document and the following recommendations when preparing a registration dossier.

- Before you submit the dossier to ECHA, use the IUCLID Validation assistant tool.
- If the Validation assistant does not indicate any failures, it is not an automatic confirmation of that the dossier is complete, since the manual verifications are not displayed in the Validation assistant report. Ensure that you have included all the required data for the areas that are described in the information document on manual verification.
- When preparing your dossier, consider that the registration dossier should not only be prepared to pass the completeness check – it should contain all the information on the substance as specified by REACH and should aim to demonstrate that the substance is used in a safe manner.
- Each registrant is responsible for ensuring that they register the substance as part of the correct joint submission, and that they provide the correct substance identification information in their registration dossier. Registrants should not rely on company-specific substance identification information provided by the lead registrant (such as analytical or compositional information).
- Use the available templates that exist to support registrants with the reporting of certain information requirements. For example, IUCLID has integrated templates for the manufacturing process description that is required for UVCB substances and for the considerations of alternative methods that need to be reported with testing proposals on vertebrate animals.
- When certain information is requested in a specific IUCLID field, this information must be included in the appropriate field. Reference to other parts of the IUCLID dossier is not considered complete.

5.4 Use the support available for REACH 2018 registrants

Follow the Directors' Contact Group

The Directors' Contact Group[79] restarted their activity in 2017. Their objectives are to monitor the overall preparedness of companies and to identify and resolve the priority issues of concern in meeting obligations relevant to the registration of chemical substances. They have decided to reopen four solutions designed already for the 2010 and 2013 deadlines for

[78] The document is published on ECHA's website:
https://echa.europa.eu/documents/10162/13652/manual_completeness_check_en.pdf
[79] https://echa.europa.eu/about-us/partners-and-networks/directors-contact-group

companies in exceptional circumstances (solutions 10, 15, 20 and 21)[80] from 31 January 2018.

Consult the REACH 2018 web pages

The REACH 2018 website[81] remains the main information point for the registrants falling under the 31 May 2018 registration deadline. "*Practical guide for SME managers and REACH coordinators*"[82], published already in 2016, includes many tips on how to fulfil information requirements at tonnages 1-10 and 10-100 tonnes per year, as does ECHA's web page "*What information you need*".[83]

Check our practical examples

A new support web page bringing together practical examples[84] was published on 31 May 2017. Among others, one example relevant for information requirements was published, namely "*Steps to gather information for low tonnage substances*"[85]. In early 2018, more practical examples related to hazard and risk assessment were published:

- How to gather information to register an inorganic mono-constituent substance (including the chemical safety assessment);
- How to gather information to register a multi-constituent or a UVCB substance - toxicological information;
- How to decide whether a substance is a polymer or not and how to proceed with the relevant registration.

In addition, links to the existing examples related to assessing hazards and risks of substances were gathered on the practical examples web page. Note that the examples with the OECD QSAR Toolbox were developed with an older version of the Toolbox, but the reasoning described in the document is still valid.

If you are a SME, consider using ECHA Cloud Services

ECHA Cloud Services is a secure online platform used to distribute ECHA's IT applications in a cloud environment. By using the services, you can work together in a more transparent and interactive way. The service allows SMEs and their consultants to work online with the latest version of IUCLID without having to install IUCLID on computers or company servers. It has a simple interface focusing on the REACH 2018 registration deadline tasks, and also offers a guided approach to help inexperienced SME registrants through the process of entering their IUCLID data. The service provides the user with up to 1 GB of data storage, fully managed backups and dedicated helpdesk support. More information on IUCLID Cloud is available on-line [86,87,88].

[80] https://echa.europa.eu/documents/10162/23556156/171219_dcg_four_solutions_en.pdf/9451fa44-266c-74d5-40d9-8beebd0e5c8b
[81] https://echa.europa.eu/reach-2018
[82] https://echa.europa.eu/practical-guides
[83] https://echa.europa.eu/support/registration/what-information-you-need
[84] https://echa.europa.eu/support/registration/practical-examples
[85] https://echa.europa.eu/documents/10162/23221373/example_low_info_reqs_en.pdf/3db4c47b-4ebf-1768-6350-e87b530a8f7e
[86] https://echa.europa.eu/support/dossier-submission-tools/echa-cloud-services
[87] https://www.linkedin.com/groups/12043483
[88] https://www.youtube.com/playlist?list=PLOPGDACSd6qyDkdXwPua1Fjb5bJksY75k

5.5 Avoid unnecessary testing on animals

Share data and use non-animal approaches where possible

Potential registrants of the same substance must collaborate to share the requested information and agree on the data to be submitted jointly.

If new data for skin corrosion/irritation, serious eye damage/eye irritation and/or for skin sensitisation needs to be generated, you will have to perform the *in vitro* studies first, irrespective of the annual tonnage of the substance. Unjustified *in vivo* testing when non-animal alternatives are available may lead to compliance check or direct enforcement action.

For substances expected to not be acutely toxic based on non-animal approaches (e.g. *in vitro* and QSAR data), consider conducting a sub-acute repeated-dose toxicity study (28-day study) first. The results from that study may be used within a weight-of-evidence approach to conclude on oral acute toxicity without conducting an acute oral toxicity study.

Information from non-animal approaches may also be used as supporting data for grouping and read-across adaptation. Results from several individual non-animal approaches (e.g. *in silico*, *in vitro*) may allow to adapt information requirements and avoid an animal test under weight-of-evidence adaptation.

Provide your considerations on non-animal approaches with your testing proposals

When you have concluded that generation of new information is necessary, verify whether the endpoint requires a testing proposal and prior authorisation of the testing by ECHA. Apart from information requirements listed in Annexes IX and X, some testing proposals may need to be submitted already at Annex VII or at Annex VIII level[89]. For example, the Annex VIII, Column 2 requires the registrant to consider appropriate mutagenicity *in vivo* studies in cases where positive results in *in vitro* genotoxicity studies have been obtained. It should be noted that where this involves tests mentioned in Annexes IX or X, such as *in vivo* somatic cell genotoxicity studies, testing proposals must be submitted by the registrant and accepted by ECHA in a formal decision before testing can be initiated.

When your testing proposal involves testing on vertebrate animals, you have to include your considerations on non-animal approaches for that information requirement in the dossier documentation.

Justify and document your weight-of-evidence approach

If you propose an adaptation based on weight of evidence, the individual lines of evidence and the justification should provide a sufficient confidence level when compared to information expected with the default test. Documentation of the weight-of-evidence adaptation should be transparent and conclusions justified.

You need to document the quality and relevance of the pieces of evidence, as well as their consistency and completeness, in relation to the standard information requirements. You should also address the associated uncertainties and their impact in a way that allows ECHA to assess and verify all the pieces of evidence provided in the technical dossier.

Provide robust grouping and read-across arguments

Use ECHA's Read-Across Assessment Framework (RAAF[90]) to check the robustness of your

[89] https://echa.europa.eu/documents/10162/13632/information_requirements_r7a_en.pdf/e4a2a18f-a2bd-4a04-ac6d-0ea425b2567f

[90] ECHA Read-Across Assessment Framework (RAAF): https://echa.europa.eu/documents/10162/13628/raaf_en.pdf.

read-across adaptation. The RAAF describes the aspects of grouping and read-across justifications that ECHA considers to be crucial for both human health and environmental endpoints. A technical document[91] on the key issues for assessing the complexity of grouping and read-across for multi-constituent and UVCB substances was published on ECHA's website in March 2017. This document describes the additional key issues proposed to be considered when predictions based on grouping and read-across cases involving multi-constituent substances and/or UVCBs are used to adapt standard information requirements.

Justify the grouping and read-across by showing how structural similarity and dissimilarity are connected to the prediction and create a data matrix, allowing side-by-side comparison of properties of the sources and target substances.

5.6 Your chemical safety report should reflect the actual uses and risks

Derive DNELs according to ECHA's Guidance

Derivation of DNEL (derived no-effect level) is a key element for the risk characterisation of a chemical substance. The DNEL is set by REACH as the threshold above which humans should not be exposed. Therefore, it is important that your DNEL is derived appropriately to make sure that your substance is manufactured and used in such a way that they do not adversely affect human health. A DNEL has to be derived based on the dose descriptor giving rise to the highest concern per route of exposure and type of effect. Usually it is the study with the lowest NOAEL/LOAEL (no/lowest observed adverse effect level).

A set of assessment factors should be applied to convert the dose descriptor into a DNEL. For an explanation on the background to these assessment factors, consult REACH Guidance on information requirements and chemical safety assessment, Chapter R.8: Characterisation of dose [concentration]-response for human health (version 2.1, November 2012)[92].

You need to justify and document any deviation from these default assessment factors with scientific arguments that are specific to your registered substance.

If it is not possible to derive a DNEL for a particular hazard, for example skin/eye irritation/corrosion, skin sensitisation, mutagenicity, you should carry out and report a qualitative assessment.

Use the DNEL and PNEC calculators in IUCLID 6

DNEL and PNEC calculators[93] are new features in IUCLID 6 (versions 1.2.0. and 1.3.0.).

The DNEL calculator was developed in collaboration with the State Secretariat for Economic Affairs (SECO) from the Swiss Confederation in order to support the derivation of worker and general population derived no-effect levels (DNELs) for long-term systemic effects for oral, dermal and inhalation routes based on ECHA's Guidance.

The PNEC calculator was developed to support the derivation of predicted no-effect concentrations (PNECs) for the aquatic, sediment and terrestrial environmental protection targets based on ECHA's Guidance.

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[91] Read-Across Assessment Framework (RAAF) - Considerations on multi-constituent substances and UVCBs: https://echa.europa.eu/documents/10162/13630/raaf_uvcb_report_en.pdf/3f79684d-07a5-e439-16c3-d2c8da96a316.

[92] REACH Guidance on information requirements and chemical safety assessment, Chapter R.8: Characterisation of dose [concentration]-response for human health: https://echa.europa.eu/documents/10162/13632/information_requirements_r8_en.pdf/.

[93] https://iuclid6.echa.europa.eu/documents/21812392/22308501/iuclid_functionalities_en.pdf

Both DNEL and PNEC calculators use the information already provided in the endpoint study summaries of the IUCLID dossier and populate automatically the summary records in sections 6 (Ecotoxicological information) and 7 (Toxicological information) of IUCLID.

Your exposure assessment needs to cover all identified hazards

According to Section 5.0 of Annex I to REACH, when the exposure assessment is triggered, i.e. criteria given in Article 14(4) are met, it "shall consider all stages of the life-cycle of the substance" and "cover any exposures that may relate to the hazards identified". ECHA's Guidance on information requirements and chemical safety assessment, Part B: Hazard Assessment (version 2.1, December 2011) clarifies that there are three types of identified hazards requiring exposure assessment:

1. hazards leading to classification;
2. classifiable hazards where the severity of the effects is lower than the criteria for classification and so the substance is not classified;
3. hazards for which currently no classification criteria exist.

The three points above entail that exposure assessment is not limited to the classifiable hazards or adverse effects observed at doses or concentrations where classification is triggered, but should cover all hazards identified. It should be noted that hazard is considered as identified when adverse effects have been observed in studies at the highest recommended concentration or doses tested. The DNEL or PNEC can be derived and hence exposure assessment for that route of exposure, type of effect, or protection target would be needed. For instance, when adverse effects have been observed in studies conducted at the highest practicable and biologically relevant concentration on environmental aquatic toxicity according to OECD and EU test guidelines (e.g. 100 mg/l as a limit test for acute aquatic toxicity in the OECD guideline), taking into account the properties of the substance determining the environmental fate, it would indicate that quantitative exposure assessment, i.e. derivation of predicted environmental concentrations (PECs), is mandatory for the water, sediment and soil environmental compartments.

Use correct exposure scenarios and exposure estimations

The reliability of the exposure assessment highly depends on the reliability of the exposure scenarios and input parameters used in the exposure estimation. One of the main parameters affecting the outcome of the environmental exposure assessment are the release factors to the environment. ECHA's Guidance on information requirements and chemical safety assessment, Chapter R.16: Environmental Exposure Estimation[94] suggests generic worst-case release factors for each environmental release category (ERC) that registrants can use without further justification. If non-default ERC release factors (site-specific or sector-proposed specific environmental release categories (SpERCs)) are available and used for exposure estimation, this should always be justified. This justification should be detailed enough, the source referenced (and retrievable) and linked to the related operational conditions or risk management measures, so ECHA can understand whether it covers the relevant scenarios for possible releases from substance processing according to the relevant exposure scenario. For example, SpERC developers and users should ensure that the description provided in the SpERC factsheet is detailed in a clear and accurate manner with sufficient justification, and covers all relevant activities or processes, operational conditions, and risk management measures claimed. In general, SpERCs include a definition of scope (applicability domain), information on conditions of use leading to a certain expected release factor, expected release factors, and an explanation of how the release factors were derived. If the SpERC factsheet does not contain sufficient background information on the release factor proposed, the registrant's CSR may not be convincing in demonstrating the control of risk.

[94] https://echa.europa.eu/documents/10162/13632/information_requirements_r16_en.pdf/b9f0f406-ff5f-4315-908e-e5f83115d6af

The exposure assessment requires the estimation of the level of the substance to which humans and the environment may be exposed. It is another key element in assessing whether the risks are adequately controlled throughout the lifecycle of a substance. It consists of two clear steps: identifying exposure scenarios (as discussed above) and estimating the exposure in each scenario.

