BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

PRAIRIE RIVERS NETWORK,	)	
Complainant,	)	
v.	)	PCB No- (Enforcement-)
DYNEGY MIDWEST GENERATION, LLC,	)	
Respondent.	)	

NOTICE OF ELECTRONIC FILING

To: Attached Service List

PLEASE TAKE NOTICE that on March 29, 2019, I electronically filed with the Clerk of the Illinois Pollution Control Board ("Board") the formal COMPLAINT of Prairie Rivers Network, ENTRY OF APPEARANCE of Jennifer Cassel, ENTRY OF APPEARANCE of Thomas Cmar, and CERTIFICATE OF SERVICE, copies of which are served on you along with this notice. You may be required to attend a hearing on a date set by the Board. Failure to file an answer to this Complaint within 60 days may have severe consequences. Failure to answer will mean that all allegations in this Complaint will be taken as if admitted for purposes of this proceeding. If you have any questions about this procedure, you should contact the hearing officer assigned to this proceeding, the Clerk's Office or an attorney.

Dated: March 29, 2019

Respectfully Submitted,

[signature]

Jennifer Cassel (IL Bar No. 6296047)
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Counsel for Complainant Prairie Rivers Network

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

PRAIRIE RIVERS NETWORK,	)	
Complainant,	)	
	)	PCB No-
v.	)	(Enforcement-)
DYNEGY MIDWEST GENERATION, LLC,	)	
Respondent.	)	

ENTRY OF APPEARANCE

Jennifer Cassel hereby enters her appearance on behalf of Prairie Rivers Network in the above captioned case.

Respectfully Submitted,

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Complainant,	)	
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DYNEGY MIDWEST GENERATION, LLC,	)	
Respondent.	)	

<u>ENTRY OF APPEARANCE</u>

Thomas Cmar hereby enters his appearance on behalf of Prairie Rivers Network in the above captioned case.

Respectfully Submitted,

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Counsel for Complainant Prairie Rivers Network

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

PRAIRIE RIVERS NETWORK,	)	
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DYNEGY MIDWEST GENERATION, LLC,	)	
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COMPLAINT

Complainant Prairie Rivers Network hereby alleges as follows:

FACTUAL BACKGROUND

1. The Vermilion Power Station is owned by Respondent Dynegy Midwest Generation, LLC ("Dynegy"), a subsidiary of Vistra Energy Corporation ("Vistra"). The Vermilion Power Station ("Vermilion plant" or "the plant") is a retired coal-fired power plant located approximately five miles north of the village of Oakwood, Illinois.

The Middle Fork

2. The plant sits on the west bank of the Middle Fork of the Vermilion River ("Middle Fork"), in a 17-mile section designated as Illinois' only National Scenic River and first State Scenic River.

3. As a National Scenic River, the Middle Fork's outstandingly remarkable values[1] include scenic, geologic, fish and wildlife, ecological, recreational, and historic resources. The

[1] The Wild and Scenic Rivers Act, which was enacted in 1968, established a national policy that certain rivers with "outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, shall be preserved in free-flowing condition," and that these rivers "and their immediate environments shall be protected for the benefit and enjoyment of present and future generations." 16 U.S.C. § 1271.

Middle Fork and its surrounding area are home to 22 threatened or endangered species,[2] 57 types of fish,[3] 46 different mammal species,[4] and 270 different bird species.[5] Among the aquatic life that have been found in the Middle Fork, including areas directly adjacent to the plant, are the state-endangered Bluebreast Darter and several species of rare, threatened, and endangered mussels.[6] The American bald eagle, river otter, and wild turkey have all returned to the area, sharing their habitat with mink, turtles, Great Blue Heron, and other species that never left.[7]

4. The Middle Fork and the flora and fauna the river supports draw visitors from near and far. Canoeing and kayaking on the Middle Fork are popular pastimes, as is hiking the trails of the Kickapoo State Recreation Area, Kennekuk Cove County Park, and Middle Fork State Fish and Wildlife Area, all located along the Middle Fork. Other visitors come to the river and its shoreline parks to camp, walk their dogs, ride horses, hunt, photograph wildlife, picnic, or just to bask in the Middle Fork's scenic beauty.

The Vermilion Plant

5. From the mid-1950s until 2011, the Vermilion plant burned coal and generated millions of tons of coal combustion residuals ("coal ash"). Dynegy and its predecessors mixed the coal ash generated at the plant with water and sluiced it into three unlined coal ash pits, known as the Old East Ash Pond, the North Ash Pond System, and the New East Ash Pond.

6. When the plant opened in 1955, ash was flushed into the Old East Ash Pond. That pit was in service until the North Ash Pond System, a two-cell pit, was built in the mid-

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[2] Illinois Natural History Survey, "Vermilion River," http://wwx.inhs.illinois.edu/research/rra/site17/.
[3] Illinois Department of Conservation, Corridor Management Plan, Middle Fork of the Vermilion River, National Wild and Scenic River System, at 37 (Apr. 1992), https://www.rivers.gov/documents/plans/middle-fork-vermilion-plan.pdf.
[4] Illinois Department of Natural Resources, The Vermilion River Basin: An Inventory of the Region's Resources, at 16 (2000), https://www.dnr.illinois.gov/publications/Documents/00000416.pdf.
[5] *Id*. at 15.
[6] *Id*. at 17.
[7] *Id*. at 15-19; Vermilion County Conservation District, "Wildlife," http://www.vccd.org/wildlife/.

1970s. In 1989, the coal ash was diverted to the New East Ash Pond, which received coal ash until the plant's closure in 2011.

7. Although the coal ash pits are out of service, all three continue to store coal ash – including coal ash as deep as 44 feet in some locations. The three unlined coal ash pits contain an approximate total of 3.33 million cubic yards of coal ash.

8. Dynegy continues to own these coal ash pits and remains responsible for maintaining them, as well as performing any remaining activities at the plant.

Coal Ash

9. Coal ash, such as that in the coal ash pits at the Vermilion plant, contains heavy metals and other toxic pollutants that are harmful and at times deadly to people, aquatic life, and animals. Among the contaminants found in coal ash are arsenic, barium, boron, chromium, lead, manganese, molybdenum, nickel, and sulfate.[8]

10. These contaminants can inflict severe harm, including brain damage, cancer, learning disabilities, birth defects, and reproductive defects. They are also dangerous to aquatic ecosystems, which is a significant concern where that contaminated groundwater is migrating into adjacent surface water bodies.

11. Boron, sulfate, pH, and total dissolved solids ("TDS") are primary indicators of coal ash impacts to water.[9]

12. Arsenic is a well-known carcinogen that also damages the nervous system.[10]

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[8] *See, e.g.*, 80 Fed. Reg. 21,302, 21,311, 21,500 (Apr. 17, 2015), https://www.gpo.gov/fdsys/pkg/FR-2015-04-17/pdf/2015-00257.pdf.

[9] *See, e.g.*, *id.* at 21,342 (identifying boron, sulfate, pH, and TDS as "indicator parameters . . . known to be leading indicators of releases of contaminants associated with [coal combustion residuals]").

[10] *See, e.g.*, U.S. EPA, Integrated Risk Information System: Arsenic, inorganic, https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0278_summary.pdf; U.S. Agency for Toxic Substances and Disease Registry ("ATSDR"), Toxicological Profile for Arsenic (Aug. 2007), https://www.atsdr.cdc.gov/toxprofiles/tp2.pdf.

13. Manganese is associated with learning disabilities and nervous system impairment, and can render water unusable by discoloring the water, giving it a metallic taste, and causing black staining.[11]

14. Molybdenum has been linked to gout (joint pain, fatigue), increased blood uric acid levels, high blood pressure, liver disease, and potential adverse impacts on the reproductive system.[12]

15. Boron, a dependable indicator of coal ash contamination, can lead to reduced sperm count, testicular degeneration, birth defects, and low birth weight among humans.[13]

Groundwater Contamination at Dynegy's Vermilion Power Station

16. Groundwater monitoring at the North Ash Pond System and Old East Ash Pond was performed from 1992 through 2007, and again in 2011 and 2017 through 2018. The locations of the groundwater monitoring wells sampled during those time periods are depicted on maps included in Dynegy's groundwater monitoring reports, attached hereto as Exhibits 1[14] and 2[15].

17. Over the extended period of groundwater monitoring undertaken between 1992 and 2007, concentrations of boron and sulfate consistently exceeded Illinois Class I and Class II

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[11] *See, e.g.*, U.S. EPA, Integrated Risk Information System: Manganese, https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0373_summary.pdf; U.S. EPA, "Secondary Drinking Water Regulations: Guidance for Nuisance Chemicals," http://water.epa.gov/drink/contaminants/secondarystandards.cfm.

[12] *See* ATSDR, Toxicological Profile for Molybdenum: Draft for Public Comment, at 9-10 (Apr. 2017), https://www.atsdr.cdc.gov/toxprofiles/tp212.pdf; U.S. EPA, Integrated Risk Information System: Molybdenum, https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0425_summary.pdf.

[13] *See, e.g.*, U.S. EPA, Toxicological Review of Boron and Compounds at 60-61 (June 2004), https://cfpub.epa.gov/ncea/iris/iris_documents/documents/toxreviews/0410tr.pdf; U.S. EPA, Integrated Risk Information System: Boron and Compounds, https://cfpub.epa.gov/ncea/iris/iris_documents/documents/subst/0410_summary.pdf.

[14] Natural Resource Technology, Inc. ("NRT"), Application for Groundwater Management Zone, North Ash Pond System and Old East Ash Pond, at Figure 2 (Mar. 27, 2012).

[15] OBG, 2018 Groundwater Monitoring and Modeling Report, North Ash Pond System and Old East Ash Pond System, at Figure 2 (Oct. 2018).

groundwater quality standards, 35 Ill. Admin. Code §§ 620.410, 620.420.[16] *See* Violations of Illinois Class I Groundwater Quality Standards, attached hereto as Exhibit 3 and Violations of Illinois Class II Groundwater Quality Standards, attached hereto as Exhibit 4.[17] Upon information and belief, over this same extended period of groundwater monitoring, concentrations of iron, manganese, pH, and TDS consistently exceeded Illinois Class I groundwater quality standards.[18]

18. During four groundwater sampling events in 2011, there were at least 61 exceedances of Class I and Class II Illinois groundwater quality standards for boron, sulfate, TDS, pH, and iron,[19] and at least 21 exceedances of Illinois Class I groundwater quality standards for arsenic, beryllium, and manganese.[20] *See* Violations of Illinois Class I Groundwater Quality Standards, attached hereto as Exhibit 3 and Violations of Illinois Class II Groundwater Quality Standards, attached hereto as Exhibit 4.

19. Dynegy's 2018 Groundwater Monitoring and Modeling Report shows that from July 2017 to May 2018 there were at least 88 exceedances of Class I and Class II Illinois groundwater quality standards for boron, iron, pH, sulfate, and TDS,[21] and at least 43 exceedances of Class I Illinois groundwater quality standards for arsenic and manganese at multiple locations.[22] *See* Violations of Illinois Class I Groundwater Quality Standards, attached hereto as Exhibit 3 and Violations of Illinois Class II Groundwater Quality Standards, attached

[16] *See* Kelron Environmental, Hydrogeology and Groundwater Quality of the Old East Ash Pond, Vermilion Power Station, at Table 10 (Mar. 15, 2012) [hereinafter "OEAP Report"].
[17] The charts attached as Exhibits 3 and 4 were assembled as summaries of available sampling data and reports prepared by consultants to Dynegy and its predecessors.
[18] OEAP Report at Table 10.
[19] *See* Kelron Environmental, Hydrogeology and Groundwater Quality of the North Ash Pond System, at Table 11 (Mar. 15, 2012) [hereinafter "NAPS Report"].
[20] *Id.*
[21] OBG, 2018 Groundwater Monitoring and Modeling Report at Table 3.
[22] *Id.*

hereto as Exhibit 4. The locations of the groundwater monitoring wells sampled during those time periods are depicted on maps included in Dynegy's groundwater monitoring report, attached hereto as Exhibits 1 & 2.

20. Consultants to Dynegy and its predecessors have concluded that the presence of boron and sulfate at the concentrations found at the Vermilion plant "indicat[e] that groundwater quality at the facility has been impacted by leachate from the [Old East Ash Pond] and [North Ash Pond System],"[23] and that the elevated concentrations of boron, sulfate, manganese, iron, pH, and TDS are "due to [coal ash] impacts to groundwater."[24]

21. Coal ash at the Vermilion plant has groundwater flowing through it year round.[25] While the thickness of saturated ash varies as groundwater levels rise and fall with the seasons, groundwater has saturated coal ash at depths of more than 21 feet.[26] That groundwater flows laterally through the ash, picking up contaminants in the process, while precipitation leaching down through the top of the coal ash mixes with the groundwater and further adds to the pollutant load in the groundwater.[27]

22. On July 6, 2012, the Illinois Environmental Protection Agency ("IEPA") sent Dynegy a Violation Notice describing violations of Section 12 of the Illinois Environmental Protection Act, 415 ILCS 5/12, and groundwater quality regulations, 35 Ill. Adm. Code §§ 620.115, 620.301, 620.401, 620.405, and 620.410, at the Vermilion plant. *See* 2012 Violation Notice for the Vermilion Power Station, attached hereto as Exhibit 5. In the Violation Notice,

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[23] NRT, Application for Groundwater Management Zone at 1-3; *see also* NRT, Corrective Action Plan: North Ash Pond System (Revised), at 1-2 (Apr. 2, 2014) [hereinafter "NAPS Revised CAP"]; NRT, Corrective Action Plan: Old East Ash Pond (Revised), at 1-2 (Apr. 2, 2014); OEAP Report at vi, 33, 35 (identifying boron and sulfate as primary indicators of coal ash contamination).
[24] OEAP Report at vi.
[25] *Id*. at v.
[26] *Id*.; *see also* NAPS Report at 22, Figures 6A, 6D.
[27] *See* OEAP Report at 26; NAPS Report at 26; NAPS Revised CAP at 2-2.

IEPA identified groundwater monitoring results that exceeded Illinois Class I and Class II groundwater quality standards and violated several sections of the Illinois Administrative Code.

Surface Water Contamination at Dynegy's Vermilion Power Station

23. Dynegy's own reports and reports authored by consultants to Dynegy or its predecessors have concluded that the coal ash contaminated groundwater flows right into the adjacent Middle Fork.[28]

24. In May 2016 and September 2017, Complainant Prairie Rivers Network ("PRN") sampled five discrete groundwater seeps discharging into the river. Independent laboratory testing revealed concentrations of arsenic, barium, boron, chromium, manganese, molybdenum, and sulfate in those seeps that exceed background levels and, for multiple pollutants, exceed health-based standards set by the U.S. Environmental Protection Agency and IEPA. Among the concentrations found in those sampling events was iron at concentrations as high as 241 mg/l and manganese at concentrations as high as 7.41 mg/l. Iron concentrations exceeded Illinois effluent standards in two samples taken in September 2017, and manganese concentrations exceeded Illinois effluent standards in one sample taken in May 2016 and one sample taken in September 2017. *See* Vermilion Sampling Results from May 2016, attached hereto as Exhibit 6 and Vermilion Sampling Results from September 2017, attached hereto as Exhibit 7.

25. Upon information and belief, dating back to at least June 2015, discharges from the coal ash pits at Vermilion plant have discolored, and are continuing to discolor, the Middle Fork in low-flow areas of the river adjacent to the coal ash pits with a bright orange-red color not of natural origin and not below obvious levels. *See* photos, attached hereto as Exhibit 9.

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[28] *See, e.g.*, OEAP Report at vi, 26; NAPS Report at 26, Tables 10 & 11; NAPS Revised CAP at 2-2; Dynegy Form 10-K, at 22 (fiscal year ending Dec. 31, 2016), https://www.Dynegy.com/sites/default/files/Dynegy_2016_Annual_Report.pdf.

26. On June 20, 2018, IEPA sent Dynegy a Violation Notice describing violations of Section 12 of the Illinois Environmental Protection Act, 415 ILCS 5/12, and Illinois water quality standards, 35 Ill. Admin. Code § 302.203, at the Vermilion plant. *See* 2018 Violation Notice for the Vermilion Power Station, attached hereto as Exhibit 8.

PARTIES

27. Complainant PRN is an Illinois non-profit organization with more than 1,000 members that protects water, heals land, and inspires change. Using the creative power of science, law, and collective action, PRN protects and restores rivers, returns healthy soils and diverse wildlife to lands, and transforms how the people of Illinois care for the earth and for each other. PRN holds events for members of the organization and the public along and on the Middle Fork, including immediately downstream of the pollution discharge points of Dynegy. It intends to hold similar events in the near future and thereafter.

28. Respondent Dynegy, a subsidiary of Vistra, owns the Vermilion plant. Dynegy and Vistra are headquartered at 6555 Sierra Drive in Irving, TX 75039. Dynegy is incorporated in the State of Delaware.

LEGAL BACKGROUND

29. Section 12 of the Illinois Environmental Protection Act provides that no person shall "[c]ause or threaten or allow the discharge of any contaminants into the environment . . . so as to cause or tend to cause water pollution in Illinois," 415 ILCS 5/12(a), and prohibits the deposition of "any contaminants upon the land in such place and manner so as to create a water pollution hazard." 415 ILCS 5/12(d).

30. "Water pollution" is defined as the "discharge of any contaminant into any waters of the State, as will or is likely to create a nuisance or render such waters harmful or detrimental

or injurious to public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate uses, or to livestock, wild animals, birds, fish, or other aquatic life." 415 ILCS 5/3.545.

31. "Water[]" is defined as "all accumulations of water, surface and underground, natural, and artificial, public and private, or parts thereof, which are wholly or partially within, flow through, or border upon this State." 415 ILCS 5/3.550.

32. "Contaminant" is defined as "any solid, liquid, or gaseous matter, any odor, or any form of energy, from whatever source." 415 ILCS 5/3.165.

33. Section 620.115 the Illinois Administrative Code states that "[n]o person shall cause, threaten or allow a violation of the [Illinois Environmental Protection] Act, the [Illinois Groundwater Protection Act] or regulations adopted by the Board thereunder, including but not limited to this Part." 35 Ill. Adm. Code § 620.115.

34. Section 620.301(a) states that "[n]o person shall cause, threaten or allow the release of any contaminant to a resource groundwater such that: (1) Treatment or additional treatment is necessary to continue an existing use or to assure a potential use of such groundwater; or (2) An existing or potential use of such groundwater is precluded." *Id.* § 620.301(a).

35. Section 620.405 states that "[n]o person shall cause, threaten or allow the release of any contaminant to groundwater so as to cause a groundwater quality standard set forth in this Subpart to be exceeded." *Id.* § 620.405.

36. The Illinois Administrative Code establishes different groundwater quality standards for Class I and Class II groundwater. *Id.* §§ 620.410, 620.420.

37. Section 620.410 establishes Class I groundwater quality standards that cannot be exceeded in potable resource groundwater. *Id.* § 620.410. "Potable resource groundwater" is defined as:

> Groundwater located 10 feet or more below the land surface and within: (1) The minimum setback zone of a well which serves as a potable water supply and to the bottom of such well; (2) Unconsolidated sand, gravel or sand and gravel which is 5 feet or more in thickness and that contains 12 percent or less of fines . . . ; (3) Sandstone which is 10 feet or more in thickness, or fractured carbonate which is 15 feet or more in thickness; or (4) Any geologic material which is capable of a: (A) sustained groundwater yield, from up to a 12 inch borehole, of 150 gallons per day or more from a thickness of 15 feet or less; or (B) Hydraulic conductivity of 1 x 10^{-4} cm/sec or greater using one of the following test methods or its equivalent: (i) Permeameter; (ii) Slug test; or (iii) Pump test.

Id. § 620.210(a).

38. Section 620.420 establishes Class II groundwater quality standards that cannot be exceeded in general resource groundwater. *Id.* § 620.420. "General resource groundwater" is defined as "groundwater which does not meet the provisions of . . . Class I . . . Class III . . . or . . . Class IV" and "groundwater which is found by the Board, pursuant to the petition procedures set forth in Section 620.260, to be capable of agricultural, industrial, recreational or other beneficial uses." *Id.* § 620.220.

39. The Illinois Class I and Class II groundwater quality standards for contaminants identified in this complaint are as follows:

Pollutant	Illinois Class I Groundwater Quality Standard	Illinois Class II Groundwater Quality Standard
Arsenic (mg/L)	0.010	0.2
Beryllium (mg/L)	0.004	0.5
Boron (mg/L)	2.0	2.0
Iron (mg/L)	5.0	5.0
Manganese (mg/L)	0.15	10.0
pH	Except due to natural causes, a pH range of 6.5 - 9.0 units must not be exceeded in Class I groundwater.	Except due to natural causes, a pH range of 6.5 - 9.0 units must not be exceeded in Class II groundwater that is within 5 feet of the land surface.
Sulfate (mg/L)	400.0	400.0
TDS (mg/L)	1,200	1,200.0

40. Section 304.106 provides that "no effluent shall contain settleable solids, floating debris, visible oil, grease, scum or sludge solids. Color, odor and turbidity must be reduced to below obvious levels." *Id.* § 304.106. The term "effluent" is defined, in relevant part, as "any wastewater discharged, directly or indirectly, to the waters of the State or to any storm sewer, and the runoff from land used for the disposition of wastewater or sludges." *Id.* § 301.275.

41. Section 304.124 provides that "[n]o person shall cause or allow the concentration of the following constituents in any effluent to exceed the following levels, subject to the averaging rules contained in Section 304.104(a)." *Id.* § 304.124(a).

42. Section 304.124 sets the effluent limit for iron (total) at 2.0 mg/l, while the maximum level for manganese is 1.0 mg/l. *Id.*

43. Section 304.104(a) contains averaging rules which provide that no "grab sample" – that is, a sample "taken at a single time" – "shall exceed five times the prescribed numerical standard." *Id.* § 304.104(a)(3), (b)(3).

44. Section 302.203 provides that "[w]aters of the State shall be free from sludge or bottom deposits, floating debris, visible oil, odor, plant or algal growth, color or turbidity of other than natural origin." *Id.* § 302.203.

CLAIMS FOR RELIEF

Count 1: Violations of Illinois Environmental Protection Act Section 12(a)

45. Complainant re-alleges and incorporates the allegations of all the preceding paragraphs of this Complaint, as well as all exhibits, as if fully set forth herein.

46. Dynegy, through its disposal and storage of coal ash at the Vermilion Power Station, has discharged contaminants into the environment and the Middle Fork and thereby caused, and continues to cause, water pollution in violation of 415 ILCS 5/12(a).

47. Specifically, between 1992 and 2018, contamination from Dynegy's disposal and storage of coal ash at the Vermilion Power Station caused at least 540 exceedances of Illinois Class I Groundwater Quality Standards for arsenic, beryllium, boron, iron, manganese, pH, sulfate, and TDS. *See* Exhibit 3; 35 Ill. Admin. Code § 620.410.

48. Alternatively, between 1992 and 2018, contamination from Dynegy's disposal and storage of coal ash at the Vermilion Power Station caused at least 476 exceedances of Illinois Class II Groundwater Quality Standards for boron, iron, pH, sulfate, and TDS. *See* Exhibit 4; 35 Ill. Admin. Code § 620.420.

Count 2: Violations of Illinois Environmental Protection Act Section 12(d)

49. Complainant re-alleges and incorporates the allegations of all the preceding paragraphs of this Complaint, as well as all exhibits, as if fully set forth herein.

50. Dynegy, through its disposal and storage of coal ash at Vermilion Power Station, has discharged contaminants into the environment and the Middle Fork and thereby created, and continues to create, a water pollution hazard in violation of 415 ILCS 5/12(d).

51. Specifically, between 1992 and 2018, contamination from Dynegy's disposal and storage of coal ash at the Vermilion Power Station caused at least 540 exceedances of Illinois Class I Groundwater Quality Standards for arsenic, beryllium, boron, iron, manganese, pH, sulfate, and TDS. *See* Exhibit 3; 35 Ill. Admin. Code § 620.410.

52. Alternatively, between 1992 and 2018, contamination from Dynegy's disposal and storage of coal ash at the Vermilion Power Station caused at least 476 exceedances of Illinois Class II Groundwater Quality Standards for boron, iron, pH, sulfate, and TDS. *See* Exhibit 4; 35 Ill. Admin. Code § 620.420.

Count 3: Violations of Illinois Groundwater Regulations

53. Complainant re-alleges and incorporates the allegations of all the preceding paragraphs of this Complaint, as well as all exhibits, as if fully set forth herein.

54. As result of the multiple exceedances of Class I and Class II groundwater quality standards caused by contamination from the coal ash impoundments at the Vermilion plant, Dynegy has violated, and continues to violate, 35 Ill. Admin. Code §§ 620.115, 620.301(a), and 620.405.

Count 4: Violations of Illinois Effluent Standards

55. Complainant re-alleges and incorporates the allegations of all the preceding paragraphs of this Complaint, as well as all the exhibits, as if fully set forth herein.

56. Dynegy's discharges have included, and continue to include, iron, and manganese at concentrations exceeding the effluent limits in 35 Ill. Admin. Code § 304.124.

