



# 2018 Annual Groundwater Monitoring and Corrective Action Report - Boiler Slag Pond NIPSCO Michigan City Generating Station

Prepared Pursuant to 40 CFR §257.90(e) and Corresponding Regulations under 329 Indiana  
Administrative Code 10-9-1

Submitted to:

**Northern Indiana Public Service Company**

Michigan City Generating Station  
Michigan City, Indiana

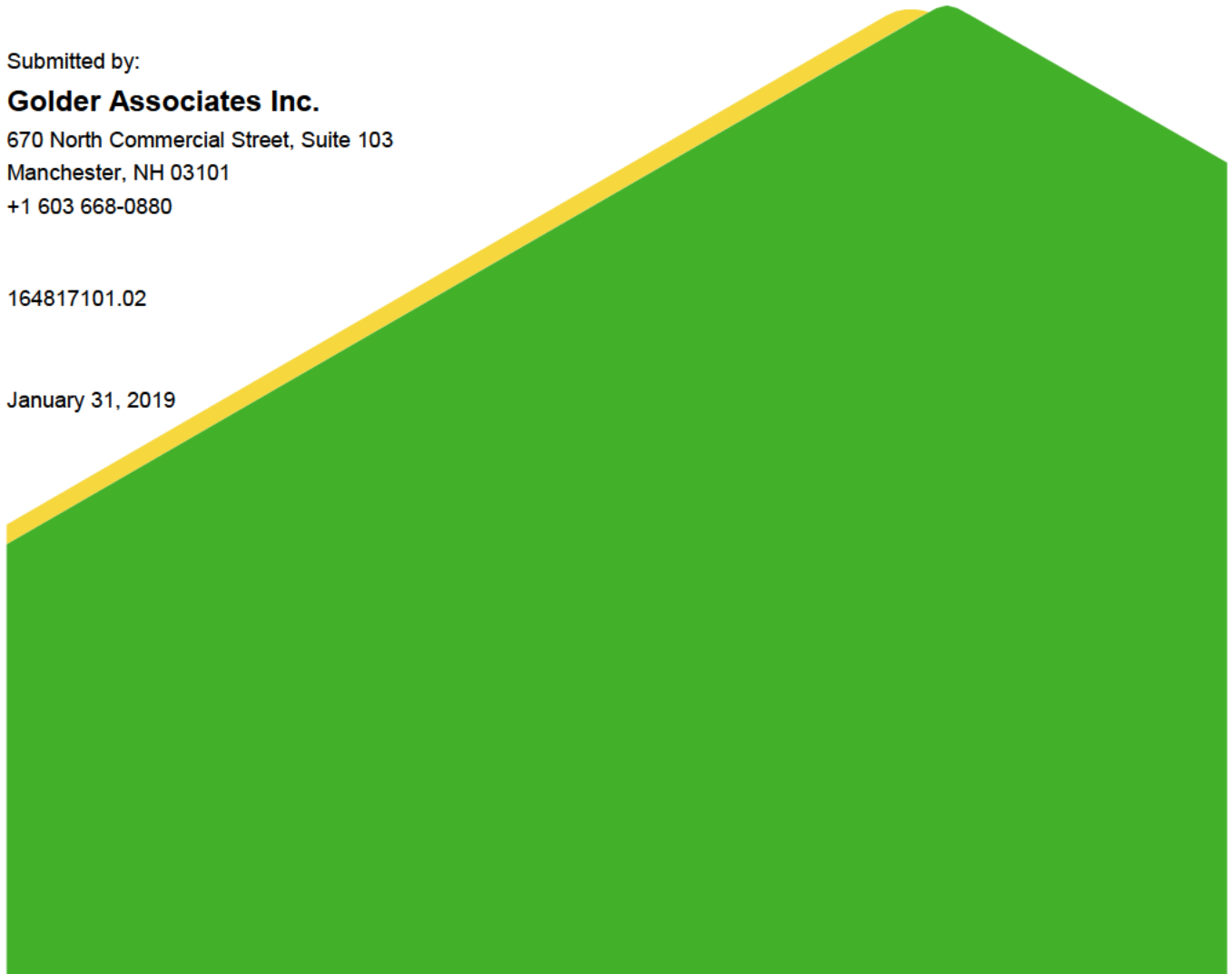
Submitted by:

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January 31, 2019



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## 1.0 INTRODUCTION

On behalf of Northern Indiana Public Service Company (NIPSCO), Golder Associates Inc. (Golder) prepared this 2018 CCR Annual Groundwater Monitoring and Corrective Action Report (2018 Annual Report) for the Boiler Slag Pond (the CCR Unit) located at the Michigan City Generating Station (MCGS) 101 Wabash Street, in Michigan City, LaPorte County, Indiana (Latitude 41° 43' 15" N and Longitude 86° 54' 30" W, see Figure 1). The BSP is an approximately 2.5-acre unlined impoundment/materials dewatering area, as shown in Figure 2.

Golder prepared the 2018 Annual Report in accordance with 40 Code of Federal Regulations (CFR) Part 257, "Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities; Final Rule" (CCR Final Rule) and corresponding regulations under 329 Indiana Administrative Code (IAC) 10-9-1.

Routine monitoring activities performed during the reporting period include inspection of wells for integrity and security, measurement of groundwater levels prior to sample collection to assess groundwater flow direction, and collection of samples for laboratory analysis.

In conformance with the applicable requirements of 40 CFR §257.90(e)(1) through (5) and corresponding State of Indiana requirements, the 2018 Annual Report:

- Documents the status of the groundwater monitoring and corrective action program
- Provides figures showing the CCR Unit and monitoring well locations
- Summarizes key CCR groundwater activities completed during calendar year 2018
- Includes CCR groundwater monitoring data obtained in calendar year 2018
- Describes any problems encountered during the monitoring activities
- Discusses actions taken to resolve the problems, if applicable
- Projects key activities for the upcoming year

## 2.0 GROUNDWATER MONITORING AND CORRECTIVE ACTION PROGRAM STATUS

Starting in 2016 following the installation of a groundwater monitoring system and throughout calendar year 2017, Golder collected background groundwater samples and performed the first Detection Monitoring sampling event at MCGS BSP pursuant to the requirements of 40 CFR §257.94 and corresponding State of Indiana requirements. In April 2018, Golder performed the second Detection Monitoring sampling event. In October 2018, Golder performed the first Assessment Monitoring sampling event pursuant to the requirements of 40 CFR §257.95. Based upon groundwater monitoring results collected pursuant to the CCR Final Rule to date, corrective action program requirements have neither been triggered nor implemented at this CCR Unit.

### 2.1 Key Actions Completed - 2018

NIPSCO completed the following key actions relative to CCR groundwater monitoring at the BSP during calendar year 2018:

- Submittal of the 2017 Groundwater Monitoring and Corrective Action Annual Report in January 2018 (40 CFR §257.90(e))

- Evaluation of the results of the first Detection Monitoring event in January 2018 (40 CFR §257.94)
- Performance of the second Detection Monitoring event in April 2018 (40 CFR §257.94)
- Evaluation of the results of the second Detection Monitoring event in July 2018 (40 CFR §257.95(d))
- Notification that an Assessment Monitoring program has been established in August 2018 (40 CFR §257.94(e))
- Performance of the first Assessment Monitoring event in October 2018 (40 CFR §257.95)

## 2.2 Monitoring System Modification

The groundwater monitoring system did not require any modifications in 2018 (see Figure 2). Table 1 provides a summary of the well rationale/purpose and date of installation. An overview of the groundwater monitoring network is provided below.

CCR Unit	Background Monitoring Wells	Downgradient Monitoring Wells
Boiler Slag Pond	GAMW-05, GAMW-12, GAMW-18	GAMW-10, GAMW-11, GMMW-2

## 2.3 Background Monitoring (2016 to 2017)

Per the requirements of 40 CFR §257.94, Golder collected eight independent background groundwater samples from each background and downgradient well between July 2016 and August 2017. Golder used the results of the background monitoring phase to develop appropriate, statistically valid background values for each constituent/monitoring well. Golder submitted the samples to a contract laboratory, in accordance with chain of custody and quality assurance/quality control procedures, for analysis of 40 CFR Part 257 Appendix III and Appendix IV constituents. In addition, Golder personnel measured field water quality parameters including specific conductance, temperature, dissolved oxygen, turbidity, oxidation-reduction potential, and pH. The background data set is included in the 2017 CCR Annual Groundwater Monitoring and Corrective Action Report, dated January 31, 2018 (2017 Annual Report).