The exposure estimates give the level of exposure that is expected when manufacturing and using a chemical substance and they are compared with the derived DNELs to ensure that human health is not adversely affected. For estimating the level of exposure, an adequate or representative set of measured data can be used. In the absence of workplace exposure data, the exposures should be carefully estimated by using the exposure models that are appropriate for the physico-chemical properties of the substance and the route of exposure. When using a model to obtain exposure estimates, you should understand how it works and its limitations, so that it is fit for purpose and you can enter the parameters correctly. In other words, you should use the model within its domain of applicability, and you should not deviate from the underlying assumptions in the model. For exposure tools integrated into Chesar, users receive warnings when using the tool in a way that may conflict with the applicability domain.

Justify your exposure based adaptions

When you use Annex XI, section 3, substance-tailored exposure-driven testing by claiming implementation of strictly controlled conditions throughout the life-cycle of the substance, for confirmation of applied conditions during the whole lifecycle of the substance, you should also provide a description of the specific activities performed at each lifecycle stage and on each relevant site concerning the handling and use of the substance in the registration dossier. For each specific activity it should contain a brief description of the system and/or equipment that demonstrates how the substance is rigorously contained by technical means during its whole lifecycle and how other requirements of Article 18(4)(a) to (f) of REACH are implemented.

More information on what information and documentation is relevant and necessary to be submitted in the registration dossier to support a claim of strictly controlled conditions is given in ECHA's Practical Guide 16, "*How to assess whether a substance is used as an intermediate under strictly controlled conditions and how to report the information for the intermediate registration in IUCLID*"[95], and ECHA's Guidance on intermediates[96].

Improve use descriptions

The basis for prioritising substances for evaluation and regulatory risk management are their hazard properties and exposure potential. In order to assess the exposure potential of a substance, there needs to be sufficient information on how it is used. For example, the work on the plastic additives has demonstrated that insufficient information on uses has been provided in REACH registrations to allow (de)prioritisation of substances used as additives in plastics based on their exposure potential. The lack of such information means adequate safety assessments for substances in plastic articles cannot be performed. In order to be able to prioritise and deprioritise plastic additives, registrations should be updated so that they provide a clear picture on the use patterns of these substances and conditions of safe use.

Use maps are a tool which aim to improve the quality of information on use and conditions of

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[95] https://echa.europa.eu/documents/10162/23036412/pg16_intermediate_registration_en.pdf/291b6e50-5598-42d3-8a2b-d63d50a68104

[96] https://echa.europa.eu/documents/10162/23036412/intermediates_en.pdf/0386199a-bdc5-4bbc-9548-0d27ac222641

use communicated up the supply chain and the efficiency of this communication process. Use maps are now available on ECHA's website for plastic compounding and conversion, which we recommend the registrants use. These use maps will be extended to cover article service life.

5.7 Familiarise yourself with new guidance on PBT/vPvB assessment

Take note that Chapter R.11 of the Guidance on Information Requirements and Chemical Safety Assessment[97] which covers PBT/vPvB assessment was updated in 2017. The integrated testing strategies for persistence and bioaccumulation were updated and there is further explanation on applying a weight-of-evidence approach, as required by REACH Annex XIII.

5.8 Identify and address information of the degradation products

The identification of the degradation products is a standard information requirement of Annex IX, Section 9.2.3. of REACH. Information on degradation products should be provided if you do not have valid evidence showing that your substance is readily biodegradable.

It is necessary for the PBT/vPvB assessment, as Annex XIII to REACH specifies that "the identification [of PBT and vPvB substances] shall also take account of the PBT/vPvB-properties of relevant constituents of a substance and relevant transformation and/or degradation products". Information on degradation products should also be taken into account for the exposure assessment (Annex I 5.2.4. of REACH), when applicable, and for the hazard assessment (e.g. Column 2 of Annex X 9.4 and Annex X 9.5.1 to REACH). Finally, this information is required for the preparation of section 12 of the safety data sheet (Annex II to REACH), when applicable.

Information on degradation products is generally obtained from simulation tests. For further information see ECHA's Guidance on Information Requirements and Chemical Safety Assessment, Chapter R.7.9.

5.9 Classify multi-constituent and UVCB substances correctly

The classification of a substance containing impurities, additives or multiple constituents (multi-constituent, UVCB) should, similar to mixtures, primarily be based on available relevant information (including test data) on the substance. However, when classifying for CMR properties or when evaluating the bioaccumulation and degradation properties within the hazardous to the aquatic environment hazard class, it is strongly recommended that the classification of the substance, similar to mixtures, should be based on information of the known individual constituent(s), as there is no toxicological difference between a mixture and a substance containing other constituent substances.

In exceptional cases, data on the substance itself might show more severe effects for classification for CMR or relevant effects on the bioaccumulation or degradation properties, which have not been identified from the information on the constituent substances. These data should then be used, if available. For non-CMR hazard classes, data on the constituents should be used for classification in accordance with the mixture rules where data on the substance is not available. The testing of a complex substance for classification purposes is strongly discouraged if there are data on the constituents.

[97] https://echa.europa.eu/documents/10162/13632/information_requirements_r11_en.pdf/a8cce23f-a65a-46d2-ac68-92fee1f9e54f

5.10 Familiarise yourself with new documents on nanomaterials

ECHA invites you to familiarise yourself with the following five documents that provide advice to registrants preparing registration dossiers that cover nanoforms in 2017.

ECHA has published two completely new publications: the nano-specific Appendix R.6-1 to Chapter R.6: QSARs and grouping of chemicals of the Guidance on information requirements and chemical safety assessesment[98], and a document proposing best practices for registration of nanomaterials, "*How to prepare registration dossiers that cover nanoforms: best practices*"[99].

The best practices document provides recommendations for distinguishing between different nanoforms of a substance. Following the recommendations provided in the document will ensure consistent reporting of information on nanoforms in registration dossiers and facilitate registrants in clearly demonstrating that they fulfil their registration obligations for nanomaterials. Furthermore, Appendix R.6-1 provides an approach on how to justify the use of hazard data between nanoforms (and the non-nanoforms) and within groups of nanoforms of the same substance.

In addition, ECHA published updates to three of its existing guidance documents on nanomaterials: the Appendices[100] for nanomaterials to Chapters R.7a, R.7b and R.7c of the Guidance on information requirements and chemical safety assessesment (endpoint-specific guidances). These Appendices provide nano-specific guidance on how to meet the information requirements set out in Annexes VI-X to REACH.

5.11 Respond to ECHA's evaluation decisions

Respect the deadlines set in the decision

You are reminded to respect the deadline to update the registration dossier. Even in cases where the information may be late, it is in your own interest to communicate to ECHA in a dossier update with justifications and to provide all the requested information according to the expected timeline.

Report the new information correctly

You are requested to pay attention to detail when reporting the requested information in the technical dossier. ECHA must be able to assess the studies independently and form its opinion about the study validity and the significance of the results.

Information about the test material composition is crucial for ECHA to be able to conclude on the relevance of the study results to the registered substance.

You must also take all the new hazard information into account in the chemical safety assessment and reflect this in the CSR.

When updating your dossier, if you decide to adapt the information requirement (i.e. you do not perform the requested experimental test), any such adaptations must meet the conditions described in Column 2 of the respective REACH Annex, or you should follow the rules set out in

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[98] Appendix R.6-1 for nanomaterials applicable to the Guidance on QSARs and Grouping of Chemicals: https://echa.europa.eu/documents/10162/23036412/appendix_r6_nanomaterials_en.pdf/.
[99] How to prepare registration dossiers that cover nanomaterials: best practices: https://echa.europa.eu/documents/10162/13655/how_to_register_nano_en.pdf/.
[100] https://echa.europa.eu/documents/10162/13632/appendix_r7a_nanomaterials_en.pdf/, https://echa.europa.eu/documents/10162/13632/appendix_r7b_nanomaterials_en.pdf/ and https://echa.europa.eu/documents/10162/13632/appendix_r7c_nanomaterials_en.pdf/.

Annex XI to REACH. Such adaptations must be fully justified and documented in order to allow ECHA to properly assess and verify the adaptation used.

5.12 Recommendations related to substance evaluation

When your registered substance is included in the CoRAP, review and update your dossier as early as possible

Perform a thorough check of your registration dossier and submit a dossier update, if needed, to facilitate the future evaluation process.

It is crucial to:
- Update your dossier in a timely manner before the start of the evaluation process;
- Ensure that the identitification of your registered substance is clear and appropriately documented;
- Make sure that your use and exposure scenarios are accurate and up-to-date, and that your exposure estimations are correct.

Ensure a good communication up and down the supply chain to gather the necessary information on the intended uses of your registered substance.

- Contact your downstream users as early as possible to have all the relevant information in place and also consider being in contact with specific downstream user organisations.
- Downstream users of a substance included in the CoRAP who own or have access to useful information should consider informing the lead registrant[101] or the evaluating MSCA[102].

Whenever possible, avoid submitting dossier updates once the substance evaluation has started, unless in agreement with the evaluating MSCA.

Use the opportunity to interact with the evaluating Member State competent authority

ECHA has published recommendations on best practice for informal interactions, as Member State competent authorities have agreed on a common approach on interaction with registrants during substance evaluation[103].

Discuss with your co-registrants and decide who could be nominated as a representative for interacting with the evaluating MSCA.

The evaluating MSCA may approach you in writing to request further clarifications before preparing a draft decision. Ensure your responses are timely and discuss with the evaluating MSCA on the need or timing of any update of the registration dossier.

Interact with ECHA where necessary

While the evaluating MSCA performs the evaluation, ECHA coordinates the overall substance evaluation process. You can contact ECHA for clarification on issues of more administrative nature using the ECHA contact form[104].
- Ensure that your REACH-IT contact information is kept up to date.

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[101] ECHA publishes the name of the lead registrants if permitted by the companies. For more information, check the "Lead registrant list" at: https://echa.europa.eu/regulations/reach/registration/registration-statistics.
[102] In the CoRAP list, ECHA publishes the Member State and contact details of the respective competent authority responsible for the evaluation of each substance.
[103] https://echa.europa.eu/documents/10162/13628/interaction_ms_reg_sev_en.pdf
[104] https://www.echa.europa.eu/contact/helpdesk-contact-form

When you receive a substance evaluation draft decision, review it and provide your coordinated comments

Upon receipt of the draft decision from ECHA via the REACH-IT tool, review its content to understand the requests (including the test methods and/or the testing strategy).

Whenever possible, coordinate responses and submit a single set of consolidated comments within 30 days. The deadline for comments as well as the link to the webform are specified in the notification letter.

- All relevant registration numbers are listed in an appendix to the draft decision.
- Alternatively, you can consult the Co-registrants page in REACH-IT, which displays the contact details and roles of the existing registrants of the substance.

Similarly to the comments on the draft decision, coordinate responses to the proposals for amendment (PfAs) and submit a single set of consolidated comments within 30 days.

- Only comments on the PfAs are accepted, whereas comments on the (amended) draft decision *per se* are not taken into consideration at this stage of the process.
- Also, at this stage it is not possible to extend the deadline to submit comments, due to the strict timelines of the decision-making process imposed by REACH.

Start discussing with testing laboratories to explore their capacity for new testing, so as to prepare a smooth start of activities once the final decision is received.

- This information can also be used to inform the evaluating MSCA on realistic deadlines to be included in the decision.
- No testing may be conducted until the decision-making process is completed, as there may be changes to the requests.

When you receive a substance evaluation decision, agree with your co-registrants who performs the study

After the agreement by Member State competent authorities or the Member State Committee members, ECHA adopts the decision and communicates it to the concerned registrants using REACH-IT.

Within 90 days of receipt of the decision, you need to inform ECHA of the agreed legal entity which is to perform the requested tests on behalf of the other registrants who are addressees of the decision and/or impacted by it.

- If ECHA is not informed of such agreement within 90 days, it has the obligation to designate one of the addressees of the decision to perform the tests on behalf of all concerned registrants.

Any issues regarding data and cost sharing among the registrants need to be solved within the SIEF or consortia. The substance evaluation decision is not setting rules on how to share data and costs among the registrants of the same substance. The data and cost sharing should happen in accordance with the data-sharing obligation set out in REACH and in the Commission Implementing Regulation 2016/9.

Inform ECHA and the evaluating MSCA once all information requested in the decision has been submitted

Once all the requested information has been provided by an updated registration dossier, inform ECHA about this using the webform indicated in the notification letter[105].

Inform the evaluating MSCA by e-mail.

- The evaluating MSCAs' contact information is provided in the CoRAP list published on ECHA's website[106].

If all requested information cannot be submitted according to the deadlines specified in the decision, complete the ECHA webform and include any relevant explanations and supporting evidence concerning the status of any pending information requirements.

- At the same time, inform the evaluating MSCA about the dossier update situation. This interaction should enable the evaluating MSCA to have a fully informed view for deciding whether to propose specific actions.

5.13 Take note of ECHA's Guidance updates

ECHA has continued to develop and update REACH Guidance in 2017. The following updated Guidance documents were published on ECHA's website during the year.