57. Specifically, in May 2016 and September 2017, Dynegy's discharges caused at least four exceedances of Illinois effluent standards for iron and manganese:

#	Pollutant	Sample Value (mg/L)	Numerical Standard (Five Times Effluent Limit) (mg/L)	Collection Date
1.	Manganese	7.4155	5.0	5/6/2016
2.	Iron	129.0	10.0	9/21/2017
3.	Iron	241.0	10.0	9/21/2017
4.	Manganese	7.35	5.0	9/21/2017

58. Dynegy's discharges of pollutants have been, and continue to be, a bright orange-red color that stands out distinctly and is not "below obvious levels," in violation of 35 Ill. Adm. Code § 304.106. Such brightly-colored discharges have occurred on at least five occasions and, upon information and belief, are ongoing. *See* photos, attached hereto as Exhibit 9, and table below.

#	Date of Violation
1.	June 26, 2015
2.	April 17, 2016
3.	Summer 2017
4.	September 21, 2017
5.	May 17, 2018

Count 5: Violations of Illinois Water Quality Standards

59. Complainant re-alleges and incorporates the allegations of all the preceding paragraphs of this Complaint, as well as all the exhibits, as if fully set forth herein.

60. Dynegy's discharges of pollutants have discolored, and are continuing to discolor, the Middle Fork a bright orange-red color not of natural origin, in violation of 35 Ill. Admin. Code § 302.203. Such brightly-colored discharges have discolored the Middle Fork in colors not of natural origin on at least five occasions and, upon information and belief, are ongoing.

#	Date of Violation
1.	June 26, 2015
2.	April 17, 2016
3.	Summer 2017
4.	September 21, 2017
5.	May 17, 2018

RELIEF REQUESTED

WHEREFORE, Complainant Prairie Rivers Network respectfully requests that the Illinois Pollution Control Board enter an order against Respondent Dynegy that:

A. DECLARES that Respondent has violated, and continues to violate, the Illinois Environmental Protection Act and implementing regulations by causing groundwater and surface water pollution at its Vermilion Power Station site;

B. IMPOSES civil penalties for these hundreds of violations, pursuant to 415 Ill. Comp. Stat. 5/42;

C. ORDERS Respondent, pursuant to 415 Ill. Comp. Stat. 5/33, to:

i. Cease and desist from causing or threatening to cause water pollution,

ii. Modify its coal ash and coal combustion residual waste disposal and storage practices so as to avoid future water contamination, and

iii. Remediate the contaminated groundwater and surface water so that it meets applicable Illinois Groundwater Quality Standards and Illinois Water Quality Standards; and

D. GRANTS other such relief as the Board deems just and proper.

Respectfully submitted the 29th of March, 2019.

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Exhibit 1

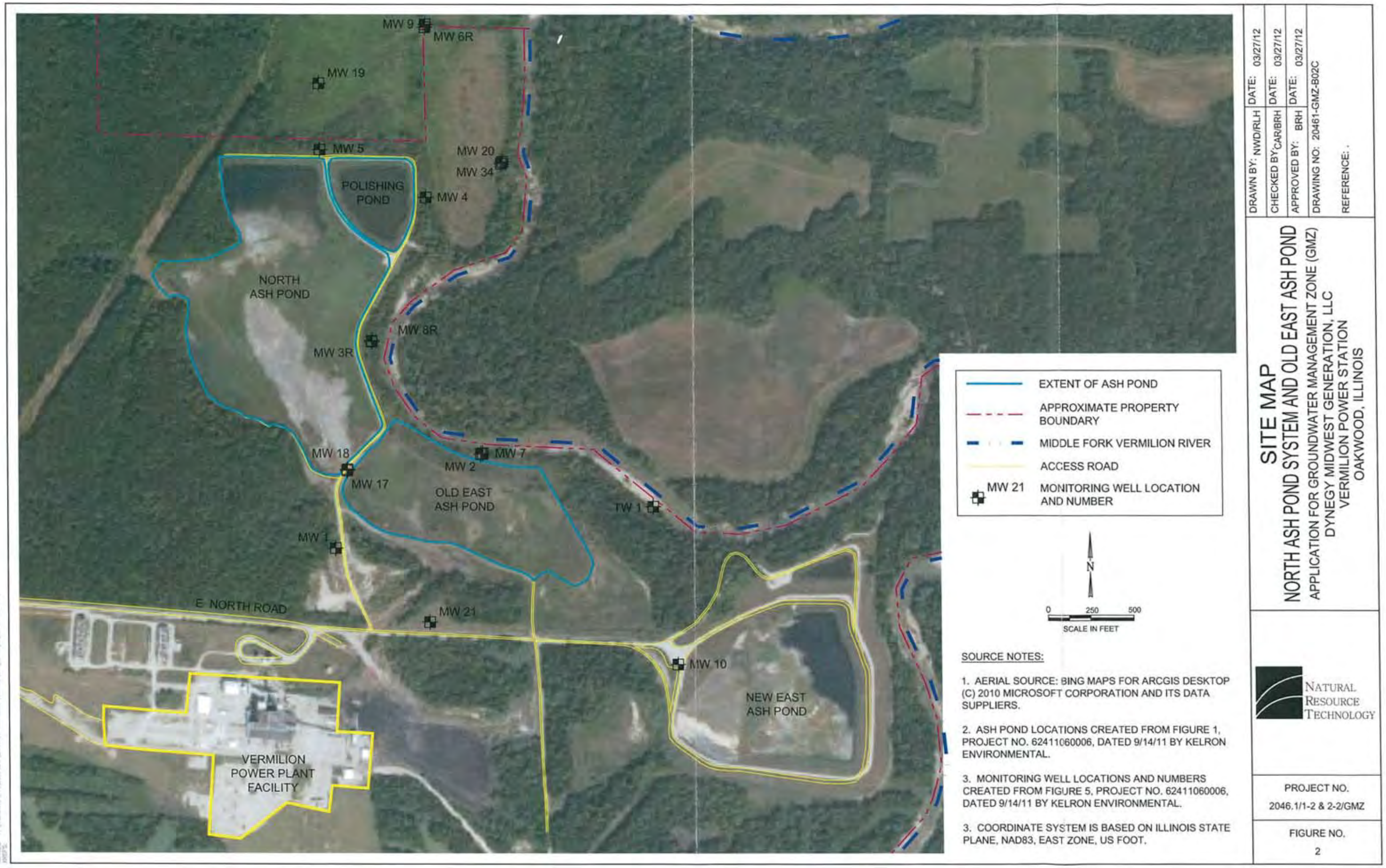
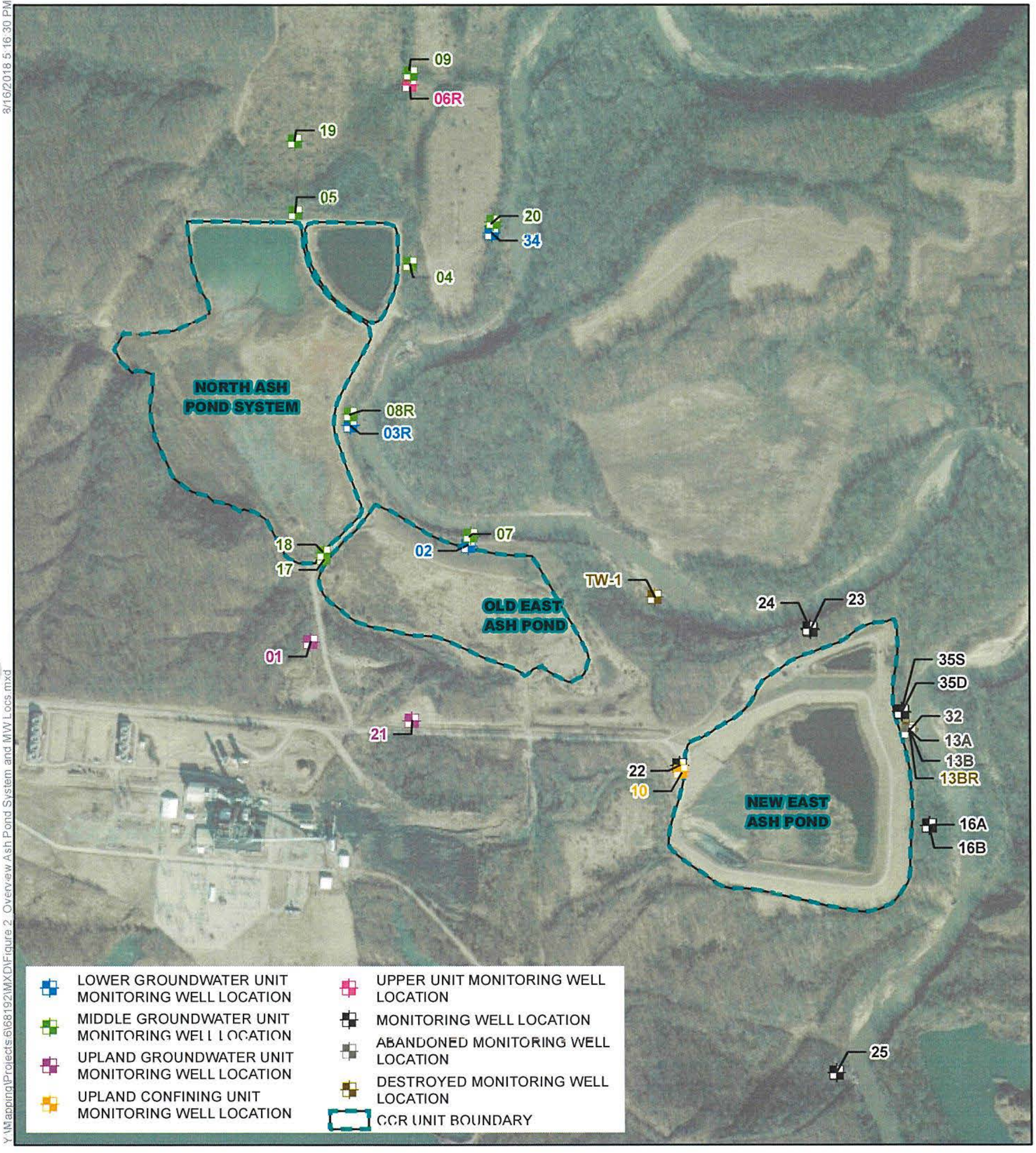

MW 9
MW 6R
MW 19
MW 5
MW 20
MW 34
POLISHING POND
MW 4
NORTH ASH POND
MW 8R
MW 3R
MW 18
MW 17
MW 7
MW 2
OLD EAST ASH POND
TW 1
MW 1
E. NORTH ROAD
MW 21
MW 10
NEW EAST ASH POND
VERMILION POWER PLANT FACILITY
EXTENT OF ASH POND
APPROXIMATE PROPERTY BOUNDARY
MIDDLE FORK VERMILION RIVER
ACCESS ROAD
MW 21 MONITORING WELL LOCATION AND NUMBER
N
0 250 500
SCALE IN FEET
SOURCE NOTES:
1. AERIAL SOURCE: BING MAPS FOR ARCGIS DESKTOP (C) 2010 MICROSOFT CORPORATION AND ITS DATA SUPPLIERS.
2. ASH POND LOCATIONS CREATED FROM FIGURE 1, PROJECT NO. 62411060006, DATED 9/14/11 BY KELRON ENVIRONMENTAL.
3. MONITORING WELL LOCATIONS AND NUMBERS CREATED FROM FIGURE 5, PROJECT NO. 62411060006, DATED 9/14/11 BY KELRON ENVIRONMENTAL.
3. COORDINATE SYSTEM IS BASED ON ILLINOIS STATE PLANE, NAD83, EAST ZONE, US FOOT.
DRAWN BY: NWD/RLH DATE: 03/27/12
CHECKED BY: CAR/BRH DATE: 03/27/12
APPROVED BY: BRH DATE: 03/27/12
DRAWING NO: 20461-GMZ-B02C
REFERENCE: .
SITE MAP
NORTH ASH POND SYSTEM AND OLD EAST ASH POND
APPLICATION FOR GROUNDWATER MANAGEMENT ZONE (GMZ)
DYNEGY MIDWEST GENERATION, LLC
VERMILION POWER STATION
OAKWOOD, ILLINOIS
NATURAL RESOURCE TECHNOLOGY
PROJECT NO.
2046.1/1-2 & 2-2/GMZ
FIGURE NO.
2

Exhibit 2

FIGURE NO. 2



OVERVIEW OF ASH POND SYSTEM AND SITE MONITORING WELL LOCATIONS

GROUNDWATER MONITORING AND MODELING REPORT
NORTH ASH POND SYSTEM AND OLD EAST ASH POND
VERMILION SITE
OAKWOOD, ILLINOIS

O'BRIEN & GERE ENGINEERS, INC.

Exhibit 3

Violations of Illinois Class I Groundwater Quality Standards

#	Well	Pollutant	Sample Value (mg/l)	Class I GW Standard (mg/l)	Collection Date
1.	MW-08R	Arsenic	0.0106	0.010	11/08/2017
2.	MW-08R	Arsenic	0.0134	0.010	01/24/2018
3.	MW-02	Arsenic	0.0107	0.010	03/22/2018
4.	MW-34	Arsenic	0.023	0.010	07/13/2017
5.	MW-34	Arsenic	0.0232	0.010	09/13/2017
6.	MW-34	Arsenic	0.0229	0.010	11/08/2017
7.	MW-34	Arsenic	0.0233	0.010	01/24/2018
8.	MW-34	Arsenic	0.0223	0.010	03/22/2018
9.	MW-34	Arsenic	0.0221	0.010	05/09/2018
10.	MW-21	Arsenic	0.073	0.010	03/14/2011
11.	MW-21	Arsenic	0.064	0.010	05/24/2011
12.	MW-21	Arsenic	0.059	0.010	07/26/2011
13.	MW-21	Arsenic	0.060	0.010	10/11/2011
14.	MW-21	Arsenic	0.0247	0.010	07/13/2017
15.	MW-21	Arsenic	0.0305	0.010	09/13/2017
16.	MW-21	Arsenic	0.0313	0.010	11/08/2017
17.	MW-21	Arsenic	0.0357	0.010	01/24/2018
18.	MW-21	Arsenic	0.0322	0.010	03/22/2018
19.	MW-21	Arsenic	0.026	0.010	05/09/2018
20.	MW-17	Beryllium	0.0084	0.004	10/11/2011
21.	MW-04	Boron	+/-6	2.0	Q1 1997
22.	MW-04	Boron	+/-6	2.0	Q2 1997
23.	MW-04	Boron	+/-7	2.0	Q3 1997
24.	MW-04	Boron	+/-5	2.0	Q4 1997
25.	MW-04	Boron	+/-5	2.0	Q1 1998
26.	MW-04	Boron	+/-10	2.0	Q2 1998
27.	MW-04	Boron	+/-12	2.0	Q3 1998
28.	MW-04	Boron	+/-11	2.0	Q4 1998
29.	MW-04	Boron	+/-12	2.0	Q1 1999
30.	MW-04	Boron	+/-13	2.0	Q2 1999
31.	MW-04	Boron	+/-14	2.0	Q3 1999
32.	MW-04	Boron	+/-11	2.0	Q4 1999
33.	MW-04	Boron	+/-10	2.0	Q1 2000
34.	MW-04	Boron	+/-12	2.0	Q2 2000
35.	MW-04	Boron	+/-14	2.0	Q3 2000
36.	MW-04	Boron	+/-13	2.0	Q4 2000
37.	MW-04	Boron	+/-16	2.0	Q1 2001
38.	MW-04	Boron	+/-22	2.0	Q3 2001
39.	MW-04	Boron	+/-18	2.0	Q4 2001

40.	MW-04	Boron	+/-19	2.0	Q1 2002
41.	MW-04	Boron	+/-19	2.0	Q2 2002
42.	MW-04	Boron	+/-19	2.0	Q3 2002
43.	MW-04	Boron	+/-18	2.0	Q4 2002
44.	MW-04	Boron	+/-17	2.0	Q1 2003
45.	MW-04	Boron	+/-16	2.0	Q2 2003
46.	MW-04	Boron	+/-18	2.0	Q3 2003
47.	MW-04	Boron	+/-18	2.0	Q4 2003
48.	MW-04	Boron	+/-15	2.0	Q1 2004
49.	MW-04	Boron	+/-15	2.0	Q2 2004
50.	MW-04	Boron	+/-15	2.0	Q3 2004
51.	MW-04	Boron	+/-12	2.0	Q4 2004
52.	MW-04	Boron	+/-12	2.0	Q1 2005
53.	MW-04	Boron	+/-13	2.0	Q2 2005
54.	MW-04	Boron	+/-15	2.0	Q3 2005
55.	MW-04	Boron	+/-11	2.0	Q4 2005
56.	MW-04	Boron	+/-8	2.0	Q1 2006
57.	MW-04	Boron	+/-9	2.0	Q2 2006
58.	MW-04	Boron	+/-10	2.0	Q3 2006
59.	MW-04	Boron	+/-9	2.0	Q4 2006
60.	MW-04	Boron	+/-8	2.0	Q1 2007
61.	MW-04	Boron	+/-10	2.0	Q2 2007
62.	MW-04	Boron	4.9	2.0	03/08/2011
63.	MW-04	Boron	5.7	2.0	05/24/2011
64.	MW-04	Boron	7.1	2.0	07/27/2011
65.	MW-04	Boron	7.8	2.0	10/10/2011
66.	MW-04	Boron	6.68	2.0	07/13/2017
67.	MW-04	Boron	6.48	2.0	09/13/2017
68.	MW-04	Boron	6.20	2.0	11/08/2017
69.	MW-04	Boron	5.48	2.0	01/24/2018
70.	MW-04	Boron	4.80	2.0	03/22/2018
71.	MW-04	Boron	5.87	2.0	05/09/2018
72.	MW-05	Boron	+/-5	2.0	Q1 1997
73.	MW-05	Boron	+/-5	2.0	Q2 1997
74.	MW-05	Boron	+/-5	2.0	Q3 1997
75.	MW-05	Boron	+/-5	2.0	Q4 1997
76.	MW-05	Boron	+/-5	2.0	Q1 1998
77.	MW-05	Boron	+/-10	2.0	Q2 1998
78.	MW-05	Boron	+/-8	2.0	Q3 1998
79.	MW-05	Boron	+/-8	2.0	Q4 1998
80.	MW-05	Boron	+/-9	2.0	Q1 1999
81.	MW-05	Boron	+/-8	2.0	Q2 1999
82.	MW-05	Boron	+/-6	2.0	Q3 1999
83.	MW-05	Boron	+/-7	2.0	Q4 1999
84.	MW-05	Boron	+/-5	2.0	Q1 2000

85.	MW-05	Boron	+/-5	2.0	Q2 2000
86.	MW-05	Boron	+/-6	2.0	Q3 2000
87.	MW-05	Boron	+/-4	2.0	Q4 2000
88.	MW-05	Boron	+/-5	2.0	Q1 2001
89.	MW-05	Boron	+/-11	2.0	Q3 2001
90.	MW-05	Boron	+/-14	2.0	Q4 2001
91.	MW-05	Boron	+/-19	2.0	Q1 2002
92.	MW-05	Boron	+/-19	2.0	Q2 2002
93.	MW-05	Boron	+/-22	2.0	Q3 2002
94.	MW-05	Boron	+/-22	2.0	Q4 2002
95.	MW-05	Boron	+/-25	2.0	Q1 2003
96.	MW-05	Boron	+/-25	2.0	Q2 2003
97.	MW-05	Boron	+/-26	2.0	Q3 2003
98.	MW-05	Boron	+/-25	2.0	Q4 2003
99.	MW-05	Boron	+/-18	2.0	Q1 2004
100.	MW-05	Boron	+/-18	2.0	Q2 2004
101.	MW-05	Boron	+/-16	2.0	Q3 2004
102.	MW-05	Boron	+/-15	2.0	Q4 2004
103.	MW-05	Boron	+/-16	2.0	Q1 2005
104.	MW-05	Boron	+/-20	2.0	Q2 2005
105.	MW-05	Boron	+/-20	2.0	Q3 2005
106.	MW-05	Boron	+/-15	2.0	Q4 2005
107.	MW-05	Boron	+/-8	2.0	Q1 2006
108.	MW-05	Boron	+/-6	2.0	Q2 2006
109.	MW-05	Boron	+/-5	2.0	Q3 2006
110.	MW-05	Boron	+/-5	2.0	Q4 2006
111.	MW-05	Boron	+/-7	2.0	Q1 2007
112.	MW-05	Boron	+/-10	2.0	Q2 2007
113.	MW-05	Boron	20	2.0	03/09/2011
114.	MW-05	Boron	19	2.0	05/24/2011
115.	MW-05	Boron	19	2.0	07/27/2011
116.	MW-05	Boron	22	2.0	10/10/2011
117.	MW-05	Boron	17.9	2.0	07/13/2017
118.	MW-05	Boron	17.2	2.0	09/14/2017
119.	MW-05	Boron	17.8	2.0	11/08/2017
120.	MW-05	Boron	18.3	2.0	01/24/2018
121.	MW-05	Boron	16.7	2.0	03/22/2018
122.	MW-05	Boron	14.5	2.0	05/09/2018
123.	MW-07	Boron	+/-10	2.0	Q1 1998
124.	MW-07	Boron	+/-8	2.0	Q1 1999
125.	MW-08R	Boron	+/-29	2.0	Q1 1997
126.	MW-08R	Boron	+/-28	2.0	Q2 1997
127.	MW-08R	Boron	+/-29	2.0	Q3 1997
128.	MW-08R	Boron	+/-28	2.0	Q4 1997
129.	MW-08R	Boron	+/-26	2.0	Q1 1998

130.	MW-08R	Boron	+/-29	2.0	Q2 1998
131.	MW-08R	Boron	+/-28	2.0	Q3 1998
132.	MW-08R	Boron	+/-28	2.0	Q4 1998
133.	MW-08R	Boron	+/-29	2.0	Q1 1999
134.	MW-08R	Boron	+/-29	2.0	Q2 1999
135.	MW-08R	Boron	+/-32	2.0	Q3 1999
136.	MW-08R	Boron	+/-31	2.0	Q4 1999
137.	MW-08R	Boron	+/-30	2.0	Q1 2000
138.	MW-08R	Boron	+/-32	2.0	Q2 2000
139.	MW-08R	Boron	+/-26	2.0	Q1 2001
140.	MW-08R	Boron	+/-30	2.0	Q3 2001
141.	MW-08R	Boron	+/-26	2.0	Q4 2001
142.	MW-08R	Boron	+/-31	2.0	Q1 2002
143.	MW-08R	Boron	+/-32	2.0	Q2 2002
144.	MW-08R	Boron	+/-36	2.0	Q3 2002
145.	MW-08R	Boron	+/-31	2.0	Q1 2003
146.	MW-08R	Boron	+/-31	2.0	Q2 2003
147.	MW-08R	Boron	+/-36	2.0	Q3 2003
148.	MW-08R	Boron	+/-36	2.0	Q4 2003
149.	MW-08R	Boron	+/-28	2.0	Q1 2004
150.	MW-08R	Boron	+/-36	2.0	Q2 2004
151.	MW-08R	Boron	+/-37	2.0	Q3 2004
152.	MW-08R	Boron	+/-24	2.0	Q4 2004
153.	MW-08R	Boron	+/-16	2.0	Q1 2005
154.	MW-08R	Boron	+/-36	2.0	Q2 2005
155.	MW-08R	Boron	+/-37	2.0	Q3 2005
156.	MW-08R	Boron	+/-34	2.0	Q4 2005
157.	MW-08R	Boron	+/-3	2.0	Q1 2006
158.	MW-08R	Boron	+/-33	2.0	Q2 2006
159.	MW-08R	Boron	+/-32	2.0	Q3 2006
160.	MW-08R	Boron	+/-34	2.0	Q4 2006
161.	MW-08R	Boron	+/-18	2.0	Q2 2007
162.	MW-08R	Boron	29	2.0	05/24/2011
163.	MW-08R	Boron	37	2.0	07/27/2011
164.	MW-08R	Boron	40	2.0	10/10/2011
165.	MW-08R	Boron	47.7	2.0	07/13/2017
166.	MW-08R	Boron	52.8	2.0	09/14/2017
167.	MW-08R	Boron	51.6	2.0	11/08/2017
168.	MW-08R	Boron	20.7	2.0	01/24/2018
169.	MW-08R	Boron	38.4	2.0	03/22/2018
170.	MW-08R	Boron	32.4	2.0	05/09/2018
171.	MW-17	Boron	3.0	2.0	03/14/2011
172.	MW-17	Boron	2.7	2.0	05/23/2011
173.	MW-17	Boron	4.9	2.0	07/27/2011
174.	MW-17	Boron	6.0	2.0	10/11/2011