## 2.4 Detection Monitoring

Golder performed the first Detection Monitoring event in October 2017, followed by a statistical evaluation and data analysis in January 2018. Golder collected groundwater samples from the BSP background and downgradient monitoring wells for analysis of Appendix III constituents per 40 CFR §257.94 and included the results in the 2017 Annual Report. Following receipt and validation of laboratory results, Golder evaluated the results of the first Detection Monitoring sampling event to compare the concentration of Appendix III constituents relative to facility background concentrations. Using Sanitas™ software, Golder pooled the background data to calculate prediction limits and compared the October 2017 results to the calculated prediction limits to determine statistically significant increases (SSIs). There were no SSIs identified from the October 2017 sampling event.

Golder performed the second Detection Monitoring event in April 2018 and follow-on pH verification sampling in May, June, and July 2018. Golder performed a statistical evaluation and data analysis in July 2018. The SSIs are summarized in the table below by downgradient monitoring well and constituent. Based on these SSIs, NIPSCO established an Assessment Monitoring program in August 2018.

Monitoring Well ID	Boron	Calcium	Chloride	Fluoride	Sulfate	pH <sup>1</sup>	Total Dissolved Solids
GAMW-10						X	
GAMW-11						X	
GMMW-2							

<sup>1</sup>"X" represents an SSI

1 = pH value is based on field water quality meter reading

## 2.5 Assessment Monitoring

Golder performed the first Assessment Monitoring event (i.e. Assessment sampling) in October 2018. Golder collected groundwater samples from each background and downgradient monitoring well for analysis of Appendix III and Appendix IV constituents per 40 CFR §257.95. Golder will collect detected Appendix IV constituents (Verification sampling) in February 2019.

## 2.6 Statistical Evaluation

Subsequent to each monitoring event, Golder assessed the analytical data for outliers, anomalies, and trends that may be an indication of a sampling or analytical error. Outliers and anomalies are generally defined as inconsistently large or small values that can occur as a result of sampling, laboratory, transportation, or transcription errors, or even by chance alone. Significant trends may indicate natural geochemical variability, a source of systematic error, influence of an upgradient/off-site source, or an actual occurrence of CCR Unit influence. Appropriate statistical methods are used to remove outliers from the database and manage trends with detrending routines, prior to the calculation of statistical limits. To assess the data for outliers, anomalies, and trends, Golder assessed the data using time vs. concentration graphs, and statistical routines included in the Sanitas™ statistical analysis software package.

Golder identified the July 2016 beryllium and cadmium results from background monitoring well GAMW-12 as outliers and removed these data from the background data set for the following reasons:

- Trend charts indicated that the beryllium and cadmium results from the July 2016 monitoring event were inconsistent with concentrations detected in other background monitoring wells; and
- These results were recorded by the validators as non-detect due to blank contamination.

Golder identified the July 2016 thallium results from background monitoring wells GAMW-12 and GAMW-18 as outliers and removed these data from the background data set for the following reasons:

- Trend charts indicated that these thallium results from the July 2016 monitoring event were inconsistent with concentrations detected in other background monitoring wells; and
- These thallium results were recorded by the validators as non-detect due to blank contamination.

Golder identified the September 2016 lead result from downgradient monitoring well GMMW-2 as an outlier and removed this datum from the background data set for the following reason:

- Trend charts indicated that the lead result from the September 2016 monitoring event was inconsistent with other concentrations detected in this monitoring well.

Golder identified the January 2017 chloride result from downgradient monitoring well GAMW-11 as an outlier and removed this datum from the background data set for the following reasons:

- Statistical testing, including the Dixon outlier test, identified chloride as an outlier; and
- Trend charts indicated that the chloride result from the January 2017 monitoring event was inconsistent with other concentrations detected in this monitoring well.