- Corrigendum to the Guidance on data sharing (version 3.1), published 13 January 2017.
- New and updated appendices on nanomaterials to Chapters R.6, R.7a, R.7b and R.7c of the Guidance on Information Requirements and Chemical Safety Assessment, published 24 May 2017.
- How to prepare registration dossiers that cover nanoforms: best practices (version 1.0), published 24 May 2017.
- Corrigendum to the Guidance for identification and naming of substances under REACH and CLP (version 2.1), published 1 June 2017 in all EU languages.
- Update to the Guidance on requirements for substances in articles *(*version 4.0), published 28 June 2017.
- Update to the Guidance on Information Requirements and Chemical Safety Assessment – Chapter R.11, Part C and specific sections of Chapters R.7b and R.7c (related to PBT/vPvB assessment) (versions 3.0/4.0), published 28 June 2017.
- Update to the Guidance in a nutshell on registration (version 3.0), published 5 July 2017.
- Update to the Guidance on Information Requirements and Chemical Safety Assessment – Chapter R.7a, Sections R.7.5 on Repeated dose toxicity (version 6.0), published 19 July 2017.
- Update to the Guidance on labelling and packaging in accordance with Regulation (EC) No 1272/2008 (version 3.0), published 4 July 2017.
- Update to the Guidance on the application of the CLP criteria (version 5.0), published 4 July 2017.

ECHA invites you to take note of these new or updated resources[107] and to update the relevant parts of your dossiers, where appropriate. ECHA will consider the new approaches described in the Guidance in ongoing and future dossier evaluations.

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[105] https://comments.echa.europa.eu/comments_cms/SEDraftDecisionComments.aspx
[106] https://echa.europa.eu/information-on-chemicals/evaluation/community-rolling-action-plan/corap-table
[107] ECHA's Guidance web pages https://echa.europa.eu/support/guidance

5.14 Consider the impact of the United Kingdom's withdrawal from the EU on your registration

As of September 2017, ECHA has been providing companies with advice to help them prepare for the expected impact of the UK's withdrawal from the EU. This is published in the Q&A section of ECHA's web pages on the matter[108]. ECHA is continually updating the information it provides on these pages as the withdrawal process develops.

ECHA recommends that you consult this information and its updates over the coming months and beyond, until the UK's withdrawal takes effect. The ongoing negotiation process underlines the importance of the recommendation to keep yourself up to date on ECHA's evolving advice on the probable impact of the United Kingdom's withdrawal from the EU.

[108] https://echa.europa.eu/uk-withdrawal-from-the-eu

LIST OF ABBREVIATIONS AND ACRONYMS

AFT	Acute fish toxicity
CCH	Compliance check
Chesar	Chemical safety assessment and reporting tool
CLP	Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures
CoRAP	Community rolling action plan
CSA	Chemical safety assessment
CSR	Chemical safety report
DNEL	Derived no-effect level
ECHA	European Chemicals Agency
ED	Endocrine disruptor
EOGRTS	Extended one-generation reproductive toxicity study
FET	Fish embryo acute toxicity
GLP	Good laboratory practice
IATA	Integrated approaches on testing and assessment
IUCLID	International Uniform Chemical Information Database
MSC	Member State Committee
MSCA	Member State competent authority
NAM	New approach methodologies
NEA	National enforcement authority
NER	Non extractable residues
PBT	Persistent, bioaccumulative and toxic
PfA	Proposal for amendment
PEC	Predicted environmental concentration
PNEC	Predicted no-effect concentration
OECD	Organisation for Economic Co-operation and Development
QSAR	Quantitative structure-activity relationship
RAAF	Read-Across Assessment Framework
REACH	Regulation (EC) No 1907/2006 concerning the registration, evaluation, authorisation and restriction of chemicals
REACH-IT	A central IT application that supports industry, Member State competent authorities and ECHA to securely submit, process and manage data and dossiersSEV Substance evaluation
SID	Substance identity
SIP	Substance identity profile
SIEF	Substance information exchange forum
SONC	Statement of non-compliance following a dossier evaluation decision
SVHC	Substance of very high concern

TPE	Testing proposal examination
t/a	Tonnes per annum (year)
UVCB	A substance of unknown or variable composition, complex reaction product or biological material
vPvB	Very persistent and very bioaccumulative
WoE	Weight of evidence

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Exhibit 9

HUMAN AND ECOLOGICAL RISK ASSESSMENT OF COAL COMBUSTION RESIDUALS

Final

December 2014

U.S. Environmental Protection Agency
Office of Solid Waste and Emergency Response
Office of Resource Conservation and Recovery

Regulation Identifier Number: 2050-AE81

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The 2010 Risk Assessment was reviewed by an external panel of experts. The panel was composed of the following individuals:

- Dr. Nicholas Basta, Ohio State University
- Dr. Charles Harvey, Massachusetts Institute of Technology
- Dr. William Hopkins, Virginia Polytechnic Institute and State University
- Dr. Kerry Rowe, Queens University
- Dr. Donna Vorhees, The Science Collaborative

Executive Summary

Purpose

The purpose of the risk assessment is to characterize the risks that may result from the current disposal practices for coal combustion residuals (CCRs) and provide a scientific basis for the development of regulations necessary to protect human health and the environment under the Resource Conservation and Recovery Act (RCRA).

Scope

CCR is a broad term used to refer to the byproducts that are generated either directly by coal combustion or as a result of applying certain pollution control devices to emissions from coal-fired combustion units. The distinct CCR categories identified in the rulemaking include fly ash, bottom ash, boiler slag, and flue gas desulfurization (FGD) materials. All coal-fired electric utility plants in the United States generate at least one of these wastes. These different CCR wastes may be generated separately or mixed together. Once generated, CCRs may be either beneficially used or disposed of in surface impoundments and landfills (collectively referred to as "waste management units" or "WMUs"). The regulatory scope of this rulemaking is limited to current disposal practices for CCRs generated by coal-fired electric utilities and independent power producers covered by the North American Industry Classification System (NAICS) code 221112. The scope of this risk assessment is limited accordingly. The United Stated Environmental Protection Agency (EPA) did not evaluate disposal of wastes other than CCRs, disposal of CCRs at off-site locations, WMUs that have ceased receiving waste, or historical disposal of CCRs by facilities that are no longer operating or not otherwise covered by NAICS code 221112.

Some coal-fired power plants conduct coal preparation activities prior to combustion. These activities may include, but are not limited to, coal handling by conveyor systems, coal washing for removing mineral matter, and coal "sizing" to reduce the average particle size of coal. The wastes generated from these coal preparation activities are collectively referred to as "coal refuse." However, some facilities are known to dispose of coal refuse together with CCRs because the chemical characteristics of the coal refuse can have a pronounced effect on the release of chemical constituents from CCRs, EPA also considered the codisposal of this additional waste stream (referred to as "ash and coal refuse") in the risk assessment.

Overview of Risk Assessment

EPA used mathematical models to determine the rate at which chemical constituents may be released from different WMUs, to predict the fate and transport of these constituents through the environment, and to estimate the resulting risks to human and ecological receptors. Modeling was conducted in a stepwise fashion, with more refined analyses used at each subsequent step. The findings at each of the analyses conducted for this risk assessment are summarized below.

Problem Formulation

EPA first developed conceptual models to illustrate a general layout of surface impoundments and landfills, the chemical constituents that may be released from these WMUs, the routes through which these constituents may migrate through environmental media, and the types of exposures that may result. These conceptual models were used as the basis for all subsequent data collection efforts. EPA first collected data on the coal-fired power plants and CCR WMUs located across the United States. EPA then collected regional and national data to characterize the environment and receptor population surrounding each WMU. The data assembled represent the most current and comprehensive information available to the Agency at the time this risk assessment was conducted. Using the data collected, EPA first conducted a simplified hazard identification to determine which constituents warranted further evaluation. At this stage, EPA considered the presence of a constituent in CCR waste, combined with the availability of at least one toxicity benchmark, sufficient evidence of hazard potential. **Table ES-1** presents a summary of the different chemical constituents retained as constituents of potential concern (COPCs) for further analysis.

Table ES-1. List of Chemical Constituents Evaluated in the CCR Risk Assessment

▪ Aluminum	▪ Cadmium	▪ Iron	▪ Molybdenum	▪ Strontium
▪ Ammonia	▪ Calcium	▪ Lanthanum	▪ Nickel	▪ Sulfate
▪ Antimony	▪ Chloride	▪ Lead	▪ Nitrate / Nitrite	▪ Sulfide
▪ Arsenic	▪ Chromium	▪ Lithium	▪ Selenium	▪ Thallium
▪ Barium	▪ Cobalt	▪ Magnesium	▪ Silicon	▪ Uranium
▪ Beryllium	▪ Copper	▪ Manganese	▪ Silver	▪ Vanadium
▪ Boron	▪ Fluoride	▪ Mercury	▪ Sodium	▪ Zinc

All risks identified in subsequent analyses were compared against risk criteria of cancer risk greater than 1×10^{-5} or a noncancer hazard quotient (HQ) greater than 1. EPA typically relies on a risk range to determine the point at which regulation is appropriate. EPA uses as an initial cancer risk "level of concern" a calculated risk level of 1×10^{-5} (one in one hundred thousand) or an HQ above 1.0 for any noncarcinogens. For example, waste streams for which the calculated high-end individual cancer-risk level is 1×10^{-5} or higher generally are considered candidates for regulation. Waste streams whose risks are calculated to be 1×10^{-4} or higher generally will be considered to pose a substantial present or potential hazard to human health and the environment and generally will be regulated. Waste streams for which these risks are calculated to be 1×10^{-6} or lower, and lower than 1.0 HQs or EQs for any noncarcinogens, generally will be considered not to pose a substantial present or potential hazard to human health and the environment and generally will not regulated. See 59 FR 66075–66077, December 22, 1994.

Screening Analysis

EPA conducted separate screening analyses for each exposure pathway to identify which COPCs are most likely to pose risk to receptors. The results of this screening generally do not provide a

precise characterization of individual risks that may occur, but rather identify those COPCs that are most likely to exceed risk criteria. In cases where well established, post-construction management practices ("controls") have been shown to minimize releases from WMUs, EPA considered exposures for both an uncontrolled and controlled management scenario.

This screening analysis identified potential risks to human and ecological receptors resulting from the releases of particulate matter and the chemical constituents contained therein through wind and run-off. Under an uncontrolled management scenario, risks to human receptors resulted from the inhalation of windblown particulates in ambient air and the ingestion of soil and animal products (i.e., meat and dairy), while risks to ecological receptors resulted from exposures to soil and sediment. Under a controlled management scenario, which consisted of fugitive dust controls and run-on/run-off controls, all risks associated with these exposure pathways decreased to below the criteria. Due to the conservative nature of the screening, there is a great deal of uncertainty surrounding the specific risks calculated for these exposure pathways. These risks represent a protective, but unlikely, combination of conditions that reflect at least an upper bound on potential exposures. Thus, the cumulative effect of these uncertainties results in an overestimation of nationwide risks to most or all receptors. Therefore, EPA makes no direct findings concerning the magnitude of the risks that may occur under either an uncontrolled or controlled management scenario, but concludes with a high degree of confidence that the reductions achievable with standard management practices are sufficient to be protective even under this conservative screening assessment. Based on these lines of evidence, EPA concluded that no further characterization was warranted for these exposure pathways.

These screening analyses identified potential risks to human and ecological receptors from leaching of chemical constituents from CCR waste into surrounding environmental media. Risks to human health resulted from ingestion of ground water and fish, while risks to ecological receptors resulted from exposure to surface water. There was no simple method to estimate the effect controls may have for these pathways. However, considerable dilution and attenuation may occur before COPCs reach downgradient private wells and surface water bodies. Therefore, EPA retained all of the COPCs found to be above risk criteria in ground water and surface water for further characterization. In addition, EPA used the uncontrolled screening results for the above ground sediment pathway as a conservative proxy for the ground water to surface water sediment pathway. As a result, sediment exposures of four COPCs were retained for further characterization. **Table ES-2** presents a summary of the chemical constituents retained as COPCs for each pathway.

Table ES-2. List of Chemical Constituents Retained for Probabilistic Analysis

Human Health		Ecological			
Ingestion of Ground Water	Ingestion of Fish	Surface Water Exposure			Sediment Exposure
▪ Antimony	▪ Arsenic	▪ Aluminum	▪ Iron		▪ Antimony
▪ Arsenic	▪ Cadmium	▪ Arsenic	▪ Lead		▪ Arsenic
▪ Boron	▪ Mercury	▪ Barium	▪ Molybdenum		▪ Silver
▪ Cadmium	▪ Selenium	▪ Beryllium	▪ Nickel		▪ Vanadium
▪ Cobalt	▪ Thallium	▪ Boron	▪ Selenium		
▪ Fluoride		▪ Cadmium	▪ Silver		
▪ Lead		▪ Chloride	▪ Vanadium		
▪ Lithium		▪ Chromium	▪ Zinc		
▪ Molybdenum		▪ Cobalt			
▪ Thallium		▪ Copper			

These screening analyses also identified potential risks to ecological receptors from direct exposure to impoundment wastewater. Unlike the other exposure pathways, no dilution or attenuation will occur within impoundment wastewater prior to ecological exposures. Thus, the direct exposures considered in the screening analysis provide a reasonable estimate of the relative magnitude of risks. Based on the screening analyses, EPA concluded that HQs for ecological receptors exceeded 1 for the following constituents (listed from highest to lowest potential): arsenic (100), barium (50), aluminum (30), boron (30), selenium (20), cadmium (10), vanadium (10), beryllium (2), chloride (2) and chromium (2). Because the screening analysis provides sufficient characterization of these exposures, this pathway was not carried forward for further analysis.