175.	MW-17	Boron	4.74	2.0	07/12/2017
176.	MW-17	Boron	5.24	2.0	09/13/2017
177.	MW-17	Boron	2.25	2.0	01/24/2018
178.	MW-17	Boron	3.25	2.0	03/22/2018
179.	MW-17	Boron	3.3	2.0	05/09/2018
180.	MW-18	Boron	11	2.0	03/14/2011
181.	MW-18	Boron	12	2.0	05/23/2011
182.	MW-18	Boron	9	2.0	07/27/2011
183.	MW-18	Boron	9.3	2.0	10/11/2011
184.	MW-18	Boron	8.22	2.0	07/12/2017
185.	MW-18	Boron	4.42	2.0	09/13/2017
186.	MW-18	Boron	3.40	2.0	11/08/2017
187.	MW-18	Boron	5.06	2.0	01/24/2018
188.	MW-18	Boron	7.95	2.0	03/22/2018
189.	MW-18	Boron	10.9	2.0	05/09/2018
190.	MW-20	Boron	+/-2.1	2.0	Q1 1997
191.	MW-20	Boron	+/-2.1	2.0	Q3 1997
192.	MW-20	Boron	+/-2.1	2.0	Q1 1998
193.	MW-20	Boron	+/-4	2.0	Q1 2002
194.	MW-20	Boron	+/-3	2.0	Q2 2002
195.	MW-20	Boron	+/-3	2.0	Q3 2002
196.	MW-20	Boron	+/-3	2.0	Q4 2002
197.	MW-20	Boron	+/-5	2.0	Q1 2003
198.	MW-20	Boron	+/-4	2.0	Q2 2003
199.	MW-20	Boron	+/-3	2.0	Q3 2003
200.	MW-20	Boron	+/-3	2.0	Q4 2003
201.	MW-20	Boron	+/-4	2.0	Q1 2004
202.	MW-20	Boron	+/-3	2.0	Q2 2004
203.	MW-20	Boron	+/-4	2.0	Q3 2004
204.	MW-20	Boron	+/-6	2.0	Q4 2004
205.	MW-20	Boron	+/-3	2.0	Q1 2005
206.	MW-20	Boron	+/-2.1	2.0	Q2 2005
207.	MW-20	Boron	+/-3	2.0	Q3 2005
208.	MW-20	Boron	+/-3	2.0	Q4 2005
209.	MW-20	Boron	+/-3	2.0	Q1 2006
210.	MW-20	Boron	+/-3	2.0	Q2 2006
211.	MW-20	Boron	+/-3	2.0	Q3 2006
212.	MW-20	Boron	+/-3	2.0	Q4 2006
213.	MW-20	Boron	+/-4	2.0	Q1 2007
214.	MW-20	Boron	+/-2.1	2.0	Q2 2007
215.	MW-02	Boron	+/-9	2.0	Q4 1997
216.	MW-03R	Boron	+/-2.1	2.0	Q1 1999
217.	MW-03R	Boron	+/-3	2.0	Q4 2001
218.	MW-03R	Boron	+/-4	2.0	Q1 2002
219.	MW-03R	Boron	+/-3.5	2.0	Q2 2002

220.	MW-03R	Boron	+/-3	2.0	Q3 2002
221.	MW-03R	Boron	+/-2.1	2.0	Q4 2002
222.	MW-03R	Boron	5.02	2.0	07/13/2017
223.	MW-03R	Boron	3.70	2.0	09/14/2017
224.	MW-03R	Boron	3.15	2.0	11/08/2017
225.	MW-03R	Boron	2.90	2.0	01/24/2018
226.	MW-03R	Boron	3.33	2.0	03/22/2018
227.	MW-03R	Boron	4.36	2.0	05/09/2018
228.	MW-01	Boron	+/-2.1	2.0	Q1 1997
229.	MW-01	Boron	+/-2.1	2.0	Q2 1997
230.	MW-01	Boron	+/-8	2.0	Q3 1997
231.	MW-01	Boron	+/-5	2.0	Q4 1997
232.	MW-01	Boron	+/-3.5	2.0	Q1 1998
233.	MW-01	Boron	+/-7	2.0	Q2 1998
234.	MW-01	Boron	+/-9	2.0	Q3 1998
235.	MW-01	Boron	+/-9	2.0	Q4 1998
236.	MW-01	Boron	+/-6	2.0	Q1 1999
237.	MW-01	Boron	+/-10	2.0	Q2 1999
238.	MW-01	Boron	+/-9	2.0	Q3 1999
239.	MW-01	Boron	+/-9	2.0	Q4 1999
240.	MW-01	Boron	+/-9	2.0	Q1 2000
241.	MW-01	Boron	+/-9	2.0	Q2 2000
242.	MW-01	Boron	+/-9	2.0	Q3 2000
243.	MW-01	Boron	+/-8	2.0	Q4 2000
244.	MW-01	Boron	+/-7	2.0	Q1 2001
245.	MW-01	Boron	+/-11	2.0	Q3 2001
246.	MW-01	Boron	+/-10	2.0	Q4 2001
247.	MW-01	Boron	+/-11	2.0	Q1 2002
248.	MW-01	Boron	+/-10	2.0	Q2 2002
249.	MW-01	Boron	+/-9	2.0	Q3 2002
250.	MW-01	Boron	+/-2.1	2.0	Q3 2003
251.	MW-01	Boron	+/-2.5	2.0	Q4 2003
252.	MW-01	Boron	+/-4	2.0	Q1 2004
253.	MW-01	Boron	+/-5	2.0	Q2 2004
254.	MW-01	Boron	+/-5	2.0	Q3 2004
255.	MW-01	Boron	+/-5	2.0	Q4 2004
256.	MW-01	Boron	+/-5	2.0	Q1 2005
257.	MW-01	Boron	+/-5	2.0	Q2 2005
258.	MW-01	Boron	+/-5	2.0	Q3 2005
259.	MW-01	Boron	+/-5	2.0	Q4 2005
260.	MW-01	Boron	+/-5	2.0	Q1 2006
261.	MW-01	Boron	+/-5	2.0	Q2 2006
262.	MW-01	Boron	+/-5	2.0	Q3 2006
263.	MW-01	Boron	+/-4	2.0	Q4 2006
264.	MW-01	Boron	+/-3.5	2.0	Q1 2007

265.	MW-01	Boron	+/-3.5	2.0	Q2 2007
266.	MW-01	Boron	2.1	2.0	03/14/2011
267.	MW-01	Boron	3.0	2.0	10/11/2011
268.	MW-17	Iron	6.2	5.0	07/27/2011
269.	MW-17	Iron	8.6	5.0	10/11/2011
270.	MW-34	Iron	5.7	5.0	03/08/2011
271.	MW-34	Iron	5.3	5.0	07/26/2011
272.	MW-34	Iron	5.22	5.0	07/13/2017
273.	MW-34	Iron	5.34	5.0	09/13/2017
274.	MW-34	Iron	5.45	5.0	11/08/2017
275.	MW-34	Iron	5.12	5.0	01/24/2018
276.	MW-34	Iron	5.01	5.0	03/22/2018
277.	MW-34	Iron	5.02	5.0	05/09/2018
278.	MW-04	Manganese	0.91	0.15	03/08/2011
279.	MW-04	Manganese	1.0	0.15	05/24/2011
280.	MW-04	Manganese	0.9	0.15	07/27/2011
281.	MW-04	Manganese	1.0	0.15	10/10/2011
282.	MW-04	Manganese	0.551	0.15	07/13/2017
283.	MW-04	Manganese	0.547	0.15	09/13/2017
284.	MW-04	Manganese	0.547	0.15	11/08/2017
285.	MW-04	Manganese	0.629	0.15	01/24/2018
286.	MW-04	Manganese	0.595	0.15	03/22/2018
287.	MW-04	Manganese	0.750	0.15	05/09/2018
288.	MW-05	Manganese	0.31	0.15	03/09/2011
289.	MW-05	Manganese	0.29	0.15	05/24/2011
290.	MW-05	Manganese	0.31	0.15	07/27/2011
291.	MW-05	Manganese	0.34	0.15	10/10/2011
292.	MW-05	Manganese	0.332	0.15	07/13/2017
293.	MW-05	Manganese	0.325	0.15	09/14/2017
294.	MW-05	Manganese	0.456	0.15	11/08/2017
295.	MW-05	Manganese	0.362	0.15	01/24/2018
296.	MW-05	Manganese	0.358	0.15	03/22/2018
297.	MW-05	Manganese	0.408	0.15	05/09/2018
298.	MW-06R	Manganese	0.220	0.15	07/13/2017
299.	MW-06R	Manganese	0.225	0.15	09/13/2017
300.	MW-06R	Manganese	0.258	0.15	11/08/2017
301.	MW-06R	Manganese	0.228	0.15	01/24/2018
302.	MW-06R	Manganese	0.166	0.15	05/09/2018
303.	MW-08R	Manganese	0.22	0.15	05/24/2011
304.	MW-08R	Manganese	0.419	0.15	07/13/2017
305.	MW-08R	Manganese	0.343	0.15	01/24/2018
306.	MW-08R	Manganese	0.244	0.15	03/22/2018
307.	MW-17	Manganese	0.17	0.15	03/14/2011
308.	MW-17	Manganese	0.31	0.15	07/27/2011
309.	MW-17	Manganese	0.98	0.15	10/11/2011

310.	MW-17	Manganese	0.511	0.15	07/12/2017
311.	MW-17	Manganese	0.601	0.15	09/13/2017
312.	MW-18	Manganese	0.96	0.15	03/14/2011
313.	MW-18	Manganese	0.97	0.15	05/23/2011
314.	MW-18	Manganese	1.2	0.15	07/27/2011
315.	MW-18	Manganese	1.3	0.15	10/11/2011
316.	MW-18	Manganese	1.60	0.15	07/12/2017
317.	MW-18	Manganese	1.47	0.15	09/13/2017
318.	MW-18	Manganese	1.52	0.15	11/08/2017
319.	MW-18	Manganese	1.43	0.15	01/24/2018
320.	MW-18	Manganese	1.33	0.15	03/22/2018
321.	MW-18	Manganese	1.23	0.15	05/09/2018
322.	MW-08R	pH	6.35	6.5-9.0 s.u.	10/10/2011
323.	MW-17	pH	6.49	6.5-9.0 s.u.	03/14/2011
324.	MW-17	pH	5.05	6.5-9.0 s.u.	10/11/2011
325.	MW-10	pH	6.24	6.5-9.0 s.u.	05/09/2018
326.	MW-04	Sulfate	+/-500	400.0	Q2 1997
327.	MW-04	Sulfate	+/-450	400.0	Q3 1997
328.	MW-04	Sulfate	+/-500	400.0	Q1 1998
329.	MW-04	Sulfate	+/-500	400.0	Q2 1998
330.	MW-04	Sulfate	+/-450	400.0	Q3 1998
331.	MW-04	Sulfate	+/-500	400.0	Q1 1999
332.	MW-04	Sulfate	+/-500	400.0	Q3 1999
333.	MW-04	Sulfate	+/-450	400.0	Q4 1999
334.	MW-04	Sulfate	+/-500	400.0	Q1 2000
335.	MW-04	Sulfate	+/-500	400.0	Q2 2000
336.	MW-04	Sulfate	+/-600	400.0	Q3 2000
337.	MW-04	Sulfate	+/-700	400.0	Q4 2000
338.	MW-04	Sulfate	+/-1,100	400.0	Q1 2001
339.	MW-04	Sulfate	+/-1,200	400.0	Q3 2001
340.	MW-04	Sulfate	+/-1,400	400.0	Q4 2001
341.	MW-04	Sulfate	+/-500	400.0	Q1 2002
342.	MW-04	Sulfate	+/-800	400.0	Q2 2002
343.	MW-04	Sulfate	+/-800	400.0	Q3 2002
344.	MW-04	Sulfate	+/-900	400.0	Q4 2002
345.	MW-04	Sulfate	+/-800	400.0	Q1 2003
346.	MW-04	Sulfate	+/-800	400.0	Q2 2003
347.	MW-04	Sulfate	+/-1,000	400.0	Q3 2003
348.	MW-04	Sulfate	+/-700	400.0	Q4 2003
349.	MW-04	Sulfate	+/-500	400.0	Q1 2004
350.	MW-04	Sulfate	+/-450	400.0	Q2 2004
351.	MW-05	Sulfate	+/-500	400.0	Q1 1997
352.	MW-05	Sulfate	+/-500	400.0	Q2 1997
353.	MW-05	Sulfate	+/-410	400.0	Q3 1997
354.	MW-05	Sulfate	+/-410	400.0	Q4 1997

355.	MW-05	Sulfate	+/-500	400.0	Q1 1998
356.	MW-05	Sulfate	+/-500	400.0	Q2 1998
357.	MW-05	Sulfate	+/-500	400.0	Q3 1998
358.	MW-05	Sulfate	+/-500	400.0	Q4 1998
359.	MW-05	Sulfate	+/-450	400.0	Q1 1999
360.	MW-05	Sulfate	+/-410	400.0	Q2 1999
361.	MW-05	Sulfate	+/-410	400.0	Q4 1999
362.	MW-05	Sulfate	+/-410	400.0	Q4 2000
363.	MW-05	Sulfate	+/-450	400.0	Q1 2001
364.	MW-05	Sulfate	+/-800	400.0	Q3 2001
365.	MW-05	Sulfate	+/-1400	400.0	Q4 2001
366.	MW-05	Sulfate	+/-450	400.0	Q1 2002
367.	MW-05	Sulfate	+/-800	400.0	Q2 2002
368.	MW-05	Sulfate	+/-900	400.0	Q3 2002
369.	MW-05	Sulfate	+/-700	400.0	Q4 2002
370.	MW-05	Sulfate	+/-500	400.0	Q2 2003
371.	MW-05	Sulfate	+/-700	400.0	Q3 2003
372.	MW-05	Sulfate	+/-700	400.0	Q4 2003
373.	MW-05	Sulfate	+/-800	400.0	Q1 2004
374.	MW-05	Sulfate	+/-700	400.0	Q2 2004
375.	MW-05	Sulfate	+/-600	400.0	Q3 2004
376.	MW-05	Sulfate	+/-600	400.0	Q4 2004
377.	MW-05	Sulfate	+/-600	400.0	Q1 2005
378.	MW-05	Sulfate	+/-600	400.0	Q2 2005
379.	MW-05	Sulfate	+/-500	400.0	Q3 2005
380.	MW-05	Sulfate	+/-500	400.0	Q4 2005
381.	MW-05	Sulfate	+/-410	400.0	Q2 2007
382.	MW-05	Sulfate	410	400.0	05/24/2011
383.	MW-05	Sulfate	450	400.0	07/27/2011
384.	MW-05	Sulfate	480	400.0	10/10/2011
385.	MW-07	Sulfate	+/-1,100	400.0	Q1 1998
386.	MW-07	Sulfate	+/-1,200	400.0	Q1 1999
387.	MW-08R	Sulfate	+/-1,600	400.0	Q1 1997
388.	MW-08R	Sulfate	+/-1,600	400.0	Q2 1997
389.	MW-08R	Sulfate	+/-1,600	400.0	Q3 1997
390.	MW-08R	Sulfate	+/-1,800	400.0	Q4 1997
391.	MW-08R	Sulfate	+/-1,600	400.0	Q1 1998
392.	MW-08R	Sulfate	+/-1,500	400.0	Q2 1998
393.	MW-08R	Sulfate	+/-1,500	400.0	Q3 1998
394.	MW-08R	Sulfate	+/-1,400	400.0	Q4 1998
395.	MW-08R	Sulfate	+/-1,000	400.0	Q1 1999
396.	MW-08R	Sulfate	+/-1,300	400.0	Q2 1999
397.	MW-08R	Sulfate	+/-1,400	400.0	Q3 1999
398.	MW-08R	Sulfate	+/-1,300	400.0	Q4 1999
399.	MW-08R	Sulfate	+/-1,300	400.0	Q1 2000

400.	MW-08R	Sulfate	+/-1,300	400.0	Q2 2000
401.	MW-08R	Sulfate	+/-1,200	400.0	Q1 2001
402.	MW-08R	Sulfate	+/-1,300	400.0	Q3 2001
403.	MW-08R	Sulfate	+/-1,400	400.0	Q4 2001
404.	MW-08R	Sulfate	+/-1,400	400.0	Q1 2002
405.	MW-08R	Sulfate	+/-1,300	400.0	Q2 2002
406.	MW-08R	Sulfate	+/-1,600	400.0	Q3 2002
407.	MW-08R	Sulfate	+/-1,400	400.0	Q1 2003
408.	MW-08R	Sulfate	+/-1,200	400.0	Q2 2003
409.	MW-08R	Sulfate	+/-1,200	400.0	Q3 2003
410.	MW-08R	Sulfate	+/-1,500	400.0	Q4 2003
411.	MW-08R	Sulfate	+/-1,000	400.0	Q1 2004
412.	MW-08R	Sulfate	+/-1,200	400.0	Q2 2004
413.	MW-08R	Sulfate	+/-1,300	400.0	Q3 2004
414.	MW-08R	Sulfate	+/-800	400.0	Q4 2004
415.	MW-08R	Sulfate	+/-500	400.0	Q1 2005
416.	MW-08R	Sulfate	+/-1,300	400.0	Q2 2005
417.	MW-08R	Sulfate	+/-1,300	400.0	Q3 2005
418.	MW-08R	Sulfate	+/-1,400	400.0	Q4 2005
419.	MW-08R	Sulfate	+/-1,200	400.0	Q2 2006
420.	MW-08R	Sulfate	+/-1,300	400.0	Q3 2006
421.	MW-08R	Sulfate	+/-1,500	400.0	Q4 2006
422.	MW-08R	Sulfate	+/-800	400.0	Q2 2007
423.	MW-08R	Sulfate	1,000	400.0	05/24/2011
424.	MW-08R	Sulfate	1,300	400.0	07/27/2011
425.	MW-08R	Sulfate	1,500	400.0	10/10/2011
426.	MW-08R	Sulfate	1,140	400.0	07/13/2017
427.	MW-08R	Sulfate	1,210	400.0	09/14/2017
428.	MW-08R	Sulfate	1,140	400.0	11/08/2017
429.	MW-08R	Sulfate	1,010	400.0	03/22/2018
430.	MW-08R	Sulfate	754	400.0	05/09/2018
431.	MW-17	Sulfate	1,800	400.0	03/14/2011
432.	MW-17	Sulfate	1,700	400.0	05/23/2011
433.	MW-17	Sulfate	1,300	400.0	07/27/2011
434.	MW-17	Sulfate	610	400.0	10/11/2011
435.	MW-17	Sulfate	1,110	400.0	07/12/2017
436.	MW-17	Sulfate	1,020	400.0	09/13/2017
437.	MW-17	Sulfate	1,200	400.0	11/08/2017
438.	MW-17	Sulfate	976	400.0	01/24/2018
439.	MW-17	Sulfate	1,270	400.0	03/22/2018
440.	MW-17	Sulfate	1,150	400.0	05/09/2018
441.	MW-18	Sulfate	1,100	400.0	03/14/2011
442.	MW-18	Sulfate	1,300	400.0	05/23/2011
443.	MW-18	Sulfate	1,200	400.0	07/27/2011
444.	MW-18	Sulfate	930	400.0	10/11/2011

445.	MW-18	Sulfate	754	400.0	07/12/2017
446.	MW-18	Sulfate	784	400.0	09/13/2017
447.	MW-18	Sulfate	835	400.0	11/08/2017
448.	MW-18	Sulfate	749	400.0	01/24/2018
449.	MW-18	Sulfate	795	400.0	03/22/2018
450.	MW-18	Sulfate	700	400.0	05/09/2018
451.	MW-02	Sulfate	+/-1,100	400.0	Q4 1997
452.	MW-01	Sulfate	+/-1,600	400.0	Q1 1997
453.	MW-01	Sulfate	+/-1,600	400.0	Q2 1997
454.	MW-01	Sulfate	+/-1,100	400.0	Q3 1997
455.	MW-01	Sulfate	+/-1,500	400.0	Q4 1997
456.	MW-01	Sulfate	+/-1,800	400.0	Q1 1998
457.	MW-01	Sulfate	+/-1,300	400.0	Q2 1998
458.	MW-01	Sulfate	+/-1,200	400.0	Q3 1998
459.	MW-01	Sulfate	+/-1,300	400.0	Q4 1998
460.	MW-01	Sulfate	+/-1,100	400.0	Q1 1999
461.	MW-01	Sulfate	+/-1,400	400.0	Q2 1999
462.	MW-01	Sulfate	+/-1,400	400.0	Q3 1999
463.	MW-01	Sulfate	+/-1,300	400.0	Q4 1999
464.	MW-01	Sulfate	+/-1,400	400.0	Q1 2000
465.	MW-01	Sulfate	+/-1,200	400.0	Q2 2000
466.	MW-01	Sulfate	+/-1,300	400.0	Q3 2000
467.	MW-01	Sulfate	+/-1,400	400.0	Q4 2000
468.	MW-01	Sulfate	+/-1,400	400.0	Q1 2001
469.	MW-01	Sulfate	+/-1,600	400.0	Q3 2001
470.	MW-01	Sulfate	+/-1,300	400.0	Q4 2001
471.	MW-01	Sulfate	+/-1,200	400.0	Q1 2002
472.	MW-01	Sulfate	+/-1,400	400.0	Q2 2002
473.	MW-01	Sulfate	+/-1,500	400.0	Q3 2002
474.	MW-01	Sulfate	+/-1,500	400.0	Q4 2002
475.	MW-01	Sulfate	+/-1,500	400.0	Q1 2003
476.	MW-01	Sulfate	+/-1,300	400.0	Q2 2003
477.	MW-01	Sulfate	+/-1,500	400.0	Q3 2003
478.	MW-01	Sulfate	+/-1,500	400.0	Q4 2003
479.	MW-01	Sulfate	+/-1,500	400.0	Q1 2004
480.	MW-01	Sulfate	+/-1,500	400.0	Q2 2004
481.	MW-01	Sulfate	+/-1,400	400.0	Q3 2004
482.	MW-01	Sulfate	+/-1,300	400.0	Q4 2004
483.	MW-01	Sulfate	+/-1,200	400.0	Q1 2005
484.	MW-01	Sulfate	+/-1,000	400.0	Q2 2005
485.	MW-01	Sulfate	+/-1,000	400.0	Q3 2005
486.	MW-01	Sulfate	+/-1,100	400.0	Q4 2005
487.	MW-01	Sulfate	+/-1,100	400.0	Q1 2006
488.	MW-01	Sulfate	+/-1,000	400.0	Q2 2006
489.	MW-01	Sulfate	+/-1,100	400.0	Q3 2006

490.	MW-01	Sulfate	+/-1,100	400.0	Q4 2006
491.	MW-01	Sulfate	+/-1,000	400.0	Q1 2007
492.	MW-01	Sulfate	+/-1,000	400.0	Q2 2007
493.	MW-01	Sulfate	980	400.0	03/14/2011
494.	MW-01	Sulfate	950	400.0	05/24/2011
495.	MW-01	Sulfate	940	400.0	07/27/2011
496.	MW-01	Sulfate	1,000	400.0	10/11/2011
497.	MW-01	Sulfate	1,070	400.0	07/13/2017
498.	MW-01	Sulfate	995	400.0	09/13/2017
499.	MW-01	Sulfate	1,000	400.0	11/08/2017
500.	MW-01	Sulfate	1,040	400.0	01/24/2018
501.	MW-01	Sulfate	1,280	400.0	03/22/2018
502.	MW-01	Sulfate	1,070	400.0	05/09/2018
503.	MW-08R	TDS	1,700	1,200.0.	05/24/2011
504.	MW-08R	TDS	2,000	1,200.0	07/27/2011
505.	MW-08R	TDS	2,200	1,200.0	10/10/2011
506.	MW-08R	TDS	2,040	1,200.0	07/13/2017
507.	MW-08R	TDS	2,080	1,200.0	09/14/2017
508.	MW-08R	TDS	2,040	1,200.0	11/08/2017
509.	MW-08R	TDS	1,700	1,200.0	03/22/2018
510.	MW-08R	TDS	1,400	1,200.0	05/09/2018
511.	MW-17	TDS	2,700	1,200.0	03/14/2011
512.	MW-17	TDS	2,600	1,200.0	05/23/2011
513.	MW-17	TDS	2,200	1,200.0	07/27/2011
514.	MW-17	TDS	3,100	1,200.0	10/11/2011
515.	MW-17	TDS	2,030	1,200.0	07/12/2017
516.	MW-17	TDS	1,970	1,200.0	09/13/2017
517.	MW-17	TDS	2,020	1,200.0	11/08/2017
518.	MW-17	TDS	1,630	1,200.0	01/24/2018
519.	MW-17	TDS	2,090	1,200.0	03/22/2018
520.	MW-17	TDS	1,980	1,200.0	05/09/2018
521.	MW-18	TDS	2,000	1,200.0	03/14/2011
522.	MW-18	TDS	1,900	1,200.0	05/23/2011
523.	MW-18	TDS	1,800	1,200.0	07/27/2011
524.	MW-18	TDS	1,800	1,200.0	10/11/2011
525.	MW-18	TDS	1,600	1,200.0	07/12/2017
526.	MW-18	TDS	1,650	1,200.0	09/13/2017
527.	MW-18	TDS	1,710	1,200.0	11/08/2017
528.	MW-18	TDS	1,590	1,200.0	01/24/2018
529.	MW-18	TDS	1,540	1,200.0	03/22/2018
530.	MW-18	TDS	1,420	1,200.0	05/09/2018
531.	MW-01	TDS	1,900	1,200.0	03/14/2011
532.	MW-01	TDS	1,800	1,200.0	05/24/2011
533.	MW-01	TDS	1,800	1,200.0	07/27/2011
534.	MW-01	TDS	1,900	1,200.0	10/11/2011

535.	MW-01	TDS	2,060	1,200.0	07/13/2017
536.	MW-01	TDS	2,040	1,200.0	09/13/2017
537.	MW-01	TDS	2,070	1,200.0	11/08/2017
538.	MW-01	TDS	2,080	1,200.0	01/24/2018
539.	MW-01	TDS	2,240	1,200.0	03/22/2018
540.	MW-01	TDS	2,090	1,200.0	05/09/2018

