



We Energies
333 W. Everett St.
Milwaukee, WI 53203
www.we-energies.com

August 1, 2019

Ms. Shanna Laube-Anderson
Wisconsin Department of Natural Resources
141 NW Barstow Street
Waukesha, WI 53188-3789

RE: Pleasant Prairie Power Plant Sulfate in Groundwater
BRRTS# 02-30-527479
Request for Technical Assistance and No Further Action Determination

Dear Ms. Laube-Anderson:

Enclosed please find the technical memorandum, *Pleasant Prairie Power Plant (P4) Sulfate in Groundwater BRRTS#: 02-30-527479*, dated August 1, 2019, which was prepared with the intent of obtaining a No Further Action determination from the Department. We have also included a request for technical assistance (Form 4400-237) with the accompanying fee of \$350 in the form of a check.

Please contact me at (414) 221-2457 or Tim Muehlfeld at (414) 221-2206 if you would like to discuss this request.

Sincerely,

A handwritten signature in blue ink that reads 'Thomas Jansen'.

Thomas Jansen
Manager – Combustion Product Program
WEC Energy Group – Business Services

cc: Tim Muehlfeld – We Energies

Notice: Use this form to request a **written response (on agency letterhead)** from the Department of Natural Resources (DNR) regarding technical assistance, a post-closure change to a site, a specialized agreement or liability clarification for Property with known or suspected environmental contamination. A fee will be required as is authorized by s. 292.55, Wis. Stats., and NR 749, Wis. Adm. Code., unless noted in the instructions below. Personal information collected will be used for administrative purposes and may be provided to requesters to the extent required by Wisconsin's Open Records law [ss. 19.31 - 19.39, Wis. Stats.].

Definitions

"Property" refers to the subject Property that is perceived to have been or has been impacted by the discharge of hazardous substances.

"Liability Clarification" refers to a written determination by the Department provided in response to a request made on this form. The response clarifies whether a person is or may become liable for the environmental contamination of a Property, as provided in s. 292.55, Wis. Stats.

"Technical Assistance" refers to the Department's assistance or comments on the planning and implementation of an environmental investigation or environmental cleanup on a Property in response to a request made on this form as provided in s. 292.55, Wis. Stats.

"Post-closure modification" refers to changes to Property boundaries and/or continuing obligations for Properties or sites that received closure letters for which continuing obligations have been applied or where contamination remains. Many, but not all, of these sites are included on the GIS Registry layer of RR Sites Map to provide public notice of residual contamination and continuing obligations.

Select the Correct Form

This form should be used to request the following from the DNR:

- Technical Assistance
- Liability Clarification
- Post-Closure Modifications
- Specialized Agreements (tax cancellation, negotiated agreements, etc.)

Do not use this form if one of the following applies:

- Request for an **off-site liability exemption or clarification** for Property that has been or is perceived to be contaminated by one or more hazardous substances that originated on another Property containing the source of the contamination. Use DNR's Off-Site Liability Exemption and Liability Clarification Application Form 4400-201.
- Submittal of an Environmental Assessment for the **Lender Liability Exemption**, s 292.21, Wis. Stats., **if no response or review by DNR is requested**. Use the Lender Liability Exemption Environmental Assessment Tracking Form 4400-196.
- Request for an **exemption to develop on a historic fill site** or licensed landfill. Use DNR's Form 4400-226 or 4400-226A.
- **Request for closure** for Property where the investigation and cleanup actions are completed. Use DNR's Case Closure - GIS Registry Form 4400-202.

All forms, publications and additional information are available on the internet at: dnr.wi.gov/topic/Brownfields/Pubs.html.

Instructions

1. Complete sections 1, 2, 6 and 7 for all requests. Be sure to provide adequate and complete information.
2. Select the type of assistance requested: Section 3 for technical assistance or post-closure modifications, Section 4 for a written determination or clarification of environmental liabilities; or Section 5 for a specialized agreement.
3. Include the fee payment that is listed in Section 3, 4, or 5, unless you are a "Voluntary Party" enrolled in the Voluntary Party Liability Exemption Program **and** the questions in Section 2 direct otherwise. Information on to whom and where to send the fee is found in Section 8 of this form.
4. Send the completed request, supporting materials and the fee to the appropriate DNR regional office where the Property is located. See the map on the last page of this form. A paper copy of the signed form and all reports and supporting materials shall be sent with an electronic copy of the form and supporting materials on a compact disk. For electronic document submittal requirements see: <http://dnr.wi.gov/files/PDF/pubs/rr/RR690.pdf>

The time required for DNR's determination varies depending on the complexity of the site, and the clarity and completeness of the request and supporting documentation.

Technical Assistance, Environmental Liability Clarification or Post-Closure Modification Request

Form 4400-237 (R 12/18)

Page 2 of 7

Section 1. Contact and Recipient Information

Requester Information

This is the person requesting technical assistance or a post-closure modification review, that his or her liability be clarified or a specialized agreement and is identified as the requester in Section 7. DNR will address its response letter to this person.

Last Name	First	MI	Organization/ Business Name
Muehlfeld	Tim		We Energies / WEC Energy Group- Business Services
Mailing Address			City
231 West Michigan Street			Milwaukee
			State
			WI
			ZIP Code
			53203
Phone # (include area code)	Fax # (include area code)	Email	
(414) 221-2206		tim.muehlfeld@wecenergygroup.com	

The requester listed above: (select all that apply)

- Is currently the owner
- Is currently considering selling the Property
- Is renting or leasing the Property
- Is currently considering acquiring the Property
- Is a lender with a mortgagee interest in the Property
- Other. Explain the status of the Property with respect to the applicant:

Contact Information (to be contacted with questions about this request)

Select if same as requester

Contact Last Name	First	MI	Organization/ Business Name
Muehlfeld	Tim		We Energies / WEC Energy Group- Business Services
Mailing Address			City
231 West Michigan Street			Milwaukee
			State
			WI
			ZIP Code
			53204
Phone # (include area code)	Fax # (include area code)	Email	
(414) 221-2206		tim.muehlfeld@wecenergygroup.com	

Environmental Consultant (if applicable)

Contact Last Name	First	MI	Organization/ Business Name
Keller	Nathaniel	R	Ramboll
Mailing Address			City
234 W. Florida St			Milwaukee
			State
			WI
			ZIP Code
			53204
Phone # (include area code)	Fax # (include area code)	Email	
(414) 837-3630		nate.keller@ramboll.com	

Section 2. Property Information

Property Name	FID No. (if known)
We Energies Pleasant Rairie Power Plant	230006260
BRRTS No. (if known)	Parcel Identification Number
02-30-527479	
Street Address	City
8000 95th Street	Pleasant Prairie
	State
	WI
	ZIP Code
	53158
County	Municipality where the Property is located
Kenosha	<input type="radio"/> City <input type="radio"/> Town <input checked="" type="radio"/> Village of Pleasant Prairie
	Property is composed of:
	<input type="radio"/> Single tax parcel <input type="radio"/> Multiple tax parcels
	Property Size Acres
	403

**Technical Assistance, Environmental Liability
Clarification or Post-Closure Modification Request**

Form 4400-237 (R 12/18)

Page 3 of 7

1. Is a response needed by a specific date? (e.g., Property closing date) Note: Most requests are completed within 60 days. Please plan accordingly.

- No Yes

Date requested by: 10/01/2019

Reason: Preparing for site decommissioning.

2. Is the "Requester" enrolled as a Voluntary Party in the Voluntary Party Liability Exemption (VPLE) program?

- No. Include the fee that is required for your request in Section 3, 4 or 5.
 Yes. Do not include a separate fee. This request will be billed separately through the VPLE Program.

Fill out the information in Section 3, 4 or 5 which corresponds with the type of request:

Section 3. Technical Assistance or Post-Closure Modifications;

Section 4. Liability Clarification; or Section 5. Specialized Agreement.

Section 3. Request for Technical Assistance or Post-Closure Modification

Select the type of technical assistance requested: [Numbers in brackets are for WI DNR Use]

- No Further Action Letter (NFA) (Immediate Actions) - NR 708.09, [183] - Include a fee of \$350. Use for a written response to an immediate action after a discharge of a hazardous substance occurs. Generally, these are for a one-time spill event.
- Review of Site Investigation Work Plan - NR 716.09, [135] - Include a fee of \$700.
- Review of Site Investigation Report - NR 716.15, [137] - Include a fee of \$1050.
- Approval of a Site-Specific Soil Cleanup Standard - NR 720.10 or 12, [67] - Include a fee of \$1050.
- Review of a Remedial Action Options Report - NR 722.13, [143] - Include a fee of \$1050.
- Review of a Remedial Action Design Report - NR 724.09, [148] - Include a fee of \$1050.
- Review of a Remedial Action Documentation Report - NR 724.15, [152] - Include a fee of \$350
- Review of a Long-term Monitoring Plan - NR 724.17, [25] - Include a fee of \$425.
- Review of an Operation and Maintenance Plan - NR 724.13, [192] - Include a fee of \$425.

Other Technical Assistance - s. 292.55, Wis. Stats. [97] (For request to build on an abandoned landfill use Form 4400-226)

- Schedule a Technical Assistance Meeting - Include a fee of \$700.
- Hazardous Waste Determination - Include a fee of \$700.
- Other Technical Assistance - Include a fee of \$700. Explain your request in an attachment.

Post-Closure Modifications - NR 727, [181]

- Post-Closure Modifications: Modification to Property boundaries and/or continuing obligations of a closed site or Property; sites may be on the GIS Registry. This also includes removal of a site or Property from the GIS Registry. Include a fee of \$1050, and:
- Include a fee of \$300 for sites with residual soil contamination; and
- Include a fee of \$350 for sites with residual groundwater contamination, monitoring wells or for vapor intrusion continuing obligations.

Attach a description of the changes you are proposing, and documentation as to why the changes are needed (if the change to a Property, site or continuing obligation will result in revised maps, maintenance plans or photographs, those documents may be submitted later in the approval process, on a case-by-case basis).

Technical Assistance, Environmental Liability
Clarification or Post-Closure Modification Request

Form 4400-237 (R 12/18)

Page 4 of 7

Skip Sections 4 and 5 if the technical assistance you are requesting is listed above and complete Sections 6 and 7 of this form.

Section 4. Request for Liability Clarification

Select the type of liability clarification requested. Use the available space given or attach information, explanations, or specific questions that you need answered in DNR's reply. Complete Sections 6 and 7 of this form. [Numbers in brackets are for DNR Use]

"Lender" liability exemption clarification - s. 292.21, Wis. Stats. [686]

❖ Include a fee of \$700.

Provide the following documentation:

- (1) ownership status of the real Property, and/or the personal Property and fixtures;
- (2) an environmental assessment, in accordance with s. 292.21, Wis. Stats.;
- (3) the date the environmental assessment was conducted by the lender;
- (4) the date of the Property acquisition; for foreclosure actions, include a copy of the signed and dated court order confirming the sheriff's sale.
- (5) documentation showing how the Property was acquired and the steps followed under the appropriate state statutes.
- (6) a copy of the Property deed with the correct legal description; and,
- (7) the Lender Liability Exemption Environmental Assessment Tracking Form (Form 4400-196).
- (8) If no sampling was done, please provide reasoning as to why it was not conducted. Include this either in the accompanying environmental assessment or as an attachment to this form, and cite language in s. 292. 21(1)(c)2.,h.-i., Wis. Stats.:
 - h. The collection and analysis of representative samples of soil or other materials in the ground that are suspected of being contaminated based on observations made during a visual inspection of the real Property or based on aerial photographs, or other information available to the lender, including stained or discolored soil or other materials in the ground and including soil or materials in the ground in areas with dead or distressed vegetation. The collection and analysis shall identify contaminants in the soil or other materials in the ground and shall quantify concentrations.
 - i. The collection and analysis of representative samples of unknown wastes or potentially hazardous substances found on the real Property and the determination of concentrations of hazardous waste and hazardous substances found in tanks, drums or other containers or in piles or lagoons on the real Property.

"Representative" liability exemption clarification (e.g. trustees, receivers, etc.) - s. 292.21, Wis. Stats. [686]

❖ Include a fee of \$700.

Provide the following documentation:

- (1) ownership status of the Property;
- (2) the date of Property acquisition by the representative;
- (3) the means by which the Property was acquired;
- (4) documentation that the representative has no beneficial interest in any entity that owns, possesses, or controls the Property;
- (5) documentation that the representative has not caused any discharge of a hazardous substance on the Property; and
- (6) a copy of the Property deed with the correct legal description.

Clarification of local governmental unit (LGU) liability exemption at sites with: (select all that apply)

- hazardous substances spills - s. 292.11(9)(e), Wis. Stats. [649];
- Perceived environmental contamination - [649];
- hazardous waste - s. 292.24 (2), Wis. Stats. [649]; and/or
- solid waste - s. 292.23 (2), Wis. Stats. [649].

❖ Include a fee of \$700, a summary of the environmental liability clarification being requested, and the following:

- (1) clear supporting documentation showing the acquisition method used, and the steps followed under the appropriate state statute(s).
- (2) current and proposed ownership status of the Property;
- (3) date and means by which the Property was acquired by the LGU, where applicable;
- (4) a map and the ¼, ¼ section location of the Property;
- (5) summary of current uses of the Property;
- (6) intended or potential use(s) of the Property;
- (7) descriptions of other investigations that have taken place on the Property; and
- (8) (for solid waste clarifications) a summary of the license history of the facility.

Technical Assistance, Environmental Liability
Clarification or Post-Closure Modification Request

Form 4400-237 (R 12/18)

Page 5 of 7

Section 4. Request for Liability Clarification (cont.)