Probabilistic Analysis

EPA conducted a national-scale, probabilistic analysis to better characterize the potential risks to human and ecological receptors associated with leachate released from surface impoundments and landfills. The specific exposure routes evaluated for these releases were human ingestion of ground water used as a source of drinking water and fish caught from freshwater lakes or streams, as well as ecological contact with and ingestion of surface water and sediment. A combination of models was used to predict COPC fate and transport through the environment, receptor exposures, and the resulting risks. Site-specific data were used, supplemented by regional and national data sets, to capture the national variability of disposal practices, environmental conditions and receptor behavior. EPA modeled risks for both highly exposed individuals (90th percentile risks) and more moderately exposed individuals (50th percentile risks). In instances where the speciation of a COPC has been shown to greatly affect fate and transport, EPA modeled multiple species to provide a bounding on potential exposures.

Table ES-3 shows the 90th percentile human health risks to the most sensitive age cohorts for constituents that exceeded the risk criteria. Risks are presented for arsenic modeled entirely as two different species (III and V) to provide a bounding on potential risks. Values that exceed the selected risk criteria (cancer risk > 1×10^{-5} or noncancer HQ > 1) are shown in **bold**. No 90th percentile risks above ecological criteria were identified for either surface impoundment or landfills. No 50th percentile risks above human health or ecological criteria were identified for either surface impoundment or landfills.

Table ES-3. 90th Percentile Nationwide Probabilistic Risk Results

COPC	Ingestion of Ground Water	
	Surface Impoundments	Landfills
Cancer Risks		
Arsenic III	**2×10^{-4}**	5×10^{-6}
Arsenic V	1×10^{-5}	7×10^{-8}
Noncancer Risks		
Arsenic III	**5**	0.1
Arsenic V	0.4	< 0.01
Lithium	**2**	--[a]
Molybdenum	**2**	< 0.01

a) Leachate data were not available to model this COPC for landfills.

- **Surface Impoundments:** Ingestion of ground water was the only exposure pathway that resulted in risks above a cancer risk of 1×10^{-5} or noncancer HQ of 1. 90th percentile cancer risks above 1×10^{-5} were identified for arsenic III (2×10^{-4}). The 90th percentile noncancer risks above an HQ of 1 were identified for arsenic III (5), lithium (2) and molybdenum (2).
- **Landfills:** All 90th percentile cancer and noncancer risks were below human health criteria.

High-end risks identified for surface impoundments are consistently higher than those for landfills. These results are attributed to the higher infiltration rates through surface impoundments, which are driven by the hydraulic head of the ponded water. Median risks for both surface impoundments and landfills were substantially lower than both the high-end risks in this risk assessment and the median risks modeled in the 2010 Risk Assessment (U.S. EPA, 2010a). This decrease is attributed primarily to the interception of ground water by surface water bodies, which is accounted for in the revised risk assessment to provide a more accurate mass balance of constituent mass during transport. It is common for coal-fired utilities to be located near water bodies, which are used as a source of cooling water and conveyance of waste. As a result, in the majority of model iterations, the interception of ground water by surface water bodies resulted in negligible downstream well concentrations.

Based on the results of the probabilistic analysis, EPA concludes that leaching from CCR waste management units has the potential to pose risk to receptors. Arsenic, lithium and molybdenum are the chemical constituents found to pose the greatest risks from surface impoundments, while

arsenic posed the greatest risks from landfills. Available toxicological profiles indicate that risks from arsenic ingestion are linked to an increased likelihood of cancer in the skin, liver, bladder and lungs, as well as nausea, vomiting, abnormal heart rhythm, and damage to blood vessels;[1] risks from lithium ingestion are linked to neurological and psychiatric effects, decreased thyroid function, renal effects, cardiovascular effects, skin eruptions, and gastrointestinal effects;[2] and risks from molybdenum ingestion are linked to higher levels of uric acid in the blood, gout-like symptoms, and anemia.[3]

Sensitivity and Uncertainty Analyses

The modeled probabilistic risks capture the range of current, nationwide CCR disposal practices. However, because of the broad scope of the analysis, there are a number of sources of variability and uncertainty present. Therefore, to confirm the results of the probabilistic analysis and to better understand whether any particular subset of disposal practices drives the risks identified, EPA conducted additional sensitivity and uncertainty analyses.

EPA reviewed the models used, as well as the data and assumptions input into these models, to better understand the sources of variability and uncertainty inherent in the probabilistic analysis. The Agency then qualitatively and, to the extent possible, quantitatively analyzed these sources to understand the potential effects each may have on the modeled risk results. During this review, specific attention was focused on the parameters shown to have the greatest influence on model results. As a further method of validation, EPA compared the results of the sensitivity and uncertainty analyses with proven and potential damage cases. Together these analyses and comparisons show that there is a high degree of confidence in the principal findings of the probabilistic analysis. However, the review of sensitive parameters revealed some specific disposal practices that may result in greater risks than identified in the probabilistic modeling.

Through these additional sensitivity and uncertainty analyses, which explored different subsets of national disposal practices, EPA identified the potential for higher risks than those identified in the broader, national analysis. In particular, consideration of different waste pH values showed higher risks for arsenic at more acidic and basic pH values, as well as additional risks for boron, cobalt, fluoride and mercury at these more extreme pH values. Consideration of specific liner types showed that ground water risks are driven by disposal in unlined units and, in particular, unlined surface impoundments. For these units, EPA identified higher risks for arsenic and molybdenum, as well as additional risks for thallium. Clay-lined units were found to pose lower risks than unlined units. Composite-lined units were found to be the most protective disposal practice, resulting in risks far below all criteria identified in this risk assessment.

[1] Profile for arsenic available online at: www.epa.gov/iris/subst/0278.htm and www.atsdr.cdc.gov/toxprofiles/tp2.pdf

[2] Profile for lithium available online at: hhpprtv.ornl.gov/issue_papers/Lithium.pdf

[3] Profile for molybdenum available online at: www.epa.gov/iris/subst/0425.htm

Conclusions

Based on the analyses presented in this document, EPA concludes that current management practice of placing CCR waste in surface impoundments and landfills poses risks to human health and the environment within the range that OSWER typically regulates. On a national scale, surface impoundments presented higher risks than landfills. Risks to ecological receptors were identified from exposures to aluminum, arsenic, barium, beryllium, boron, cadmium, chloride, chromium, selenium and vanadium through direct exposure to impoundment wastewater. Risks to residential receptors were identified primarily from exposures to arsenic and molybdenum in ground water used as a source of drinking water, but additional risks from boron, cadmium, cobalt, fluoride, mercury and thallium were identified for specific subsets of national disposal practices.

Sensitivity analyses on liner type indicate that disposal of CCR wastes in unlined surface impoundments and landfills presents the greatest risks to human health and the environment. As modeled, the national risks from clay-lined units are lower than those for unlined units, but such units can exceed risk criteria at individual sites. Composite liners were the only liner type modeled that effectively reduced risks from all pathways and constituents far below human health and ecological criteria in every sensitivity analysis conducted. Sensitivity analyses on waste type indicate that the acidic conditions that result from codisposal of CCR waste with coal refuse and the basic conditions that result from disposal of FGD waste result in higher risks from arsenic and other constituents than CCR waste disposed alone.

The risk results are consistent with the ground water damage cases compiled by EPA. These damage cases were primarily associated with unlined units and were most frequently associated with releases of arsenic. Recent surveys of the industry indicate the majority of newly constructed units are lined, and that that the practice of codisposal with coal refuse has declined. However, this risk assessment presents a static snapshot of current disposal practices. While newer units may be managed in a more protective manner, older units, which still comprise the majority of current units, continue to operate in a manner that poses risks to human health and the environment within the range that OSWER typically regulates.

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3 Screening Analysis

EPA conducted a screening analysis for each of the exposure pathways identified in the conceptual models developed in **Section 2**. Consistent with the regional screening tables used in the Superfund program, EPA screened risks using children and adult age cohorts, but not infants. The results of this screening are not intended to provide a precise characterization of individual risks that may occur, but rather to identify those COPCs that are most likely to pose risk. Because this screening analysis is deterministic, it does not account for site-based variability. Based on the results of this screening, EPA determined which pathways and associated COPCs to retain for further characterization with more refined, probabilistic modeling summarized in **Section 4**. The discussion of the screening analysis is divided into the following sections:

- **Section 3.1** discusses the development of source concentrations used to characterize releases from WMUs in the screening.
- **Section 3.2** provides an overview of the screening for exposures through ambient air that result from transport of CCR waste by wind.
- **Section 3.3** provides an overview of the screening for exposures through soil, sediment, produce and livestock that result from transport of CCR waste by wind and overland run-off.
- **Section 3.4** provides an overview of the screening for exposures through ground water, surface water, and fish that result from transport of leachate through ground water.
- **Section 3.5** summarizes the results and conclusions of the screening and identifies the COPCs and exposure pathways retained for further probabilistic modeling.

3.1 Waste Source Concentrations

EPA used the data contained in the CCR constituent database (**Appendix C**) as the basis for calculating COPC concentrations present in and released from surface impoundments and landfills. These data have been collected over time from many facilities and are intended to capture national variability. EPA calculated 90th percentile concentrations to represent high-end releases from WMUs. Prior to calculation, all available data were processed to minimize bias, as described below. The resulting 90th percentile values are presented in **Table 3-1** at the end of this subsection.

- **Treatment of Nondetects:** Nondetect measurements represent constituent concentrations below the capability of an analytical methodology to differentiate from background noise and do not provide definitive evidence that a constituent is or is not present. However, nondetect measurements do indicate that the constituents are not present at concentrations above the detection limit. Thus, eliminating nondetects outright will unduly bias the remaining, truncated data set toward the higher, detected values. The revised risk assessment replaced nondetect values with half of the reported detection limit according to the recommendations in *Risk Assessment Guidance for Superfund (RAGS) Part A* (U.S. EPA, 1989) and *EPA Region 3 Guidance on Handling Chemical Concentration Data near the Detection Limit in Risk Assessments* (U.S. EPA, 1991).

- **Data for Mercury.** With the exception of mercury, EPA used all available data in the CCR constituent database to characterize exposures. The majority of mercury data measured prior to 2010 had high detection limits and a large proportion of nondetects. Newer data made available to the Agency since the 2010 Risk Assessment (U.S. EPA, 2010a) were measured using newer methods with significantly lower detection limits. In many cases, the mercury concentrations detected with the new methods were less than half the older detection limits. Because use of the older mercury data has the potential to introduce a large bias into the analysis, EPA chose to use only the post-2010 mercury data in the revised risk assessment. These data contain few nondetects and are more likely to accurately represent the mercury concentrations present in and released from CCR WMUs.
- **Development of Waste Types:** Given the large size of the WMUs and the generally basic nature of CCR leachate, it is possible that leachate could alter the subsurface geochemistry that governs the migration of inorganic constituents. Therefore, a statistical analysis of the concentrations of major ions (e.g., calcium, sulfate, hydrogen ions) in the pore water was conducted to identify distinct waste types (**Appendix H**). These waste types are considered separately to better capture the behavior of COPCs released from these wastes in the subsurface environment. The three distinct waste types considered in this analysis are:
  - **Ash and Coal Refuse:** Includes any CCR that is codisposed with coal refuse, which is waste coal produced from coal handling, crushing and sizing operations. This waste type is characterized by a low to moderate pH (1.7–8.2) and high levels of sulfate, iron and manganese.
  - **FGD Wastes:** Includes any type of wet or dry FGD waste when disposed in dedicated monofills. This waste type is characterized by a moderate to high pH (8.7–11.3) and high levels of calcium, sulfate, sodium and chlorine.
  - **Combined Ash:** Includes any CCRs other than those listed above (e.g., fly ash, bottom ash, boiler slag) either monofilled or in combination with each other. Due to the variability in disposal practices, this waste type is characterized by a broad range in pH (3.9–12.3), sulfate and calcium levels.
- **Site Quartiles:** Some sample sites in the CCR constituent database have many data points, while others have only a few. Thus, the available data would tend to bias concentrations toward those sites where more samples were collected. To avoid this, EPA developed quartiles of the COPC concentrations for each site. This approach provides equal weighting to each site while also retaining some of the intrasite variability that would be lost through the use of a single summary statistic for each site, such as an average. To develop the site quartiles, EPA first separated the data at each site into the different waste types reported at that site. This was done because combining the data for the different waste types into a single set of quartiles for a site might bias concentrations toward the most sampled waste types. Where only one sample was available for a waste type at a sample site, all of the quartiles were set to this value to ensure equal weighting. For the purposes of this screening, all

quartiles developed were then combined into a single distribution representing all sites and all waste types, from which a 90th percentile concentration was drawn.