Exhibit 4

Violations of Illinois Class II Groundwater Quality Standards

#	Well	Pollutant	Sample Value (mg/l)	Class II GW Standard (mg/l)	Collection Date
1.	MW-04	Boron	+/-6	2.0	Q1 1997
2.	MW-04	Boron	+/-6	2.0	Q2 1997
3.	MW-04	Boron	+/-7	2.0	Q3 1997
4.	MW-04	Boron	+/-5	2.0	Q4 1997
5.	MW-04	Boron	+/-5	2.0	Q1 1998
6.	MW-04	Boron	+/-10	2.0	Q2 1998
7.	MW-04	Boron	+/-12	2.0	Q3 1998
8.	MW-04	Boron	+/-11	2.0	Q4 1998
9.	MW-04	Boron	+/-12	2.0	Q1 1999
10.	MW-04	Boron	+/-13	2.0	Q2 1999
11.	MW-04	Boron	+/-14	2.0	Q3 1999
12.	MW-04	Boron	+/-11	2.0	Q4 1999
13.	MW-04	Boron	+/-10	2.0	Q1 2000
14.	MW-04	Boron	+/-12	2.0	Q2 2000
15.	MW-04	Boron	+/-14	2.0	Q3 2000
16.	MW-04	Boron	+/-13	2.0	Q4 2000
17.	MW-04	Boron	+/-16	2.0	Q1 2001
18.	MW-04	Boron	+/-22	2.0	Q3 2001
19.	MW-04	Boron	+/-18	2.0	Q4 2001
20.	MW-04	Boron	+/-19	2.0	Q1 2002
21.	MW-04	Boron	+/-19	2.0	Q2 2002
22.	MW-04	Boron	+/-19	2.0	Q3 2002
23.	MW-04	Boron	+/-18	2.0	Q4 2002
24.	MW-04	Boron	+/-17	2.0	Q1 2003
25.	MW-04	Boron	+/-16	2.0	Q2 2003
26.	MW-04	Boron	+/-18	2.0	Q3 2003
27.	MW-04	Boron	+/-18	2.0	Q4 2003
28.	MW-04	Boron	+/-15	2.0	Q1 2004
29.	MW-04	Boron	+/-15	2.0	Q2 2004
30.	MW-04	Boron	+/-15	2.0	Q3 2004
31.	MW-04	Boron	+/-12	2.0	Q4 2004
32.	MW-04	Boron	+/-12	2.0	Q1 2005
33.	MW-04	Boron	+/-13	2.0	Q2 2005
34.	MW-04	Boron	+/-15	2.0	Q3 2005
35.	MW-04	Boron	+/-11	2.0	Q4 2005
36.	MW-04	Boron	+/-8	2.0	Q1 2006
37.	MW-04	Boron	+/-9	2.0	Q2 2006
38.	MW-04	Boron	+/-10	2.0	Q3 2006
39.	MW-04	Boron	+/-9	2.0	Q4 2006

40.	MW-04	Boron	+/-8	2.0	Q1 2007
41.	MW-04	Boron	+/-10	2.0	Q2 2007
42.	MW-04	Boron	4.9	2.0	03/08/2011
43.	MW-04	Boron	5.7	2.0	05/24/2011
44.	MW-04	Boron	7.1	2.0	07/27/2011
45.	MW-04	Boron	7.8	2.0	10/10/2011
46.	MW-04	Boron	6.68	2.0	07/13/2017
47.	MW-04	Boron	6.48	2.0	09/13/2017
48.	MW-04	Boron	6.20	2.0	11/08/2017
49.	MW-04	Boron	5.48	2.0	01/24/2018
50.	MW-04	Boron	4.80	2.0	03/22/2018
51.	MW-04	Boron	5.87	2.0	05/09/2018
52.	MW-05	Boron	+/-5	2.0	Q1 1997
53.	MW-05	Boron	+/-5	2.0	Q2 1997
54.	MW-05	Boron	+/-5	2.0	Q3 1997
55.	MW-05	Boron	+/-5	2.0	Q4 1997
56.	MW-05	Boron	+/-5	2.0	Q1 1998
57.	MW-05	Boron	+/-10	2.0	Q2 1998
58.	MW-05	Boron	+/-8	2.0	Q3 1998
59.	MW-05	Boron	+/-8	2.0	Q4 1998
60.	MW-05	Boron	+/-9	2.0	Q1 1999
61.	MW-05	Boron	+/-8	2.0	Q2 1999
62.	MW-05	Boron	+/-6	2.0	Q3 1999
63.	MW-05	Boron	+/-7	2.0	Q4 1999
64.	MW-05	Boron	+/-5	2.0	Q1 2000
65.	MW-05	Boron	+/-5	2.0	Q2 2000
66.	MW-05	Boron	+/-6	2.0	Q3 2000
67.	MW-05	Boron	+/-4	2.0	Q4 2000
68.	MW-05	Boron	+/-5	2.0	Q1 2001
69.	MW-05	Boron	+/-11	2.0	Q3 2001
70.	MW-05	Boron	+/-14	2.0	Q4 2001
71.	MW-05	Boron	+/-19	2.0	Q1 2002
72.	MW-05	Boron	+/-19	2.0	Q2 2002
73.	MW-05	Boron	+/-22	2.0	Q3 2002
74.	MW-05	Boron	+/-22	2.0	Q4 2002
75.	MW-05	Boron	+/-25	2.0	Q1 2003
76.	MW-05	Boron	+/-25	2.0	Q2 2003
77.	MW-05	Boron	+/-26	2.0	Q3 2003
78.	MW-05	Boron	+/-25	2.0	Q4 2003
79.	MW-05	Boron	+/-18	2.0	Q1 2004
80.	MW-05	Boron	+/-18	2.0	Q2 2004
81.	MW-05	Boron	+/-16	2.0	Q3 2004
82.	MW-05	Boron	+/-15	2.0	Q4 2004
83.	MW-05	Boron	+/-16	2.0	Q1 2005
84.	MW-05	Boron	+/-20	2.0	Q2 2005

85.	MW-05	Boron	+/-20	2.0	Q3 2005
86.	MW-05	Boron	+/-15	2.0	Q4 2005
87.	MW-05	Boron	+/-8	2.0	Q1 2006
88.	MW-05	Boron	+/-6	2.0	Q2 2006
89.	MW-05	Boron	+/-5	2.0	Q3 2006
90.	MW-05	Boron	+/-5	2.0	Q4 2006
91.	MW-05	Boron	+/-7	2.0	Q1 2007
92.	MW-05	Boron	+/-10	2.0	Q2 2007
93.	MW-05	Boron	20	2.0	03/09/2011
94.	MW-05	Boron	19	2.0	05/24/2011
95.	MW-05	Boron	19	2.0	07/27/2011
96.	MW-05	Boron	22	2.0	10/10/2011
97.	MW-05	Boron	17.9	2.0	07/13/2017
98.	MW-05	Boron	17.2	2.0	09/14/2017
99.	MW-05	Boron	17.8	2.0	11/08/2017
100.	MW-05	Boron	18.3	2.0	01/24/2018
101.	MW-05	Boron	16.7	2.0	03/22/2018
102.	MW-05	Boron	14.5	2.0	05/09/2018
103.	MW-07	Boron	+/-10	2.0	Q1 1998
104.	MW-07	Boron	+/-8	2.0	Q1 1999
105.	MW-08R	Boron	+/-29	2.0	Q1 1997
106.	MW-08R	Boron	+/-28	2.0	Q2 1997
107.	MW-08R	Boron	+/-29	2.0	Q3 1997
108.	MW-08R	Boron	+/-28	2.0	Q4 1997
109.	MW-08R	Boron	+/-26	2.0	Q1 1998
110.	MW-08R	Boron	+/-29	2.0	Q2 1998
111.	MW-08R	Boron	+/-28	2.0	Q3 1998
112.	MW-08R	Boron	+/-28	2.0	Q4 1998
113.	MW-08R	Boron	+/-29	2.0	Q1 1999
114.	MW-08R	Boron	+/-29	2.0	Q2 1999
115.	MW-08R	Boron	+/-32	2.0	Q3 1999
116.	MW-08R	Boron	+/-31	2.0	Q4 1999
117.	MW-08R	Boron	+/-30	2.0	Q1 2000
118.	MW-08R	Boron	+/-32	2.0	Q2 2000
119.	MW-08R	Boron	+/-26	2.0	Q1 2001
120.	MW-08R	Boron	+/-30	2.0	Q3 2001
121.	MW-08R	Boron	+/-26	2.0	Q4 2001
122.	MW-08R	Boron	+/-31	2.0	Q1 2002
123.	MW-08R	Boron	+/-32	2.0	Q2 2002
124.	MW-08R	Boron	+/-36	2.0	Q3 2002
125.	MW-08R	Boron	+/-31	2.0	Q1 2003
126.	MW-08R	Boron	+/-31	2.0	Q2 2003
127.	MW-08R	Boron	+/-36	2.0	Q3 2003
128.	MW-08R	Boron	+/-36	2.0	Q4 2003
129.	MW-08R	Boron	+/-28	2.0	Q1 2004

130.	MW-08R	Boron	+/-36	2.0	Q2 2004
131.	MW-08R	Boron	+/-37	2.0	Q3 2004
132.	MW-08R	Boron	+/-24	2.0	Q4 2004
133.	MW-08R	Boron	+/-16	2.0	Q1 2005
134.	MW-08R	Boron	+/-36	2.0	Q2 2005
135.	MW-08R	Boron	+/-37	2.0	Q3 2005
136.	MW-08R	Boron	+/-34	2.0	Q4 2005
137.	MW-08R	Boron	+/-3	2.0	Q1 2006
138.	MW-08R	Boron	+/-33	2.0	Q2 2006
139.	MW-08R	Boron	+/-32	2.0	Q3 2006
140.	MW-08R	Boron	+/-34	2.0	Q4 2006
141.	MW-08R	Boron	+/-18	2.0	Q2 2007
142.	MW-08R	Boron	29	2.0	05/24/2011
143.	MW-08R	Boron	37	2.0	07/27/2011
144.	MW-08R	Boron	40	2.0	10/10/2011
145.	MW-08R	Boron	47.7	2.0	07/13/2017
146.	MW-08R	Boron	52.8	2.0	09/14/2017
147.	MW-08R	Boron	51.6	2.0	11/08/2017
148.	MW-08R	Boron	20.7	2.0	01/24/2018
149.	MW-08R	Boron	38.4	2.0	03/22/2018
150.	MW-08R	Boron	32.4	2.0	05/09/2018
151.	MW-17	Boron	3.0	2.0	03/14/2011
152.	MW-17	Boron	2.7	2.0	05/23/2011
153.	MW-17	Boron	4.9	2.0	07/27/2011
154.	MW-17	Boron	6.0	2.0	10/11/2011
155.	MW-17	Boron	4.74	2.0	07/12/2017
156.	MW-17	Boron	5.24	2.0	09/13/2017
157.	MW-17	Boron	2.25	2.0	01/24/2018
158.	MW-17	Boron	3.25	2.0	03/22/2018
159.	MW-17	Boron	3.3	2.0	05/09/2018
160.	MW-18	Boron	11	2.0	03/14/2011
161.	MW-18	Boron	12	2.0	05/23/2011
162.	MW-18	Boron	9	2.0	07/27/2011
163.	MW-18	Boron	9.3	2.0	10/11/2011
164.	MW-18	Boron	8.22	2.0	07/12/2017
165.	MW-18	Boron	4.42	2.0	09/13/2017
166.	MW-18	Boron	3.40	2.0	11/08/2017
167.	MW-18	Boron	5.06	2.0	01/24/2018
168.	MW-18	Boron	7.95	2.0	03/22/2018
169.	MW-18	Boron	10.9	2.0	05/09/2018
170.	MW-20	Boron	+/-2.1	2.0	Q1 1997
171.	MW-20	Boron	+/-2.1	2.0	Q3 1997
172.	MW-20	Boron	+/-2.1	2.0	Q1 1998
173.	MW-20	Boron	+/-4	2.0	Q1 2002
174.	MW-20	Boron	+/-3	2.0	Q2 2002

175.	MW-20	Boron	+/-3	2.0	Q3 2002
176.	MW-20	Boron	+/-3	2.0	Q4 2002
177.	MW-20	Boron	+/-5	2.0	Q1 2003
178.	MW-20	Boron	+/-4	2.0	Q2 2003
179.	MW-20	Boron	+/-3	2.0	Q3 2003
180.	MW-20	Boron	+/-3	2.0	Q4 2003
181.	MW-20	Boron	+/-4	2.0	Q1 2004
182.	MW-20	Boron	+/-3	2.0	Q2 2004
183.	MW-20	Boron	+/-4	2.0	Q3 2004
184.	MW-20	Boron	+/-6	2.0	Q4 2004
185.	MW-20	Boron	+/-3	2.0	Q1 2005
186.	MW-20	Boron	+/-2.1	2.0	Q2 2005
187.	MW-20	Boron	+/-3	2.0	Q3 2005
188.	MW-20	Boron	+/-3	2.0	Q4 2005
189.	MW-20	Boron	+/-3	2.0	Q1 2006
190.	MW-20	Boron	+/-3	2.0	Q2 2006
191.	MW-20	Boron	+/-3	2.0	Q3 2006
192.	MW-20	Boron	+/-3	2.0	Q4 2006
193.	MW-20	Boron	+/-4	2.0	Q1 2007
194.	MW-20	Boron	+/-2.1	2.0	Q2 2007
195.	MW-02	Boron	+/-9	2.0	Q4 1997
196.	MW-03R	Boron	+/-2.1	2.0	Q1 1999
197.	MW-03R	Boron	+/-3	2.0	Q4 2001
198.	MW-03R	Boron	+/-4	2.0	Q1 2002
199.	MW-03R	Boron	+/-3.5	2.0	Q2 2002
200.	MW-03R	Boron	+/-3	2.0	Q3 2002
201.	MW-03R	Boron	+/-2.1	2.0	Q4 2002
202.	MW-03R	Boron	5.02	2.0	07/13/2017
203.	MW-03R	Boron	3.70	2.0	09/14/2017
204.	MW-03R	Boron	3.15	2.0	11/08/2017
205.	MW-03R	Boron	2.90	2.0	01/24/2018
206.	MW-03R	Boron	3.33	2.0	03/22/2018
207.	MW-03R	Boron	4.36	2.0	05/09/2018
208.	MW-01	Boron	+/-2.1	2.0	Q1 1997
209.	MW-01	Boron	+/-2.1	2.0	Q2 1997
210.	MW-01	Boron	+/-8	2.0	Q3 1997
211.	MW-01	Boron	+/-5	2.0	Q4 1997
212.	MW-01	Boron	+/-3.5	2.0	Q1 1998
213.	MW-01	Boron	+/-7	2.0	Q2 1998
214.	MW-01	Boron	+/-9	2.0	Q3 1998
215.	MW-01	Boron	+/-9	2.0	Q4 1998
216.	MW-01	Boron	+/-6	2.0	Q1 1999
217.	MW-01	Boron	+/-10	2.0	Q2 1999
218.	MW-01	Boron	+/-9	2.0	Q3 1999
219.	MW-01	Boron	+/-9	2.0	Q4 1999

220.	MW-01	Boron	+/-9	2.0	Q1 2000
221.	MW-01	Boron	+/-9	2.0	Q2 2000
222.	MW-01	Boron	+/-9	2.0	Q3 2000
223.	MW-01	Boron	+/-8	2.0	Q4 2000
224.	MW-01	Boron	+/-7	2.0	Q1 2001
225.	MW-01	Boron	+/-11	2.0	Q3 2001
226.	MW-01	Boron	+/-10	2.0	Q4 2001
227.	MW-01	Boron	+/-11	2.0	Q1 2002
228.	MW-01	Boron	+/-10	2.0	Q2 2002
229.	MW-01	Boron	+/-9	2.0	Q3 2002
230.	MW-01	Boron	+/-2.1	2.0	Q3 2003
231.	MW-01	Boron	+/-2.5	2.0	Q4 2003
232.	MW-01	Boron	+/-4	2.0	Q1 2004
233.	MW-01	Boron	+/-5	2.0	Q2 2004
234.	MW-01	Boron	+/-5	2.0	Q3 2004
235.	MW-01	Boron	+/-5	2.0	Q4 2004
236.	MW-01	Boron	+/-5	2.0	Q1 2005
237.	MW-01	Boron	+/-5	2.0	Q2 2005
238.	MW-01	Boron	+/-5	2.0	Q3 2005
239.	MW-01	Boron	+/-5	2.0	Q4 2005
240.	MW-01	Boron	+/-5	2.0	Q1 2006
241.	MW-01	Boron	+/-5	2.0	Q2 2006
242.	MW-01	Boron	+/-5	2.0	Q3 2006
243.	MW-01	Boron	+/-4	2.0	Q4 2006
244.	MW-01	Boron	+/-3.5	2.0	Q1 2007
245.	MW-01	Boron	+/-3.5	2.0	Q2 2007
246.	MW-01	Boron	2.1	2.0	03/14/2011
247.	MW-01	Boron	3.0	2.0	10/11/2011
248.	MW-17	Iron	6.2	5.0	07/27/2011
249.	MW-17	Iron	8.6	5.0	10/11/2011
250.	MW-34	Iron	5.7	5.0	03/08/2011
251.	MW-34	Iron	5.3	5.0	07/26/2011
252.	MW-34	Iron	5.22	5.0	07/13/2017
253.	MW-34	Iron	5.34	5.0	09/13/2017
254.	MW-34	Iron	5.45	5.0	11/08/2017
255.	MW-34	Iron	5.12	5.0	01/24/2018
256.	MW-34	Iron	5.01	5.0	03/22/2018
257.	MW-34	Iron	5.02	5.0	05/09/2018
258.	MW-08R	pH	6.35	6.5-9.0 s.u.	10/10/2011
259.	MW-17	pH	6.49	6.5-9.0 s.u.	03/14/2011
260.	MW-17	pH	5.05	6.5-9.0 s.u.	10/11/2011
261.	MW-10	pH	6.24	6.5-9.0 s.u.	05/09/2018
262.	MW-04	Sulfate	+/-500	400.0	Q2 1997
263.	MW-04	Sulfate	+/-450	400.0	Q3 1997
264.	MW-04	Sulfate	+/-500	400.0	Q1 1998

265.	MW-04	Sulfate	+/-500	400.0	Q2 1998
266.	MW-04	Sulfate	+/-450	400.0	Q3 1998
267.	MW-04	Sulfate	+/-500	400.0	Q1 1999
268.	MW-04	Sulfate	+/-500	400.0	Q3 1999
269.	MW-04	Sulfate	+/-450	400.0	Q4 1999
270.	MW-04	Sulfate	+/-500	400.0	Q1 2000
271.	MW-04	Sulfate	+/-500	400.0	Q2 2000
272.	MW-04	Sulfate	+/-600	400.0	Q3 2000
273.	MW-04	Sulfate	+/-700	400.0	Q4 2000
274.	MW-04	Sulfate	+/-1,100	400.0	Q1 2001
275.	MW-04	Sulfate	+/-1,200	400.0	Q3 2001
276.	MW-04	Sulfate	+/-1,400	400.0	Q4 2001
277.	MW-04	Sulfate	+/-500	400.0	Q1 2002
278.	MW-04	Sulfate	+/-800	400.0	Q2 2002
279.	MW-04	Sulfate	+/-800	400.0	Q3 2002
280.	MW-04	Sulfate	+/-900	400.0	Q4 2002
281.	MW-04	Sulfate	+/-800	400.0	Q1 2003
282.	MW-04	Sulfate	+/-800	400.0	Q2 2003
283.	MW-04	Sulfate	+/-1,000	400.0	Q3 2003
284.	MW-04	Sulfate	+/-700	400.0	Q4 2003
285.	MW-04	Sulfate	+/-500	400.0	Q1 2004
286.	MW-04	Sulfate	+/-450	400.0	Q2 2004
287.	MW-05	Sulfate	+/-500	400.0	Q1 1997
288.	MW-05	Sulfate	+/-500	400.0	Q2 1997
289.	MW-05	Sulfate	+/-410	400.0	Q3 1997
290.	MW-05	Sulfate	+/-410	400.0	Q4 1997
291.	MW-05	Sulfate	+/-500	400.0	Q1 1998
292.	MW-05	Sulfate	+/-500	400.0	Q2 1998
293.	MW-05	Sulfate	+/-500	400.0	Q3 1998
294.	MW-05	Sulfate	+/-500	400.0	Q4 1998
295.	MW-05	Sulfate	+/-450	400.0	Q1 1999
296.	MW-05	Sulfate	+/-410	400.0	Q2 1999
297.	MW-05	Sulfate	+/-410	400.0	Q4 1999
298.	MW-05	Sulfate	+/-410	400.0	Q4 2000
299.	MW-05	Sulfate	+/-450	400.0	Q1 2001
300.	MW-05	Sulfate	+/-800	400.0	Q3 2001
301.	MW-05	Sulfate	+/-1400	400.0	Q4 2001
302.	MW-05	Sulfate	+/-450	400.0	Q1 2002
303.	MW-05	Sulfate	+/-800	400.0	Q2 2002
304.	MW-05	Sulfate	+/-900	400.0	Q3 2002
305.	MW-05	Sulfate	+/-700	400.0	Q4 2002
306.	MW-05	Sulfate	+/-500	400.0	Q2 2003
307.	MW-05	Sulfate	+/-700	400.0	Q3 2003
308.	MW-05	Sulfate	+/-700	400.0	Q4 2003
309.	MW-05	Sulfate	+/-800	400.0	Q1 2004

310.	MW-05	Sulfate	+/-700	400.0	Q2 2004
311.	MW-05	Sulfate	+/-600	400.0	Q3 2004
312.	MW-05	Sulfate	+/-600	400.0	Q4 2004
313.	MW-05	Sulfate	+/-600	400.0	Q1 2005
314.	MW-05	Sulfate	+/-600	400.0	Q2 2005
315.	MW-05	Sulfate	+/-500	400.0	Q3 2005
316.	MW-05	Sulfate	+/-500	400.0	Q4 2005
317.	MW-05	Sulfate	+/-410	400.0	Q2 2007
318.	MW-05	Sulfate	410	400.0	05/24/2011
319.	MW-05	Sulfate	450	400.0	07/27/2011
320.	MW-05	Sulfate	480	400.0	10/10/2011
321.	MW-07	Sulfate	+/-1,100	400.0	Q1 1998
322.	MW-07	Sulfate	+/-1,200	400.0	Q1 1999
323.	MW-08R	Sulfate	+/-1,600	400.0	Q1 1997
324.	MW-08R	Sulfate	+/-1,600	400.0	Q2 1997
325.	MW-08R	Sulfate	+/-1,600	400.0	Q3 1997
326.	MW-08R	Sulfate	+/-1,800	400.0	Q4 1997
327.	MW-08R	Sulfate	+/-1,600	400.0	Q1 1998
328.	MW-08R	Sulfate	+/-1,500	400.0	Q2 1998
329.	MW-08R	Sulfate	+/-1,500	400.0	Q3 1998
330.	MW-08R	Sulfate	+/-1,400	400.0	Q4 1998
331.	MW-08R	Sulfate	+/-1,000	400.0	Q1 1999
332.	MW-08R	Sulfate	+/-1,300	400.0	Q2 1999
333.	MW-08R	Sulfate	+/-1,400	400.0	Q3 1999
334.	MW-08R	Sulfate	+/-1,300	400.0	Q4 1999
335.	MW-08R	Sulfate	+/-1,300	400.0	Q1 2000
336.	MW-08R	Sulfate	+/-1,300	400.0	Q2 2000
337.	MW-08R	Sulfate	+/-1,200	400.0	Q1 2001
338.	MW-08R	Sulfate	+/-1,300	400.0	Q3 2001
339.	MW-08R	Sulfate	+/-1,400	400.0	Q4 2001
340.	MW-08R	Sulfate	+/-1,400	400.0	Q1 2002
341.	MW-08R	Sulfate	+/-1,300	400.0	Q2 2002
342.	MW-08R	Sulfate	+/-1,600	400.0	Q3 2002
343.	MW-08R	Sulfate	+/-1,400	400.0	Q1 2003
344.	MW-08R	Sulfate	+/-1,200	400.0	Q2 2003
345.	MW-08R	Sulfate	+/-1,200	400.0	Q3 2003
346.	MW-08R	Sulfate	+/-1,500	400.0	Q4 2003
347.	MW-08R	Sulfate	+/-1,000	400.0	Q1 2004
348.	MW-08R	Sulfate	+/-1,200	400.0	Q2 2004
349.	MW-08R	Sulfate	+/-1,300	400.0	Q3 2004
350.	MW-08R	Sulfate	+/-800	400.0	Q4 2004
351.	MW-08R	Sulfate	+/-500	400.0	Q1 2005
352.	MW-08R	Sulfate	+/-1,300	400.0	Q2 2005
353.	MW-08R	Sulfate	+/-1,300	400.0	Q3 2005
354.	MW-08R	Sulfate	+/-1,400	400.0	Q4 2005