Lease liability clarification - s. 292.55, Wis. Stats. [646]

❖ **Include a fee of \$700 for a single Property, or \$1400 for multiple Properties and the information listed below:**

- (1) a copy of the proposed lease;
- (2) the name of the current owner of the Property and the person who will lease the Property;
- (3) a description of the lease holder's association with any persons who have possession, control, or caused a discharge of a hazardous substance on the Property;
- (4) map(s) showing the Property location and any suspected or known sources of contamination detected on the Property;
- (5) a description of the intended use of the Property by the lease holder, with reference to the maps to indicate which areas will be used. Explain how the use will not interfere with any future investigation or cleanup at the Property; and
- (6) all reports or investigations (e.g. Phase I and Phase II Environmental Assessments and/or Site Investigation Reports conducted under s. NR 716, Wis. Adm. Code) that identify areas of the Property where a discharge has occurred.

General or other environmental liability clarification - s. 292.55, Wis. Stats. [682] - Explain your request below.

❖ **Include a fee of \$700 and an adequate summary of relevant environmental work to date.**

No Action Required (NAR) - NR 716.05, [682]

❖ **Include a fee of \$700.**

Use where an environmental discharge has or has not occurred, and applicant wants a DNR determination that no further assessment or clean-up work is required. Usually this is requested after a Phase I and Phase II environmental assessment has been conducted; the assessment reports should be submitted with this form. This is not a closure letter.

Clarify the liability associated with a "closed" Property - s. 292.55, Wis. Stats. [682]

❖ **Include a fee of \$700.**

- Include a copy of any closure documents if a state agency other than DNR approved the closure.

Use this space or attach additional sheets to provide necessary information, explanations or specific questions to be answered by the DNR.

Section 5. Request for a Specialized Agreement

Select the type of agreement needed. Include the appropriate draft agreements and supporting materials. Complete Sections 6 and 7 of this form. More information and model draft agreements are available at: dnr.wi.gov/topic/Brownfields/lgu.html#tabx4.

Tax cancellation agreement - s. 75.105(2)(d), Wis. Stats. [654]

❖ **Include a fee of \$700, and the information listed below:**

- (1) Phase I and II Environmental Site Assessment Reports,
- (2) a copy of the Property deed with the correct legal description.

Agreement for assignment of tax foreclosure judgement - s.75.106, Wis. Stats. [666]

❖ **Include a fee of \$700, and the information listed below:**

- (1) Phase I and II Environmental Site Assessment Reports,
- (2) a copy of the Property deed with the correct legal description.

Negotiated agreement - Enforceable contract for non-emergency remediation - s. 292.11(7)(d) and (e), Wis. Stats. [630]

❖ **Include a fee of \$1400, and the information listed below:**

- (1) a draft schedule for remediation; and,
- (2) the name, mailing address, phone and email for each party to the agreement.

Technical Assistance, Environmental Liability
Clarification or Post-Closure Modification Request

Form 4400-237 (R 12/18)

Page 6 of 7

Section 6. Other Information Submitted

Identify all materials that are included with this request.

Send both a paper copy of the signed form and all reports and supporting materials, and an electronic copy of the form and all reports, including Environmental Site Assessment Reports, and supporting materials on a compact disk.

Include one copy of any document from any state agency files that you want the Department to review as part of this request. The person submitting this request is responsible for contacting other state agencies to obtain appropriate reports or information.

- Phase I Environmental Site Assessment Report - Date: _____
- Phase II Environmental Site Assessment Report - Date: _____
- Legal Description of Property (required for all liability requests and specialized agreements)
- Map of the Property (required for all liability requests and specialized agreements)

Analytical results of the following sampled media: Select all that apply and include date of collection.

- Groundwater
- Soil
- Sediment
- Other medium - Describe: _____

Date of Collection: 01/06/2019

- A copy of the closure letter and submittal materials
- Draft tax cancellation agreement
- Draft agreement for assignment of tax foreclosure judgment
- Other report(s) or information - Describe: Technical Memorandum on Sulfate in Groundwater

For Property with newly identified discharges of hazardous substances only: Has a notification of a discharge of a hazardous substance been sent to the DNR as required by s. NR 706.05(1)(b), Wis. Adm. Code?

- Yes - Date (if known): _____
- No

Note: The Notification for Hazardous Substance Discharge (non-emergency) form is available at:
dnr.wi.gov/files/PDF/forms/4400/4400-225.pdf.

Section 7. Certification by the Person who completed this form

- I am the person submitting this request (requester)
- I prepared this request for: Tim Muehlfeld - WEC Energy Group

Requester Name

I certify that I am familiar with the information submitted on this request, and that the information on and included with this request is true, accurate and complete to the best of my knowledge. I also certify I have the legal authority and the applicant's permission to make this request.

Signature

Date Signed

Senior Hydrogeologist

(414) 837-3630

Title

Telephone Number (include area code)

Technical Assistance, Environmental Liability Clarification or Post-Closure Modification Request

Form 4400-237 (R 12/18)

Page 7 of 7

Section 8. DNR Contacts and Addresses for Request Submittals

Send or deliver one paper copy and one electronic copy on a compact disk of the completed request, supporting materials, and fee to the region where the property is located to the address below. Contact a DNR regional brownfields specialist with any questions about this form or a specific situation involving a contaminated property. For electronic document submittal requirements see:

<http://dnr.wi.gov/files/PDF/pubs/rr/RR690.pdf>.

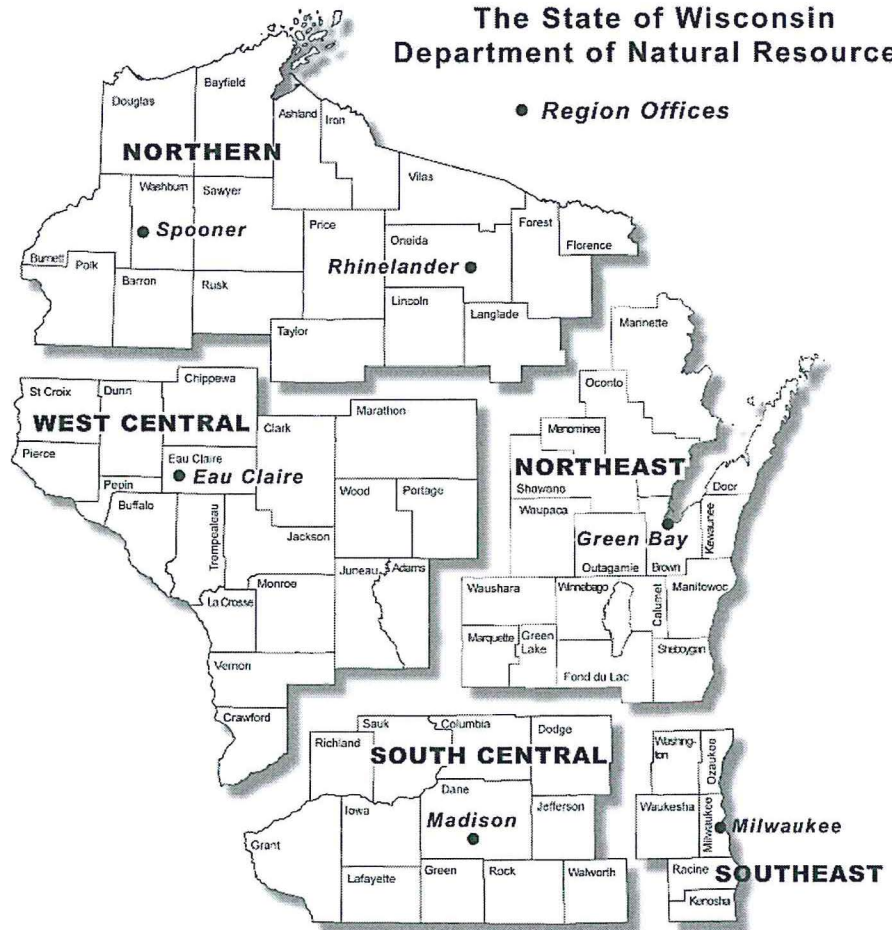
DNR NORTHERN REGION
Attn: RR Program Assistant
Department of Natural Resources
223 E Steinfest Rd Antigo, WI 54409

DNR NORTHEAST REGION
Attn: RR Program Assistant
Department of Natural Resources
2984 Shawano Avenue
Green Bay WI 54313

DNR SOUTH CENTRAL REGION
Attn: RR Program Assistant
Department of Natural Resources
3911 Fish Hatchery Road
Fitchburg WI 53711

DNR SOUTHEAST REGION
Attn: RR Program Assistant
Department of Natural Resources
2300 North Martin Luther King Drive
Milwaukee WI 53212

DNR WEST CENTRAL REGION
Attn: RR Program Assistant
Department of Natural Resources
1300 Clairemont Ave.
Eau Claire WI 54702



Note: These are the Remediation and Redevelopment Program's designated regions. Other DNR program regional boundaries may be different.

DNR Use Only			
Date Received	Date Assigned	BRRTS Activity Code	BRRTS No. (if used)
DNR Reviewer		Comments	
Fee Enclosed? <input type="radio"/> Yes <input type="radio"/> No	Fee Amount \$	Date Additional Information Requested	Date Requested for DNR Response Letter
Date Approved	Final Determination		

TO: Tom Jansen, PE – We Energies Cc: Tim Muehlfeld, PE – We Energies
FROM: Glenn Luke, PE and Nate Keller, PG –
 OBG, Part of Ramboll
RE: Pleasant Prairie Power Plant (P4)
 Sulfate in Groundwater BRRTS#: 02-
 30-527479
DATE: August 1, 2019

BACKGROUND AND OBJECTIVES

On July 2, 2018 We Energies submitted technical memorandum, *Pleasant Prairie Power Plant (P4) Groundwater Monitoring Program Review*, dated June 29, 2018, to the Wisconsin Department of Natural Resources (WDNR) for review and comment. In an email dated October 17, 2018 the WDNR provided references that identified naturally occurring sulfate concentrations in groundwater. The response from WDNR suggested that an argument could be made that the concentrations of sulfate were naturally occurring, and if substantiated, a No Action Required or No Further Action determination may be appropriate.

OBG, part of Ramboll (OBG) has evaluated the references provided by the WDNR and has gathered additional information as lines of evidence to support a No Further Action determination. This memorandum includes a discussion of the references provided by the WDNR and documentation which supports that concentrations of sulfate reported in groundwater near P4 may be naturally occurring. The lines of evidence that suggest sulfate concentrations are naturally occurring include:

- Regionally elevated concentrations of naturally occurring sulfate in groundwater and increased sulfate in precipitation
- Geochemical conditions including;
 - » Variability in groundwater elevations to release sulfate from oxidation of sulfide minerals within the clay
 - » Surficial activities that potentially mobilize sulfate from shallow clay till and/or road base materials
- Soil sample results from below the coal pile runoff basin liner

Furthermore, the power plant infrastructure including the coal pile and other potential sources (basins and runoff ditches) have been removed eliminating those facilities as potential sources that may have contributed to the sulfate concentrations in groundwater. The power plant was fueled with low sulfur coal during the life of the plant's operations.

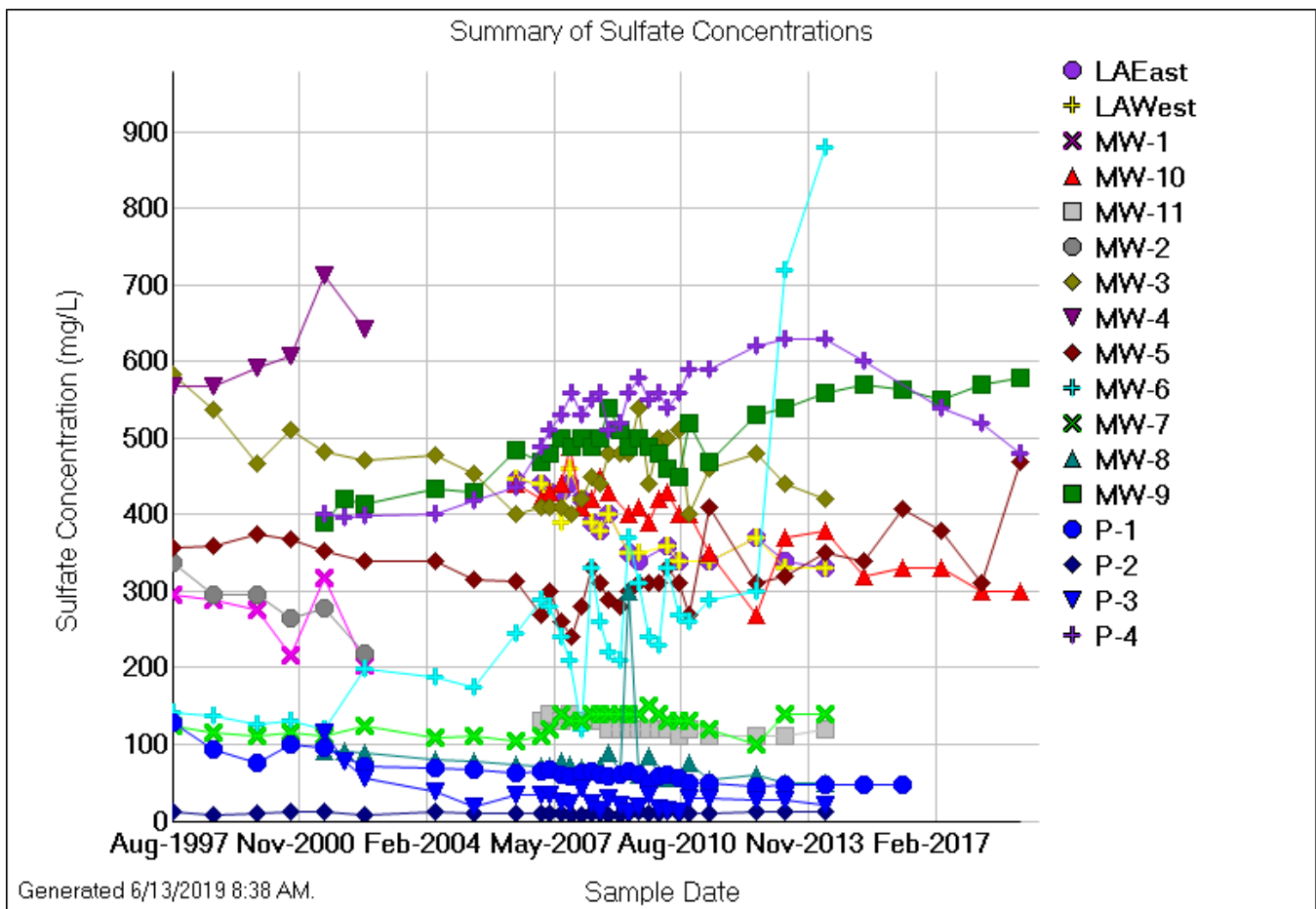
SUMMARY OF SULFATE IMPACTS IN GROUNDWATER

The sulfate concentrations detected in groundwater onsite (Figure 1) and trends were discussed in detail in the June 29, 2018 memorandum, the results are included in the Figure below and summarized as follows:

- An upward trend reported in MW-9 concentrations may have peaked and are stabilizing based on the last five rounds of data.
- Upward trends which were reported in piezometer P-4 are no longer observed and no statistically significant trends are observed. Recent data from the last four rounds suggest a downward trend.
- A downward trend reported in MW-10 is no longer present and concentrations indicate a stable trend. However, the median concentration detected over the eight most recent sampling events (330.5 mg/L) is less than the median concentration (420 mg/L) detected previously (1997-2011) indicating overall improvement in groundwater quality.