Table 3-1. 90th Percentile Concentrations Used for Screening Analysis

Constituent	Impoundment Pore Water (mg/L)	Impoundment Wastewater (mg/L)	Whole Waste (mg/kg)
Aluminum	12.3	2.3	91,500
Ammonia	5.1	–	–
Antimony	0.04	0.02	47.0
Arsenic	0.78	0.13	106
Barium	0.21	0.43	1,103
Beryllium	0.001	0.001	18.3
Boron	97.8	36.2	388
Cadmium	0.06	0.003	3.8
Calcium	592	577	114,750
Chloride	2,023	345	384
Chromium	0.2	0.03	153
Cobalt	0.05	0.02	65.9
Copper	0.13	0.01	226
Fluoride	21.3	–	25
Iron	11.9	0.04	42,426
Lanthanum	–	–	58.6
Lead	0.10	0.0006	75.3
Lithium	0.45	1.99	–
Magnesium	174	1,990	17,550
Manganese	1.8	0.56	413
Mercury	0.000007	0.00003	1.1
Molybdenum	7.1	0.42	31.0
Nickel	0.3	0.07	199
Nitrate	13.7	–	0.25
Nitrite	5.0	–	–
Potassium	221	40	9,622
Selenium	0.32	0.10	18.2
Silicon	19.0	12.7	262,700
Silver	0.005	0.0001	11.1
Sodium	3,288	743	3,557

Table 3-1. 90th Percentile Concentrations Used for Screening Analysis

Constituent	Impoundment Pore Water (mg/L)	Impoundment Wastewater (mg/L)	Whole Waste (mg/kg)
Strontium	9.1	4.3	891
Sulfate	4,398	10,400	9,630
Sulfide	–	–	26.2
Sulfur	3,842	–	36,000
Thallium	0.003	0.009	33.9
Uranium	0.01	0.004	5.0
Vanadium	0.52	0.23	562
Zinc	0.19	0.06	269

These 90th percentile values represent the concentrations present in and released from CCR wastes. Impoundment pore water is the water present within interstitial spaces of the settled CCRs. Impoundment wastewater is the free water ponded on top of the settled CCR waste. Whole waste represents the concentrations present within CCRs at the time of generation. However, most receptors will not come in direct contact with CCR wastes. Instead, receptors are exposed to environmental media, such as air; soil and water, that have been contaminated by releases from these wastes. To estimate the concentrations that may be present in these environmental media, EPA used conservative assumptions to account for fate and transport of COPCs through the environment. The calculation of these media-specific exposure concentrations are discussed in the following subsections.

3.2 Ambient Air Screening

This subsection summarizes the screening for exposure pathways associated with two management scenarios: uncontrolled and controlled releases. Uncontrolled releases occur when no action is taken to reduce particulate emissions. Controlled releases occur when management practices are put in place to minimize the rate of particulates emissions. The controls considered in this analysis include wetting and/or the use of surfactants.[10] Yet, even with the best available management practices, some emissions may still occur. Relevant exposure pathways include human inhalation of particulate matter and any COPCs contained therein. The greatest source of these pathways are landfills during operation, as water cover for impoundments and postclosure cap for landfills will limit the release of particulate matter. Therefore, EPA screened these pathways for landfills and the results were also used to identify any COPCs for surface impoundments.

[10] Surfactants refer to compounds that lower the surface tension (or interfacial tension) between a liquid and a solid, and can increase the effectiveness of water as a dust control mechanism.

3.2.1 Exposure Concentrations

EPA used the 90th percentile whole waste concentrations presented in **Table 3-1** to estimate exposures to ambient air. However, these whole waste concentrations represent the mass of COPCs present within CCR wastes. To translate the concentrations in CCR waste to those in ambient air, EPA conducted modeling in two phases with the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) and the corresponding screening model, AERSCREEN. Unitized particulate emission rates of 1 g/s and 1 µg/s-m^2 were used as inputs for AERSCREEN and AERMOD, respectively, to calculate a set of unitized dispersion factors. The purpose of these unitized factors was to allow for quick and easy scaling of the model results and to minimize the number of model runs required. Further discussion of this approach and the inputs used to run and scale these models is provided in **Appendix F**.

EPA first used AERSCREEN to calculate maximum unitized dispersion factors that could occur over one hour with weather data from a number of climate stations. This 1-hour averaging time was chosen as the most appropriate value to represent short-term exposures. AERSCREEN also calculates maximum air concentrations for other averaging times (i.e., 3-hour, 8-hour, 24-hour, annual) by scaling the 1-hour concentration. However, for area sources such as landfills, the screening model uses a scaling factor of 1 for these longer averaging times, which results in overly conservative long-term concentrations that are equal to the 1-hour concentration. Instead, a second phase of modeling was conducted with AERMOD to calculate unitized dispersion factors for 24-hour, monthly and annual averaging times. To minimize the resources required, EPA conducted a single AERMOD model run using five years of weather data from the climate station associated with the 90th percentile unitized dispersion factor from AERSCREEN. For both models, EPA selected the modeled unitized dispersion factors from the distance that resulted in the highest value and scaled each using **Equation 3-1**:

(3-1) $$C_{air} = \frac{E \cdot DF \cdot C_{waste}}{A \cdot \left(10^9 \frac{\mu g}{kg}\right)}$$

Where:

C_{air} = Air concentration of constituent (mg/m^3),
E = Aggregate emission rate (g/s),
DF = Unitized dispersion factor (µg/m^3 per g/m^2-s),
C_{waste} = 90th percentile constituent-specific whole waste concentration (mg/kg),
A = Active area of landfill (m^2).

Emission rates were calculated for particles 10 micrometers in diameter or smaller (PM_{10}), and were separately scaled for the fraction of PM_{10} that are 2.5 micrometers in diameter or smaller ($PM_{2.5}$). These are the particles most likely pass through the nose and throat and enter the lungs, dramatically increasing the risk of adverse health effects. Emission rates were calculated for four specific sources: wind erosion, vehicular activity, loading/unloading and spreading/compaction using equations from *AP-42: Compilation of Air Pollutant Emission Factors* (U.S. EPA, 1985a) and *Rapid Assessment of Exposure to Particulate Emissions from Surface Contamination Sites*

(U.S. EPA, 1985b). To capture the variability of national meteorological conditions, emission estimates were developed for a range of active landfill sizes with data from more than 40 meteorological stations that represent locations throughout the conterminous United States where CCR disposal in landfills are known to occur. Each of these emission rates was developed for both uncontrolled and controlled management scenarios. For each set of conditions evaluated, EPA summed the contributions from the four sources together to obtain an aggregate PM_{10} emission rate (E_{10}) and an aggregate $PM_{2.5}$ emission rate ($E_{2.5}$).

AERSCREEN and AERMOD results were scaled using every combination of PM_{10} emission rates, whole waste concentrations from **Table 3-1**, and active landfill sizes drawn from EPA surveys to obtain COPC concentrations in ambient air. A second scaling was conducted without the whole waste concentration data, to obtain PM_{10} and $PM_{2.5}$ concentrations in ambient air. From each of these sets of calculations, EPA selected the highest air concentrations from each management scenario for comparison in the screening.

3.2.2 Air Risks

EPA used the calculated air concentrations of particulates and COPCs to estimate risks for human receptors. EPA considered human health risks from inhalation of particulates and the COPCs contained on or in those particulates. Because air concentrations can vary considerably over time, EPA considered multiple averaging times to screen both short-term (i.e., acute) and long-tem (i.e., chronic) exposures.

Acute Human Inhalation Risks

Acute human health risks associated with the inhalation of COPCs present in ambient air were evaluated using concentration-based benchmarks (**Appendix E**). These benchmarks represent air concentrations below which no acute adverse effects are known or anticipated to occur for short exposure durations. Acute risks were evaluated by comparing these benchmarks to the maximum 1-hour concentrations calculated with AERSCREEN. The resulting noncancer risks were calculated using **Equation 3-2**:

(3-2) $$HQ_A = \frac{C_{air}}{RfC_A}$$

Where:

HQ_A = Acute hazard quotient (unitless)
C_{air} = 1-hour air concentration (mg/m^3)
RfC_A = Acute reference concentration (mg/m^3)

Table 3-2 presents these screening results for acute health risks resulting from inhalation of the COPCs from airborne particulates. These conservative results are presented for each COPC under both the controlled and uncontrolled management scenarios. Values found to be above the selected risk criteria (i.e., an $HQ_A > 1$) are shown in **bold**.

Table 3-2. Screening Results for Acute Human Health Risks Resulting from the Inhalation of Ambient Air

COPC	Management Scenario	
	Uncontrolled	Controlled
Aluminum	0.1	0.03
Antimony	< 0.01	< 0.01
Arsenic	**2**	0.5
Barium	< 0.01	< 0.01
Beryllium	0.02	< 0.01
Boron	< 0.01	< 0.01
Cadmium	< 0.01	< 0.01
Calcium	0.01	< 0.01
Chloride	< 0.01	< 0.01
Chromium	< 0.01	< 0.01
Cobalt	< 0.01	< 0.01
Copper	< 0.01	< 0.01
Fluoride	< 0.01	< 0.01
Iron	0.02	0.01
Lanthanum	< 0.01	< 0.01
Lead	< 0.01	< 0.01
Magnesium	0.01	< 0.01
Manganese	< 0.01	< 0.01
Mercury (elemental)	< 0.01	< 0.01
Molybdenum	< 0.01	< 0.01
Nickel	0.1	0.03
Nitrate/Nitrite	< 0.01	< 0.01
Potassium	0.2	0.05
Selenium	< 0.01	< 0.01
Silicon	0.02	< 0.01
Silver	< 0.01	< 0.01
Sodium	< 0.01	< 0.01
Strontium	< 0.01	< 0.01
Sulfate	< 0.01	< 0.01
Thallium	< 0.01	< 0.01
Uranium	< 0.01	< 0.01
Vanadium	< 0.01	< 0.01
Zinc	< 0.01	< 0.01

Noncancer risks above the risk criteria were identified for arsenic by a factor of 2 under the uncontrolled management scenario, but decreased below risk criteria when fugitive dust controls were considered. All other COPCs were below the risk criteria under the uncontrolled management scenario, and were over an order of magnitude below the criteria for the controlled management scenario.

Chronic Human Inhalation Risks

Chronic human health risks associated with the inhalation of COPCs present in ambient air were evaluated using concentration-based benchmarks. These benchmarks represent air concentrations below which no adverse effects are known or anticipated to occur over a lifetime of chronic exposure. Chronic risks were evaluated by comparing these benchmarks to the maximum annual concentrations calculated with AERMOD. Cancer risks were calculated using **Equation 3-3**:

(3-3) $$\mathrm{Risk_{Inhal}} = \mathrm{C_{air}} \cdot \mathrm{URF_{inhal}} \cdot 1{,}000 \left(\frac{\mu g}{mg}\right)$$

Where:

$\mathrm{Risk_{Inhal}}$ = Individual cancer risk from inhalation of contaminants (unitless)
$\mathrm{C_{air}}$ = Annual air concentration (mg/m^3)
$\mathrm{URF_{inhal}}$ = Inhalation unit risk factor (per $\mu g/m^3$)

While noncancer HQs were calculated using **Equation 3-4**:

(3-4) $$\mathrm{HQ_C} = \frac{\mathrm{C_{air}}}{\mathrm{RfC_C}}$$

Where:

$\mathrm{HQ_C}$ = Chronic hazard quotient (unitless)
$\mathrm{C_{air}}$ = Annual air concentration (mg/m^3)
$\mathrm{RfC_C}$ = Chronic reference concentration (mg/m^3).

Table 3-3 presents the screening results for both cancer and noncancer risks. Where benchmarks were available for multiple species of a constituent, the most conservative was used in the screening calculations. These conservative results are presented for each COPC under controlled and uncontrolled management scenarios. No values were found to be above either the cancer or noncancer criteria for either scenario.

Table 3-3. Screening Results for Chronic Human Health Risks Resulting from Inhalation of Ambient Air

COPC	Management Scenario	
	Uncontrolled	Controlled
Carcinogenic Risks		
Arsenic	2×10^{-6}	7×10^{-7}
Beryllium	2×10^{-7}	7×10^{-8}
Cadmium	4×10^{-8}	1×10^{-8}
Chromium	9×10^{-6}	3×10^{-6}
Cobalt	3×10^{-6}	9×10^{-7}

(continued)

Table 3-3. Screening Results for Chronic Human Health Risks Resulting from Inhalation of Ambient Air

COPC	Management Scenario	
	Uncontrolled	Controlled
Noncarcinogenic Risks		
Aluminum	0.6	0.2
Antimony	< 0.01	< 0.01
Arsenic	0.2	0.07
Beryllium	0.03	0.01
Cadmium	0.01	< 0.01
Chromium	0.05	0.02
Cobalt	0.4	0.1
Manganese	0.3	0.09
Mercury	< 0.01	< 0.01
Nickel	0.08	0.02
Selenium	< 0.01	< 0.01
Sulfide	< 0.01	< 0.01
Uranium	< 0.01	< 0.01
Vanadium	0.2	0.06

National Ambient Air Quality Standards

NAAQS are concentration-based regulatory limits developed for several priority pollutants by EPA. These benchmarks represent air concentrations protective of public health, including sensitive populations, such as asthmatics, children and the elderly. NAAQS exceedances were evaluated by comparing these benchmarks to the concentrations calculated with AERMOD for the available averaging time closest to that specified by the NAAQS standards. Annual concentrations were used for PM_{10} while both annual and 24-hour concentrations were used for $PM_{2.5}$. The specified averaging time for lead is a rolling 3-month average, which is not an available output from either AERSCREEN or AERMOD. Instead, lead concentrations were evaluated using a more protective monthly average concentration. The HQs were calculated using **Equation 3-5**:

$$\textbf{(3-5)} \quad \text{Ratio} = \frac{C_{air}}{NAAQS}$$

Where:

Ratio = Exposure ratio (unitless)
C_{air} = 24-hour/monthly/annual air concentration (mg/m^3)
NAAQS = National ambient air quality standard (mg/m^3).