Golder identified the January 2017 pH results from background monitoring wells GAMW-10, GAMW-11, and GAMW-18 as outliers and removed these data from the background data set for the following reasons:

- Statistical testing, including the Dixon outlier test, identified pH as an outlier;
- Trend charts indicated that the pH results from January 2017 monitoring event were inconsistent with other concentrations detected in these monitoring wells; and
- pH measurements collected by one field staff member during the January 2017 monitoring event were lower than historic pH measurements, suggesting a field equipment error.

Golder identified the March 2017 antimony result from background monitoring well GAMW-05 as an outlier and removed this datum from the background data set for the following reasons:

- Trend charts indicated that the antimony result from the March 2017 monitoring event was inconsistent with concentrations detected in other background monitoring wells.

Golder identified the March 2017 barium result from background monitoring well GAMW-18 as an outlier and removed this datum from the background data set for the following reasons:

- Trend charts indicated that the barium result from the March 2017 monitoring event was inconsistent with concentrations detected in other background monitoring wells.

Golder identified the March 2017 lithium result from background monitoring well GAMW-18 as an outlier and removed this datum from the background data set for the following reasons:

- Trend charts indicated that the lithium result from the March 2017 monitoring event was inconsistent with concentrations detected in other background monitoring wells; and
- This lithium result is the only non-detect result detected in the background wells.

Golder identified the July 2017 barium and thallium results from downgradient monitoring well GMMW-2 as outliers and removed these data from the background data set for the following reasons:

- Statistical testing, including the Dixon outlier test, identified barium and thallium as outliers; and
- Trend charts indicated that barium and thallium results from monitoring well GMMW-2 in the July 2017 monitoring event were inconsistent with other concentrations detected in this monitoring well.

Golder identified the August 2017 calcium result from downgradient monitoring well GAMW-10 as an outlier and removed this datum from the background data set for the following reasons:

- Statistical testing, including the Dixon outlier test, identified calcium as an outlier; and

- Trend charts indicated that the calcium result from the August 2017 monitoring event was inconsistent with other concentrations detected in this monitoring well.

Golder evaluated the background data for trends using Sanitas™ software. Golder will continue to monitor trends and will perform detrending routines before using this data to calculate GWPS:

- Cobalt concentrations detected in groundwater samples collected from well GAMW-05 show an increasing trend;
- Lithium concentrations detected in groundwater samples collected from wells GAMW-05 and GAMW-12 show a decreasing trend;
- Mercury concentrations detected in groundwater samples collected from wells GAMW-12 and GAMW-18 show an increasing trend; and
- Molybdenum concentrations detected in groundwater samples collected from well GAMW-12 show a decreasing trend.

## 2.7 Problems Encountered and Follow-Up Corrective Actions

No problems were encountered in 2018.

## 3.0 KEY ACTIVITIES PROJECTED FOR 2019

During calendar year 2019, NIPSCO anticipates conducting the following key CCR groundwater monitoring activities for the BSP:

- Prepare and submit the appropriate notifications according to the CCR Rule;
- Continue semi-annual Assessment Monitoring groundwater sampling per CCR requirements; and
- Inspect and maintain monitoring system including wells, pumps, and equipment.

## TABLES



**Table 1 Monitoring Well Network**  
**CCR Unit Michigan City Boiler Slag Pond**  
**NIPSCO Michigan City Generating Station**  
**Michigan City, Indiana**

CCR Unit	Well Purpose	Monitoring Well ID	Installation Date (If Applicable)	Decommission Date (If Applicable)	Basis For Action
Boiler Slag Pond	Background Monitoring Well	GAMW-05	-	-	Installed for Groundwater Quality Monitoring*
		GAMW-12	6/14/2016	-	
		GAMW-18	6/14/2016	-	
	Downgradient Monitoring Well	GAMW-10	6/14/2016	-	
		GAMW-11	6/14/2016	-	
		GMMW-2	-	-	

\* Per the CCR Rule requirements, Golder collected eight rounds of background data prior to October 17, 2017.