- Concentrations of sulfate in MW-5 have been variable following completion of basin lining activities and following their recent removal; recent data from the last three events indicates sulfate continues to be variable with concentrations ranging 160 mg/L (from 470 to 310 mg/L).

The sulfate concentrations and trends detected in groundwater may be the result of several contributing factors which include: natural sources and the former plant infrastructure (as historically attributed). The relative contribution from each of these potential sources was not evaluated, but the potential sources from the former plant operations that are associated with this BRRTS case have been removed and as a result will not impact groundwater.



POTENTIAL SOURCES OF SULFATE IMPACTS IN GROUNDWATER

In addition to the information in the references provided by the WDNR, a literature search and review was conducted to identify potential sources of sulfate in shallow clay soils and within the sand and gravel aquifer in which the P4 monitoring wells are screened. Literature review indicated that the following conditions in addition to the plant operations may contribute to elevated concentrations sulfate detected in groundwater:

- Elevated sulfate concentrations in the Silurian dolomite and glacial sand and gravel aquifer
- Local evidence for elevated sulfate in shallow monitoring wells as demonstrated by a nearby BRRTS case with similar/higher sulfate concentrations unrelated to the plant operations

- Increased sulfur (as sulfate) present in southeast Wisconsin precipitation
- Low pH is measured in precipitation in southeast Wisconsin (influences geochemical conditions)

Each of these potential sources is discussed below.

Sulfate Concentrations in the Silurian Dolomite and Overlying Sand and Gravel

The monitoring wells at the site are screened within the unconsolidated glacial deposits which include clay till, silt, and sand. In general, the deeper wells (labeled with "P") are screened within the sand and gravel aquifer, while shallower wells are screened at least partially in the clay till. Based on the literature review, "the sand and gravel aquifer is connected hydrologically with the Silurian dolomite aquifer. Water moves freely between the aquifers, which generally are considered to be a single hydrologic unit referred to as the shallow aquifer" (SEWRPC, 2002).

A summary of groundwater data from this aquifer compiled by Kemmerer (1984) indicates that the regional concentrations of sulfate in the sand and gravel aquifer range from 0.4 to 893 mg/L, and in the Silurian dolomite the range is 0.4 to 1,400 mg/L. Furthermore, "log transformed sulfate concentration values are distributed normally or closely approximate normal distributions in all units. As a result, it is assumed that these data represent valid statistical samples of likely concentrations in areas of these units where data are available" (Kemmerer, 1984). Concentrations of sulfate detected in the site monitoring wells are within the range of concentrations detected in the same aquifer throughout the state prior to plant operations began in 1984, and summarized in this study, and therefore may be a result of natural variability within these aquifers.

Evidence for Elevated Sulfate at Nearby BRRS Sites

A survey of BRRS Cases located in the vicinity of the P4 was completed using the WDNR Remediation and Redevelopment Sites Map (RR Sites Map), to identify sites that may have analyzed groundwater for sulfate concentrations. Sulfate concentrations are sometimes measured to evaluate whether natural attenuation is occurring at petroleum or chlorinated volatile organic compound (PVOCs or CVOCs) sites. Decreases in sulfate concentrations are expected along the length of a plume, if natural attenuation is occurring.

One site, BRRS Case #02-30-107682, was identified with accessible information that included concentrations of sulfate in shallow groundwater wells. The site is located about 1.5 miles northeast of the P4 property (see Figure below). The concentrations of sulfate in shallow groundwater monitoring wells and remediation sumps ranged from non-detect in sump locations to 870 mg/L in a background well (MW-1, Attachment B). The upgradient well is screened within clay till and the measured water elevations were variable but were within the screened elevation of the well, (potentially resulting in oxidation of sulfide minerals in clay). The measured concentrations are similar to those associated with the P4 groundwater and, as discussed previously, within the range of regional concentrations reported in the summary report (Kemmerer, 1984). The BRRS activity for this identified site was closed on September 25, 2002, with a groundwater use restriction because of residual petroleum impacts with no further requirements related to sulfate concentrations.

Sulfate in Precipitation

Sulfate in precipitation is elevated in the southeast portion of the state, including Milwaukee, Racine, and Kenosha Counties (see Figure 12-6 below.) Sulfate deposition occurs when sulfur dioxide reacts with water in the air to form sulfate and sulfuric acid. The sulfate and sulfuric acid is deposited or transferred to surface or groundwater when it rains. Through evaporation and evapotranspiration water is removed and sulfate may become concentrated in soils, surface water, and groundwater. Due to the distribution of industry and heavy transportation traffic in southern Wisconsin and northern Illinois, the southeast portion of Wisconsin is susceptible to higher concentrations and more sulfate deposition with acidic precipitation as shown in the figure

Figure 12-6. Sulfate sulfur in precipitation.

Source: National Atmospheric Deposition Program, 1999.



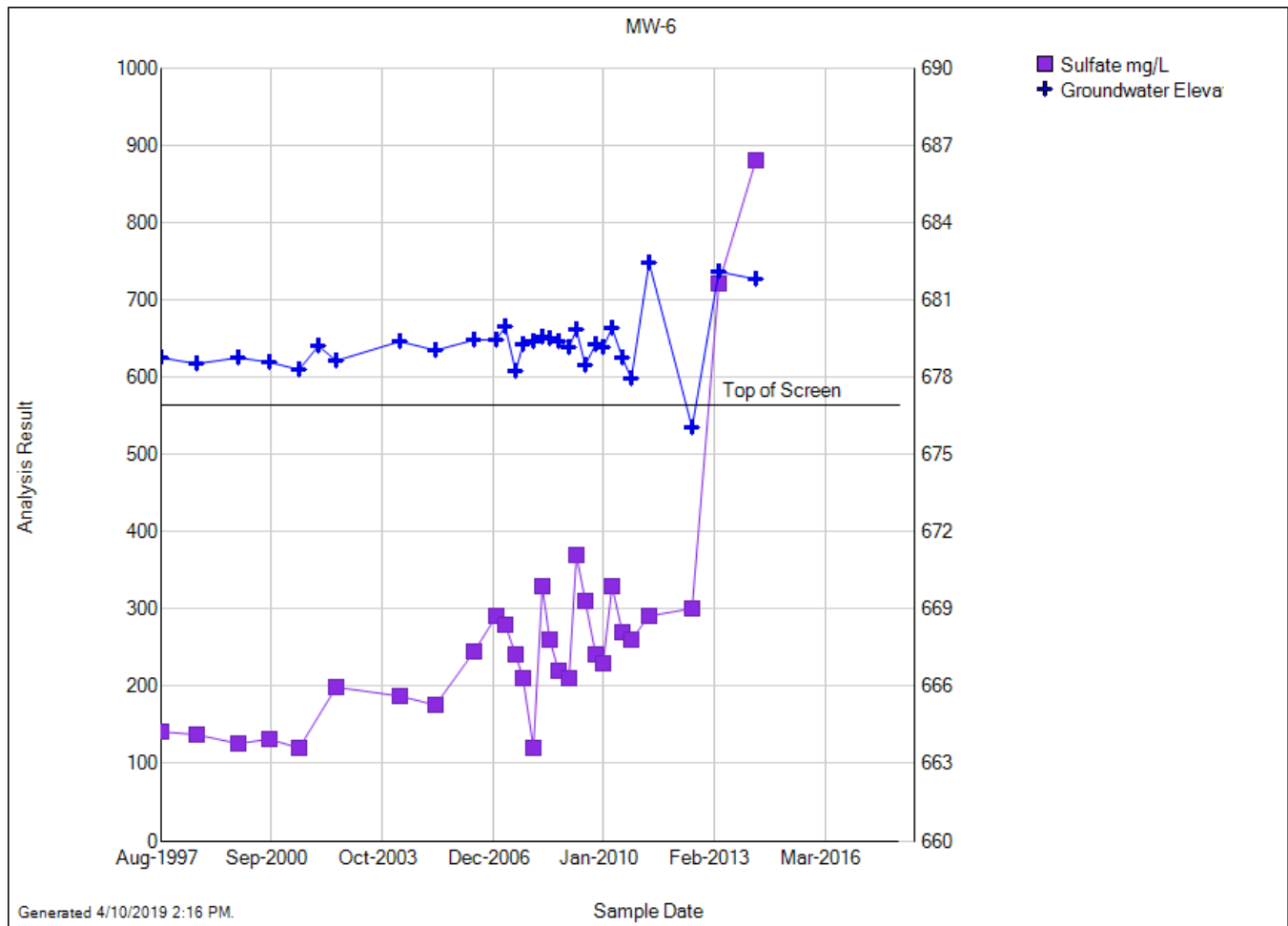
below.

The amount of sulfate deposition and the acidity of precipitation has decreased as levels of SO₂ released to the atmosphere have been reduced in the last 30 years. In this area of the state the sulfate concentrations in precipitation have decreased from >2 mg/L in 1985 to <1 mg/L in 2017 (Attachment A1). Similarly, the pH in precipitation has increased from about 4.4 S.U. in 1985 to 5.8 S.U. in 2017 (Attachment A2). The presence of over a century of sulfate in precipitation likely contributed to sulfate concentrations detected in groundwater, and the acidity of the precipitation influences the geochemical conditions of the aquifer. Changes in geochemical conditions can increase the potential sulfate release from soils and aquifer solids (discussed above).

GEOCHEMICAL CONDITIONS

The natural sources of sulfate at the site (described above) can be mobilized or migrate due to changes in the geochemical conditions at the site. In 2014, increasing concentrations of sulfate and arsenic in groundwater at