Table 3-4 presents the screening results for both NAAQS standards. These conservative results are presented for each COPC under both the controlled and uncontrolled management scenarios. Values found to be above the selected risk criteria (i.e., a ratio > 1) are shown in **bold**.

Table 3-4. Screening Results for NAAQS

COPC	Averaging Time	Management Scenario	
		Uncontrolled	Controlled
PM_{10}	24-hour	0.4	0.1
$PM_{2.5}$	Annual	0.5	0.3
$PM_{2.5}$	24-hour	**2**	1
Lead	Monthly	0.03	0.02

An air concentration above the NAAQS for 24-hr $PM_{2.5}$ by a factor of 2 was identified under an uncontrolled management scenario, but decreased below relevant NAAQS when fugitive dust controls were considered.

3.3 Soil, Sediment, Plant and Animal Screening

This section summarizes the screening for all exposure pathways that result from aboveground transport of COPCs to downgradient soil and sediment. Aboveground transport occurs through windblown dust and particulates suspended in overland run-off. Two management scenarios are considered: uncontrolled and controlled releases. Uncontrolled releases occur when no action is taken to control particulate releases. Controlled releases occur when there is active management of CCR waste to minimize the rate of particulates emissions. These management practices include the use of wetting and surfactants to reduce windblown dust, and run-on/run-off controls to collect or otherwise control run-off from all rainfall events less than the maximum storm predicted for each 25-year interval in the area.

Relevant human exposure pathways include incidental ingestion of contaminated soils, as well as ingestion of any crops or livestock raised on contaminated soils. Relevant ecological exposures include direct contact with and ingestion of contaminated soils and sediment, as well as ingestion of any biota living around contaminated soil and sediment. Sediment exposures were screened through this pathway under the assumption that overland transport would contribute substantially higher loadings to downgradient water bodies than subsurface transport through ground water. Each of these exposure pathways are primarily associated with landfills during operation, as the constant water cover in impoundments and the postclosure cap in landfills will limit the transport of particulates by wind and overland run-off.

3.3.1 Exposure Concentrations

EPA used the 90th percentile whole waste concentrations listed in **Table 3-1** to estimate exposures to soil, sediment, produce and animal products. However, these whole waste concentrations represent the total mass of COPCs present in CCR wastes. To translate the concentrations in CCR waste to those in soil, sediment, produce and livestock, additional calculations were necessary.

Soil and Sediment Concentrations

EPA used dilution attenuation factors (DAFs) to estimate the COPC concentrations that may accumulate in downgradient soils and sediments under the uncontrolled management scenario. A DAF is a ratio of the initial constituent concentration at the point of release to the final constituent concentration at the point of exposure. EPA identified an appropriate DAF for the uncontrolled management scenario from the 1998 Risk Assessment (U.S. EPA, 1998a), which considered unmitigated transport of CCR waste from uncovered CCR landfills by wind and overland runoff. **Figure 3-1** plots the DAFs for each modeled constituent against the corresponding soil–water partition coefficient (K_d). K_d values are a measure of the tendency of a constituent to distribute between the solid and liquid phases. A strong inverse relationship can be seen between the DAFs and the K_d values for the COPCs. This is because the constituents most likely to leach out (i.e., those with low K_d values) will not accumulate in surficial soils to the same degree as those least likely to leach out (i.e., those with high K_d values).

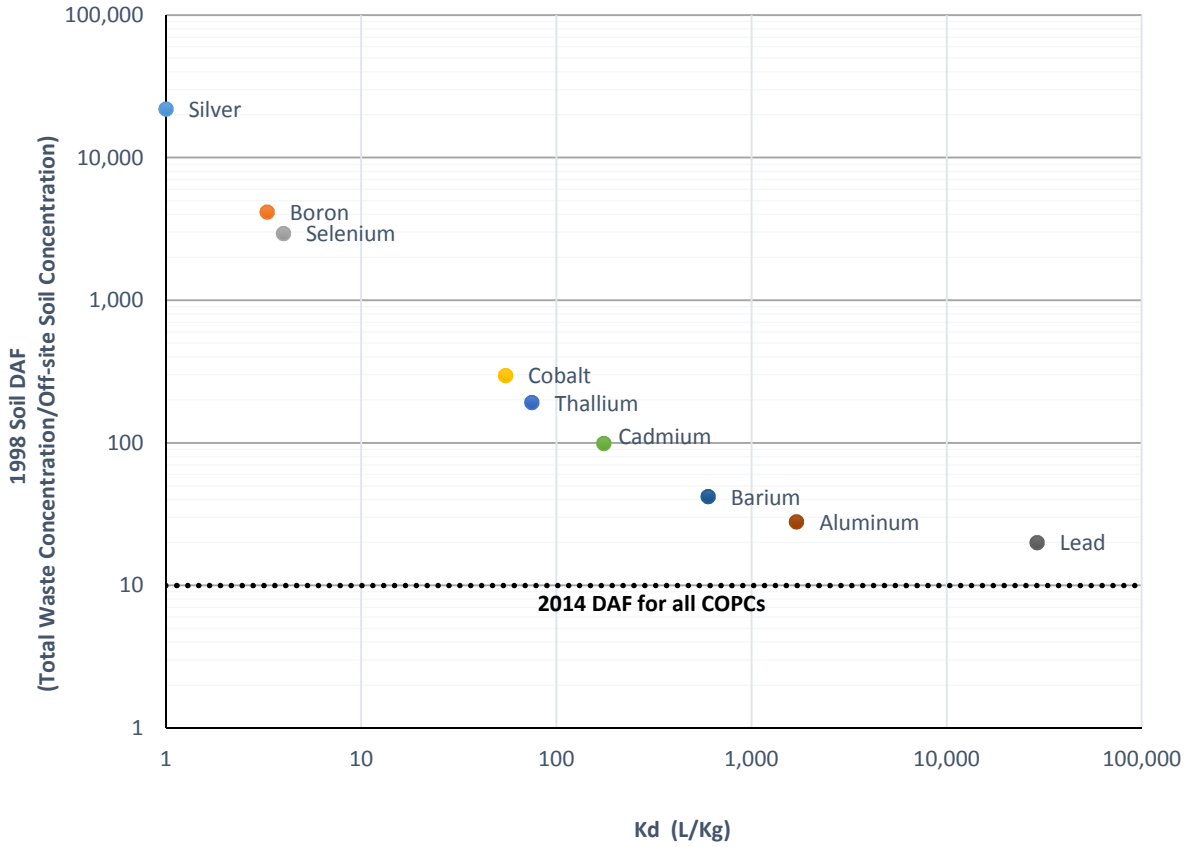

Figure 3-1. Dilution-attenuation factors as a function of K_d values as modeled in the 1998 risk assessment (adapted from U.S. EPA, 1998a).

For ease of calculation and to ensure that potential exposures were not underestimated, the revised risk assessment applied a single DAF of 10 to all COPCs for the uncontrolled management scenario. The selected DAF is below the lowest value identified in U.S. EPA (1998a) for lead, which had the highest K_d value of any COPC modeled. EPA divided the 90th percentile whole

waste concentrations by the DAF of 10 to generate downgradient concentrations used to screen exposures to both soil and sediment for the uncontrolled management scenario.

For the controlled management scenario, run-on and run-off controls for landfills require collection and control of all run-off up to that of a 24-hour, 25-year event. These controls would essentially eliminate all off-site migration through overland run-off on an annual basis. Thus, EPA assumed that run-off was negligible. Instead, soil and sediment concentrations were calculated assuming that transport resulted only from the deposition of windblown particulates onto soil. EPA calculated a total deposition rate onto soils with **Equation 3-6**:

$$\textbf{(3-6)} \qquad D_p = \left[\frac{E_{10} \cdot C_{waste}}{A \cdot \left(10^6 \frac{mg}{kg}\right)}\right] \cdot \left[D_{ydp} + D_{wdp}\right]$$

Where:

D_p = Deposition rate (g/m^2-yr)
E_{10} = PM_{10} emission rate (g/s)
C_{waste} = 90th percentile constituent-specific whole waste concentration (mg/kg)
A = Active landfill area (m^2)
D_{ydp} = Unitized dry deposition rate (g/m^2-yr per g/m^2-s)
D_{wdp} = Unitized wet deposition rate (g/m^2-yr per g/m^2-s).

The unitized dry and wet deposition rates are outputs generated by AERMOD during the model runs conducted to screen ambient air concentrations. Thus, all inputs were the same. Further detail on the inputs used for AERMOD is provided in **Appendix F**. The soil and sediment concentrations that result from deposition under the controlled management scenario were calculated using the conservative assumption that the deposition of particulates occurs continuously without any losses over the course of 10 years, consistent with an average exposure duration for adults. The settled particulates are uniformly mixed within the first centimeter of topsoil and surface sediment, which has a fixed density of 1,300 kg/m^3.

Concentrations in Produce

COPCs present in the soil can be drawn into plants through the root systems and consumed along with the edible portion of the plant. Plants may also become contaminated from windblown particulates that settle out on the plant surface. Both root uptake and air deposition may happen simultaneously, and thus, the resulting exposures are assumed to be additive. However, air deposition will not contribute to exposures for some produce categories because the plants have protective outer layers that are discarded prior to consumption. **Table 3-5** provides a breakdown of the different types of plants considered. Some of these plant categories (i.e., silage, forage) are considered as feed for cattle raised as a source of beef and milk for human consumption.

Table 3-5. Potential Routes of Contamination for Different Plant Types

Produce/Plant Category	Example	Root Uptake	Air Deposition
Exposed Fruits	Strawberry	✓	✓
Exposed Vegetables	Lettuce	✓	✓
Silage	Alfalfa	✓	✓
Forage	Grass	✓	✓
Protected Fruit	Watermelon	✓	–
Protected Vegetables	Onion	✓	–
Grains	Wheat	✓	–
Root Vegetables	Carrot	✓	–

The degree to which COPCs are taken up from the soil by different plants varies. To represent these differences, EPA used bioconcentration factors (BCFs) drawn from the available literature for each of the eight plant types listed above. BCFs provide information on the amount of uptake and accumulation of a substance from soil and are expressed as a concentration in the plant per unit of concentration in the soil. The COPC concentration in the edible portion of the plant was calculated by multiplying the concentration in the soil by the appropriate BCF. The resulting concentrations are in terms of dry weight, but human consumption data are available on a wet weight basis. Therefore, the calculated dry weight concentrations were multiplied by a water adjustment factor to scale to wet weight. The specific equations, BCFs and other inputs used for this pathway are presented in **Appendix G**.

In addition to soil uptake, several plant types also accumulate particulates on exposed surfaces from air deposition. The deposition to soils in **Equation 3-6** was adjusted to account for the fraction of deposition that will not adhere to the plant surface, resulting in **Equation 3-7**:

(3-7) $$D_p = \left[\frac{E_{10} \cdot C_{waste}}{A \cdot \left(10^6 \frac{mg}{kg}\right)}\right] \cdot \left[D_{ydp} + \left(F_w \cdot D_{wdp}\right)\right]$$

Where:

D_p = Deposition rate (g/m^2-yr)
E_{10} = PM_{10} emission rate (g/s)
C_{waste} = 90th percentile constituent-specific whole waste concentration (mg/kg)
A = Active landfill area (m^2)
D_{ydp} = Unitized dry deposition rate (g/m^2-yr per g/m^2-s)
D_{wdp} = Unitized wet deposition rate (g/m^2-yr per g/m^2-s)
F_w = Fraction of wet deposition adhering to plant surface (unitless).

As with deposition onto soil, the unitized dry and wet dry deposition rates are outputs generated by AERMOD during the model runs conducted to screen ambient air concentrations. Thus, all weather data, active landfill area, emission rates and other inputs were the same. **Appendix G**

provides the plant-specific parameters (i.e., F_w) used in this equation, as well as the other equations used to convert the deposition rate into a concentration for aboveground produce.

Concentrations in Livestock

COPCs may concentrate in livestock through the ingestion of contaminated soil and feedstock. To represent this accumulation, EPA used biotransfer factors (BTFs) drawn from the available literature. BTFs provide information on the amount of accumulation of a chemical compound in animal products (e.g., beef, milk) based on the rate of consumption of feed and soil. The COPC concentrations in beef and milk were calculated for uncontrolled and controlled management scenarios by multiplying the mass of contaminant consumed each day by the appropriate BTF. The mass consumed was calculated by multiplying the quantity of feed or soil consumed by the concentration in the feed or soil and then summed across the types of feed plus soil. For both the uncontrolled and controlled management scenarios, EPA assumed all feedstock consumed by cattle were grown on contaminated soils, and that any soil consumed while foraging was also contaminated. The specific equations and BTFs used are presented in **Appendix G.**

3.3.2 Receptor Risks

EPA used the COPC concentrations calculated for each environmental media to estimate risks for human and ecological receptors under both uncontrolled and controlled management scenarios. EPA considered human health risks from ingestion of media from around home-based farm and ecological risks from ingestion of and direct contact with media. All pathways were evaluated for adverse effects resulting from chronic exposures. Generally, adverse effects from chronic exposures occur at lower media concentrations than acute exposures. Therefore, the constant, high-end concentrations used to screen chronic exposures will also be protective of acute exposures.