355.	MW-08R	Sulfate	+/-1,200	400.0	Q2 2006
356.	MW-08R	Sulfate	+/-1,300	400.0	Q3 2006
357.	MW-08R	Sulfate	+/-1,500	400.0	Q4 2006
358.	MW-08R	Sulfate	+/-800	400.0	Q2 2007
359.	MW-08R	Sulfate	1,000	400.0	05/24/2011
360.	MW-08R	Sulfate	1,300	400.0	07/27/2011
361.	MW-08R	Sulfate	1,500	400.0	10/10/2011
362.	MW-08R	Sulfate	1,140	400.0	07/13/2017
363.	MW-08R	Sulfate	1,210	400.0	09/14/2017
364.	MW-08R	Sulfate	1,140	400.0	11/08/2017
365.	MW-08R	Sulfate	1,010	400.0	03/22/2018
366.	MW-08R	Sulfate	754	400.0	05/09/2018
367.	MW-17	Sulfate	1,800	400.0	03/14/2011
368.	MW-17	Sulfate	1,700	400.0	05/23/2011
369.	MW-17	Sulfate	1,300	400.0	07/27/2011
370.	MW-17	Sulfate	610	400.0	10/11/2011
371.	MW-17	Sulfate	1,110	400.0	07/12/2017
372.	MW-17	Sulfate	1,020	400.0	09/13/2017
373.	MW-17	Sulfate	1,200	400.0	11/08/2017
374.	MW-17	Sulfate	976	400.0	01/24/2018
375.	MW-17	Sulfate	1,270	400.0	03/22/2018
376.	MW-17	Sulfate	1,150	400.0	05/09/2018
377.	MW-18	Sulfate	1,100	400.0	03/14/2011
378.	MW-18	Sulfate	1,300	400.0	05/23/2011
379.	MW-18	Sulfate	1,200	400.0	07/27/2011
380.	MW-18	Sulfate	930	400.0	10/11/2011
381.	MW-18	Sulfate	754	400.0	07/12/2017
382.	MW-18	Sulfate	784	400.0	09/13/2017
383.	MW-18	Sulfate	835	400.0	11/08/2017
384.	MW-18	Sulfate	749	400.0	01/24/2018
385.	MW-18	Sulfate	795	400.0	03/22/2018
386.	MW-18	Sulfate	700	400.0	05/09/2018
387.	MW-02	Sulfate	+/-1,100	400.0	Q4 1997
388.	MW-01	Sulfate	+/-1,600	400.0	Q1 1997
389.	MW-01	Sulfate	+/-1,600	400.0	Q2 1997
390.	MW-01	Sulfate	+/-1,100	400.0	Q3 1997
391.	MW-01	Sulfate	+/-1,500	400.0	Q4 1997
392.	MW-01	Sulfate	+/-1,800	400.0	Q1 1998
393.	MW-01	Sulfate	+/-1,300	400.0	Q2 1998
394.	MW-01	Sulfate	+/-1,200	400.0	Q3 1998
395.	MW-01	Sulfate	+/-1,300	400.0	Q4 1998
396.	MW-01	Sulfate	+/-1,100	400.0	Q1 1999
397.	MW-01	Sulfate	+/-1,400	400.0	Q2 1999
398.	MW-01	Sulfate	+/-1,400	400.0	Q3 1999
399.	MW-01	Sulfate	+/-1,300	400.0	Q4 1999

400.	MW-01	Sulfate	+/-1,400	400.0	Q1 2000
401.	MW-01	Sulfate	+/-1,200	400.0	Q2 2000
402.	MW-01	Sulfate	+/-1,300	400.0	Q3 2000
403.	MW-01	Sulfate	+/-1,400	400.0	Q4 2000
404.	MW-01	Sulfate	+/-1,400	400.0	Q1 2001
405.	MW-01	Sulfate	+/-1,600	400.0	Q3 2001
406.	MW-01	Sulfate	+/-1,300	400.0	Q4 2001
407.	MW-01	Sulfate	+/-1,200	400.0	Q1 2002
408.	MW-01	Sulfate	+/-1,400	400.0	Q2 2002
409.	MW-01	Sulfate	+/-1,500	400.0	Q3 2002
410.	MW-01	Sulfate	+/-1,500	400.0	Q4 2002
411.	MW-01	Sulfate	+/-1,500	400.0	Q1 2003
412.	MW-01	Sulfate	+/-1,300	400.0	Q2 2003
413.	MW-01	Sulfate	+/-1,500	400.0	Q3 2003
414.	MW-01	Sulfate	+/-1,500	400.0	Q4 2003
415.	MW-01	Sulfate	+/-1,500	400.0	Q1 2004
416.	MW-01	Sulfate	+/-1,500	400.0	Q2 2004
417.	MW-01	Sulfate	+/-1,400	400.0	Q3 2004
418.	MW-01	Sulfate	+/-1,300	400.0	Q4 2004
419.	MW-01	Sulfate	+/-1,200	400.0	Q1 2005
420.	MW-01	Sulfate	+/-1,000	400.0	Q2 2005
421.	MW-01	Sulfate	+/-1,000	400.0	Q3 2005
422.	MW-01	Sulfate	+/-1,100	400.0	Q4 2005
423.	MW-01	Sulfate	+/-1,100	400.0	Q1 2006
424.	MW-01	Sulfate	+/-1,000	400.0	Q2 2006
425.	MW-01	Sulfate	+/-1,100	400.0	Q3 2006
426.	MW-01	Sulfate	+/-1,100	400.0	Q4 2006
427.	MW-01	Sulfate	+/-1,000	400.0	Q1 2007
428.	MW-01	Sulfate	+/-1,000	400.0	Q2 2007
429.	MW-01	Sulfate	980	400.0	03/14/2011
430.	MW-01	Sulfate	950	400.0	05/24/2011
431.	MW-01	Sulfate	940	400.0	07/27/2011
432.	MW-01	Sulfate	1,000	400.0	10/11/2011
433.	MW-01	Sulfate	1,070	400.0	07/13/2017
434.	MW-01	Sulfate	995	400.0	09/13/2017
435.	MW-01	Sulfate	1,000	400.0	11/08/2017
436.	MW-01	Sulfate	1,040	400.0	01/24/2018
437.	MW-01	Sulfate	1,280	400.0	03/22/2018
438.	MW-01	Sulfate	1,070	400.0	05/09/2018
439.	MW-08R	TDS	1,700	1,200.0	05/24/2011
440.	MW-08R	TDS	2,000	1,200.0	07/27/2011
441.	MW-08R	TDS	2,200	1,200.0	10/10/2011
442.	MW-08R	TDS	2,040	1,200.0	07/13/2017
443.	MW-08R	TDS	2,080	1,200.0	09/14/2017
444.	MW-08R	TDS	2,040	1,200.0	11/08/2017

445.	MW-08R	TDS	1,700	1,200.0	03/22/2018
446.	MW-08R	TDS	1,400	1,200.0	05/09/2018
447.	MW-17	TDS	2,700	1,200.0	03/14/2011
448.	MW-17	TDS	2,600	1,200.0	05/23/2011
449.	MW-17	TDS	2,200	1,200.0	07/27/2011
450.	MW-17	TDS	3,100	1,200.0	10/11/2011
451.	MW-17	TDS	2,030	1,200.0	07/12/2017
452.	MW-17	TDS	1,970	1,200.0	09/13/2017
453.	MW-17	TDS	2,020	1,200.0	11/08/2017
454.	MW-17	TDS	1,630	1,200.0	01/24/2018
455.	MW-17	TDS	2,090	1,200.0	03/22/2018
456.	MW-17	TDS	1,980	1,200.0	05/09/2018
457.	MW-18	TDS	2,000	1,200.0	03/14/2011
458.	MW-18	TDS	1,900	1,200.0	05/23/2011
459.	MW-18	TDS	1,800	1,200.0	07/27/2011
460.	MW-18	TDS	1,800	1,200.0	10/11/2011
461.	MW-18	TDS	1,600	1,200.0	07/12/2017
462.	MW-18	TDS	1,650	1,200.0	09/13/2017
463.	MW-18	TDS	1,710	1,200.0	11/08/2017
464.	MW-18	TDS	1,590	1,200.0	01/24/2018
465.	MW-18	TDS	1,540	1,200.0	03/22/2018
466.	MW-18	TDS	1,420	1,200.0	05/09/2018
467.	MW-01	TDS	1,900	1,200.0	03/14/2011
468.	MW-01	TDS	1,800	1,200.0	05/24/2011
469.	MW-01	TDS	1,800	1,200.0	07/27/2011
470.	MW-01	TDS	1,900	1,200.0	10/11/2011
471.	MW-01	TDS	2,060	1,200.0	07/13/2017
472.	MW-01	TDS	2,040	1,200.0	09/13/2017
473.	MW-01	TDS	2,070	1,200.0	11/08/2017
474.	MW-01	TDS	2,080	1,200.0	01/24/2018
475.	MW-01	TDS	2,240	1,200.0	03/22/2018
476.	MW-01	TDS	2,090	1,200.0	05/09/2018

Exhibit 5

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 NORTH GRAND AVENUE EAST, P.O. BOX 19276, SPRINGFIELD, ILLINOIS 62794-9276 • (217) 782-3397

PAT QUINN, GOVERNOR JOHN J. KIM, INTERIM DIRECTOR

217/785-0561

July 6, 2012

CERTIFIED MAIL # 7010 2780 0002 1163 6974
RETURN RECEIPT REQUESTED

Mr. Rick Diericx, Sr. Director, Environmental Compliance
Dynegy Operating Company
604 Pierce Boulevard
O'Fallon, IL 62269

Re: Violation Notice: Dynegy Midwest Generation LLC; Vermilion Power Station
Identification No.: 6293
Violation Notice No.: W-2012-00071

Dear Mr. Diericx:

This constitutes a Violation Notice pursuant to Section 31(a)(1) of the Illinois Environmental Protection Act ('Act'), 415 ILCS 5/31(a)(1), and is based upon a review of available information and an investigation by representatives of the Illinois Environmental Protection Agency ('Illinois EPA').

The Illinois EPA hereby provides notice of alleged violations of environmental laws, regulations, or permits as set forth in Attachment A to this notice. Attachment A includes an explanation of the activities that the Illinois EPA believes may resolve the specified alleged violations. Due to the nature and seriousness of the alleged violations, please be advised that resolution of the violations may also require the involvement of a prosecutorial authority for purposes that may include, among others, the imposition of statutory penalties.

A written response, which may include a request for a meeting with representatives of the Illinois EPA, must be submitted via certified mail to the Illinois EPA within 45 days of receipt of this letter. If a meeting is requested, it shall be held within 60 days of receipt of this notice. The response must include information in rebuttal, explanation, or justification of each alleged violation and a statement indicating whether or not the facility wishes to enter into a Compliance Commitment Agreement ('CCA') pursuant to Section 31(a) of the Act. If the facility wishes to enter into a CCA, the written response must also include proposed terms for the CCA that includes dates for achieving each commitment and may include a statement that compliance has been achieved for some or all of the alleged violations. The proposed terms of the CCA should contain sufficient detail and must include steps to be taken to achieve compliance and the necessary dates by which compliance will be achieved.

The Illinois EPA will review the proposed terms for a CCA provided by the facility and, within 30 days of receipt, will respond with either a proposed CCA or a notice that no CCA will be issued by the Illinois EPA. If the Illinois EPA sends a proposed CCA, the facility must respond in writing by either agreeing to and signing the proposed CCA or by notifying the Illinois EPA that the facility rejects the terms of the proposed CCA.

If a timely written response to this Violation Notice is not provided, it shall be considered a waiver of the opportunity to respond and meet, and the Illinois EPA may proceed with referral to a prosecutorial authority.

Written communications should be directed to:

Illinois EPA – Division of Public Water Supplies
Attn: Andrea Rhodes, CAS #19
P.O. BOX 19276
Springfield, IL 62794-9276

All communications must include reference to this Violation Notice number, W-2012-00071.

Questions regarding this Violation Notice should be directed to Andrea Rhodes at 217/785-0561.

Sincerely,

Michael Crumly
Manager, Compliance Assurance Section
Division of Public Water Supplies
Bureau of Water

Attachments

CASE ID: 2012-009

ATTACHMENT A

DYNEGY MIDWEST GENERATION LLC; VERMILION POWER STATION, ID:6293
VIOLATION NOTICE NO. W-2012-00071:

A review of information available to the Illinois EPA indicates the following on-going violations of statutes, regulations, or permits. Included with each type of violation is an explanation of the activities that the Illinois EPA believes may resolve the violation.

Groundwater Quality
No person shall cause, threaten or allow the release of any contaminant to a resource groundwater such that: treatment or additional treatment is necessary to continue an existing use or to assure a potential use of such groundwater; or an existing or potential use of such groundwater is precluded. No person shall cause, threaten or allow the release of any contaminant to groundwater so as to cause a groundwater quality standard to be exceeded. Dynegy Midwest Generation, LLC must take actions to mitigate existing contamination and prevent the continuing release of contaminants into the environment.

Violation
Description
Operations at ash impoundments have resulted in violations of the Groundwater Quality Standards at monitoring well MW-04 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Boron	7.8 mg/l	2.0 mg/l	10/10/2011
Boron	7.1 mg/l	2.0 mg/l	07/27/2011
Boron	5.7 mg/l	2.0 mg/l	05/24/2011
Boron	4.9 mg/l	2.0 mg/l	03/08/2011
Manganese	1.0 mg/l	0.15 mg/l	10/10/2011
Manganese	0.9 mg/l	0.15 mg/l	07/27/2011
Manganese	1.0 mg/l	0.15 mg/l	05/24/2011
Manganese	0.91 mg/l	0.15 mg/l	03/08/2011

Rule/Reg. Section 12 of the Act, 415 ILCS 5/12, 35 Ill. Adm. Code 620.115, 620.301, 620.401, 620.405, and 620.410.

ATTACHMENT A

DYNEGY MIDWEST GENERATION LLC; VERMILION POWER STATION, ID:6293
VIOLATION NOTICE NO. W-2012-00071:

Violation
Description
Operations at ash impoundments have resulted in violations of the Groundwater Quality Standards at monitoring well MW-05 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Boron	22 mg/l	2.0 mg/l	10/10/2011
Boron	19 mg/l	2.0 mg/l	07/27/2011
Boron	19 mg/l	2.0 mg/l	05/24/2011
Boron	20 mg/l	2.0 mg/l	03/08/2011
Manganese	0.34 mg/l	0.15 mg/l	10/10/2011
Manganese	0.31 mg/l	0.15 mg/l	07/27/2011
Manganese	0.29 mg/l	0.15 mg/l	05/24/2011
Manganese	0.31 mg/l	0.15 mg/l	03/08/2011
Sulfate	480 mg/l	400 mg/l	10/10/2011
Sulfate	450 mg/l	400 mg/l	07/27/2011
Sulfate	410 mg/l	400 mg/l	05/24/2011

Rule/Reg. Section 12 of the Act, 415 ILCS 5/12, 35 Ill. Adm. Code 620.115, 620.301, 620.401, 620.405, and 620.410.

Violation
Description
Operations at ash impoundments have resulted in violations of the Groundwater Quality Standards at monitoring well MW-08R for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	6.35 su	6.5-9.0 su	10/10/2011
Boron	40 mg/l	2.0 mg/l	10/10/2011
Boron	37 mg/l	2.0 mg/l	07/27/2011
Boron	29 mg/l	2.0 mg/l	05/24/2011
Manganese	0.22 mg/l	0.15 mg/l	05/24/2011
Sulfate	1,500 mg/l	400 mg/l	10/10/2011
Sulfate	1,300 mg/l	400 mg/l	07/27/2011
Sulfate	1,000 mg/l	400 mg/l	05/24/2011
TDS	2,200 mg/l	1,200 mg/l	10/10/2011
TDS	2,000 mg/l	1,200 mg/l	07/27/2011
TDS	1,700 mg/l	1,200 mg/l	05/24/2011

Rule/Reg. Section 12 of the Act, 415 ILCS 5/12, 35 Ill. Adm. Code 620.115, 620.301, 620.401, 620.405, and 620.410.

ATTACHMENT A

DYNEGY MIDWEST GENERATION LLC; VERMILION POWER STATION, ID:6293
VIOLATION NOTICE NO. W-2012-00071:

Violation
Description
Operations at ash impoundments have resulted in violations of the Groundwater Quality Standards at monitoring well MW-34 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
Iron	5.3 mg/l	5.0 mg/l	07/26/2011
Iron	5.7 mg/l	5.0 mg/l	03/08/2011

Rule/Reg. Section 12 of the Act, 415 ILCS 5/12, 35 Ill. Adm. Code 620.115, 620.301, 620.401, 620.405, and 620.410.

Exhibit 6

NICHOLAS SCHOOL OF THE ENVIRONMENT
DUKE UNIVERSITY

FIELD SAMPLE SUMMARY

Project: DUKE-Vermillion

Sample ID	Color Code	Sample Type	Sample Source	Sampled Date	Sampler
Vermillion-1	Anions (Red)	Field Sample	Background Seep	5/6/2016	Sulkin
Vermillion-1	Alkalinity (Red/black)	Field Sample	Background Seep	5/6/2016	Sulkin
Vermillion-1	Isotopes (Green)	Field Sample	Background Seep	5/6/2016	Sulkin
Vermillion-1	Cations/Trace Metals (Yellow)	Field Sample	Background Seep	5/6/2016	Sulkin
Vermillion-2	Anions (Red)	Field Sample	Upstream Seep	5/6/2016	Sulkin
Vermillion-2	Alkalinity (Red/black)	Field Sample	Upstream Seep	5/6/2016	Sulkin
Vermillion-2	Isotopes (Green)	Field Sample	Upstream Seep	5/6/2016	Sulkin
Vermillion-2	Cations/Trace Metals (Yellow)	Field Sample	Upstream Seep	5/6/2016	Sulkin
Vermillion-3	Anions (Red)	Field Sample	Discharge at Cave	5/6/2016	Sulkin
Vermillion-3	Alkalinity (Red/black)	Field Sample	Discharge at Cave	5/6/2016	Sulkin
Vermillion-3	Isotopes (Green)	Field Sample	Discharge at Cave	5/6/2016	Sulkin
Vermillion-3	Cations/Trace Metals (Yellow)	Field Sample	Discharge at Cave	5/6/2016	Sulkin

Sample ID	Color Code	Date Received	pH	Conductivity (uS/cm)	Temperature (Degrees Celcius)
Vermillion-1	Anions (Red)	5/12/16 10:00	NA	NA	NA
Vermillion-1	Alkalinity (Red/black)	5/12/16 10:00	NA	NA	NA
Vermillion-1	Isotopes (Green)	5/12/16 10:00	NA	NA	NA
Vermillion-1	Cations/Trace Metals (Yellow)	5/12/16 10:00	NA	NA	NA
Vermillion-2	Anions (Red)	5/12/16 10:00	NA	NA	NA
Vermillion-2	Alkalinity (Red/black)	5/12/16 10:00	NA	NA	NA
Vermillion-2	Isotopes (Green)	5/12/16 10:00	NA	NA	NA
Vermillion-2	Cations/Trace Metals (Yellow)	5/12/16 10:00	NA	NA	NA
Vermillion-3	Anions (Red)	5/12/16 10:00	NA	NA	NA
Vermillion-3	Alkalinity (Red/black)	5/12/16 10:00	NA	NA	NA
Vermillion-3	Isotopes (Green)	5/12/16 10:00	NA	NA	NA

Vermillion-3	Cations/Trace Metals (Yellow)	5/12/16 10:00	NA	NA	NA

LAB SAMPLE SUMMARY

Sample ID	Color Code	Sample Source	Lab Receipt Date	Standard Solution Source
Vermillion-1	Anions (Red)	Background Seep	5/12/16	GFS Chemicals, Inc. Ion Chromatography Standard Solution 1,000 ppm
Vermillion-1	Alkalinity (Red/black)	Background Seep	5/12/16	BDH Buffer pH 7 and pH 4
Vermillion-1	Isotopes (Green)	Background Seep	5/12/16	NIST SRM 987/ 951
Vermillion-1	Cations/Trace Metals (Yellow)	Background Seep	5/12/16	NIST SRM 1643e
Vermillion-2	Anions (Red)	Upstream Seep	5/12/16	GFS Chemicals, Inc. Ion Chromatography Standard Solution 1,000 ppm
Vermillion-2	Alkalinity (Red/black)	Upstream Seep	5/12/16	BDH Buffer pH 7 and pH 4
Vermillion-2	Isotopes (Green)	Upstream Seep	5/12/16	NIST SRM 987/ 951
Vermillion-2	Cations/Trace Metals (Yellow)	Upstream Seep	5/12/16	NIST SRM 1643e
Vermillion-3	Anions (Red)	Discharge at Cave	5/12/16	GFS Chemicals, Inc. Ion Chromatography Standard Solution 1,000 ppm
Vermillion-3	Alkalinity (Red/black)	Discharge at Cave	5/12/16	BDH Buffer pH 7 and pH 4
Vermillion-3	Isotopes (Green)	Discharge at Cave	5/12/16	NIST SRM 987/ 951
Vermillion-3	Cations/Trace Metals (Yellow)	Discharge at Cave	5/12/16	NIST SRM 1643e

LAB TEST SUMMARY

Sample ID	Color Code	Analytical Method	Analysis Date	Test Type	Prep Method	Prep Date	Analyst	Preservative
Vermillion-1	Anions (Red)	EPA 300.0	8/18/16	IC	Dilution	8/16/16	JSH	none
Vermillion-1	Alkalinity (Red/black)	EPA 310.1	NA	Titration	None	NA	NA	none
Vermillion-1	Isotopes (Green)	TIMS	10/11/16 (Sr) 11/9/16 (B)	TIMS	Ion Exchange Column (Sr)	9/27/16	JSH	none
Vermillion-1	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Dilution	5/16/16	GSD	10% nitric acid
Vermillion-2	Anions (Red)	EPA 300.0	8/18/16	IC	Dilution	8/16/16	JSH	none
Vermillion-2	Alkalinity (Red/black)	EPA 310.1	11/20/16	Titration	None	11/20/16	RMC	none
Vermillion-2	Isotopes (Green)	TIMS	(Sr) 10/24/16 (B)	TIMS	Ion Exchange Column (Sr)	9/27/16	JSH	none
Vermillion-2	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Dilution	5/16/16	GSD	10% nitric acid
Vermillion-3	Anions (Red)	EPA 300.0	8/18/16	IC	Dilution	8/16/16	JSH	none
Vermillion-3	Alkalinity (Red/black)	EPA 310.1	11/20/16	Titration	None	11/20/16	RMC	none
Vermillion-3	Isotopes (Green)	TIMS	(Sr) 10/24/16 (B)	TIMS	Ion Exchange Column (Sr)	9/27/16	JSH	none
Vermillion-3	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Dilution	5/16/16	GSD	10% nitric acid

NICHOLAS SCHOOL OF THE ENVIRONMENT
DUKE UNIVERSITY

LAB RESULT SUMMARY

Vermillion – 1 Background Seep

Sample ID	Color Code	Analytical Method	Analysis Date	Test Type	Chemical Name(s)	Result Value	Units	RDL
Vermillion-1	Anions (Red)	EPA 300.0	8/18/16	IC	Fluoride	0.08	mg/L	0.02
Vermillion-1	Anions (Red)	EPA 300.0	8/18/16	IC	Chloride	0.75	mg/L	0.2
Vermillion-1	Anions (Red)	EPA 300.0	8/18/16	IC	Bromide	<DL	mg/L	0.04
Vermillion-1	Anions (Red)	EPA 300.0	8/18/16	IC	Nitrate	<DL	mg/L	0.4
Vermillion-1	Anions (Red)	EPA 300.0	8/18/16	IC	Sulfate	13.5	mg/L	0.2
Vermillion-1	Alkalinity (Red/black)	EPA 310.1	8/18/16	Titration	Dissolved Inorganic Carbon		mg/L	0
Vermillion-1	Isotopes (Green)	TIMS	10/11/16	TIMS	$^{87}Sr/^{86}Sr$	0.711104		0.000006
Vermillion-1	Isotopes (Green)	TIMS	11/9/16	TIMS	$\delta^{11}B$	11.9	‰	1
Vermillion-1	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/2016	ICP-MS	Lithium	<DL	ug/L	1.2
Vermillion-1	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/2016	ICP-MS	Beryllium	<DL	ug/L	0.2
Vermillion-1	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/2016	ICP-MS	Boron	27.0	ug/L	12.6
Vermillion-1	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/2016	ICP-MS	Magnesium	24.9	mg/L	0.4
Vermillion-1	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/2016	ICP-MS	Aluminum	<DL	ug/L	25.4
Vermillion-1	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/2016	ICP-MS	Calcium	57.1	mg/L	1.2
Vermillion-1	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/2016	ICP-MS	Vanadium	1.1	ug/L	0.4
Vermillion-1	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/2016	ICP-MS	Chromium	1.4	ug/L	1.2
Vermillion-1	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/2016	ICP-MS	Manganese	<DL	ug/L	6.6