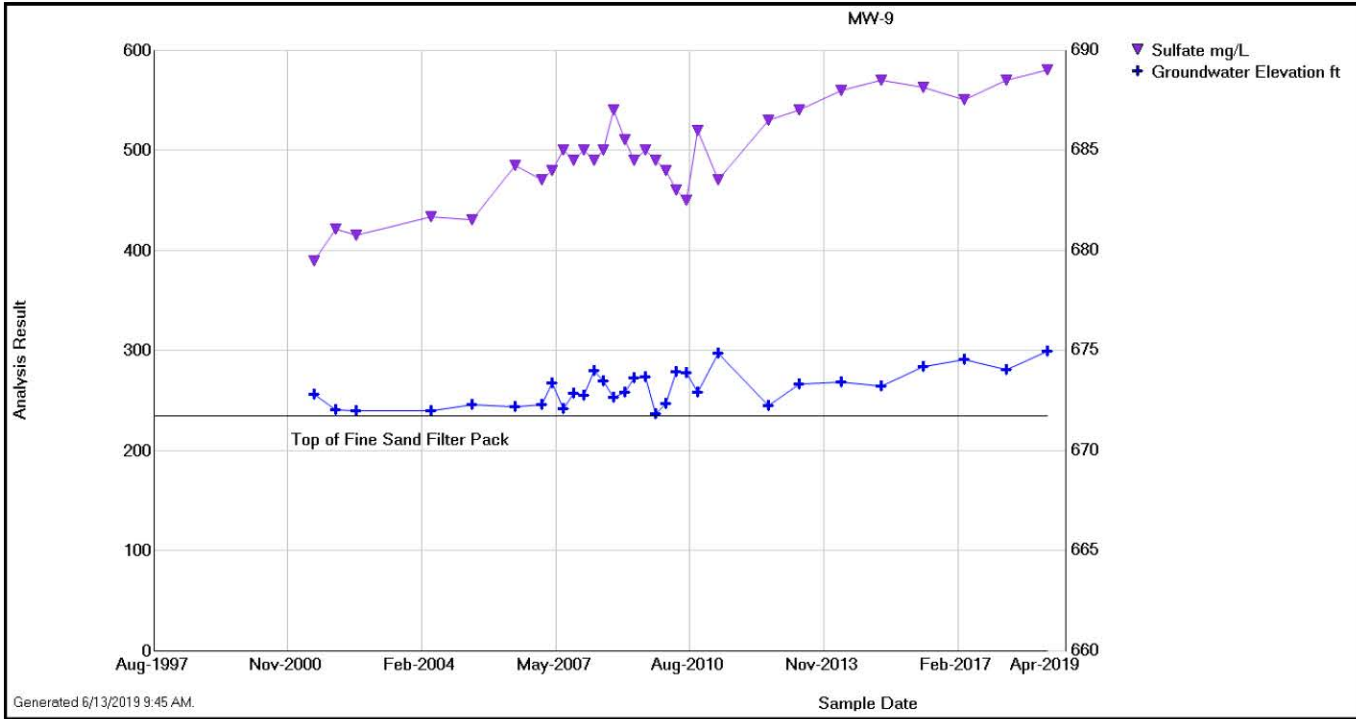
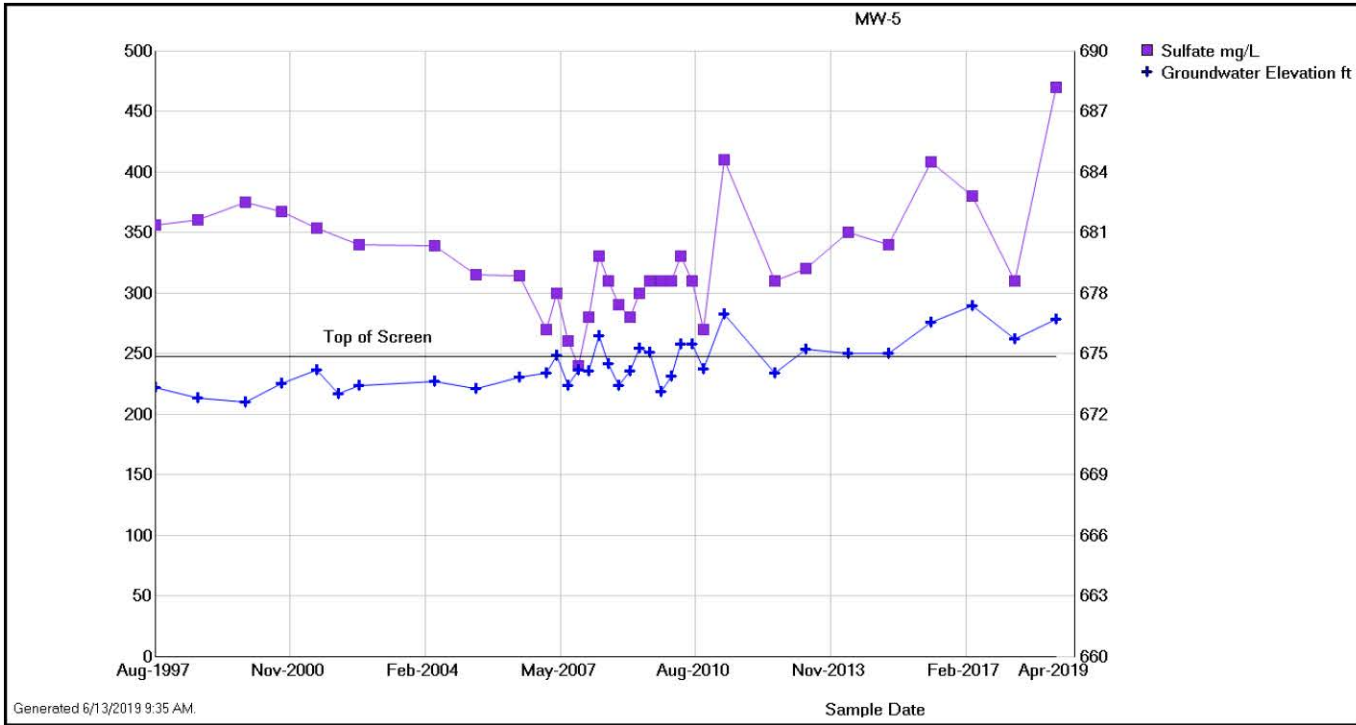
upgradient well MW-6 were attributed to oxidation of sulfide minerals at shallow depths in the soil column. High sulfate concentrations were a result of changes in groundwater elevation, which increased the potential for oxidation of pyrite minerals. In particular, the increase in sulfate during 2013, followed a significant decline and subsequent rebound in groundwater elevation (see below). When the water elevation is compared to the top of the screen elevation in MW-6, it is apparent that air (oxygen) was in contact with the aquifer materials which can explain the sharp increase in sulfate observed in MW-6 during 2013.

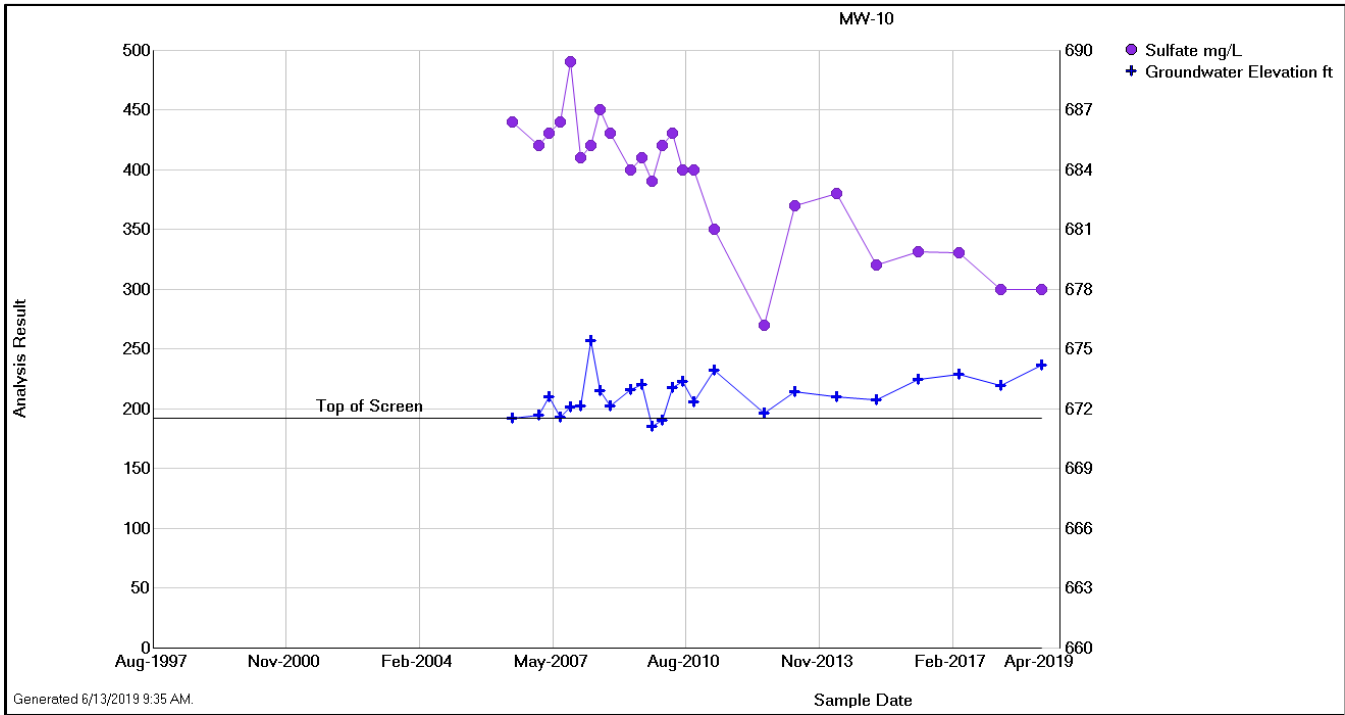


In addition to changes in water elevations, leaching of sulfate from surface deposition (see above) and/or oxidation of sulfide minerals contained in materials placed at the surface (i.e. road base, railroad ballast, and laydown lots), has the potential to release sulfate to the aquifers over the long term. Both mechanisms that have the potential to release sulfate to the aquifer are evaluated below.

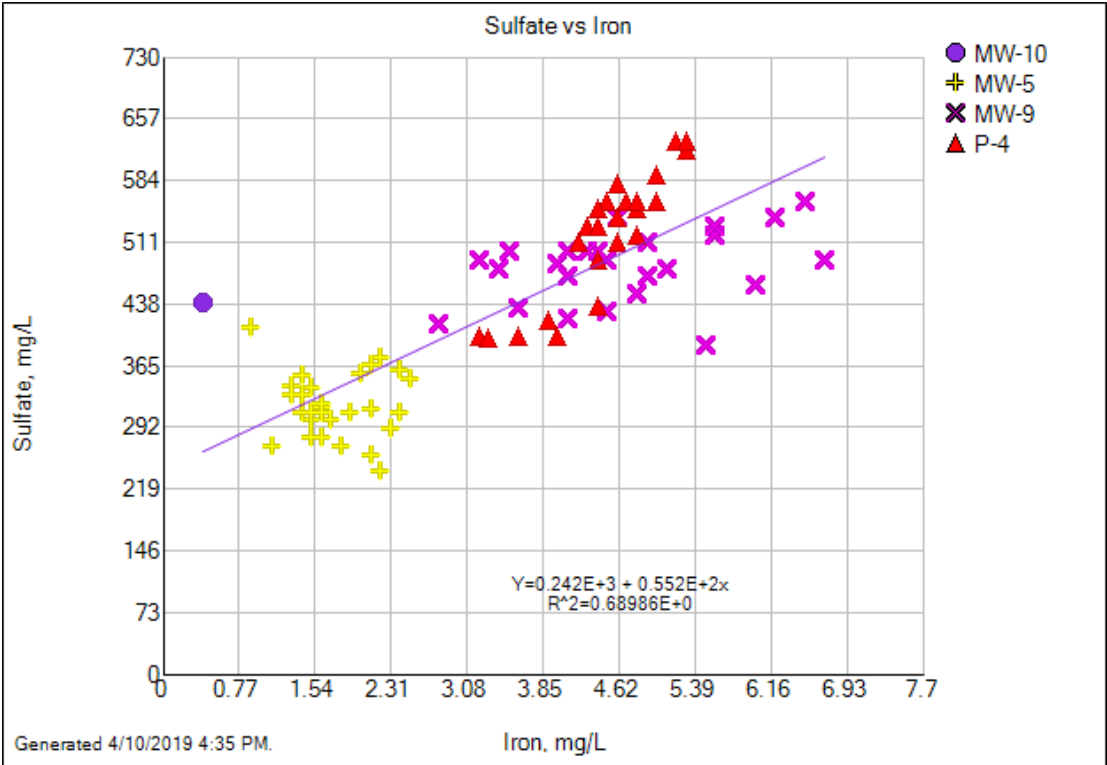
Variability in Groundwater Elevation

Groundwater elevations and sulfate concentrations are plotted for monitoring wells MW-5, MW-9, and MW-10. As shown in the plots, sulfate concentrations appear elevated when water elevations are at or near the screened interval. Significant increases also occur following periods when the water elevation declines to be within the screened interval (i.e. MW-5 and MW-9 in fall 2010, or MW-10 in fall 2012) which allows oxygen to contact the aquifer materials. P-4 is a piezometer, therefore changes in water elevation are not expected to result in variability in groundwater concentrations, however concentrations exhibit similar trends which indicates groundwater concentrations may be responding to variable water levels in upgradient recharge areas.





A scatter plot of iron and sulfate concentrations in these wells (below) provides support that pyrite oxidation is occurring because the resulting iron and sulfate concentrations show a relatively high correlation.



Surficial Activity and Potential Mobilization of Sulfate from Shallow Soils

Sulfate concentrations can also be mobilized from surficial deposition (discussed above) or shallow materials that contain sulfide minerals. During construction of P4 and the necessary support structures, (i.e. substations, transmission lines, parking lots, roads, etc.) clay soils at the surface were disturbed over a large area (Figures 2 and 3). Limestone and gravel road base that is quarried in the area and utilized for construction often contains minor inclusions of sulfide minerals (arsenopyrite, pyrite, marcasite, sphalerite) and it is likely that these were displaced and exposed to air and/or precipitation which changes the geochemical conditions and increases the potential for oxidation and sulfate migration. Long term leaching of sulfate may occur from these sources:

- Pyrite and other sulfide minerals within formerly anaerobic clay till or road base materials (see historic aeriels Figures 2 and 3)
- Lake Andrea was a former quarry as shown in historic aeriels from 1974 to the 1990's (Figures 2-4), it is unclear what was mined from the quarry, but minerals were exposed to oxidation during the quarrying activities and could result in long term elevated sulfate within the lake

Soil Sample Results- Coal Pile Runoff Basin

Following removal of the Basins, soil samples were collected from the soils underlying the Coal Pile Runoff Basin. The samples were analyzed for metals and indicators of potential impacts, and the results are provided in Table 1. The results indicate that only arsenic in two samples was detected above the industrial direct contact residual contaminant level (RCL). Arsenopyrite (Fe, As-S) and pyrite often are found in similar settings and as expected concentrations of arsenic and sulfate were reported coincidentally within the clay till and road base materials. Sulfate was detected at concentrations ranging from 97.9 to 376 mg/kg. The presence of these compounds and their concentrations are representative of the clay till and gravel fill below the liner and because they are not significantly elevated are not indicative of a release from the basins.

Removal of the lined basins also expose the underlying materials (clay and gravel) to precipitation and potential oxidations since they are no longer isolated by the liners. The ground disturbance that occurred during removal and the remaining soils that are exposed at the surface could continue to be a source of sulfate to the aquifer until available sulfate is leached. The recent concentration increase in MW-5 may be a result of these activities.

REMOVAL AND DECOMMISSIONING OF POTENTIAL SOURCES

After further investigation and evaluation of sulfate concentrations in the vicinity of the site, there is significant evidence to suggest that the sulfate in the groundwater is naturally occurring to a substantial extent. Historically, the plant infrastructure may have contributed to the sulfate concentration detected in groundwater but the magnitude is unclear. And these facilities were removed in 2017-2018 and any potential contribution has been eliminated.

CONCLUSIONS

Based on the information provided in this memorandum, sulfate in groundwater near P4 is likely a result of natural sources; however plant operations, including construction activities and the low sulfur coal pile and ditches and basins, cannot be ruled out as a former contributing source. However, these sources have been removed, and although elevated sulfate concentrations may persist due to removal activities, We Energies operations no longer contributes to sulfate concentrations in groundwater, and no further action for We Energies is appropriate.