Human Health Risk from Ingestion

Human health risks associated with ingestion are evaluated using dose-based benchmarks. In order to translate the calculated exposure concentrations for each medium into risks, EPA first had to characterize the potential receptors. This was done for each receptor cohort by calculating an average daily dose (ADD), which is the intake rate averaged over specified exposure duration and expressed as a daily dose per unit of body weight. For noncancer risks, the dose was averaged on an annual basis using **Equation 3-8**.

(3-8) $$ADD = \sum_{i=s}^{n} \left[\frac{I_i \cdot ED_i}{ED_{total}} \right]$$

Where:

ADD = Average daily dose (mg/kg-day)
I_i = Intake for receptor age cohort i (mg/kg-day) (calculated in **Appendix G**)
ED_i = Exposure duration of age cohort i (yr) (cannot exceed length of age cohort)
ED_{total} = Total exposure duration (yr).

For cancer risks, the dose averaged over the lifetime of the individual using **Equation 3-9**, resulting in a lifetime average daily dose (LADD).

(3-9) $$\text{LADD} = \sum_{i=s}^{n} \left[\frac{\text{ADD} \cdot \text{ED}_i \cdot \text{EF}_i}{\text{AT} \cdot \left(365 \frac{\text{days}}{\text{year}}\right)} \right]$$

Where:

LADD = Lifetime average daily dose (mg/kg-day)
EF_i = Exposure frequency for age cohort i (day/yr)
AT = Averaging time (yr).

To calculate these dose rates, EPA used central tendency exposure factors. These factors were chosen to balance some of the conservatism present elsewhere in the screening. Exposures were considered separately for receptors starting in seven different age cohorts (i.e., 1 to < 2 yrs, 2 to < 3 yrs, 3 to < 6 yrs, 6 to < 11 yrs, 11 to < 16 yrs, 16 to < 21 yrs, and > 21 yrs). Since some exposure factors were specific to an age cohort, exposure calculations aged receptors from the beginning of the specified cohort through subsequent cohorts until the full exposure duration had been reached.

ADD and LADD were calculated on a COPC-specific basis for each age cohort. The calculated doses were compared to human health benchmarks for noncancer and cancer effects, respectively. A reference dose (RfD), which is an estimate of a daily exposure that is likely to be without appreciable risk, was used to estimate HQs for noncancer effects. These HQs were calculated using **Equation 3-10**.

(3-10) $$\text{HQ}_C = \frac{\text{ADD}}{\text{RfD}}$$

Where:

HQ_C = Noncancer risk from ingestion (unitless)
RfD = Reference dose (mg/kg-day).

A cancer slope factor (CSF), which is an upper-bound estimate of the increased human cancer risk from a lifetime of daily exposure, was used to estimate cancer risks. These cancer risks were calculated using **Equation 3-11**.

(3-11) $$\text{Risk}_{\text{Ing}} = \text{LADD} \cdot \text{CSF}_{\text{oral}}$$

Where:

$Risk_{Ing}$ = Cancer risk from ingestion (unitless)
CSF_{oral} = Oral cancer slope factor (risk per mg/kg-day)

Table 3-6 presents the screening results for human exposures to soil, produce, and animal products. Where benchmarks were available for multiple species of a constituent, the most conservative was used in the screening calculations. Results are presented for both the controlled and uncontrolled management scenarios. For both scenarios, these conservative results are based on the most sensitive age cohorts for cancer risks and noncancer risks. For cancer risks, this was 1 to < 2-year-olds for soil ingestion and adults for produce, beef, and milk ingestion. For noncancer risks, this was 1 to < 2-year-olds for all pathways. Results are presented under both the controlled

and uncontrolled management scenarios. Values found to be above the selected risk criteria (i.e., an HQ > 1) are shown in **bold**.

Table 3-6. Screening Results for Human Health Risks Resulting from Soil, Produce, Beef and Milk Ingestion

COPC	Uncontrolled				Controlled			
	Soil	Produce	Beef	Milk	Soil	Produce	Beef	Milk
Cancer Effects								
Arsenic	7×10^{-6}	9×10^{-6}	6×10^{-6}	2×10^{-6}	6×10^{-8}	8×10^{-7}	3×10^{-7}	7×10^{-8}
Chromium	3×10^{-6}	7×10^{-7}	4×10^{-6}	9×10^{-6}	3×10^{-8}	4×10^{-7}	3×10^{-7}	8×10^{-7}
Noncancer Effects								
Aluminum	0.06	0.02	0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.01
Antimony	0.08	0.9	0.07	0.1	< 0.01	0.01	< 0.01	< 0.01
Arsenic	0.2	0.1	0.1	0.05	< 0.01	0.01	< 0.01	< 0.01
Barium	< 0.01	0.03	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Beryllium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Boron	< 0.01	0.6	0.02	0.5	< 0.01	0.01	< 0.01	< 0.01
Cadmium	< 0.01	0.05	< 0.01	0.06	< 0.01	< 0.01	< 0.01	< 0.01
Chromium	0.03	< 0.01	0.02	0.08	< 0.01	< 0.01	< 0.01	< 0.01
Cobalt	0.1	0.3	0.6	0.8	< 0.01	< 0.01	0.03	0.05
Copper	0.01	0.7	0.2	0.6	< 0.01	< 0.01	< 0.01	< 0.01
Fluoride	< 0.01	< 0.01	–	–	< 0.01	< 0.01	–	–
Iron	0.04	< 0.01	0.1	0.02	< 0.01	< 0.01	< 0.01	< 0.01
Lanthanum	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Manganese	< 0.01	0.03	< 0.01	0.01	< 0.01	< 0.01	< 0.01	< 0.01
Mercury	< 0.01	0.05	0.1	0.6	< 0.01	< 0.01	< 0.01	< 0.01
Molybdenum	< 0.01	0.08	0.03	0.1	< 0.01	< 0.01	< 0.01	< 0.01
Nickel	< 0.01	0.06	< 0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.01
Nitrate/Nitrite	< 0.01	< 0.01	–	–	< 0.01	< 0.01	–	–
Selenium	< 0.01	0.01	< 0.01	0.03	< 0.01	< 0.01	< 0.01	< 0.01
Silver	< 0.01	0.04	< 0.01	0.7	< 0.01	< 0.01	< 0.01	0.01
Strontium	< 0.01	0.1	< 0.01	0.2	< 0.01	< 0.01	< 0.01	< 0.01
Thallium	**2**	0.6	**10**	**8**	0.03	0.09	0.8	0.6
Uranium	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Vanadium	0.04	0.03	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Zinc	< 0.01	0.08	0.07	0.1	< 0.01	< 0.01	< 0.01	< 0.01

– Indicates that no BCF or BTF was available

All cancer risks fell below human health risk criteria under both uncontrolled and controlled scenarios. Noncancer risks were identified above human health criteria for thallium in soil (2), beef (10) and milk (8) under the uncontrolled management scenario. When management controls were considered, all human health risks fell below the risk range.

Ecological Risk

Ecological risks from direct contact with and ingestion of environmental media were evaluated using concentration-based benchmarks (**Appendix E**). These benchmarks, which represent concentrations below which no adverse effects are known or anticipated to occur, were used to estimate HQs using **Equation 3-12**.

(3-12) $$HQ = \frac{C_{soil}}{Eco_{soil}} \text{ or } \frac{C_{sed}}{Eco_{sed}}$$

Where:

C_{soil} = Soil concentration (mg/kg)
C_{sed} = Sediment concentration (mg/kg)
Eco_{soil} = Ecological soil benchmark (mg/kg)
Eco_{sed} = Ecological sediment benchmark (mg/kg).

Table 3-7 presents the screening results for ecological exposures to soil and sediment. Where benchmarks were available for multiple species of a constituent, the most conservative was used in the screening calculations. Results are presented for both the controlled and uncontrolled management scenarios. For both scenarios, these conservative results are based on the most sensitive receptors, specified by the toxicity benchmarks. Values that exceed the selected risk criteria (i.e., HQ > 1) are shown in **bold**.

Table 3-7. Screening Results for Ecological Risks Resulting from Soil and Sediment Exposures

COPC	Uncontrolled		Controlled	
	Soil	Sediment	Soil	Sediment
Antimony	**20**	**2**	0.1	< 0.01
Arsenic	0.6	**2**	< 0.01	< 0.01
Barium	0.3	0.6	< 0.01	< 0.01
Beryllium	0.1	–	< 0.01	–
Boron	**80**	–	0.6	–
Cadmium	1	0.7	< 0.01	< 0.01
Chromium	0.6	0.4	< 0.01	< 0.01
Cobalt	0.5	–	< 0.01	–
Copper	0.8	0.6	< 0.01	< 0.01
Lead	0.7	0.2	< 0.01	< 0.01
Manganese	0.2	–	< 0.01	–
Mercury	1	0.6	< 0.01	< 0.01
Molybdenum	0.1	0.1	< 0.01	< 0.01
Nickel	0.5	1	0.01	< 0.01
Selenium	**3**	–	0.03	–
Silver	0.3	**2**	< 0.01	< 0.01
Vanadium	**7**	**3**	0.1	< 0.01
Zinc	0.6	0.2	< 0.01	< 0.01

– Indicates that no benchmark was available for these receptors

Ecological soil risks above an HQ of 1 were identified were identified for the following constituents: boron (80) antimony (20) vanadium (7) and selenium (3). Ecological sediment risks were also identified above an HQ of 1 for the following constituents: vanadium (3), antimony (2), arsenic (2) and silver (2). When fugitive dust and run-off controls were considered, all ecological risks fell below the ecological risk criteria.

3.4 Ground Water, Surface Water, Wastewater and Fish Screening

This section summarizes the screening for all exposure pathways that result from leaching of COPCs into water. These exposure pathways are associated with both landfills and surface impoundments as a result of rainfall and/or wastewater percolating through the WMU. Relevant pathways include ecological exposures to impoundment wastewater, ecological exposure to downgradient surface waters, human consumption of ground water and fish, and human dermal and inhalation exposure through bathing and showering. While these pathways may be present for both impoundments and landfills, the 2010 Risk Assessment demonstrated that risks from surface impoundments are consistently higher than those from landfills. Therefore, EPA screened these pathways for surface impoundments and the results also were used to identify COPCs for landfills.

3.4.1 Exposure Concentrations

EPA used the 90th percentile concentrations for impoundment pore water and wastewater listed in **Table 3-1** to estimate exposures to ground water, surface water, wastewater and fish. Impoundment wastewater concentrations were used to screen exposures for ecological receptors that live in and around surface impoundments. These concentrations were collected from the surface water within surface impoundments after CCR solids settled out. Since wastewater concentrations are representative of the environment that these ecological receptors would inhabit, the measured concentrations were used directly in the screening. Impoundment pore water concentrations were used to screen human exposures to ground water and fish, as well as exposures for ecological receptors that live in and around downgradient surface water bodies. Pore water concentrations were collected from the interstitial water between waste particles at the bottom of the surface impoundment. These concentrations are representative of leachate released from impoundments to downgradient receptor wells and surface water bodies.

Dilution Attenuation Factors

DAFs were used to conservatively account for the reduction in concentrations that would occur during subsurface transport between a WMU and a downgradient water body. The 2010 Risk Assessment yielded a 10th percentile DAF of approximately 2 across all modeled constituents. For ease of calculation and to ensure that potential exposures were not underestimated, the revised risk assessment applied a single DAF of 1 to all water pathways. This DAF is equivalent to direct exposure to pore water. The 90th percentile pore water concentrations were divided by the selected DAF to generate exposure concentrations.

Bioconcentration in Fish

The fish caught and consumed by recreational fishers and their families were assumed to be exposed to undiluted pore water. EPA assumed that all of the fish consumed by receptors originated from the third trophic level (TL3) and fourth trophic level (TL4). TL3 consists of carnivores that eat herbivores or secondary consumers such as invertebrates and plankton (e.g., carp, smelt, perch, catfish, sucker, bullhead, sauger), while TL4 consists of carnivores that eat other carnivores (e.g., salmon, trout, walleye, bass). While specific fish may not fit entirely into one category, EPA chose conservative categorizations for these fish to remain protective of human health. Because the degree of bioconcentration may differ between these two trophic levels, the Agency used separate BCFs for these two trophic levels, when available. For BCFs and the equations used to calculate fish concentrations, see **Appendix G**.

3.4.2 Ground Water, Surface Water, Wastewater and Fish Risks

EPA used the calculated concentrations in the different media to calculate risks for human and ecological receptors. EPA considered human health risks from ingestion of ground water and fish, as well as dermal contact with ground water and inhalation of volatilized COPCs. EPA considered ecological risks from ingestion of and direct contact with impoundment wastewater and downgradient surface water. All pathways were evaluated for adverse effects resulting from chronic exposures. Generally, adverse effects from chronic exposures occur at lower media concentrations than acute exposures. Therefore, the constant, high-end concentrations used to screen chronic exposures will also be protective of acute exposures.

Chronic Human Ingestion Risks

Human health risks associated with ingestion were evaluated using dose-based benchmarks. In order to translate the calculated exposure concentrations for each media into risks, EPA first had to characterize the potential receptors. For most COPCs, this was done for each receptor cohort by calculating either a noncancer ADD using **Equation 3-8** or a cancer LADD using **Equation 3-9**. The calculated ADD and LADD were then used to calculate HQs using **Equation 3-10** and cancer risks using **Equation 3-11**, respectively. In contrast, lead risks were characterized by comparing the ground water concentrations directly to the concentration-based MCL because no dose-based benchmark is currently available. This was done using **Equation 3-13**.