Prepared by: KMC  
 Checked by: DFS  
 Reviewed by: MAH

**Table 2: Summary of Sampling Events**  
**CCR Unit Michigan City Boiler Slag Pond**  
**NIPSCO Michigan City Generating Station**  
**Michigan City, Indiana**

Well Purpose	Monitoring Well ID	Sample Event #10			Sample Event #11	Total Number of Samples	
		Detection Monitoring	Verification Sampling	Verification Sampling	Verification Sampling		Annual Assessment Monitoring
Sample Parameters		Appendix III	Field Parameters Only	Field Parameters Only	Field Parameters Only		Appendix III and Appendix IV
Background Monitoring Well	GAMW-05	4/17/2018	5/8/2018	NS	NS	10/4/2018	3
	GAMW-12	4/17/2018	5/8/2018	NS	NS	10/4/2018	3
	GAMW-18	4/17/2018	5/8/2018	NS	NS	10/4/2018	3
Downgradient Monitoring Well	GAMW-10	4/16/2018	5/8/2018	6/27/2018	7/26/2018	10/4/2018	5
	GAMW-11	4/16/2018	5/8/2018	NS	7/26/2018	10/4/2018	4
	GMMW-2	4/16/2018	5/8/2018	6/27/2018	7/26/2018	10/3/2018	5
Total Number of Samples		6	6	2	3	6	23

**Notes:**

Sample counts do not include QC/QA samples.

NS= not sampled

(1) Sample events #1-#9 were completed prior to 2018. The purpose, sample parameters, and sample dates are included in the 2017 Annual Report.

Prepared by: DFS

Checked by: KMC

Reviewed by: MAH

**Table 3: Analytical Data  
CCR Unit Michigan City Boiler Slag Pond  
NIPSCO Michigan City Generating Station  
Michigan City, Indiana**

Analyte	Unit	GAMW-05			GAMW-10						GAMW-11				GAMW-12			
		2018-04-17	2018-05-08	2018-10-04	2018-04-16	2018-04-16	2018-05-08	2018-06-27	2018-07-26	2018-10-04	2018-10-04	2018-04-16	2018-05-08	2018-07-26	2018-10-04	2018-04-17	2018-05-08	2018-10-04
		N	N	N	FD	N	N	N	N	FD	N	N	N	N	N	N	N	N
<b>Appendix III Parameters</b>																		
Boron	mg/L	0.79		0.7	0.62	0.62				1.2	1.2	0.51			0.53	0.39		1.2
Calcium	mg/L	330		310	110	110				150	150	230			190	48		110
Chloride	mg/L	340		180	86	77				87	87	190			160	71		120
Fluoride	mg/L	0.8 J		0.49 J+	1 J	0.86 J				0.86 J+	0.87 J+	0.71 J			0.74 J+	1.4 J		1
pH	SU	6.85	6.74	6.45		8.5	8.36	8.01	8		7.64	7.12	7.02	7.45	6.77	7.35	7.31	6.93
Sulfate	mg/L	1300		1100	250	240				450	440	520			570	80		390
Total Dissolved Solids	mg/L	2500		1900 J+	610	620				850	860	1300			1200	310		780
<b>Appendix IV Parameters</b>																		
Antimony	mg/L			0.002 U						0.002 U	0.002 U				0.002 U			0.002 U
Arsenic	mg/L			0.0012 J						0.021	0.022				0.0021 J			0.0082
Barium	mg/L			0.023						0.069	0.071				0.035			0.073
Beryllium	mg/L			0.00087 J						0.001 U	0.001 U				0.001 U			0.001 U
Cadmium	mg/L			0.001 U						0.001 U	0.001 U				0.001 U			0.001 U
Chromium	mg/L			0.002 U						0.002 U	0.002 U				0.002 U			0.002 U
Cobalt	mg/L			0.00075 J						0.00028 J	0.00037 J				0.0012			0.00049 J
Fluoride	mg/L	0.8 J		0.49 J+	1 J	0.86 J				0.86 J+	0.87 J+	0.71 J			0.74 J+	1.4 J		1
Lead	mg/L			0.001 U						0.001 U	0.001 U				0.001 U			0.001 U
Lithium	mg/L			0.022						0.036	0.037				0.027			0.041
Mercury	mg/L			0.0002 U						0.0002 U	0.0002 U				0.0002 U			0.0002 U
Molybdenum	mg/L			0.01 U						0.054	0.056				0.0066 J			0.11
Radium 226 + 228	pCi/L			0.95 J+						0.869 J+	0.624 J+				0.402 J+			0.832 J+
Radium-226	pCi/L			0.689 J+						0.464 J+	0.286 J+				0.237 J+			0.493 J+
Radium-228	pCi/L			0.4 U						0.405	0.341 U				0.379 U			0.41 U
Selenium	mg/L			0.0035 J						0.001 J	0.00089 J				0.0019 J			0.0019 J
Thallium	mg/L			0.001 U						0.001 U	0.001 U				0.001 U			0.001 U
<b>Field Parameters</b>																		
Dissolved Oxygen	mg/L	0.26	0.09	0.31		0.1	0.12	0.49	0.11		0.44	0.1	0.11	0.12	0.43	6.28	3.08	1.05
Oxidation-Reduction Potential	millivolts	-144.3	-276.4	-98.9		-156.8	-302.8	-191	-174.1		-79	-92.6	-322.4	-69.9	-90.1	-89.8	-240.7	-44.4
pH	SU	6.85	6.74	6.45		8.36	8.01	8	8.5		7.64	7.12	7.02	7.45	6.77	7.35	7.31	6.93
Specific Conductance	uS/cm	3952	2952	2251		865	892	942	1079		1195	1668	1654	1807	1596	544	709	1097
Temperature	deg C	6.81	14.5	17.3		9.6	11.7	14.6	17.5		21.3	8.56	11.1	18.8	18.8	9.1	11.1	17.1
Turbidity	NTU	4.22	2.01	0.73		4.3	1.95	0.55	0.77		0.7	4.39	3.11	1.36	0.58	3.78	2.58	0.39