FIGURES

- | | |
|----------|------------------------|
| Figure 1 | Monitoring Locations |
| Figure 2 | Aerial photograph 1981 |
| Figure 3 | Aerial Photograph 1987 |
| Figure 4 | Aerial Photograph 1974 |

TABLES

Table 1 Soil Analytical Results

ATTACHMENTS

Attachment A1 Sulfate in Precipitation 1985-2017

Attachment A2 pH in Precipitation 1985-2017

Attachment B Ocean Spray Summary, Figure, and Table



Figures

6/27/2018 11:17:02 AM stolzsd

Y:\GIS\Projects\161660\4\IMXD\Figure 1 Monitoring Locations.mxd

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



- CURRENT MONITORING LOCATION
- PAST MONITORING LOCATION

MONITORING LOCATIONS

WE ENERGIES GROUNDWATER/SURFACE WATER MONITORING
 PLEASANT PRAIRIE POWER PLANT
 PLEASANT PRAIRIE, WISCONSIN



6/13/2019 5:01:47 PM

Y:\GIS\Projects\16\1660\IP4\MXD\Historical_Aerials\Figure 2_1981_.mxd



1981 IMAGERY

WE ENERGIES P4 ASH LANDFILL
PLEASANT PRAIRIE, WISCONSIN



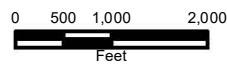
6/13/2019 4:57:56 PM

Y:\GIS\Projects\16\1660\IP4\MXD\Historical_Aerials\Figure 3_1987.mxd



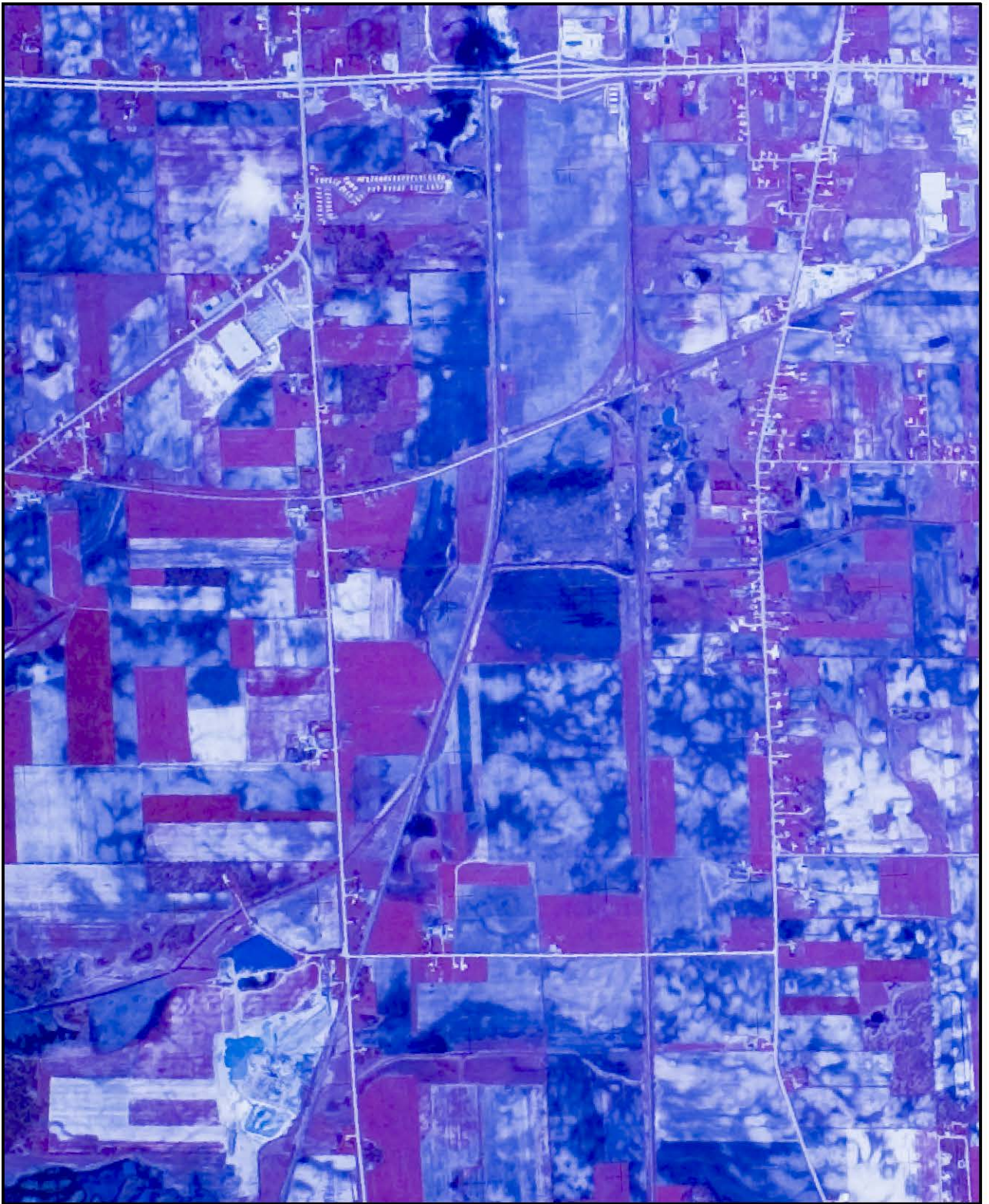
1987 IMAGERY

WE ENERGIES P4 ASH LANDFILL
PLEASANT PRAIRIE, WISCONSIN



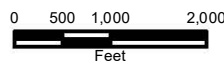
6/13/2019 5:14:50 PM

Y:\GIS\Projects\16\1660\IP4\MXD\Historical_Aerials\Figure 4_1974.mxd



1974 IMAGERY

WE ENERGIES P4 ASH LANDFILL
PLEASANT PRAIRIE, WISCONSIN





Tables

TABLE 1A
SUMMARY OF POST-LINER REMOVAL SOIL SAMPLE FIELD OBSERVATION
 COAL PILE RUNOFF BASIN ABANDONMENT
 Pleasant Prairie Power Plant
 Pleasant Prairie, Wisconsin

Sample ID	Sample Collection Date	Sample Depth (feet, bgs)	PID (ppm)	Soil Classification
SS-01	1/16/2019	0-0.5	4.0	gray/black CLAY (FILL), moist
SS-02	1/16/2019	0-0.5	< 1	brown/dark gray CLAY (FILL), moist, trace gravel
SS-03	1/16/2019	0-0.5	1.4	brown/dark gray CLAY (FILL), moist, trace gravel
SS-04	1/16/2019	0-0.5	< 1	brown/dark gray CLAY (FILL), moist, trace gravel
SS-05	1/16/2019	0-0.5	< 1	brown/dark gray CLAY (FILL), moist, trace gravel
SS-06	1/16/2019	0-0.5	< 1	brown/grayish brown CLAY (FILL), moist, trace to few gravel
SS-07	1/16/2019	0-0.5	< 1	gray/black CLAY (FILL), moist, trace gravel
SS-08	1/16/2019	0-0.5	1.1	gray/brown CLAY (FILL), moist, few sand, trace gravel
SS-09	1/16/2019	0-0.5	< 1	gray CLAY, moist, few sand, trace gravel
SS-10	1/16/2019	0-0.5	< 1	gray/grayish brown CLAY, moist, few sand, trace gravel
SS-11	1/16/2019	0-0.5	< 1	brown/grayish brown CLAY (FILL), moist, few sand, trace gravel
SS-12	1/16/2019	0-0.5	< 1	brown/grayish brown CLAY, moist, few sand, trace gravel
SS-13	1/16/2019	0-0.5	< 1	grayish brown CLAY (FILL), moist, few sand, trace gravel
SS-14	1/16/2019	0-0.5	< 1	grayish brown CLAY, moist, few sand, trace gravel
SS-15	1/16/2019	0-0.5	< 1	dark gray CLAY with GRAVEL (FILL), moist, few sand
SS-16	1/16/2019	0-0.5	< 1	black/brown/gray CLAY (FILL), moist, few sand, trace to few gravel

Notes:

bgs - below ground surface

PID - photoionization detector VOC field screening instrument

ppm - parts per million

VOC - volatile organic compound

TABLE 1B
SUMMARY OF POST-LINER REMOVAL SOIL SAMPLE LABORATORY ANALYTICAL RESULTS
 COAL PILE RUNOFF BASIN ABANDONMENT
 Pleasant Prairie Power Plant
 Pleasant Prairie, Wisconsin

Sample ID	SS-01	SS-02	SS-03	SS-04	SS-05	SS-06	SS-06 DUP	SS-07	SS-08	WDNR Soil RCL			WDNR BTV
										Direct Contact		Groundwater Protection (DF=2)	
Sample Collection Date	1/16/2019	1/16/2019	1/16/2019	1/16/2019	1/16/2019	1/16/2019	1/16/2019	1/16/2019	1/16/2019	1/16/2019	Non-Industrial	Industrial	Groundwater Protection (DF=2)
Sample Depth (feet, bgs)	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5			
Metals (mg/kg)													
Arsenic	6.9	7.5	8.5	8.0	10.2	8.0	8.4	8.6	7.1	0.677	3	0.584	8
Cadmium	0.17 J	< 0.12	< 0.11	< 0.11	< 0.12	< 0.11	< 0.11	< 0.12	< 0.12	71.1	985	0.752	1
Chromium, trivalent	22.2 J	22.5 J	27.5 J	22.1 J	23.2 J	22.5 J	19.6 J	19.7 J	23.0 J	100000	100000	--	44
Chromium, hexavalent	< 2.56	< 2.57	< 2.59	< 2.53	< 2.57	< 2.58	< 2.52	< 2.63	< 2.52	0.301	6.36	--	
Copper	20.4	20.4	23.0	23.2	23.8	31.3	22.3	21.6	17.7	3130	46700	91.6	35
Iron	20500	20400	24400	20200	21900	19700	19100	19800	23200	54800	100000	--	34314
Lead	10.3	10.6	14.0	11.8	14.9	11.6	10.9	11.9	12.4	400	800	27	52
Manganese	575	551	578	498	559	527	578	505	365	1830	25900	39.1244	2937
Sulfate	252	296	272	155	142	139	209	253	186	--	--	--	--
Zinc	60.9	61.0	66.7	59.7	64.2	438	46.7	61.6	64.3	23500	100000	--	150
VOCs (ug/kg)	ND	--	ND	--	--	--	--	--	ND	--	--	--	--

Sample ID	SS-09	SS-10	SS-11	SS-12	SS-13	SS-14	SS-15	SS-16
Sample Depth (feet, bgs)	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5	0-0.5
Metals (mg/kg)								
Arsenic	6.7	7.5	10.6	7.2	8.8	8.9	9.7	8.5
Cadmium	< 0.11	< 0.11	< 0.12	< 0.11	0.24 J	< 0.12	0.12 J	0.17 J
Chromium, trivalent	19.4 J	20.6 J	26.1 J	20.2 J	20.2 J	11.8 J	19.7 J	16.8 J
Chromium, hexavalent	< 2.50	< 2.54	< 2.61	< 2.53	< 2.57	6.56 J	< 2.52	< 2.61
Copper	18.9	18.7	27.0	19.0	29.6	21.0	29.9	20.7
Iron	18800	21900	24600	18100	21300	19800	22000	18300
Lead	9.6	14.2	14.1	10.7	13.3	11.0	16.2	11.7
Manganese	494	387	618	523	544	579	446	498
Sulfate	235	97.9	234	137	160	129	376	313
Zinc	42.7	59.1	64.8	54.5	70.0	58.1	74.8	62.8
VOCs (ug/kg)	--	--	--	--	--	--	--	--

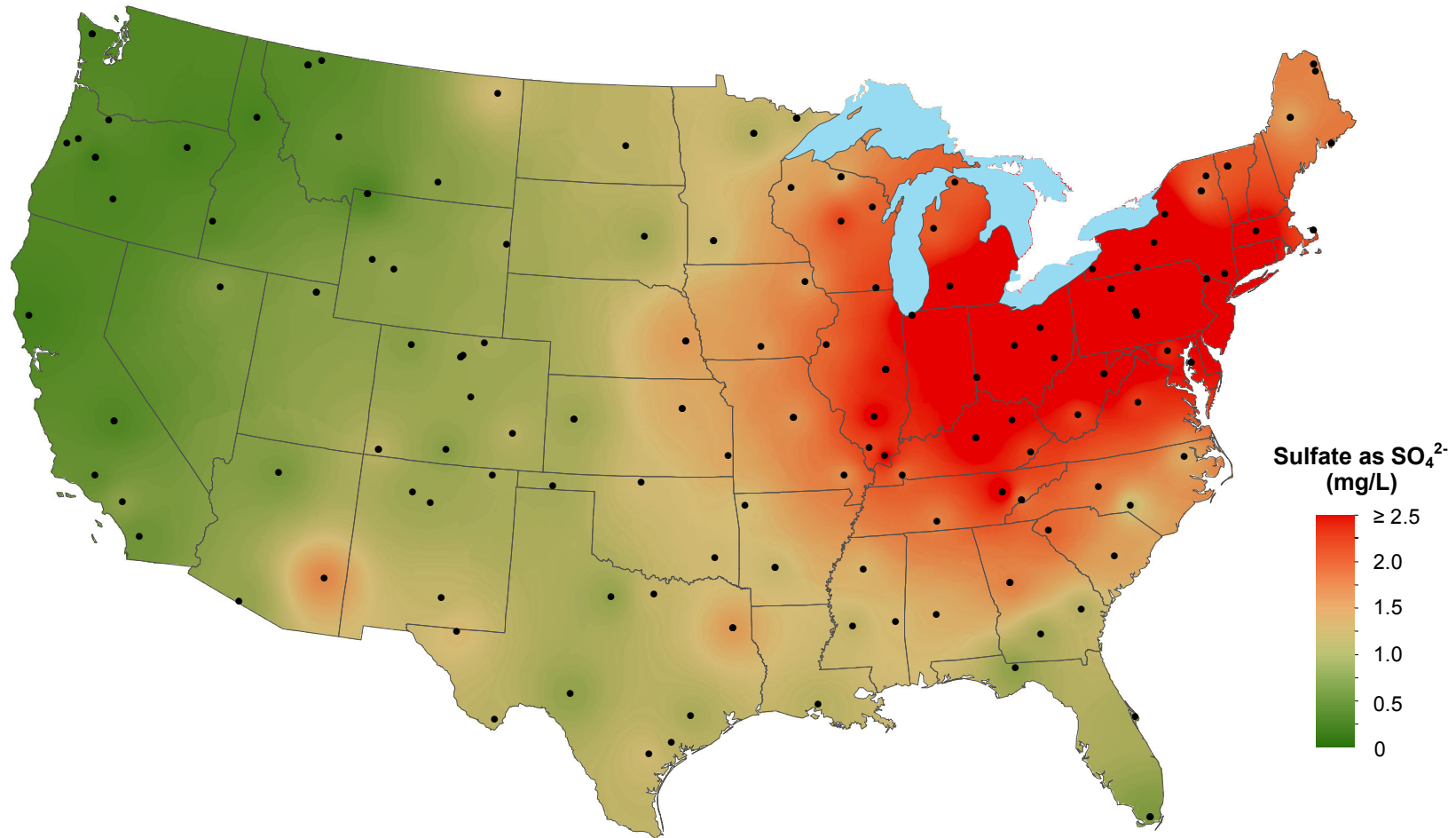
WDNR Soil RCL			WDNR BTV
Direct Contact		Groundwater Protection (DF=2)	
Non-Industrial	Industrial		
0.677	3	0.584	8
71.1	985	0.752	1
100000	100000	--	44
0.301	6.36	--	
3130	46700	91.6	35
54800	100000	--	34314
400	800	27	52
1830	25900	39.1244	2937
--	--	--	--
23500	100000	--	150
--	--	--	--