(3-13) $$\text{Ratio} = \frac{C_{DW}}{MCL}$$

Where:

Ratio = Exposure Ratio (unitless)
C_{DW} = Drinking water concentration (mg/L)
MCL = Maximum contaminant level (mg/L).

Table 3-8 presents the screening results for chronic exposures to ground water and fish. Where benchmarks were available for multiple species of a constituent, the most conservative was used in the screening calculations. For both scenarios, these conservative results are based on the most

sensitive age cohorts for cancer risks (adults) and noncancer risks (children ages 1 to < 2). Values that exceed the selected criteria (i.e., a cancer risk > 1×10^{-5} or an HQ > 1) are shown in **bold**.

Table 3-8. Screening Results for Human Health Risks Resulting from Ground Water and Fish Ingestion

COPC	Ground Water Ingestion	Fish Ingestion
Cancer Effects		
Arsenic	**3×10^{-3}**	**4×10^{-5}**
Chromium	**3×10^{-4}**	5×10^{-7}
Noncancer Effect		
Aluminum	0.2	0.06
Ammonia	0.1	–
Antimony	**2**	< 0.01
Arsenic	**50**	1
Barium	0.02	0.02
Beryllium	0.01	< 0.01
Boron	**10**	–
Cadmium	**2**	**2**
Chromium	1	< 0.01
Cobalt	**3**	–
Copper	0.2	< 0.01
Fluoride	**7**	0.1
Iron	0.3	0.04
Lead	**7**	–
Lithium	**4**	–
Manganese	0.8	< 0.01
Mercury	< 0.01	**7**
Molybdenum	**30**	0.7
Nickel	0.3	< 0.01
Nitrate/Nitrite	0.2	–
Selenium	1	**10**
Silver	0.02	–
Strontium	0.3	0.02
Thallium	**6**	**4**
Uranium	0.08	0.02
Vanadium	1	0.2
Zinc	0.01	0.03

–Indicates no BCF was available

Ingestion of ground water resulted in risks above the human health criteria. Cancer risks above 1×10^{-5} were identified for arsenic (3×10^{-3}) and chromium VI (3×10^{-4}). Noncancer risks above an HQ of 1 were identified were identified for: arsenic (50), molybdenum (30), boron (10), fluoride (7), lead (7) thallium (6), lithium (4), cobalt (3), antimony (2) and cadmium (2).

Ingestion of fish resulted in risks above the human health criteria. Cancer risks above 1×10^{-5} were identified for arsenic (4×10^{-5}). Noncancer risks above an HQ of 1 were identified were identified for: selenium (10), mercury (7), thallium (4) and cadmium (2).

Human Health Risks from Inhalation

In addition to dermal exposure during showering and bathing, receptors may also be exposed to volatile COPCs present in the ground water through inhalation of any vapors released. The elevated temperature and physical disturbance of water as it is forced through faucets and showerheads for baths and showers may facilitate the volatilization of COPCs. The extent to which a constituent will volatilize from shower water depends on a number of factors, including chemical properties, the water temperature, the type of shower nozzle, and the duration of showering. Elemental mercury is the only COPC identified that may volatilize to any appreciable degree under the relevant range of household conditions. Based on an estimate of air concentrations calculated by multiplying the 90th percentile mercury pore water concentration by the Andelman volatilization factor of 0.5 L/m^3 (U.S. EPA, 1991), this exposure pathway resulted in an HQ below the risk criteria using **Equation 3-4**. Therefore, this pathway was not retained for further evaluation.

Human Health Risks from Dermal Contact

Human receptors may be exposed to COPC concentrations in ground water through prolonged dermal contact with contaminated water during showering or bathing. EPA screened these dermal exposures based on the recommendations in *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual* (*Part E, Supplemental Guidance for Dermal Risk Assessment*) (U.S. EPA, 2004), which recommends that dermal exposure should be retained for evaluation if the dermal exposure is greater than 10 percent of oral exposure. Prior performing the calculations, EPA reviewed the literature to ensure the use of the most appropriate values. Based the *Public Health Goals for Chemicals in Drinking Water: Hexavalent Chromium (Cr VI)* (CalEPA, 2011), the dermal permeability coefficient (K_p) was updated to 7×10^{-6} cm/hr and gastrointestinal absorption updated to 1% for Chromium VI. Values provided by RAGS Part E were used for all other constituents. Using the process demonstrated in Exhibit B-4 of RAGS Part E, EPA determined that a screening assessment should be conducted for barium, beryllium, cadmium, chromium III, manganese, mercury (divalent), silver, vanadium, and zinc.[11]

Risk calculations were performed for a showering adult, identified in RAGS Part E as the most highly exposed receptor, using *Inorganic Chemicals in Water* spreadsheet provided in U.S. EPA (2004). The spreadsheet was updated to reflect residential exposure assumptions consistent with

[11] Because gastrointestinal adsorption of zinc is listed as highly variable, a conservative value of 1% was used for the purposes of this screening.

the ingestion screening (see **Appendix D**). **Table 3-9** Results are presented for each COPC under controlled and uncontrolled management scenarios. No values were found to be above noncancer criteria.

Table 3-9. Screening Results for Human Health Risks Resulting from Dermal Contact

COPC	Dermal Contact
Noncancer Risks	
Barium	< 0.01
Beryllium	< 0.01
Cadmium	0.7
Chromium	< 0.01
Manganese	0.09
Mercury	< 0.01
Silver	< 0.01
Vanadium	0.3
Zinc	0.2

Ecological Risk

Ecological risks associated with direct contact with and ingestion of environmental media were evaluated using concentration-based benchmarks. These benchmarks, which represent media concentrations below which no adverse effects are known or anticipated to occur for the species, were used to estimate HQs using **Equation 3-13**.

(3-13) $$HQ = \frac{C_{sw}}{Eco_{water}} \text{ or } \frac{C_{ww}}{Eco_{water}}$$

Where:

HQ = Hazard quotient (unitless)
C_{sw} = Surface water concentration (mg/L)
C_{ww} = Wastewater concentration (mg/L)
Eco_{water} = Ecological water benchmarks (mg/L).

Table 3-10 presents the screening results for direct ecological exposures to surface water and impoundment wastewater. Where benchmarks were available for multiple species of a constituent, the most conservative was used in the screening calculations. These results are based on the most sensitive receptors for each COPC, specified by the selected toxicity benchmark. Values that exceed the selected risk criteria (i.e., an HQ > 1) are shown in **bold**.

Table 3-10. Screening Result for Ecological Risks Resulting from Surface Water and Impoundment Water Exposure

COPC	Surface Water	Impoundment Wastewater
Aluminum	**100**	**30**
Antimony	1	0.7
Arsenic	**100**	**20**
Barium	**50**	**100**
Beryllium	**2**	**2**
Boron	**100**	**30**
Cadmium	**200**	**10**
Chloride	**9**	**2**
Chromium	**20**	**2**
Cobalt	**2**	0.8
Copper	**10**	1
Iron	**10**	0.05
Lead	**40**	0.2
Mercury	0.4	< 0.01
Molybdenum	**20**	1
Nickel	**6**	1
Selenium	**60**	**20**
Silver	**10**	0.3
Thallium	0.3	0.7
Vanadium	**30**	**10**
Zinc	**2**	0.5

Direct contact with and ingestion of surface water resulted in risks above ecological criteria. Ecological risks above an HQ of 1 were identified were identified for, listed from highest to lowest: cadmium (200), aluminum (100), arsenic (100), boron (100), selenium (60), barium (50), lead (40), vanadium (30), chromium III (20), molybdenum (20), copper (10), iron (10), silver (10), chloride (9), nickel (6), beryllium (2), cobalt (2) and zinc (2).

Direct contact with and ingestion of impoundment wastewater resulted in risks above ecological criteria. Ecological risks above an HQ of 1 were identified were identified for, listed from highest to lowest: arsenic (100), barium (50), aluminum (30), boron (30), selenium (20), cadmium (10), vanadium (10), beryllium (2), chloride (2) and chromium (2).

3.5 Screening Analysis Conclusions

EPA conducted this screening analysis to determine which COPCs are most likely to pose risk to receptors for each of the exposure pathways identified in **Section 2**. Based on the results of this

conservative screening, EPA determined which pathways to retain for further characterization with more refined, probabilistic modeling discussed in **Section 4**. The following subsection summarizes the results of the different screening analyses and the Agency's conclusions.

3.5.1 Ambient Air Conclusions

EPA calculated ambient air concentrations that result from windblown dust from landfills under uncontrolled and controlled management scenarios. Risks were estimated for based on short-term (i.e., acute) and long-term (i.e., chronic) exposures. Under the uncontrolled management scenario, concentrations of arsenic were found to pose acute risks and $PM_{2.5}$ was found to exceed the 24-hour NAAQS. However, all risks fell below selected criteria under the controlled management scenario. Based on these results, EPA did not retain exposures to ambient air for further analysis. Even with the conservative assumptions used here, risks fell below selected criteria when dust controls were considered. Thus, these screening results are sufficient to characterize high-end risks for this pathway, and the controls required by the rule are considered protective.

3.5.2 Soil, Sediment, Produce and Animal Product Conclusions

EPA calculated downgradient soil, sediment, produce, beef and milk concentrations that result from windblown dust and run-off from landfills under uncontrolled and controlled management scenarios. Under the uncontrolled management scenario, thallium was found to pose human health risks for multiple pathways, while multiple constituents were found to pose ecological risks for soil and sediment. However, all risks fell below selected criteria under the controlled management scenario. Based on these results, EPA did not retain these aboveground pathways for further analysis. Even with the conservative assumptions used here, risks fell below all benchmarks when fugitive dust and run-on/run-off controls were considered. Thus, these screening results are sufficient to characterize high-end risks for this pathway, and the controls required by the rule are considered protective.

Although aboveground transport of CCR waste was not retained for further analysis, the sediment screening was used as a more conservative estimate of sediment concentrations than may occur due belowground transport of leachate from CCR waste water. Thus, these results were used to identify COPCs for subsurface transport through ground water. As a result, EPA retained antimony, arsenic, silver and vanadium for further characterization through the ground water to surface water sediment pathway.

3.5.3 Ground Water, Surface Water, Wastewater and Fish Conclusions

These conservative screening analyses identified potential risks to human and ecological receptors from leaching of chemical constituents from CCR waste into surrounding environmental media. Risks to human health resulted from ingestion of ground water and fish, while risks to ecological receptors resulted from exposure to surface water. While EPA did not consider the various controls that may mitigate these releases, considerable dilution and attenuation may occur before COPCs reach downgradient private wells and surface water bodies. Nevertheless, EPA retained all of the COPCs found to be above risk criteria in ground water and surface water for further

characterization in the probabilistic analysis. A summary of the COPCs retained for ground water, surface water, and sediment is presented in **Table 3-11**.

Table 3-11. Summary of the Exposure Pathways and COPCs Carried Forward for Probabilistic Analysis

COPC	Human Health		Ecological	
	Ground Water Ingestion	Fish Ingestion	Surface Water	Sediment
Carcinogenic Effects				
Arsenic	✓	✓	–	–
Chromium	✓	–	–	–
Noncarcinogenic Effects				
Aluminum	–	–	✓	–
Ammonia	–	–	–	–
Antimony	✓	–	–	✓
Arsenic	✓	–	✓	✓
Barium	–	–	✓	–
Beryllium	–	–	✓	–
Boron	✓	–	✓	–
Cadmium	✓	✓	✓	–
Chloride	–	–	✓	–
Chromium	–	–	✓	–
Cobalt	✓	–	✓	–
Copper	–	–	✓	–
Fluoride	✓	–	–	–
Iron	–	–	✓	–
Lead	✓	–	✓	–
Lithium	✓		–	–
Manganese	–	–	–	–
Mercury	–	✓	–	–
Molybdenum	✓	–	✓	–
Nickel	–	–	✓	–
Nitrate/Nitrite	–	–	–	–
Selenium	–	✓	✓	–
Silver	–	–	✓	✓
Strontium	–	–	–	–
Thallium	✓	✓	–	–
Uranium	–	–	–	–
Vanadium	–	–	✓	✓
Zinc	–	–	✓	–

These screening analyses also identified potential risks to ecological receptors from direct exposures to impoundment wastewater. Unlike the other exposure pathways, no dilution or attenuation will occur within impoundment wastewater prior to ecological exposures. Because of this, the screening analysis provides sufficient characterization of these exposures. Based on these results, EPA concludes that there is the potential for risks to ecological receptors from aluminum, arsenic, barium, beryllium, boron, cadmium, chloride, chromium, selenium and vanadium based on direct contact with surface impoundment wastewater. Therefore, this exposure pathway was not carried forward for further analysis, but is discussed in the risk characterization.

CERTIFICATE OF SERVICE

The undersigned, Jennifer Cassel, an attorney, certifies that I have served by email the Clerk and by email the individuals with email addresses named on the Service List provided on the Board's website, *available at* https://pcb.illinois.gov/Cases/GetCaseDetailsById?caseId=16858, a true and correct copy of the **ENVIRONMENTAL LAW & POLICY CENTER, PRAIRIE RIVERS NETWORK, AND SIERRA CLUB'S INDEX OF EXHIBITS AND EXHIBITS FOR THE SECOND HEARING,**, before 5 p.m. Central Time on September 28, 2020. The number of pages in the email transmission is 291 pages.

Dated: September 28, 2020

Respectfully Submitted,

/s/ Jennifer Cassel

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