Vermillion-1	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/2016	ICP-MS	Iron	<DL	ug/L	143
Vermillion-1	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/2016	ICP-MS	Cobalt	<DL	ug/L	0.6
Vermillion-1	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/2016	ICP-MS	Nickel	<DL	ug/L	2.0
Vermillion-1	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/2016	ICP-MS	Copper	2.0	ug/L	1.2
Vermillion-1	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/2016	ICP-MS	Zinc	7.3	ug/L	2.4
Vermillion-1	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/2016	ICP-MS	Arsenic	0.5	ug/L	0.2
Vermillion-1	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/2016	ICP-MS	Selenium	2.4	ug/L	2.4
Vermillion-1	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/2016	ICP-MS	Rubidium	0.4	ug/L	0.2
Vermillion-1	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/2016	ICP-MS	Strontium	42.6	ug/L	3.2
Vermillion-1	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/2016	ICP-MS	Molybdenum	4.6	ug/L	0.4
Vermillion-1	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/2016	ICP-MS	Silver	<DL	ug/L	0.02
Vermillion-1	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/2016	ICP-MS	Cadmium	<DL	ug/L	0.10
Vermillion-1	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/2016	ICP-MS	Antimony	<DL	ug/L	0.08
Vermillion-1	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/2016	ICP-MS	Barium	16.1	ug/L	1.4
Vermillion-1	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/2016	ICP-MS	Thallium	0.41	ug/L	0.02
Vermillion-1	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/2016	ICP-MS	Lead	<DL	ug/L	0.04
Vermillion-1	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/2016	ICP-MS	Thorium	<DL	ug/L	0.10
Vermillion-1	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/2016	ICP-MS	Uranium	0.44	ug/L	0.04

Vermillion – 2 Upstream Seep

Sample ID	Color Code	Analytical Method	Analysis Date	Test Type	Chemical Name	Result Value	Units	RDL
Vermillion-2	Anions (Red)	EPA 300.0	8/18/16	IC	Fluoride	0.27	mg/L	0.05
Vermillion-2	Anions (Red)	EPA 300.0	8/18/16	IC	Chloride	12.2	mg/L	0.5
Vermillion-2	Anions (Red)	EPA 300.0	8/18/16	IC	Bromide	<DL	mg/L	0.10
Vermillion-2	Anions (Red)	EPA 300.0	8/18/16	IC	Nitrate	3.9	Mg/L	1.0
Vermillion-2	Anions (Red)	EPA 300.0	8/18/16	IC	Sulfate	209.2	mg/L	0.5
Vermillion-2	Alkalinity (Red/black)	EPA 310.1	11/20/16	Titration	Dissolved Inorganic Carbon	66	mg/L	0
Vermillion-2	Isotopes (Green)	TIMS		TIMS	$^{87}Sr/^{86}Sr$			0.000006
Vermillion-2	Isotopes (Green)	TIMS	10/24/16	TIMS	$\delta^{11}B$	12.0	‰	0.5
Vermillion-2	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Lithium	334.6	ug/L	6.0
Vermillion-2	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Beryllium	<DL	ug/L	0.8
Vermillion-2	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Boron	24212.2	ug/L	60.3
Vermillion-2	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Magnesium	20.4	mg/L	2.2
Vermillion-2	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Aluminum	<DL	ug/L	127
Vermillion-2	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Calcium	607.8	mg/L	5.6
Vermillion-2	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Vanadium	3.1	ug/L	1.7
Vermillion-2	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Chromium	6.7	ug/L	6.0
Vermillion-2	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Manganese	571.3	ug/L	32.8

Vermillion-2	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Iron	1515.5	ug/L	715
Vermillion-2	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Cobalt	<DL	ug/L	2.6
Vermillion-2	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Nickel	20.1	ug/L	9.5
Vermillion-2	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Copper	9.1	ug/L	5.5
Vermillion-2	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Zinc	33.1	ug/L	12.2
Vermillion-2	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Arsenic	1.7	ug/L	0.7
Vermillion-2	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Selenium	<DL	ug/L	11.6
Vermillion-2	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Rubidium	50.7	ug/L	0.6
Vermillion-2	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Strontium	2357.6	ug/L	25.7
Vermillion-2	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Molybdenum	532.0	ug/L	1.5
Vermillion-2	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Silver	<DL	ug/L	0.1
Vermillion-2	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Cadmium	1.2	ug/L	0.5
Vermillion-2	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Antimony	<DL	ug/L	0.4
Vermillion-2	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Barium	25.4	ug/L	7.0
Vermillion-2	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Thallium	3.9	ug/L	0.1
Vermillion-2	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Lead	0.2	ug/L	0.2
Vermillion-2	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Thorium	<DL	ug/L	0.5
Vermillion-2	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Uranium	<DL	ug/L	0.2

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Vermillion – 3 Discharge at Cave

Sample ID	Color Code	Analytical Method	Analysis Date	Test Type	Chemical Name	Result Value	Units	RDL
Vermillion-3	Anions (Red)	EPA 300.0	8/18/16	IC	Fluoride	<DL	mg/L	0.05
Vermillion-3	Anions (Red)	EPA 300.0	8/18/16	IC	Chloride	21.9	mg/L	0.5
Vermillion-3	Anions (Red)	EPA 300.0	8/18/16	IC	Bromide	0.11	mg/L	0.10
Vermillion-3	Anions (Red)	EPA 300.0	8/18/16	IC	Nitrate	<DL	mg/L	1.0
Vermillion-3	Anions (Red)	EPA 300.0	8/18/16	IC	Sulfate	1918.4	mg/L	0.5
Vermillion-3	Alkalinity (Red/black)	EPA 310.1	11/20/16	Titration	Dissolved Inorganic Carbon	99	mg/L	0
Vermillion-3	Isotopes (Green)	TIMS		TIMS	$^{87}Sr/^{86}Sr$			0.000006
Vermillion-3	Isotopes (Green)	TIMS	10/11/16	TIMS	$\delta^{11}B$	6.2	‰	0.5
Vermillion-3	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Lithium	392.6	ug/L	6.0
Vermillion-3	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Beryllium	<DL	ug/L	0.8
Vermillion-3	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Boron	15745.7	ug/L	60.3
Vermillion-3	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Magnesium	62.1	mg/L	2.2
Vermillion-3	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Aluminum	<DL	ug/L	127
Vermillion-3	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Calcium	624.7	mg/L	5.6
Vermillion-3	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Vanadium	3.5	ug/L	1.7

Vermillion-3	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Chromium	<DL	ug/L	6.0
Vermillion-3	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Manganese	7415.5	ug/L	32.8
Vermillion-3	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Iron	6549.0	ug/L	715
Vermillion-3	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Cobalt	3.8	ug/L	2.6
Vermillion-3	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Nickel	23.4	ug/L	9.5
Vermillion-3	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Copper	5.6	ug/L	5.5
Vermillion-3	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Zinc	22.2	ug/L	12.2
Vermillion-3	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Arsenic	5.3	ug/L	0.7
Vermillion-3	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Selenium	<DL	ug/L	11.6
Vermillion-3	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Rubidium	126.0	ug/L	0.6
Vermillion-3	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Strontium	2337.9	ug/L	25.7
Vermillion-3	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Molybdenum	98.6	ug/L	1.5
Vermillion-3	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Silver	<DL	ug/L	0.1
Vermillion-3	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Cadmium	<DL	ug/L	0.5
Vermillion-3	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Antimony	<DL	ug/L	0.4
Vermillion-3	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Barium	37.7	ug/L	7.0
Vermillion-3	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Thallium	2.2	ug/L	0.1
Vermillion-3	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Lead	<DL	ug/L	0.2
Vermillion-3	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Thorium	<DL	ug/L	0.5
Vermillion-3	Cations/Trace Metals (Yellow)	EPA 200.8	5/24/16	ICP-MS	Uranium	0.2	ug/L	0.2

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Appendix A: Definitions

IC – Ion chromatography
TIMS – Thermal Ionization Mass Spectrometry
ICP-MS – Inductively Coupled Mass Spectrometry
NA – Not analyzed
RDL – Reporting Detection Limit
RPD – Relative percent difference for duplicate measurements

Isotope methods:

Boron isotopes: Boron from surface water, effluents and leachates will be processed through cation-exchange resin to remove all cations, treated with peroxide to remove organic matter and CNO complexes, loaded on the Triton (Thermo) thermal ionization mass spectrometer at Duke University and measured as BO_2- ions on low-temperature negative ion method developed recently by our group (Dywer and Vengosh, 2008). 1 to 4 µL samples (containing a total of ~1 to 5ng of boron) are directly loaded onto outgassed single rhenium filaments along with 2 µL of activator solution containing Na, Mg, Ca, and K (roughly in proportions of seawater), mixed from high-purity single-element standard solutions in 5% HCl matrix. Loads are evaporated to dryness at low current (~0.4A), typically taking 8 to 15 minutes depending sample volume. After drying, current is gradually raised to ~0.7A and gradually decreased to 0.0A over ~25 sec. All sample loading is carried out in a vertical laminar flow clean hood equipped with boron-free PTFE HEPA filtration. Data on standards (NIST951, OISL Atlantic seawater, and IAEA Groundwater B-3) loaded using this method are presented in and yield external precision of approximately 0.5‰ $\delta^{11}B$. Total loading blank is <15pg B as determined by isotope dilution (NIST952). The load solution delivers ionization efficiency similar to seawater and has negligible CNO- (mass 42) interference, based on negligible signal at proxy mass 26 (CN-).

Strontium isotopes: Strontium from surface water, effluents and leachates will be evaporatively preconcentrated in HEPA filtered clean hood and re-digested in 0.6mL of 3.5N HNO_3 from which strontium is separated using Eichrom Sr-specific ion exchange resin. Approximately 1 to 10µg Sr is loaded onto out-gassed single rhenium filaments along with TaO activator solution and loaded onto the Triton TIMS at Duke University. Samples and standards are gradually heated to obtain a ^{88}Sr beam intensity of ~3V, after which 300 cycles of data are collected, yielding a typical internal precision of ~0.000004 for $^{87}Sr/^{86}Sr$ ratios (1 sd). External reproducibility on standard NIST987 yields a mean $^{87}Sr/^{86}Sr$ ratio of 0.710233 ± 0.000009 (1 sd).

Appendix B: Data Quality Criteria

The QA measures implemented will be held to the following criteria and acceptance limits:

Analyte	Prep/ Analytical Method	Chemical Yield (%)	LCS Accuracy (% Recovery)	MS/MSD Accuracy (% Recovery)	LCS/LCSD Precision (RPD)	MS/MSD Precision (RPD)	Laboratory Duplicate Precision (RPD)	Field Duplicate Precision (RPD)
pH	USGS	NA	NA	NA	NA	NA	±0.1 pH units	±0.1 pH units
Anions	USGS protocol/ Ion Chromatography	NA	80-120	75-125	20	20	20	RPD <20% difference < the RL
Cations	USGS Protocol/ DCP	NA	85-115 80-120	75-125	20	20	20	RPD <20% difference < the RL
Trace Metals	USGS Protocol/ ICPMS	NA	85-115 80-120	75-125	20	20	20	RPD <20% difference < the RL
Alkalinity	USGS Protocol/ Titration to pH 4.5	NA	80-120	75-125	20	20	20	RPD <20% difference < the RL
B isotopes	USGS Protocol/ TIMS	NA	Run with NIST Certified Reference Material 951					
Sr isotopes	USGS Protocol/ TIMS	NA	Run with NIST Certified Reference Material 987					

Appendix C: SAMPLING METHODS REQUIREMENTS

C. 1 Collection Procedure and Methods

Table C.1.1: Analytes and measured in field and laboratory leaching experiments

Analytes	Preparatory Method	Analytical Method
Cations/Trace Metals	USGS Protocol	ICPMS/ DCP
Anions	USGS Protocol	Ion Chromatography
Alkalinity	USGS Protocol	Titration to pH 4.5
B isotopes	USGS Protocol	Thermal Ionization Mass Spectrometer
Sr isotopes	USGS Protocol	Thermal Ionization Mass Spectrometer

C.2 Sample containers, preservation, and holding times

Table C.2.1: Field Sampling Containers, preservation, and holding times

Analyte and Solid Material (in accordance with laboratory instructions)	**Container type (tape color for label)**	**Preservative**	**Volume**	**Holding Time**
Cations/Trace Metals	New Polypropylene (Acid Washed) (yellow)	200ul Nitric Acid	60ml	6 months
Anions	New polypropylene (red)	none	60ml	28 days
Alkalinity	New polypropylene (red and black)	none	60ml	14 days
B/Sr isotopes	New polypropylene (green)	none	125ml	6 months

The Duke Field Team will strictly follow the United States Geological Survey's (USGS) National Field Manual for the Collection of Water-Quality Data (http://water.usgs.gov/owq/FieldManual/index.html), which includes water sampling, decontamination of equipment, and maintenance of sampling equipment. The solid sampling will be based on the EPA's SOP#2016 entitled "Sediment Sampling", but instead of a glass jar with a Teflon lined lid, we will be using an I-Chem* Series 300 High-Density Polyethelene Jar to prevent potential boron contamination from borosilicate glassware. (*I-Chem bottleware is certified to meet or exceed EPA analyte specifications and detection/quantification limits.) Disposable sampling equipment will be utilized to the extent possible in an effort to limit the potential for cross-contamination.

Samples will be stored according to the applicable storage criteria from the time of collection until the time of analysis by the laboratory. Field personnel will keep samples cold by placing ice in the coolers in which samples will be stored until delivery to the analytical laboratory personnel. After receipt of the samples, it is the laboratory's responsibility to store the applicable samples according to the applicable preservation conditions until preparation and analysis has been initiated.

Samples have a finite holding time (the time between sample collection, sample digestion, and sample analysis) to limit the potential for degradation of the analytes. The holding times for required analyses are measured from the verified time of sample collection.

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Appendix D: SAMPLE HANDLING AND CUSTODY

Field sampling personnel are responsible for the collection, description, documentation, labeling, packaging, storage, handling, and shipping of samples obtained in the field. These practices are necessary to ensure sample integrity from collection through laboratory analysis and data reporting. To demonstrate and document sample integrity aspects, information relative to the collected project samples will be described and thoroughly documented. Samples will be labeled, packaged, preserved, and delivered to the laboratories for analysis in appropriate sample containers, under the recommended temperature conditions with a COC record documenting the time and day of sample collection. The samples will remain in the sampler's possession in a locked vehicle with a custody seal on the cooler used in transporting the samples to the lab, at which point the samples will become the laboratory's responsibility.

Laboratory-supplied sample kits (provided by Duke University Vengosh Lab) with custody seals, packing materials, and EPA/USGS recommended sample containers and preservation methods will be used for all project samples during sample collection and transport to the designated laboratory. The sample containers and preservation requirements per parameter are presented in Table C.2.1.

In general, samples collected for the Duke University research project are identified using the following nomenclature and labeled with colored tape. The colored tape used will indicate to the Duke Laboratory what matrix and sample type is contained in the sampling bottle and is noted in Table 11.2.

Sample ID: [site]-[date]-[location]

D.1 Sample Documentation

Field activity evidentiary files will be maintained by the Duke Project Team (and associated labs) and will include information that defines the Project in its entirety, including but not limited to, the information below.

- Field logbooks.
- Raw data.
- QC information.
- COC Records.
- Photographs.

D.1.1 Chain-of-Custody Record

A primary consideration for environmental data is the ability to demonstrate that samples have been obtained from specific locations and have reached the laboratory without alteration.
Evidence of collection, shipment, laboratory receipt, and laboratory custody while samples are in the laboratory's possession will be documented by maintaining a COC that records each sample and the individuals responsible for sample collection, shipment, and receipt at the project laboratory. A COC record will accompany samples collected. The following information will be recorded to complete the COC record:

- Project name and number.
- Name of sampler.
- Sample identifier/name, location, date and time collected, and sample type.
- Analyses requested.
- Special instructions and/or sample hazards, if applicable.
- Signature of sampler in the designated blocks, including date, time, and company.
- Sample condition (including temperature) upon receipt as reported by the analytical laboratory.
- Signature of the laboratory receipt personnel in the designated blocks, including date, time, and company

affiliation.

Copies of COC records are maintained in the Duke Project File. Unused portions of samples collected in association with the Duke University Project will be archived at Duke University in the Vengosh Laboratory. Archived samples will be cataloged by the Duke Project Team and stored in an organized manner. In the event that project DQOs are not met for a sample, any remaining portion with preparation/analytical holding time remaining may be retrieved and submitted to a contracted laboratory for additional analysis.

D.1.2 Sample Custody in the Field

The purpose of sample custody procedures is to document the history of samples (and sample extracts or digestates) from the time of sample collection through shipment, analysis, and disposal. A sample is considered to be in one's custody if one of the following conditions applies:

- The sample is in an individual's actual possession.
- The sample is in view after being in an individual's physical possession.
- It was in the physical possession of an investigator and then they secured it to prevent tampering; and/or
- It is placed in a designated secure area.

Each individual field sampler is responsible for the care and custody of the samples he/she collects until the samples are properly transferred to temporary storage or are shipped to the laboratory. The following COC procedures will be followed for samples submitted to the laboratory for analyses:

- Each individual field sampler is responsible for the care and custody of samples he/she collects until the samples are properly transferred (relinquished on the COC by a field team member) to another person ("acceptor" of the samples) or are shipped to the laboratory.
- A COC form will be completed by the sampling team for each batch of samples submitted to the laboratory.
- If multiple coolers are needed, one COC form should accompany each cooler that contains the samples identified on the COC.
- Sample coolers will be packed sealed with custody seals for transport from field and shipment to laboratory in.
- Each time a sample batch is transferred (field sampling personnel relinquish custody to the laboratory), signatures of the individuals relinquishing and receiving the sample batch, as well as the date and time of transfer, will be documented on the COC. Note: commercial courier custody is tracked by commercial courier records and not by COC.
- A copy of the carrier air bill will be retained as part of the permanent COC documentation record.
- The laboratory will record the condition of the sample containers, and cooler temperature upon receipt, and record this information on a combination of sample receipt documentation and the COC.

Changes or corrections to the information documented by the COC record (including, but not limited to, field sample ID or requested analyses) must be changed, dated, and initialed by the person making the change. If the request for a change or correction comes from the Field Team after the COC records have been relinquished to the laboratory, a copy of the COC record will be revised, initialed, and forwarded to the laboratory, where the revised version will supersede the original COC record. The original COC record and any documented changes to the original record will be included as part of the final analytical report. This record will be used to document sample custody transfer from the sampler to the laboratory and will become a permanent part of the Project File.

D.2 Sample Packaging and Shipment

Samples will be packed and shipped to the laboratory in accordance with applicable U.S. Department of Transportation (US DOT) regulations, consulting corporate guidelines, and International Air Transport Association (IATA) standards (as detailed in the most current edition of *IATA Dangerous Goods Regulations* for hazardous materials shipments), as applicable.

Samples requiring temperature preservation at <6°C (not frozen) will be placed immediately after sample collection on wet ice and packaged with additional wet ice (as necessary) for shipment to the analytical laboratory. Samples requiring temperature preservation at <-10°C will be packaged with dry ice for shipment to the analytical laboratory.

D.3 Sample Custody in the Laboratory

The following subsections describe the COC procedures associated with sample receipt, storage, tracking, and documentation by the laboratory.

D.3.1 Sample Receipt

A designated Laboratory Sample Custodian (designated graduate student) will be responsible for samples received at the laboratory. The Laboratory Sample Custodian will be familiar with custody requirements and the potential hazards associated with environmental samples. In addition to receiving samples, the Laboratory Sample Custodian will also be responsible for documenting sample receipt, storage before and after sample analysis, and the proper disposal of samples. Upon sample receipt, the Sample Custodian will:

• Inspect the sample containers for integrity and ensure that custody seals are intact on the shipping coolers. The temperature of the samples upon receipt and the presence of leaking or broken containers will be noted on the COC record/sample receipt forms.
• Sign (with date and time of receipt) the COC/sample analysis request forms, thereby assuming custody of the samples.
• Compare the information of the COC record/sample receipt with the sample labels to verify sample identity. Any inconsistencies will be resolved with the Field Team before sample analysis proceeds.
• Store samples in accordance with Section D.3.2.

D.3.2 Sample Storage

Analytical samples will be stored in a locked facility and maintained within the appropriate temperature range as specified in EPA SW-846 Chapter 3 and Chapter 4. Required sample storage conditions are presented in Table C.2.1.

12.3.3 Sample Tracking

Each sample will receive a unique laboratory sample identification number (which will match the sample ID given in the field) at the laboratory when the sample is logged into the laboratory information management system (LIMS). This unique laboratory sample ID will consist of the following:

Lab Sample ID: [site]-[date]-[location].

Sample preparation/digestion records will be generated to fully document all sample handling prior to analysis. Laboratory data will be entered on the sample digestion form and permanently recorded in a laboratory logbook.

The laboratory will maintain a sample tracking system that documents the following:

• Organization/individual who performed sample analyses.
• Date of sample receipt, extraction or digestion, and analysis.
• Names of analysts.
• Sample preparation procedures.
• Analytical methods used to analyze the samples.
• Calibration and maintenance of instruments.
• Deviations from established analytical procedures, if applicable.
• QC procedures used to ensure that analyses were in control during data generation (instrument calibration, precision checks, method standards, method blanks, etc.).
• Procedures used for the calculation of precision and accuracy for the reported data.
• Statement of quality of analytical results.

D.4 Sample Archive

Archived samples will be received from the laboratory under COC and relinquished to the laboratory Sample Custodian. Only the laboratory Sample Custodian or those authorized by memorandum by the Project Leads are authorized to access the sample archive.

Appendix E. ANALYTICAL METHODS REQUIREMENTS

E.1 Field Analysis

Surface water samples will be monitored for the following field parameters using YSI® instruments to record field parameters for surface water samples.

E.2 Laboratory Analysis

To support the objectives of the Duke University Administered Project, the collected samples will be tested for the methods and constituents listed in Table C.1.1. Individual sample reporting limits may vary from the laboratory's routinely reported limits; this variance may be a result of dilution requirements, sample weight or volume used to perform the analysis, dry-weight adjustment for solid samples, the presence of analytical background contaminants, or other sample-related or analysis-related conditions. Additional analytical needs may be identified based on future construction or remediation activities; as needed, the Duke University QAPP addenda will be prepared to document the QC requirements associated with these additional analyses. The MDL will be used by the laboratories, except by the isotope analyses. The isotopes are run with standards (internal) as well as NIST Reference materials. Each laboratory maintains blank results in LIMS to perform this calculation. Blanks are pooled by matrix into several subsequent runs. MDLs are verified by an MDL verification sample that is run on another machine to establish the MDL, and then subsequently run on the others.

Dissolved metals analysis of surface water samples shall be performed on field-filtered (0.45-μm filter) water samples. Sample aliquots collected for dissolved analyses will be preserved after filtration. Preserved aqueous samples for metals analysis will be allowed to equilibrate a minimum of 24 hours between sample preservation and digestion.

Project MDLs are calculated based on historical blank concentrations as described by the equation below.

$$\text{Detection limit} = \text{avg} + 3\,\sigma$$

Where: avg = the numerical average of historical method blank concentrations per analyte
σ = standard deviation of the population of historical method blank concentrations per analyte

Project MDLs are employed to ensure that data are defensible to a concentration sufficient to achieve the lowest applicable regulatory standard for an analyte.

Appendix F. INSTRUMENT CALIBRATION AND FREQUENCY

This section provides the requirements for calibration of measuring and test equipment/instruments used in field sampling and laboratory analysis. The calibration procedures stipulated are designed to ensure that field equipment and instrumentation are calibrated to operate within manufacturer specifications and that the required traceability, sensitivity, and precision of the equipment/instruments are maintained.
Measurements that affect the quality of an item or activity will be taken only with instruments, tools, gauges, or other measuring devices that are accurate, controlled, calibrated, adjusted, and maintained at predetermined intervals to ensure the specified level of precision and accuracy.

In general, instrument calibration will be conducted in accordance with manufacturer's recommendations, method requirements, and field or laboratory SOPs.

E.1 Field Equipment Calibration and Procedures

Field instruments that may be used include, but are not limited to, the following:

• YSI® Instrument (Conductivity/Salinity/TDS/Temperature).
• YSI® Instrument (Oxidation Reduction Potential Meter).
• YSI® Instrument (Dissolved Oxygen Meter/Temperature).
• YSI® Instrument (pH meter/Temperature).

All field analytical equipment used to conduct surface water monitoring will be calibrated/standardized daily prior to use and a calibration check will be performed at the end of each field day. Calibration checks will be recorded in the field logbook. The calibration/ standardization procedures for field instrumentation are described in the calibration section of the applicable field SOPs. Personnel performing instrument calibrations/ standardizations shall be trained in its proper operation and calibration. The Field Team Leader in the field logbook will maintain records of all instrument calibration/standardization in the field logbook.

The calibration records will include documentation of the following information in the field logbook:

• Instrument name and identification number.
• Name of person performing the calibration.
• Date of calibration.
• Calibration points.
• Results of the calibration.
• Manufacturer lot number of the calibration standards.
• Expiration dates for the calibration standards, when applicable.

Field equipment will be properly inspected, charged, and in good working condition prior to the beginning of each working day. Prior to the start of each working day, the Field Team Leader will inspect equipment to ensure its proper working condition. Field equipment and instruments will be properly protected against inclement weather conditions during the field work. At the end of each working day, field equipment and instruments will be properly decontaminated, taken out of the field, and appropriately placed for overnight storage and/or charging. YSI® instruments used for continuous monitoring will be inspected each working day.

Calibration checks may suggest the need for maintenance or calibration by the manufacturer. Field instruments that do not meet the calibration requirements will be taken out-of-service until acceptable performance can be verified. Maintenance should be performed when the instrument will not adequately calibrate. Maintenance of field equipment should be noted in an instrument logbook or field notebook.