Notes:
 -- not analyzed, not established or not applicable
 bgs - below ground surface
 BTV - background threshold value
 DF - dilution factor
 DUP - duplicate
 J - estimated concentration at or above the limit of detection and below the limit of quantitation
 mg/kg - milligrams per kilogram
 ND - not detected (refer to laboratory report for detection limits)
 RCL - residual contaminant level (June 2018)
 ug/kg - micrograms per kilogram
 VOCs - volatile organic compounds
 WDNR - Wisconsin Department of Natural Resources



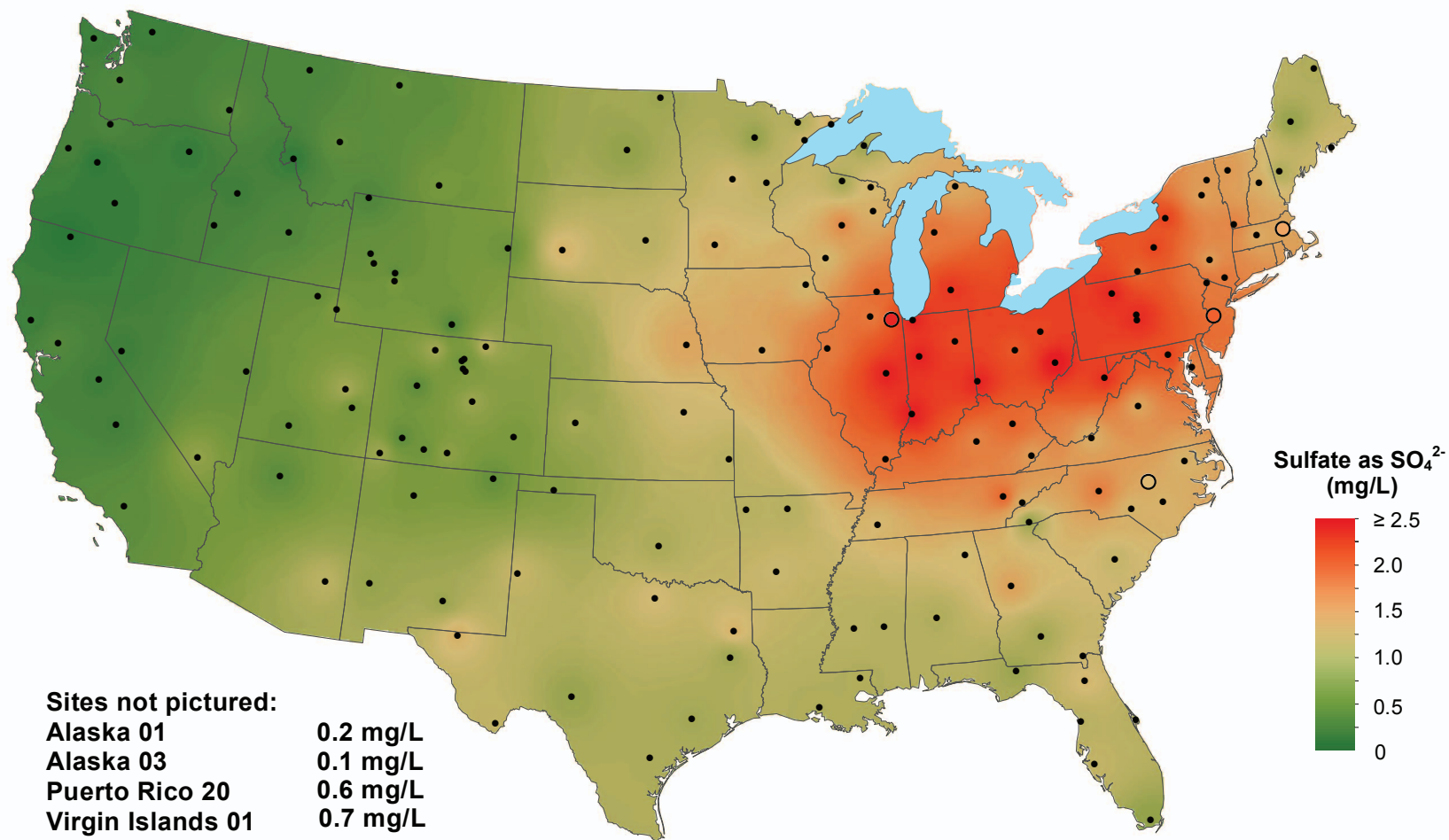
Attachment A1

Sulfate ion concentration, 1985

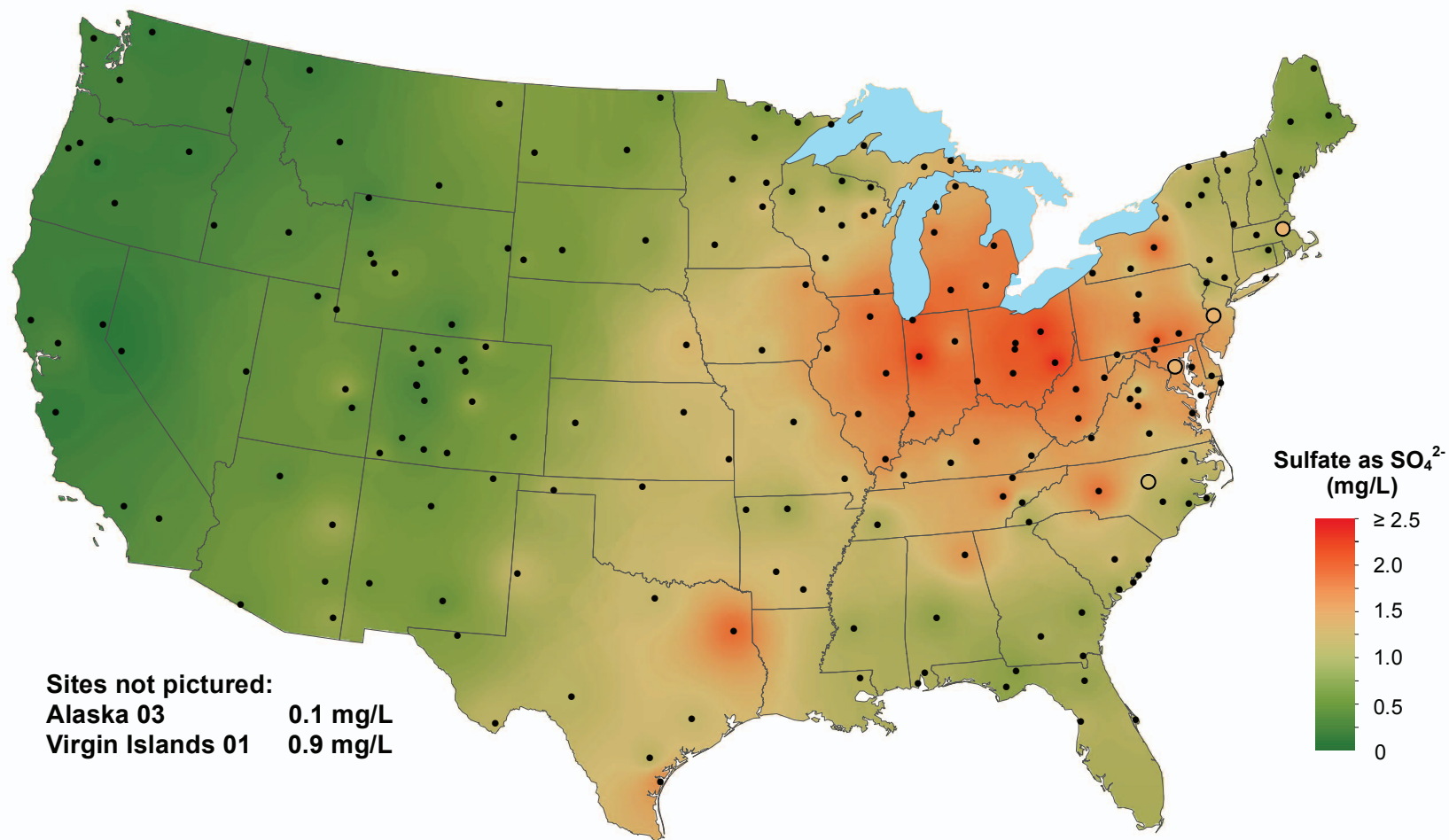


National Atmospheric Deposition Program/National Trends Network
<http://nadp.isws.illinois.edu>

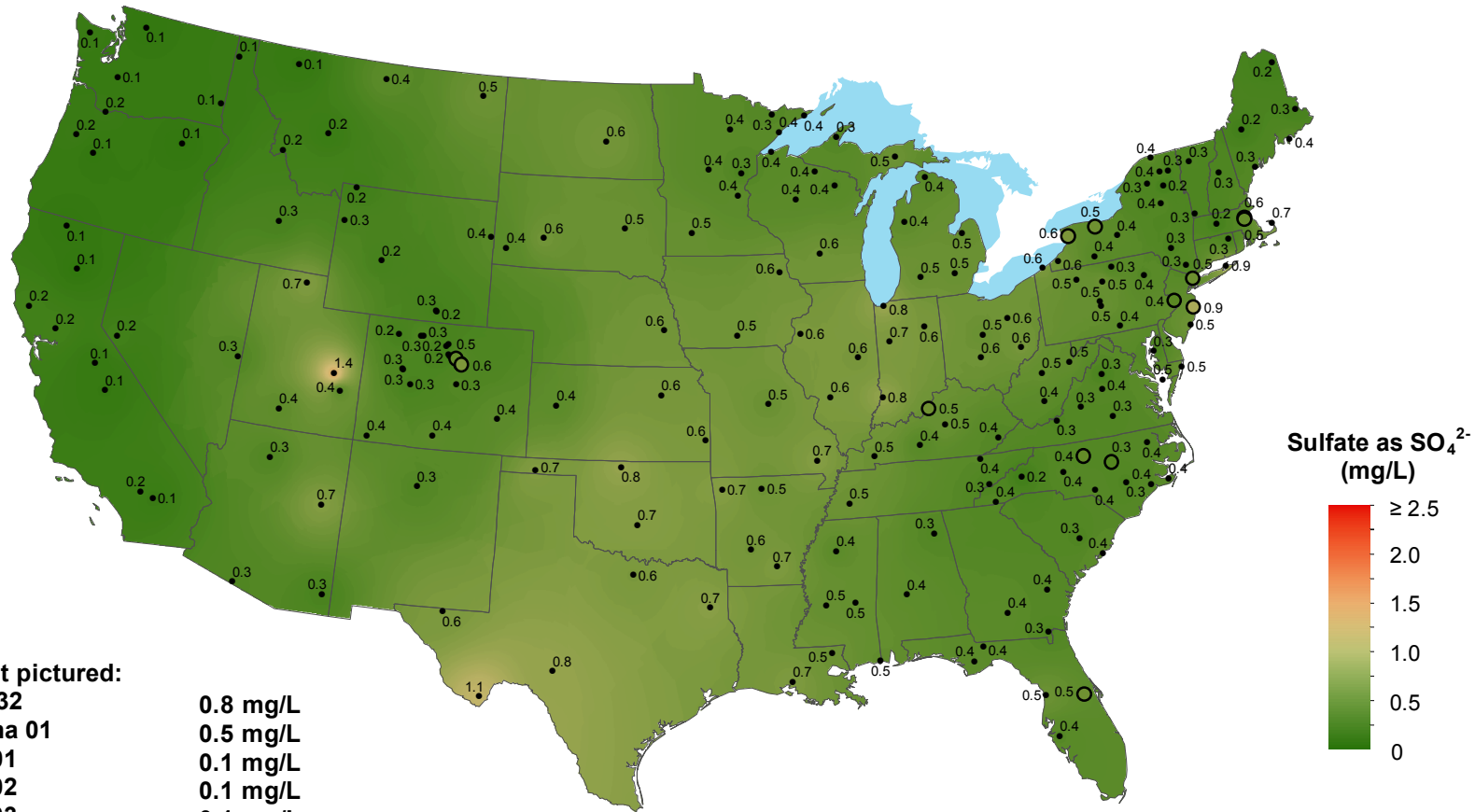
Sulfate ion concentration, 1998



Sulfate ion concentration, 2005



Sulfate ion concentration, 2017



Sites not pictured:

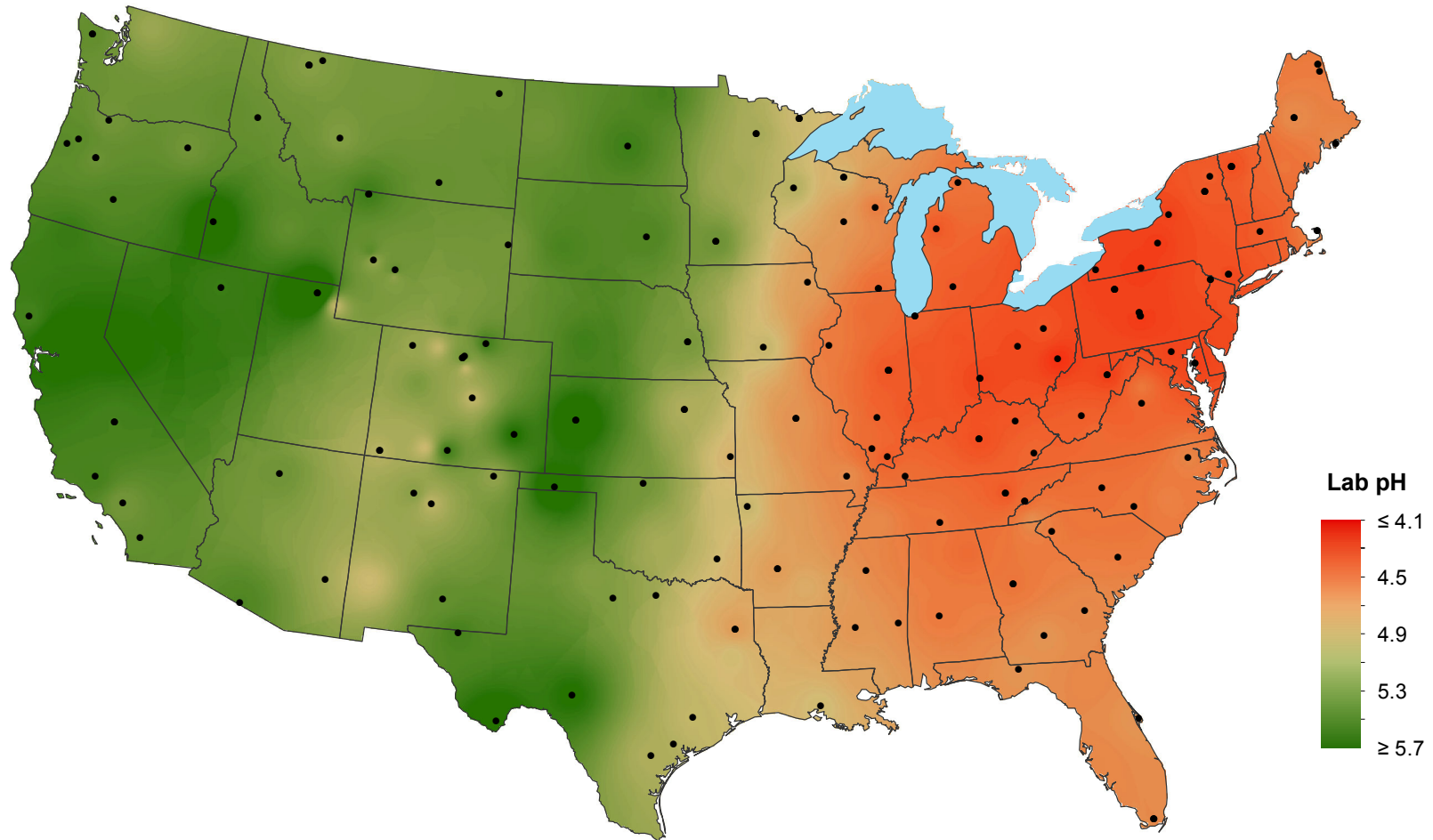
Alberta 32	0.8 mg/L
Argentina 01	0.5 mg/L
Alaska 01	0.1 mg/L
Alaska 02	0.1 mg/L
Alaska 03	0.1 mg/L
Alaska 97	0.3 mg/L
British Columbia 22	1.5 mg/L
British Columbia 23	0.3 mg/L
British Columbia 24	0.2 mg/L
Saskatchewan 21	0.3 mg/L
Saskatchewan 31	0.4 mg/L

National Atmospheric Deposition Program/National Trends Network
<http://nadp.slh.wisc.edu>



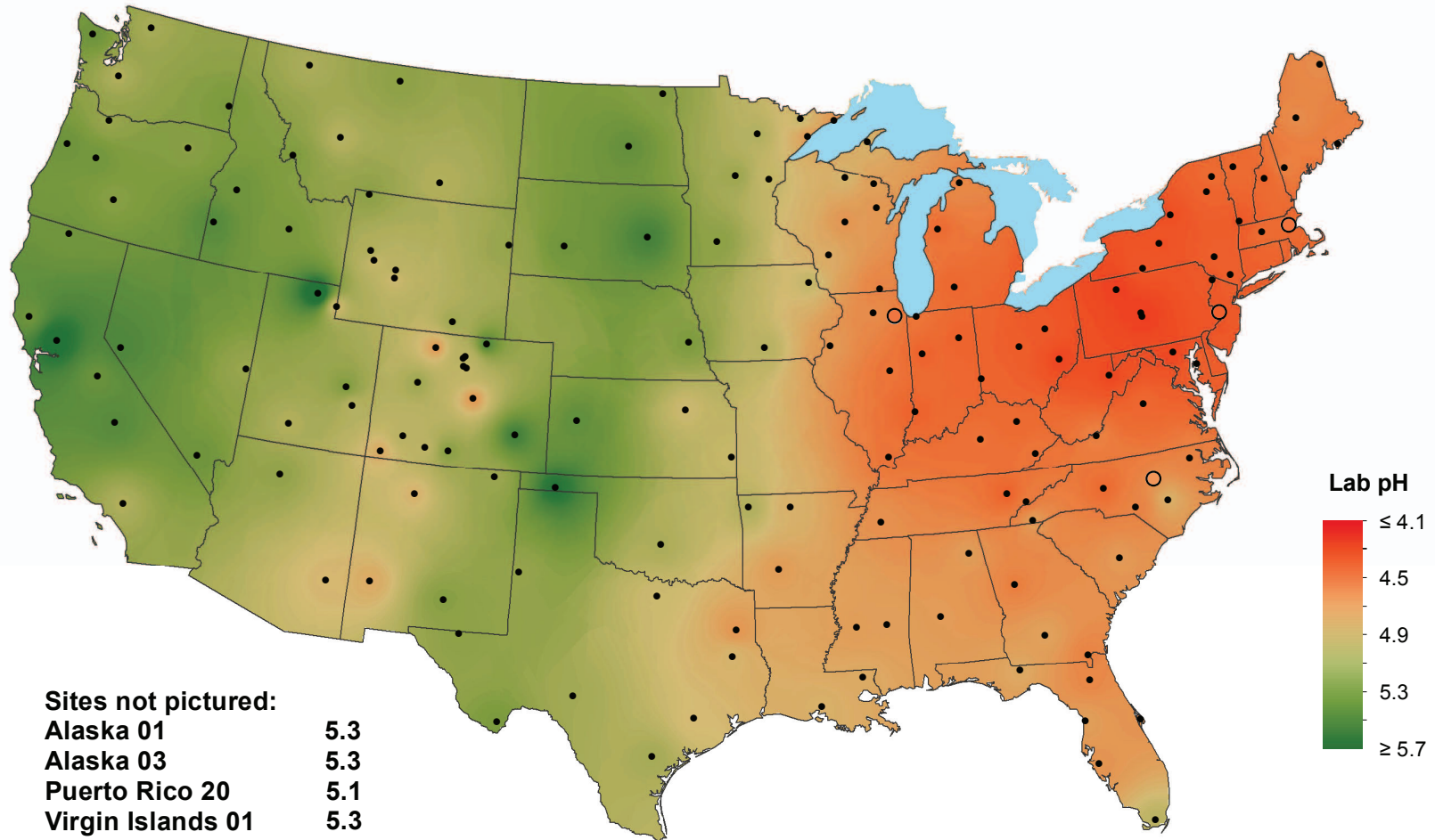
Attachment A2

Hydrogen ion concentration as pH from measurements made at the Central Analytical Laboratory, 1985

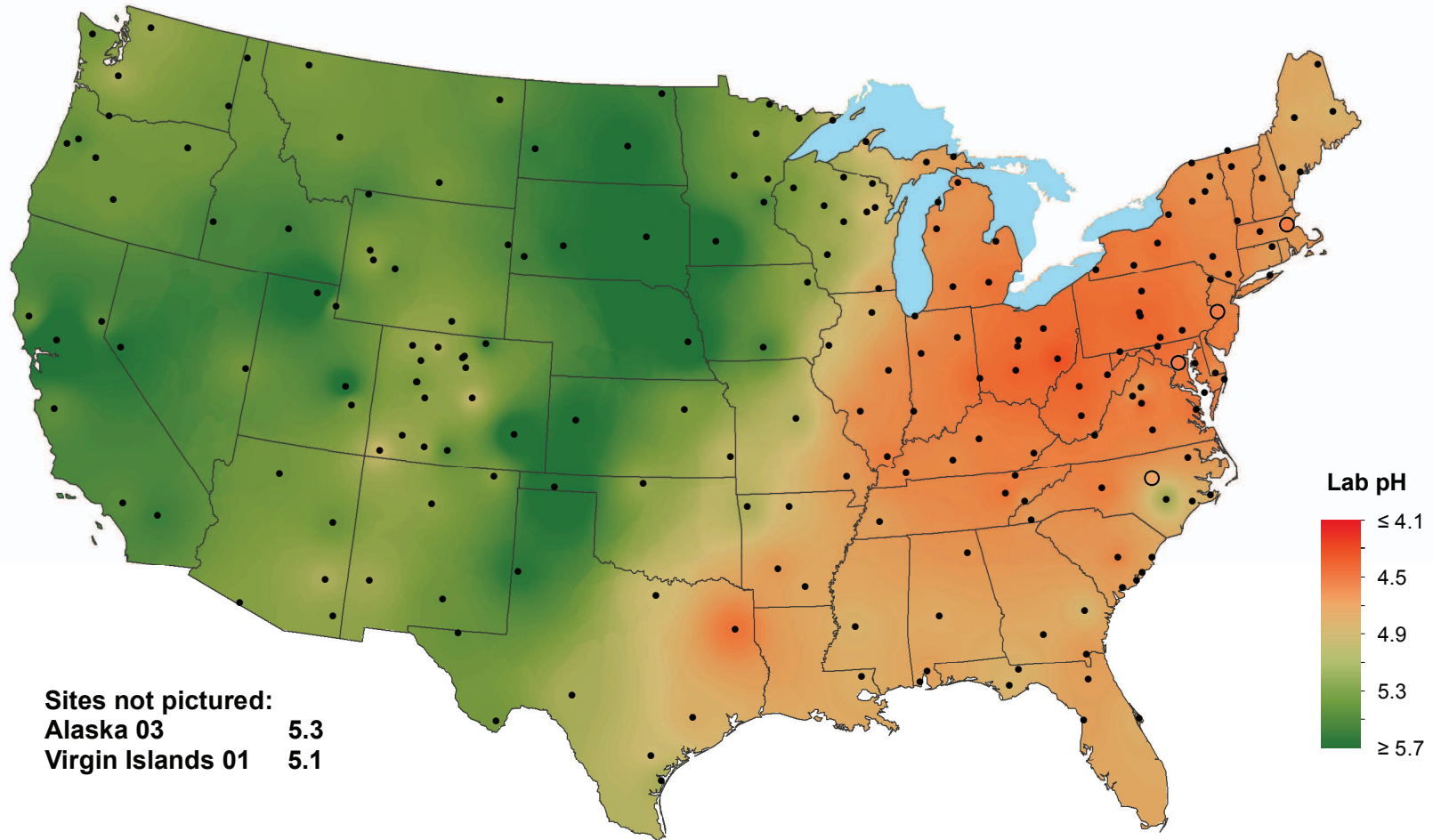


National Atmospheric Deposition Program/National Trends Network
<http://nadp.isws.illinois.edu>

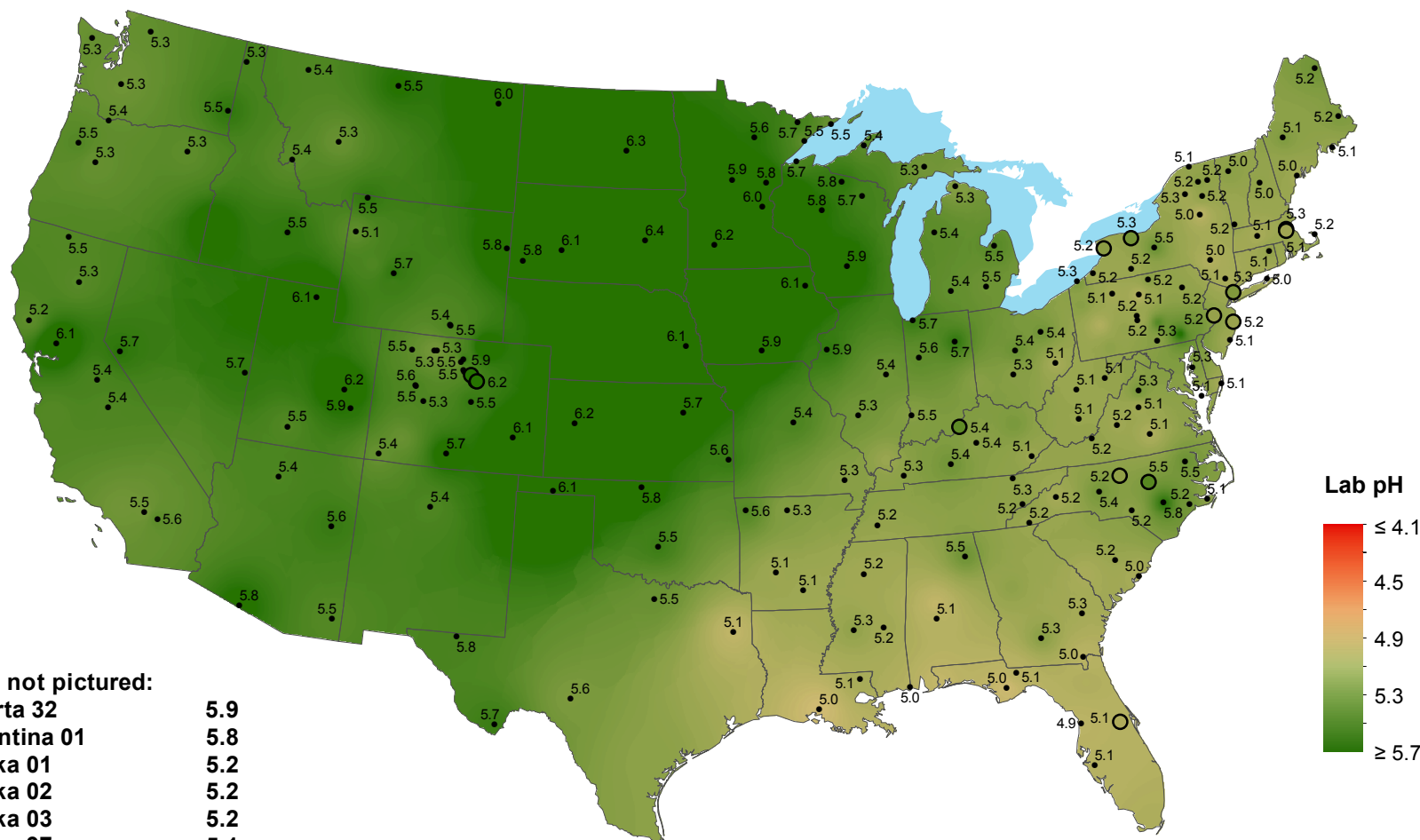
Hydrogen ion concentration as pH from measurements made at the Central Analytical Laboratory, 1998



Hydrogen ion concentration as pH from measurements made at the Central Analytical Laboratory, 2005



Hydrogen ion concentration as pH from measurements made at the Central Analytical Laboratory, 2017



Sites not pictured:

Alberta 32	5.9
Argentina 01	5.8
Alaska 01	5.2
Alaska 02	5.2
Alaska 03	5.2
Alaska 97	5.1
British Columbia 22	4.4
British Columbia 23	5.0
British Columbia 24	5.2
Saskatchewan 21	5.7
Saskatchewan 31	5.8

National Atmospheric Deposition Program/National Trends Network
<http://nadp.slh.wisc.edu>



Attachment B

TABLE 3
 REMEDIATION BY NATURAL ATTENUATION INDICATOR MEASUREMENTS
 OCEAN SPRAY CRANBERRIES, INC.
 7800 60TH AVENUE
 KENOSHA, WISCONSIN

Monitoring Location Date Sampled Lab		MW-1				MW-2			
		3/14/97 SAI	6/17/97 SAI	9/3/97 SAI	12/3/97 SAI	3/14/97 SAI	6/17/97 SAI	9/3/97 SAI	12/3/97 SAI
Lab ID:	Units	97-A020067	97-A049203	97-A074110	97-A109499	97-A020068	97-A049204	97-A074111	97-A109500
Temperature	°C	7.2	9.85	13.69	10.83	6.83	9.66	14.32	11.57
DO	mg/L	3	4.82	5.03	2.16	3.87	3.68	2.79	1.15
Specific Conductance	µmhos/cm	1902	2225	1672	1486	1183	1557	1162	1023
pH		6.82	7.00	7.08	7.12	6.94	7.09	7.16	7.12
TDS	g/L	1.218	1.427	1.071	0.951	0.757	0.995	0.744	0.654
ORP	mv	383	458	419	409	370	455	219	400
CO ₂	mg/L	NA	152.8	162	NA	NA	98.6	114	NA
Iron (dissolved)	µg/L	458	235	<50.0	298	425	243	<50.0	359
Manganese (dissolved)	µg/L	41	<15.0	<15.0	<15.0	21	<15.0	<15.0	<15.0
Nitrate-N	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sulfate (total)	mg/L	648	878	734	758	284	318	289	252
Alkalinity	mg/L	340	300	339	343	402	351	424	463
Methane	µg/L	NA	<26.0	<26.0	<26	NA	<26.0	<26.0	<26

Notes:

- °C - Degrees celsius
- DO - Dissolved oxygen
- TDS - Total dissolved solids
- ORP - Oxygen-reduction potential
- mg/L - Milligrams per liter
- µg/mL - Micrograms per milliliter
- µmhos/cm - Micromhos per centimeter
- g/L - Grams per liter
- mv - Millivolts
- NM - Not measured; Parameters were not measured due to the presence of free product.
- * - A CO₂ measurement could not be determined due to the color and turbidity of the sample.
- NA - Not analyzed
- SAI - Specialized Assays, Incorporated.
 2960 Foster Creighton Drive
 Nashville, Tennessee 37204-0566
 WDNR Certification No. 998020430

TABLE 3
 REMEDIATION BY NATURAL ATTENUATION INDICATOR MEASUREMENTS
 OCEAN SPRAY CRANBERRIES, INC.
 7800 60TH AVENUE
 KENOSHA, WISCONSIN

Monitoring Location Date Sampled Lab		MW-3				MW-4			
		3/14/97 SAI	6/17/97 SAI	9/3/97 SAI	12/3/97 SAI	3/14/97 SAI	6/17/97 SAI	9/3/97 SAI	12/3/97 SAI
Lab ID:	Units	97-A020069	97049205	97-A074112	97-A109501	97-A020070	97-A049206	97-A074113	97-A109502
Temperature	°C	6.78	12.02	15.92	13.22	5.6	14.98	16.19	12.55
DO	mg/L	4.13	3.57	1.25	0.38	NM	4.39	2.51	0.5
Specific Conductance	µmhos/cm	1080	1389	1054	984	1080	41	1192	1024
pH		6.83	7.06	7.00	7.01	6.8	6.67	6.96	7.14
TDS	g/L	6.92	0.884	0.674	0.631	NM	0.026	0.763	0.656
ORP	mv	370	461	417	408	NM	410	167	153
CO ₂	mg/L	NA	93.4	*	NA	*	114.4	133	NA
Iron (dissolved)	µg/L	463	708	76	347	501	665	125	2,500
Manganese (dissolved)	µg/L	471	396	192	136	2,290	3,280	4,560	3,510
Nitrate-N	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Sulfate (total)	mg/L	142	178	189	195	48.5	79.8	14.1	<5.0
Alkalinity	mg/L	443	364	461	478	470	424	572	598
Methane	µg/L	NA	<26.0	41	<26	NA	4,000	8,600	6,450

Notes:

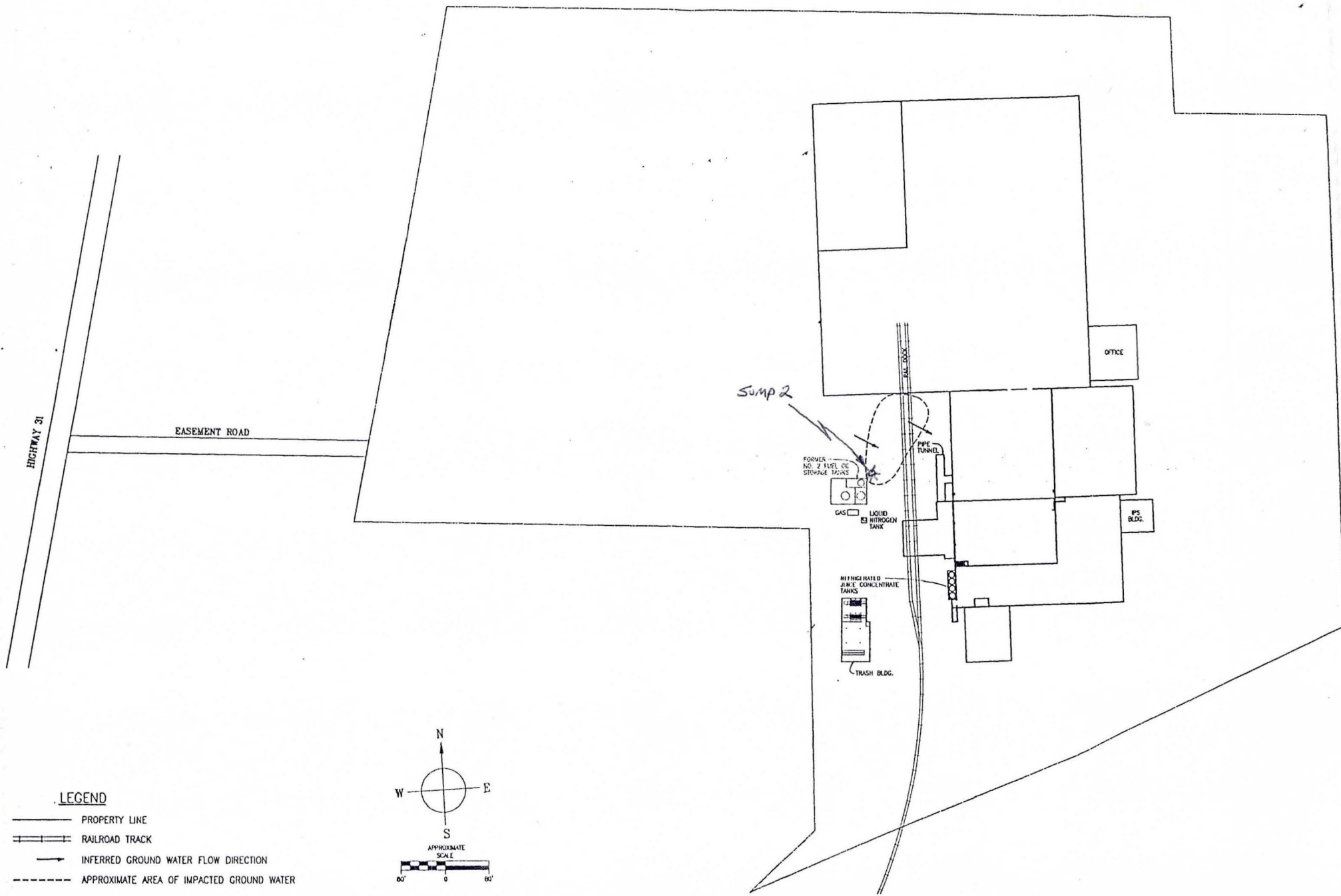
- °C - Degrees celsius
- DO - Dissolved oxygen
- TDS - Total dissolved solids
- ORP - Oxygen-reduction potential
- mg/L - Milligrams per liter
- µg/mL - Micrograms per milliliter
- µmhos/cm - Micromhos per centimeter
- g/L - Grams per liter
- mv - Millivolts
- NM - Not measured; Parameters were not measured due to the presence of free product.
- * - A CO₂ measurement could not be determined due to the color and turbidity of the sample.
- NA - Not analyzed
- SAI - Specialized Assays, Incorporated.
 2960 Foster Creighton Drive
 Nashville, Tennessee 37204-0566
 WDNR Certification No. 998020430

TABLE 3
 REMEDIATION BY NATURAL ATTENUATION INDICATOR MEASUREMENTS
 OCEAN SPRAY CRANBERRIES, INC.
 7800 60TH AVENUE
 KENOSHA, WISCONSIN

Monitoring Location Date Sampled Lab		Sump 1 (RS-1)				Sump 2 (RS-2)			
		3/14/97 SAI	6/17/97 SAI	9/3/97 SAI	12/3/97 SAI	3/14/97 SAI	6/17/97 SAI	9/3/97 SAI	12/3/97 SAI
Lab ID:	Units	97-A020071	97-A049207	97-A074114	97-A109503	97-A020072	97-A049207	97-A074115	97-A109504
Temperature	°C	6.3	15.93	17.11	8.38	5.2	15.95	19.12	12.37
DO	mg/L	NM	0.52	1.72	1.46	NM	0.30	1.28	0.53
Specific Conductance	µmhos/cm	1710	1194	19539	16317	620	7,470	7,881	6380
pH		7.8	7.15	6.76	6.69	8.1	6.8	6.94	6.82
TDS	g/L	NM	0.857	12.47	10.68	NM	4.827	5.052	4.109
ORP	mv	NM	385	149	212	NM	155	137	154
CO ₂	mg/L	NA	24.4	51	NA	NA	*	47	NA
Iron (dissolved)	µg/L	782	202	19,400	131	244	5,260	4,360	10,900
Manganese (dissolved)	µg/L	155	24	795	81.0	<15	223.0	230.0	188.0
Nitrate-N	mg/L	<0.10	0.25	<0.10	0.21	<0.10	<0.10	<0.10	<0.10
Sulfate (total)	mg/L	29.8	18.0	<5.0	28.0	11.5	<5.0	<5.0	<5.0
Alkalinity	mg/L	81	45.4	355	88.4	59.4	261	323	442
Methane	µg/L	NA	1,000	22,600	96	NA	13,000	38,800	20,800

Notes:

- °C - Degrees celsius
- DO - Dissolved oxygen
- TDS - Total dissolved solids
- ORP - Oxygen-reduction potential
- mg/L - Milligrams per liter
- µg/mL - Micrograms per milliliter
- µmhos/cm - Micromhos per centimeter
- g/L - Grams per liter
- mv - Millivolts
- NM - Not measured; Parameters were not measured due to the presence of free product.
- * - A CO₂ measurement could not be determined due to the color and turbidity of the sample.
- NA - Not analyzed
- SAI - Specialized Assays, Incorporated.
 2960 Foster Creighton Drive
 Nashville, Tennessee 37204-0566
 WDNR Certification No. 998020430



LEGEND

- PROPERTY LINE
- RAILROAD TRACK
- INFERRED GROUND WATER FLOW DIRECTION
- - - - - APPROXIMATE AREA OF IMPACTED GROUND WATER