16.2 Laboratory Equipment Calibration

Instruments and equipment used in the laboratory will be controlled by a formal calibration program as described in the laboratory's SOP. The program will verify that the equipment has the proper calibration range, accuracy, and precision to generate data comparable with specific requirements. All calibration will be performed by laboratory personnel experienced in the referenced methods for the analysis of project samples for the constituents of concern.

Instrument calibration procedures are described in the calibration section of the associated laboratory SOP. At a minimum, laboratory instrument calibration will be performed in accordance with the associated technical and quality control requirements specified in the method applicable to the associated work plans.

The laboratory will provide all data and information to demonstrate that the analytical system was properly calibrated at the time of analysis, including calibration method, required frequency, source of standards, response factors, linear range, check standards, and applicable control limits, as part of the data deliverables.

Before any instrument is used as a measuring device, the instrument's response to reference materials must be determined. The manner in which various instruments are calibrated is dependent on the particular type of instrument and its intended use. Preparation of reference materials used for calibration will be documented in a laboratory notebook.

The two types of laboratory instrument calibration are initial calibration and continuing calibration verification. Initial calibration procedures establish the calibration range of the instrument. Typically, multiple analyte concentrations are used to establish the calibration range and calibration data. The laboratory evaluates the resulting calibration data as detailed in the calibration section of the associated SOP.

Continuing calibration verification usually measures the instrument's response to fewer calibration standards and requires instrument response to fall within certain limits of the initial measured instrument response. Continuing calibration verification may be used within an analytical sequence to verify stable calibration throughout the sequence and/or to demonstrate that instrument response did not drift during a period of non-use of the instrument.

The QA measures in the calibration section of the associated laboratory SOP will be used for calibration, calibration verification, and subsequent sample analyses. In addition, the following procedures will be used for the calibration of balances and thermometers. Laboratory balances will be calibrated and serviced annually by a certified contractor. Balances will undergo a calibration check prior to use each day using multiple S-Class or equivalent class weights that bracket the usage range. A record of calibrations and daily checks will be documented.

Oven and refrigerator thermometers will be calibrated annually against a National Institute of Standards and Technology (NIST)-certified thermometer in the range of interest. Annual calibrations will be documented. Thermometers must be tagged with any applicable correction factors.

Records will be maintained as evidence of required calibration frequencies, and equipment will be marked suitably to indicate calibration status. If marking on the equipment is not possible, records traceable to the equipment will be readily available for reference.

Appendix G: ASSESSMENTS AND RESPONSE ACTIONS

The primary goal of the Duke University Administered Project QA Program is to ensure that project data objectives are met and that defensible analytical data are generated for use in the decision-making processes. The Duke University Administered Project QA Program includes systems and performance audits to ensure that established QA procedures are properly implemented.

G.1 Field Activities

Field QA will include (but not be limited to) the following:

• Instrument calibration.
• Documentation of sample collection and field conditions.
• Adherence to COC procedures.
• Adherence to the associated field SOPs.
• Collection of field QC samples.

The QA review for usability of objective field data will be performed at two levels. For the first level, data will be reviewed at the time of collection by following standard procedures and QC checks. For the second level, after data reduction to table format or arrays, the data will be reviewed for inconsistent values.

Any inconsistencies identified during data review will be investigated by the Project Team. When possible, they will seek clarification from the field personnel responsible for collecting the data. Resolution of discrepancies will be documented using the corrective action process detailed in Section 19.4.

Field data will be reviewed for reasonableness and completeness. In addition, random checks of sampling and field conditions will be made to check recorded data at that time to confirm the recorded observations. Whenever possible, peer review will also be incorporated into the QA review process in order to maximize consistency among field personnel.

Any observed discrepancies between the COC record and the samples received will be documented by the laboratory, and the Project Team will be notified.

The field COC record information will be initially keyed into and maintained in the laboratory's database. In case of discrepancies between the COC record and the sample receipt confirmation, the appropriate revisions will be communicated to the laboratory for the appropriate COC record corrections. Corrected information on the COC record will be recorded into the project data management system.

G.2 Laboratory Analysis

Internal laboratory QA will consist of the following:

- Instrument performance checks.
- Instrument calibration and calibration verification.
- Retrieval of documentation pertaining to instrument standards, samples, and data.
- Adherence to laboratory SOPs.
- Documentation of sample preservation, transport, and analytical methodology.
- Adherence to the analytical methodology (at a minimum).
- Analysis of QC samples (discussed in Section 6.2).

The samples received by the laboratory will be handled in accordance with internal laboratory QC procedures (See lab SOPs). Data package completeness will be assessed and missing or incomplete information will be obtained from the laboratory. Any incorrect data will be corrected. Data usability will be evaluated and appropriate qualifiers will be added. Any data rejected by data validation efforts due to imprecision, holding time exceedances, and failure of relevant QC measures will be qualified or not utilized for the project. The Lab manager will be responsible for following the quality assurances and associated documents. The Lab Manager oversees the laboratory, but does not analyze the samples associated with this project directly.

19.2.1 Data Reduction

Data reduction is performed by the individual analysts and consists of calculating concentrations in samples from the raw data obtained from the measuring instruments. The complexity of the data reduction is dependent upon the specific method and the number of discrete operations (i.e., extractions/digestion, dilutions, and levels/concentrations) involved in obtaining a sample that can be measured.

For all analytical methods, sample response will be applied to the average response factor or the regression line to obtain an initial raw result, which will then be factored into equations to obtain the estimate of the concentration in the original sample. Rounding will not be performed until after the final result has been obtained to minimize rounding errors; results will not normally be expressed in more than three significant figures.

Copies of raw data and calculations used to generate the final results will be retained on file to allow reconstruction of the data reduction process at a later date.

The laboratory data reduction process is described in detail in the associated laboratory SOPs.

22.1 Precision

The degree of agreement between the numerical values of a set of duplicate samples performed in an identical fashion constitutes the precision of the measurement.

During the collection of data using field methods and/or instruments, precision is checked by reporting measurements at one location and comparing results. For example, soil measurements are taken in pairs at a certain point and depth and the values compared. The measurements are considered sufficiently precise only if the values are within a specified percentage of each other.

Analytical precision is calculated by expressing, as a percentage, the relative percent difference (RPD) between results of analyses of laboratory duplicate samples for a given analyte. Precision is expressed as an RPD when both results are greater than 5× the reporting limit as calculated by the following formula:

$$RPD= abs[(A-B)/((A+B)/2)] x 100$$

Where: A = Value of original sample
B = Value of duplicate sample

When at least one result is less than 5× the reporting limit, the difference between the results is used to evaluate precision.

22.2 Accuracy

Accuracy is the degree of agreement of a measurement, X, with an accepted reference or true value, T. Accuracy is usually expressed as the difference between the two values, X-T, or the difference as a percentage of the reference or true value, 100(X-T)/T; accuracy is also sometimes expressed as a ratio X/T. Accuracy, which is a measure of the bias in a system, is assessed by means of reference samples and percent recoveries. Error may arise due to personal, instrumental, or method factors.

The two types of analytical check samples used are laboratory control samples (LCSs) and matrix spike samples. Analytical accuracy is expressed as the percent recovery (%R) of an analyte that has been added to the control sample or a standard matrix (*e.g.*, blank soil, *etc.*) at a known concentration prior to analysis.

The formula used to calculate accuracy for the laboratory control sample is:

$$\%R= (A_T/A_F) \times 100$$

Where: A_T = The total concentration of the analyte measured or recovered
A_F = The concentration of the analyte spiked

When calculating accuracy for the matrix spike analysis, a correction for background concentration found in the unspiked sample must be made. Matrix spike recovery is calculated using the following formula:

$$\%R=((A_T-A_O)/A_F) \times 100$$

Where: A_T = The concentration of the analyte measured or recovered
A_O = The unspiked concentration of the analyte
A_F = The concentration of the analyte spiked.

22.3 Completeness

Completeness is a measure of the degree to which the amount of sample data collected meets the needs of the sampling program and is quantified as the relative number of analytical data points that meet the acceptance criteria (including accuracy, precision, and any other criteria required by the specific analytical method used). Completeness is defined as a comparison between actual numbers of usable data points expressed as a percentage of expected number of points.

Difficulties encountered while handling samples in the laboratory, as well as unforeseen complications regarding analytical methods, may affect completeness during sample analysis. The minimum goal for completeness is 90%; the ability to exceed this goal is dependent on the applicability of the analytical methods to the sample matrix analyzed. If data cannot be reported without qualifications, project completion goals may still be met if the qualified data (i.e., data of known quality, even if not perfect) are suitable for specified project goals. Percent completeness will be expressed as the ratio of the total number of usable results relative to the total number of analytical results. The total number of usable analytical results will be total number of results minus any results deemed unusable (e.g., rejected) at validation.

22.4 Representativeness

Representativeness expresses the degree to which sample data are accurate and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness is a qualitative parameter associated with the proper design of the sampling program. The representativeness criterion can, therefore, be met through the proper selection of sampling locations, the collection of a sufficient number of samples and the use of EPA-approved and standardized sampling procedures to describe sampling techniques and the rationale used to select sampling locations to ensure representativeness of the sample data.

Representativeness will also be measured by the collection of field duplicates or co-located samples, as appropriate given the sample matrix. Comparison of the analytical results of field duplicates will provide a direct measure of individual sample representativeness.

22.5 Comparability

Comparability is a qualitative parameter used to express the confidence with which one data set can be compared with another. The comparability of the data, a relative measure, is influenced by sampling and analytical procedures. By providing specific protocols for obtaining and analyzing samples, data sets should be comparable regardless of who collects the sample or who performs the sample analysis.

The laboratory will be responsible providing the following controls to allow assessment of comparability:

- Adherence to current, standard EPA-approved methodology for sample preservation.
- Compliance with holding times and analysis consistent with this QAPP.
- Consistent reporting units for each parameter of similar matrices.

• EPA-traceable or NIST-traceable standards, when applicable.

Exhibit 7

ESC LAB SCIENCES a subsidiary of Pace Analytical

ANALYTICAL REPORT

October 02, 2017

myESC REAL TIME DATA ACCESS a subsidiary of Pace Analytical

Barry Sulkin

Sample Delivery Group:	L938613
Samples Received:	09/22/2017
Project Number:	VERMILLION
Description:	
Report To:	Mr. Barry Sulkin 4443 Pecan Valley Road Nashville, TN 37218

Entire Report Reviewed By: Linda Cashman

Linda Cashman
Technical Service Representative

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by ESC is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.

TABLE OF CONTENTS

#1 UPPER L938613-01 WW

Collected by	Collected date/time	Received date/time
Barry Sulkin	09/21/17 14:10	09/22/17 16:22

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Calculated Results	WG1025664	1	09/29/17 11:16	10/01/17 09:57	JER
Gravimetric Analysis by Method 2540 C-2011	WG1024549	1	09/26/17 21:57	09/26/17 22:09	EG
Wet Chemistry by Method 300.0	WG1025435	100	09/29/17 15:16	09/29/17 15:16	DR
Wet Chemistry by Method 3500Cr C-2011	WG1025596	1	09/28/17 19:19	09/28/17 19:19	MCG
Wet Chemistry by Method 351.2	WG1026541	1	09/29/17 13:25	10/01/17 09:57	KK
Wet Chemistry by Method 353.2	WG1025664	1	09/29/17 11:48	09/29/17 11:48	JER
Wet Chemistry by Method 365.4	WG1026608	1	09/29/17 13:25	10/01/17 13:09	KK
Mercury by Method 245.1	WG1024041	1	09/24/17 11:52	09/25/17 11:59	EL
Metals (ICP) by Method 200.7	WG1025438	1	09/28/17 12:18	09/29/17 02:48	JDG
Metals (ICPMS) by Method 200.8	WG1024194	1	09/28/17 07:34	09/29/17 18:22	LAT

#2 MID L938613-02 WW

Collected by	Collected date/time	Received date/time
Barry Sulkin	09/21/17 14:45	09/22/17 16:22

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Calculated Results	WG1025664	1	09/29/17 11:16	10/01/17 10:00	JER
Gravimetric Analysis by Method 2540 C-2011	WG1024549	1	09/26/17 21:57	09/26/17 22:09	EG
Wet Chemistry by Method 300.0	WG1025435	100	09/29/17 15:26	09/29/17 15:26	DR
Wet Chemistry by Method 3500Cr C-2011	WG1025596	1	09/28/17 20:10	09/28/17 20:10	MCG
Wet Chemistry by Method 351.2	WG1026541	1	09/29/17 13:25	10/01/17 10:00	KK
Wet Chemistry by Method 353.2	WG1025664	1	09/29/17 11:49	09/29/17 11:49	JER
Wet Chemistry by Method 365.4	WG1026608	1	09/29/17 13:25	10/01/17 13:11	KK
Mercury by Method 245.1	WG1024041	1	09/24/17 11:52	09/25/17 12:01	EL
Metals (ICP) by Method 200.7	WG1025438	1	09/28/17 12:18	09/29/17 02:51	JDG
Metals (ICPMS) by Method 200.8	WG1024194	1	09/28/17 07:34	09/29/17 18:26	LAT

#3 LOWER L938613-03 WW

Collected by	Collected date/time	Received date/time
Barry Sulkin	09/21/17 15:10	09/22/17 16:22

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Calculated Results	WG1025664	1	09/29/17 11:16	10/01/17 10:03	JER
Gravimetric Analysis by Method 2540 C-2011	WG1024549	1	09/26/17 21:57	09/26/17 22:09	EG
Wet Chemistry by Method 300.0	WG1025435	100	09/29/17 15:36	09/29/17 15:36	DR
Wet Chemistry by Method 3500Cr C-2011	WG1025596	1	09/28/17 20:19	09/28/17 20:19	MCG
Wet Chemistry by Method 351.2	WG1026541	1	09/29/17 13:25	10/01/17 10:03	KK
Wet Chemistry by Method 353.2	WG1025664	1	09/29/17 11:50	09/29/17 11:50	JER
Wet Chemistry by Method 365.4	WG1026608	1	09/29/17 13:25	10/01/17 13:26	KK
Mercury by Method 245.1	WG1024041	1	09/24/17 11:52	09/25/17 12:03	EL
Metals (ICP) by Method 200.7	WG1025438	1	09/28/17 12:18	09/29/17 02:53	JDG
Metals (ICPMS) by Method 200.8	WG1024194	1	09/28/17 07:34	09/29/17 18:29	LAT

All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times. All MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Linda Cashman

Linda Cashman
Technical Service Representative

Calculated Results

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Total Nitrogen	1.64		0.0197	0.100	1	10/01/2017 09:57	WG1025664

Gravimetric Analysis by Method 2540 C-2011

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Dissolved Solids	2860		2.82	10.0	1	09/26/2017 22:09	WG1024549

Wet Chemistry by Method 300.0

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Sulfate	1300		7.74	500	100	09/29/2017 15:16	WG1025435

Wet Chemistry by Method 3500Cr C-2011

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Hexavalent Chromium	U		0.000150	0.000500	1	09/28/2017 19:19	WG1025596

Wet Chemistry by Method 351.2

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Kjeldahl Nitrogen, TKN	0.539		0.0350	0.250	1	10/01/2017 09:57	WG1026541

Wet Chemistry by Method 353.2

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Nitrate-Nitrite	1.10		0.0197	0.100	1	09/29/2017 11:48	WG1025664

Wet Chemistry by Method 365.4

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Phosphorus,Total	0.0562	B J	0.0350	0.100	1	10/01/2017 13:09	WG1026608

Mercury by Method 245.1

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Mercury	U		0.0000490	0.000200	1	09/25/2017 11:59	WG1024041

Metals (ICP) by Method 200.7

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Boron	27.1		0.0159	0.200	1	09/29/2017 02:48	WG1025438
Iron	1.55		0.0282	0.100	1	09/29/2017 02:48	WG1025438
Lithium	0.658		0.00600	0.0150	1	09/29/2017 02:48	WG1025438

Metals (ICPMS) by Method 200.8

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Antimony	U		0.000754	0.00200	1	09/29/2017 18:22	WG1024194
Arsenic	0.000603	J	0.000170	0.00100	1	09/29/2017 18:22	WG1024194
Barium	0.0168		0.000550	0.00500	1	09/29/2017 18:22	WG1024194
Beryllium	U		0.000280	0.00100	1	09/29/2017 18:22	WG1024194

Metals (ICPMS) by Method 200.8

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Cadmium	U		0.000220	0.00100	1	09/29/2017 18:22	WG1024194
Chromium	0.00101		0.000320	0.00100	1	09/29/2017 18:22	WG1024194
Cobalt	0.000616	J	0.000270	0.00200	1	09/29/2017 18:22	WG1024194
Lead	0.00100		0.000260	0.00100	1	09/29/2017 18:22	WG1024194
Manganese	0.705		0.000510	0.00500	1	09/29/2017 18:22	WG1024194
Molybdenum	0.174		0.000260	0.00500	1	09/29/2017 18:22	WG1024194
Selenium	U		0.000320	0.00200	1	09/29/2017 18:22	WG1024194
Thallium	U		0.000280	0.00100	1	09/29/2017 18:22	WG1024194
Vanadium	U		0.000620	0.00500	1	09/29/2017 18:22	WG1024194

Calculated Results

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Total Nitrogen	2.58		0.0197	0.100	1	10/01/2017 10:00	WG1025664

Gravimetric Analysis by Method 2540 C-2011

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Dissolved Solids	2590		2.82	10.0	1	09/26/2017 22:09	WG1024549

Wet Chemistry by Method 300.0

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Sulfate	1760		7.74	500	100	09/29/2017 15:26	WG1025435

Wet Chemistry by Method 3500Cr C-2011

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Hexavalent Chromium	U		0.000150	0.000500	1	09/28/2017 20:10	WG1025596

Wet Chemistry by Method 351.2

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Kjeldahl Nitrogen, TKN	2.58	J6	0.0350	0.250	1	10/01/2017 10:00	WG1026541

Wet Chemistry by Method 353.2

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Nitrate-Nitrite	U		0.0197	0.100	1	09/29/2017 11:49	WG1025664

Wet Chemistry by Method 365.4

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Phosphorus,Total	0.156	B	0.0350	0.100	1	10/01/2017 13:11	WG1026608

Mercury by Method 245.1

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Mercury	U		0.0000490	0.000200	1	09/25/2017 12:01	WG1024041

Metals (ICP) by Method 200.7

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Boron	23.3		0.0159	0.200	1	09/29/2017 02:51	WG1025438
Iron	129		0.0282	0.100	1	09/29/2017 02:51	WG1025438
Lithium	0.736		0.00600	0.0150	1	09/29/2017 02:51	WG1025438

Metals (ICPMS) by Method 200.8

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Antimony	U		0.000754	0.00200	1	09/29/2017 18:26	WG1024194
Arsenic	0.00969		0.000170	0.00100	1	09/29/2017 18:26	WG1024194
Barium	0.0330		0.000550	0.00500	1	09/29/2017 18:26	WG1024194
Beryllium	U		0.000280	0.00100	1	09/29/2017 18:26	WG1024194

1 Cp 2 Tc 3 Ss 4 Cn 5 Sr 6 Qc 7 Gl 8 Al 9 Sc

Metals (ICPMS) by Method 200.8

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Cadmium	U		0.000220	0.00100	1	09/29/2017 18:26	WG1024194
Chromium	0.00233		0.000320	0.00100	1	09/29/2017 18:26	WG1024194
Cobalt	0.00427		0.000270	0.00200	1	09/29/2017 18:26	WG1024194
Lead	U		0.000260	0.00100	1	09/29/2017 18:26	WG1024194
Manganese	4.21		0.000510	0.00500	1	09/29/2017 18:26	WG1024194
Molybdenum	0.0822		0.000260	0.00500	1	09/29/2017 18:26	WG1024194
Selenium	U		0.000320	0.00200	1	09/29/2017 18:26	WG1024194
Thallium	U		0.000280	0.00100	1	09/29/2017 18:26	WG1024194
Vanadium	U		0.000620	0.00500	1	09/29/2017 18:26	WG1024194

1 Cp
2 Tc
3 Ss
4 Cn
5 Sr
6 Qc
7 Gl
8 Al
9 Sc

Calculated Results

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Total Nitrogen	2.55		0.0197	0.100	1	10/01/2017 10:03	WG1025664

Gravimetric Analysis by Method 2540 C-2011

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Dissolved Solids	3310		2.82	10.0	1	09/26/2017 22:09	WG1024549

Wet Chemistry by Method 300.0

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Sulfate	1660		7.74	500	100	09/29/2017 15:36	WG1025435

Wet Chemistry by Method 3500Cr C-2011

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Hexavalent Chromium	U		0.000150	0.000500	1	09/28/2017 20:19	WG1025596

Wet Chemistry by Method 351.2

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Kjeldahl Nitrogen, TKN	2.55		0.0350	0.250	1	10/01/2017 10:03	WG1026541

Wet Chemistry by Method 353.2

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Nitrate-Nitrite	U		0.0197	0.100	1	09/29/2017 11:50	WG1025664

Wet Chemistry by Method 365.4

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Phosphorus,Total	0.195	B	0.0350	0.100	1	10/01/2017 13:26	WG1026608

Mercury by Method 245.1

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Mercury	U		0.0000490	0.000200	1	09/25/2017 12:03	WG1024041

Metals (ICP) by Method 200.7

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Boron	24.4		0.0159	0.200	1	09/29/2017 02:53	WG1025438
Iron	241		0.0282	0.100	1	09/29/2017 02:53	WG1025438
Lithium	0.948		0.00600	0.0150	1	09/29/2017 02:53	WG1025438

Metals (ICPMS) by Method 200.8

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Antimony	U		0.000754	0.00200	1	09/29/2017 18:29	WG1024194
Arsenic	0.0380		0.000170	0.00100	1	09/29/2017 18:29	WG1024194
Barium	0.0751		0.000550	0.00500	1	09/29/2017 18:29	WG1024194
Beryllium	U		0.000280	0.00100	1	09/29/2017 18:29	WG1024194

Metals (ICPMS) by Method 200.8

Analyte	Result mg/l	Qualifier	MDL mg/l	RDL mg/l	Dilution	Analysis date / time	Batch
Cadmium	U		0.000220	0.00100	1	09/29/2017 18:29	WG1024194
Chromium	0.00658		0.000320	0.00100	1	09/29/2017 18:29	WG1024194
Cobalt	0.00658		0.000270	0.00200	1	09/29/2017 18:29	WG1024194
Lead	0.00529		0.000260	0.00100	1	09/29/2017 18:29	WG1024194
Manganese	7.35		0.000510	0.00500	1	09/29/2017 18:29	WG1024194
Molybdenum	0.113		0.000260	0.00500	1	09/29/2017 18:29	WG1024194
Selenium	0.000630	J	0.000320	0.00200	1	09/29/2017 18:29	WG1024194
Thallium	U		0.000280	0.00100	1	09/29/2017 18:29	WG1024194
Vanadium	0.00806		0.000620	0.00500	1	09/29/2017 18:29	WG1024194

Method Blank (MB)

(MB) R3253153-1 09/26/17 22:09

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Dissolved Solids	U		2.82	10.0

L938613-01 Original Sample (OS) • Duplicate (DUP)

(OS) L938613-01 09/26/17 22:09 • (DUP) R3253153-4 09/26/17 22:09

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Dissolved Solids	2860	2830	1	0.880		5

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3253153-2 09/26/17 22:09 • (LCSD) R3253153-3 09/26/17 22:09

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Dissolved Solids	8800	8420	8320	95.7	94.5	85.0-115			1.19	5

Method Blank (MB)

(MB) R3253553-1 09/29/17 12:23

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Sulfate	U		0.0774	5.00

L938609-13 Original Sample (OS) • Duplicate (DUP)

(OS) L938609-13 09/29/17 13:14 • (DUP) R3253553-4 09/29/17 13:24

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Sulfate	25.2	25.0	1	1		20

L938808-09 Original Sample (OS) • Duplicate (DUP)

(OS) L938808-09 09/29/17 17:28 • (DUP) R3253553-7 09/29/17 17:38

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Sulfate	41.6	36.8	1	12		20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3253553-2 09/29/17 12:33 • (LCSD) R3253553-3 09/29/17 12:43

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Sulfate	40.0	39.7	39.7	99	99	90-110			0	20

L938609-13 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L938609-13 09/29/17 13:14 • (MS) R3253553-5 09/29/17 13:34 • (MSD) R3253553-6 09/29/17 13:44

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Sulfate	50.0	25.2	65.0	65.3	80	80	1	80-120			0	20

L938808-09 Original Sample (OS) • Matrix Spike (MS)

(OS) L938808-09 09/29/17 17:28 • (MS) R3253553-8 09/29/17 17:48

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Sulfate	50.0	41.6	83.5	84	1	80-120	

Method Blank (MB)

(MB) R3253386-1 09/28/17 17:09

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Hexavalent Chromium	U		0.00015	0.000500

L939488-01 Original Sample (OS) • Duplicate (DUP)

(OS) L939488-01 09/28/17 19:44 • (DUP) R3253386-6 09/28/17 20:00

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Hexavalent Chromium	ND	0.000	1	0		20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3253386-4 09/28/17 17:58 • (LCSD) R3253386-5 09/28/17 18:08

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Hexavalent Chromium	0.00200	0.00187	0.00185	93	93	90-110			1	20

L939460-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L939460-01 09/28/17 20:27 • (MS) R3253386-7 09/28/17 20:35 • (MSD) R3253386-8 09/28/17 20:43

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Hexavalent Chromium	0.0500	ND	0.0518	0.0517	104	103	1	90-110			0	20

Method Blank (MB)

(MB) R3253719-1 10/01/17 09:42

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Kjeldahl Nitrogen, TKN	0.0531	J	0.035	0.250

L938613-01 Original Sample (OS) • Duplicate (DUP)

(OS) L938613-01 10/01/17 09:57 • (DUP) R3253719-5 10/01/17 09:58

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Kjeldahl Nitrogen, TKN	0.539	0.441	1	20		20

L938613-03 Original Sample (OS) • Duplicate (DUP)

(OS) L938613-03 10/01/17 10:03 • (DUP) R3253719-8 10/01/17 10:04

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Kjeldahl Nitrogen, TKN	2.55	2.63	1	3		20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3253719-2 10/01/17 09:43 • (LCSD) R3253719-3 10/01/17 09:44

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Kjeldahl Nitrogen, TKN	10.0	10.5	10.5	105	105	90-110			0	20

L938606-02 Original Sample (OS) • Matrix Spike (MS)

(OS) L938606-02 10/01/17 10:15 • (MS) R3253719-4 10/01/17 09:49

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MS Rec. %	Dilution	Rec. Limits %	MS Qualifier
Kjeldahl Nitrogen, TKN	5.00	0.448	4.47	80	1	90-110	J6

L938613-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L938613-02 10/01/17 10:00 • (MS) R3253719-6 10/01/17 10:01 • (MSD) R3253719-7 10/01/17 10:02

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Kjeldahl Nitrogen, TKN	5.00	2.58	6.94	7.39	87	96	1	90-110	J6		6	20

Method Blank (MB)

(MB) R3253830-1 09/29/17 11:31

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Nitrate-Nitrite	U		0.0197	0.100

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3253830-2 09/29/17 11:32 • (LCSD) R3253830-3 09/29/17 11:33

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Nitrate-Nitrite	5.00	3.94	3.91	99	98	90-110			1	20

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Method Blank (MB)

(MB) R3253751-1 10/01/17 13:01

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Phosphorus,Total	0.0608	J	0.035	0.100

L938613-01 Original Sample (OS) • Duplicate (DUP)

(OS) L938613-01 10/01/17 13:09 • (DUP) R3253751-4 10/01/17 13:10

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Phosphorus,Total	0.0562	0.0630	1	11	J	20

L938613-03 Original Sample (OS) • Duplicate (DUP)

(OS) L938613-03 10/01/17 13:26 • (DUP) R3253751-7 10/01/17 13:27

Analyte	Original Result mg/l	DUP Result mg/l	Dilution	DUP RPD %	DUP Qualifier	DUP RPD Limits %
Phosphorus,Total	0.195	0.194	1	1		20

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3253751-2 10/01/17 13:02 • (LCSD) R3253751-3 10/01/17 13:04

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Phosphorus,Total	2.00	2.09	2.05	105	103	90-110			2	20

L938613-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L938613-02 10/01/17 13:11 • (MS) R3253751-5 10/01/17 13:13 • (MSD) R3253751-6 10/01/17 13:17

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Phosphorus,Total	2.50	0.156	2.71	2.67	102	101	1	90-110			1	20

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Method Blank (MB)

(MB) R3252006-1 09/25/17 10:50

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Mercury	U		0.000049	0.000200

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3252006-2 09/25/17 10:53 • (LCSD) R3252006-3 09/25/17 10:55

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Mercury	0.00300	0.00292	0.00291	97	97	85-115			0	20

L937592-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L937592-01 09/25/17 11:04 • (MS) R3252006-4 09/25/17 11:06 • (MSD) R3252006-5 09/25/17 11:09

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Mercury	0.00300	ND	0.00300	0.00290	100	97	1	70-130			3	20

L938011-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L938011-01 09/25/17 11:11 • (MS) R3252006-6 09/25/17 11:13 • (MSD) R3252006-7 09/25/17 11:15

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Mercury	0.00300	ND	0.00305	0.00294	102	98	1	70-130			4	20

Method Blank (MB)

(MB) R3253273-1 09/29/17 01:40

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Boron	U		0.0159	0.200
Iron	U		0.0282	0.100
Lithium	U		0.006	0.0150

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3253273-2 09/29/17 01:43 • (LCSD) R3253273-3 09/29/17 01:45

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Boron	1.00	0.953	0.957	95	96	85-115			0	20
Iron	10.0	9.57	9.67	96	97	85-115			1	20
Lithium	1.00	0.968	0.973	97	97	85-115			1	20

L937922-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L937922-01 09/29/17 01:48 • (MS) R3253273-5 09/29/17 01:53 • (MSD) R3253273-6 09/29/17 01:56

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Iron	10.0	ND	9.77	9.74	98	97	1	70-130			0	20
Lithium	1.00	ND	0.997	0.998	100	100	1	70-130			0	20

L938058-02 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L938058-02 09/29/17 01:58 • (MS) R3253273-7 09/29/17 02:01 • (MSD) R3253273-8 09/29/17 02:03

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Iron	10.0	ND	9.94	9.83	99	98	1	70-130			1	20
Lithium	1.00	ND	1.01	0.996	101	100	1	70-130			1	20

Method Blank (MB)

(MB) R3253495-1 09/29/17 13:24

Analyte	MB Result mg/l	MB Qualifier	MB MDL mg/l	MB RDL mg/l
Antimony	U		0.000754	0.00200
Arsenic	U		0.00017	0.00100
Barium	U		0.00055	0.00500
Beryllium	U		0.00028	0.00100
Cadmium	U		0.00022	0.00100
Chromium	U		0.00032	0.00100
Cobalt	U		0.00027	0.00200
Lead	U		0.00026	0.00100
Manganese	U		0.00051	0.00500
Molybdenum	U		0.00026	0.00500
Selenium	U		0.00032	0.00200
Thallium	U		0.00028	0.00100
Vanadium	U		0.00062	0.00500

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3253495-2 09/29/17 13:28 • (LCSD) R3253495-3 09/29/17 13:31

Analyte	Spike Amount mg/l	LCS Result mg/l	LCSD Result mg/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Antimony	0.0500	0.0514	0.0514	103	103	85-115			0	20
Arsenic	0.0500	0.0503	0.0502	101	100	85-115			0	20
Barium	0.0500	0.0492	0.0473	98	95	85-115			4	20
Beryllium	0.0500	0.0483	0.0490	97	98	85-115			1	20
Cadmium	0.0500	0.0510	0.0519	102	104	85-115			2	20
Chromium	0.0500	0.0505	0.0503	101	101	85-115			0	20
Cobalt	0.0500	0.0519	0.0521	104	104	85-115			0	20
Lead	0.0500	0.0504	0.0503	101	101	85-115			0	20
Manganese	0.0500	0.0496	0.0483	99	97	85-115			3	20
Molybdenum	0.0500	0.0513	0.0507	103	101	85-115			1	20
Selenium	0.0500	0.0536	0.0539	107	108	85-115			1	20
Thallium	0.0500	0.0507	0.0505	101	101	85-115			0	20
Vanadium	0.0500	0.0504	0.0499	101	100	85-115			1	20

L937828-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L937828-01 09/29/17 13:35 • (MS) R3253495-5 09/29/17 13:42 • (MSD) R3253495-6 09/29/17 13:45

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Antimony	0.0500	ND	0.0528	0.0530	106	106	1	70-130			0	20
Arsenic	0.0500	ND	0.0498	0.0515	99	103	1	70-130			3	20
Barium	0.0500	0.0231	0.0719	0.0751	98	104	1	70-130			4	20
Beryllium	0.0500	ND	0.0496	0.0500	99	100	1	70-130			1	20
Cadmium	0.0500	ND	0.0512	0.0530	102	106	1	70-130			4	20
Chromium	0.0500	0.00433	0.0617	0.0550	115	101	1	70-130			11	20
Cobalt	0.0500	ND	0.0512	0.0522	102	104	1	70-130			2	20
Lead	0.0500	0.00131	0.0509	0.0515	99	100	1	70-130			1	20
Manganese	0.0500	0.0186	0.0684	0.0682	100	99	1	70-130			0	20
Molybdenum	0.0500	ND	0.0516	0.0524	102	104	1	70-130			2	20
Selenium	0.0500	ND	0.0531	0.0558	106	112	1	70-130			5	20
Thallium	0.0500	ND	0.0478	0.0488	96	98	1	70-130			2	20
Vanadium	0.0500	ND	0.0499	0.0507	100	101	1	70-130			2	20

L938019-01 Original Sample (OS) • Matrix Spike (MS) • Matrix Spike Duplicate (MSD)

(OS) L938019-01 09/29/17 16:25 • (MS) R3253495-7 09/29/17 16:28 • (MSD) R3253495-8 09/29/17 16:32

Analyte	Spike Amount mg/l	Original Result mg/l	MS Result mg/l	MSD Result mg/l	MS Rec. %	MSD Rec. %	Dilution	Rec. Limits %	MS Qualifier	MSD Qualifier	RPD %	RPD Limits %
Antimony	0.0500	0.00225	0.0543	0.0503	104	96	1	70-130			8	20
Arsenic	0.0500	ND	0.0522	0.0477	104	95	1	70-130			9	20
Barium	0.0500	0.00672	0.0565	0.0552	100	97	1	70-130			2	20
Beryllium	0.0500	ND	0.0498	0.0475	100	95	1	70-130			5	20
Cadmium	0.0500	ND	0.0548	0.0514	110	103	1	70-130			6	20
Chromium	0.0500	ND	0.0516	0.0481	103	96	1	70-130			7	20
Cobalt	0.0500	ND	0.0537	0.0496	107	99	1	70-130			8	20
Lead	0.0500	0.00293	0.0548	0.0528	104	100	1	70-130			4	20
Manganese	0.0500	0.0273	0.0767	0.0720	99	89	1	70-130			6	20
Molybdenum	0.0500	ND	0.0527	0.0499	105	100	1	70-130			5	20
Selenium	0.0500	ND	0.0556	0.0551	111	110	1	70-130			1	20
Thallium	0.0500	ND	0.0520	0.0500	104	100	1	70-130			4	20
Vanadium	0.0500	ND	0.0510	0.0474	102	95	1	70-130			7	20

Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

Qualifier	Description
B	The same analyte is found in the associated blank.
J	The identification of the analyte is acceptable; the reported value is an estimate.
J6	The sample matrix interfered with the ability to make any accurate determination; spike value is low.

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* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

State Accreditations

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Alaska	UST-080	New Hampshire	2975
Arizona	AZ0612	New Jersey–NELAP	TN002
Arkansas	88-0469	New Mexico	TN00003
California	01157CA	New York	11742
Colorado	TN00003	North Carolina	Env375
Conneticut	PH-0197	North Carolina [1]	DW21704
Florida	E87487	North Carolina [2]	41
Georgia	NELAP	North Dakota	R-140
Georgia [1]	923	Ohio–VAP	CL0069
Idaho	TN00003	Oklahoma	9915
Illinois	200008	Oregon	TN200002
Indiana	C-TN-01	Pennsylvania	68-02979
Iowa	364	Rhode Island	221
Kansas	E-10277	South Carolina	84004
Kentucky [1]	90010	South Dakota	n/a
Kentucky [2]	16	Tennessee [1,4]	2006
Louisiana	AI30792	Texas	T 104704245-07-TX
Maine	TN0002	Texas [5]	LAB0152
Maryland	324	Utah	6157585858
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	109
Minnesota	047-999-395	Washington	C1915
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA
Nebraska	NE-OS-15-05		

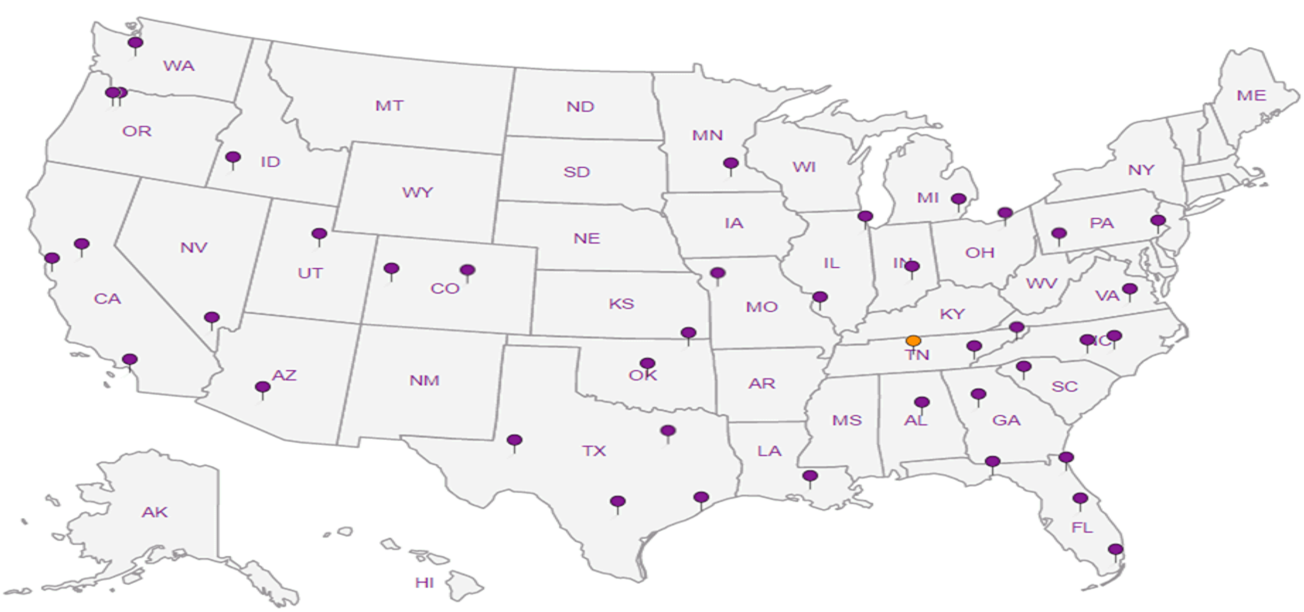
Third Party & Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC	100789
A2LA – ISO 17025 [5]	1461.02	DOD	1461.01
Canada	1461.01	USDA	S-67674
EPA–Crypto	TN00003		

[1] Drinking Water [2] Underground Storage Tanks [3] Aquatic Toxicity [4] Chemical/Microbiological [5] Mold [n/a] Accreditation not applicable

Our Locations

ESC Lab Sciences has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. **ESC Lab Sciences performs all testing at our central laboratory.**



Barry Sulkin
4443 Pecan Valley Road
Nashville, TN 37218

Billing Information:
Mr. Barry Sulkin
4443 Pecan Valley Road
Nashville, TN 37218

Report to: Mr. Barry Sulkin
Email To: sulkin@hughes.net

Project Description: Vermillion
City/State Collected: Danville, IL

Phone: 615-255-2079
Fax: -251-0111

Client Project #: Vermillion
Lab Project #: SULK07-VERMILION IL

Collected by (print): Barry Sulkin
Site/Facility ID #:
P.O. #:

Collected by (signature): Barry Sulkin
Immediately Packed on Ice N___ Y ✓

Rush? (Lab MUST Be Notified)
___ Same Day ___ Five Day
___ Next Day ___ 5 Day (Rad Only)
___ Two Day ___ 10 Day (Rad Only)
___ Three Day

Quote #:
Date Results Needed:

Chain of Custody Page ___ of ___

ESC LAB SCIENCES
12065 Lebanon Rd
Mount Juliet, TN 37122
Phone: 615-758-5858
Phone: 800-767-5859
Fax: 615-758-5859

L# 938613
G207
Acctnum: SULK07
Template: T127696
Prelogin: P618061
TSR: 650 - Linda Cashman
PB: 9-8-17
Shipped Via: Courier

Analysis / Container / Preservative — Pres Chk: 12 12 12

Sample ID	Comp/Grab	Matrix *	Depth	Date	Time	No. of Cntrs	CR6ICFFP 50mlTube/plungerPres	Metals 250mlHDPE-HNO3	PT, TKN,NO2NO3 250mlHDPE-H2SO4	TDS, Sulfate 250mlHDPE-NoPres	Remarks	Sample # (lab only)
#1 Upper	G	WW	Surf	9-21-17	2:10	4	X	X	X	X		-01
#2 Mid	G	WW	"	"	2:45	4	X	X	X	X		-02
#3 Lower	G	WW	"	"	3:10	4	X	X	X	X		-03
		WW				4	X	X	X	X		~~-04~~
		WW				4	X	X	X	X		
		WW				4	X	X	X	X		
		WW				4	X	X	X	X		
		WW				4	X	X	X	X		
		WW				4	X	X	X	X		
		WW				4	X	X	X	X		

* Matrix:
SS - Soil AIR - Air F - Filter
GW - Groundwater B - Bioassay
WW - WasteWater
DW - Drinking Water
OT - Other___

Remarks:
pH ___ Temp ___
Flow ___ Other ___

Samples returned via: ___ UPS ___ FedEx ___ Courier ___ c/t

Tracking #

Sample Receipt Checklist
COC Seal Present/Intact: NP _Y _N
COC Signed/Accurate: ✓ _N
Bottles arrive intact: ✓ _N
Correct bottles used: ✓ _N
Sufficient volume sent: ✓ _N
If Applicable
VOA Zero Headspace: _Y _N
Preservation Correct/Checked: ✓Y _N
on ice

Relinquished by: (Signature) Barry Sulkin — Date: 9/22/17 — Time: 4:22pm
Received by: (Signature)
Trip Blank Received: Yes / No HCL / MeoH TBR

Relinquished by: (Signature) — Date: — Time:
Received by: (Signature)
Temp: 2.1 °C Bottles Received: 12
If preservation required by Login: Date/Time

Relinquished by: (Signature) — Date: — Time:
Received for lab by: (Signature) Susan Ward MW
Date: 9/22/17 Time: 1622
Hold:
Condition: NCF / OK

Exhibit 8

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 NORTH GRAND AVENUE EAST, P.O. BOX 19276, SPRINGFIELD, ILLINOIS 62794-9276 • (217) 782-3397

BRUCE RAUNER, GOVERNOR **ALEC MESSINA**, DIRECTOR

217/782-9861

June 20, 2018

CERTIFIED MAIL # 7013 2630 0001 4707 8643
RETURN RECEIPT REQUESTED

Vistra Energy Corp.
6555 Sierra Drive
Irving, TX 75039

Re: Violation Notice: Vistra Energy Corp. – formerly Dynegy Midwest Generation-Vermilion – IL0004057 – W1838000002
Violation Notice No.: W-2018-50056

Dear Facility Owner:

This constitutes a Violation Notice pursuant to Section 31(a)(1) of the Illinois Environmental Protection Act ("Act"), 415 ILCS 5/31(a)(1), and is based upon a review of available information and an investigation by representatives of the Illinois Environmental Protection Agency ("Illinois EPA").

The Illinois EPA hereby provides notice of alleged violations of environmental laws, regulations, or permits as set forth in Attachment A to this notice. Attachment A includes an explanation of the activities that the Illinois EPA believes may resolve the specified alleged violations, including an estimate of a reasonable time period to complete the necessary activities. Due to the nature and seriousness of the alleged violations, please be advised that resolution of the violations may also require the involvement of a prosecutorial authority for purposes that may include, among others, the imposition of statutory penalties.

A written response, which may include a request for a meeting with representatives of the Illinois EPA, must be submitted via certified mail to the Illinois EPA within 45 days of receipt of this letter. If a meeting is requested, it shall be held within 60 days of receipt of this notice. The response must include information in rebuttal, explanation, or justification of each alleged violation and a statement indicating whether or not the facility wishes to enter into a Compliance Commitment Agreement ("CCA") pursuant to Section 31(a) of the Act. If the facility wishes to enter into a CCA, the written response must also include proposed terms for the CCA that includes dates for achieving each commitment and may include a statement that compliance has been achieved for some or all of the alleged violations. The proposed terms of the CCA should contain sufficient detail and must include steps to be taken to achieve compliance and the necessary dates by which compliance will be achieved.

The Illinois EPA will review the proposed terms for a CCA provided by the facility and, within 30 days of receipt, will respond with either a proposed CCA or a notice that no CCA will be issued by the Illinois EPA. If the Illinois EPA sends a proposed CCA, the facility must respond in writing by, either agreeing to and signing the proposed CCA, or by notifying the Illinois EPA that the facility rejects the terms of the proposed CCA. When compliance is achieved, the owner of the facility must submit a completed statement of compliance form certifying that all Compliance Commitment Agreement measures/events have been successfully completed.

If a timely written response to this Violation Notice is not provided, it shall be considered a waiver of the opportunity to respond and meet, and the Illinois EPA may proceed with referral to a prosecutorial authority.

Written communications should be directed to:

Illinois EPA – Division of Water Pollution Control
Attn: Caleb Ruyle/ CAS#19
P.O.BOX 19276
Springfield, IL 62794-9276

All communications must include reference to this Violation Notice number, **W-2018-50056**.

Questions regarding this Violation Notice should be directed to Caleb Ruyle at 217/782-9861.

Sincerely,

Roger Callaway

Roger Callaway
Compliance Assurance Section
Division of Water Pollution Control
Bureau of Water

Attachments

cc:
CERTIFIED MAIL # 7008 1830 0004 1767 4451
Phil Morris
1500 Eastport Plaza Drive
Collinsville, IL 62234

ATTACHMENT A

Vistra Energy Corp. – formerly Dynegy Midwest Generation-Vermilion – IL0004057
VIOLATION NOTICE NO. W-2018-50056

Questions regarding the violations identified in this attachment should be referred to Caleb Ruyle at (217) 782-9861.

On May 17, 2018, the Illinois EPA conducted a stream survey of a portion of the Middle Fork Vermilion River. During the survey, it was noted that previously-installed gabions bordering the Vistra-Dynegy property had been damaged, with portions of the rocks and baskets found along the lower portion of the stream bank or completely missing. Additionally, several seeps were noted along the stream bank bordering the Vistra-Dynegy property, which contained heavily stained reddish-orange discoloration. Illinois EPA personnel noted that the seeps had discharged to the River, as evidenced by stained sediment and rocks within portions of the waterway. The discharge created offensive conditions in the Middle Fork Vermilion River. Based on these findings and other information available to the Illinois EPA, the discharge is in violation of the Illinois Environmental Protection Act and Illinois Pollution Control Board regulations.

A review of information available to the Illinois EPA indicates the following violations of statutes, regulations, or permits. Included with each type of violation is an explanation of the activities that the Illinois EPA believes may resolve the violation including an estimated time period for resolution.

Discharge of Contaminants

Cease and desist from discharging contaminants that cause or threaten to cause water pollution. Review operational and maintenance procedures and correct the deficiencies which caused the violation. Compliance is expected to be pursued immediately.

Violation Date	Violation Description
05/17/2018	No person shall cause, threaten or allow the discharge of any contaminants into the environment in any State so as to cause or tend to cause water pollution in Illinois, either alone or in combination with matter from other sources, or so as to violate regulations or standards adopted by the Pollution Control Board under this Act.
Rule/Reg.:	Section 12(a) of the Act, 415 ILCS 5/12(a) (2016)

Deposit of Contaminants

Cease and desist from depositing contaminants that cause or threaten to cause water pollution. Compliance is expected to be pursued immediately.

Violation Date	Violation Description
05/17/2018	Deposited contaminants on the ground in such a manner that caused or threatened to cause a water pollution hazard.

Rule/Reg.:	Section 12(d) of the Act, 415 ILCS 5/12(d) (2016)

Offensive Conditions

Review and evaluate operational procedures in order to correct the deficiencies which caused the violations. Discharges must not cause a violation of water quality standards. Compliance is expected to be achieved immediately.

Violation Date	**Violation Description**
05/17/2018	Waters of the State shall be free from sludge or bottom deposits, floating debris, visible oil, odor, plant, oil, odor, plant or algal growth, color or turbidity of other than natural origin.
Rule/Reg.:	Section 12(a) of the Act, 415 ILCS 5/12(a) (2016), 35 Ill. Adm. Code 302.203

Exhibit 9

September 21, 2017:

April 17, 2016:

Summer 2017:

June 26, 2015:

May 17, 2018:

CERTIFICATE OF SERVICE

I hereby certify that service to all parties listed below of the foregoing Notice of Electronic Filing, Entries of Appearance, and Complaint has been initiated, but not completed, by providing the documents, with proper postage prepaid, to a U.S. Postal Service Office in San Francisco, CA for mailing via Certified Mail, Return Receipt requested, by the time of 5:00 pm Central Time on March 29, 2019.

Respectfully Submitted,

Jennifer Cassel (IL Bar No. 6296047)
Earthjustice
1010 Lake Street, Ste. 200
Oak Park, IL 60301
(215) 717-4525 (phone)
(212) 918-1556 (fax)
jcassel@earthjustice.org

Counsel for Complainant Prairie Rivers Network

SERVICE LIST

Dynegy Midwest Generation, LLC
Attn: Vistra Energy Corporation
6555 Sierra Drive
Irving, TX 75039

Capital Corporate Services, Inc.
Registered Agent - Dynegy Midwest Generation, LLC
1315 Lawrence Avenue
Springfield, IL 62704

Clerk of Illinois Pollution Control Board
James R. Thompson Center
100 W. Randolph Street
Suite 11-500
Chicago, IL 60601