Note:  
 mg/L = milligrams per liter  
 uS/cm = micro Siemens per centimeter  
 deg C = degrees Celsius  
 NTU = Nephelometric Turbidity Units  
 SU = Standard Units  
 pCi/L = picocuries per liter

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.  
 "J" = Indicates the result was estimated.  
 "J+" = Indicates the result was estimated and may be biased high.  
 "J-" = Indicates the result was estimated and may be biased low.  
 "UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.  
 "O" = Indicates the result was identified as an outlier and removed from the background data set.

**Table 3: Analytical Data**  
**CCR Unit Michigan City Boiler Slag Pond**  
**NIPSCO Michigan City Generating Station**  
**Michigan City, Indiana**

Analyte	Unit	GAMW-18			GMMW-2				
		2018-04-17	2018-05-08	2018-10-04	2018-04-16	2018-05-08	2018-06-27	2018-07-26	2018-10-03
		N	N	N	N	N	N	N	N
<b>Appendix III Parameters</b>									
Boron	mg/L	0.9		1.8	0.74				0.69
Calcium	mg/L	170		110	120				100
Chloride	mg/L	530		260	87				88
Fluoride	mg/L	1.7 J		2.3	0.98 J				0.33
pH	SU	7.17	7.03	6.84	8.16	7.29	7.6	8.31	7.58
Sulfate	mg/L	210		310	240				230
Total Dissolved Solids	mg/L	1400		920	640				560
<b>Appendix IV Parameters</b>									
Antimony	mg/L			0.002 U					0.00087 J
Arsenic	mg/L			0.0031 J					0.016
Barium	mg/L			0.067					0.11
Beryllium	mg/L			0.001 U					0.00079 J
Cadmium	mg/L			0.001 U					0.001
Chromium	mg/L			0.002 U					0.0016 J
Cobalt	mg/L			0.0011					0.00044 J
Fluoride	mg/L	1.7 J		2.3	0.98 J				0.33
Lead	mg/L			0.001 U					0.001 U
Lithium	mg/L			0.06					0.019
Mercury	mg/L			0.0002 U					0.0002 U
Molybdenum	mg/L			0.093					0.03
Radium 226 + 228	pCi/L			0.669 J+					0.403 U
Radium-226	pCi/L			0.473 J+					0.275 J+
Radium-228	pCi/L			0.369 U					0.403 U
Selenium	mg/L			0.0037 J					0.0035 J
Thallium	mg/L			0.001 U					0.0019
<b>Field Parameters</b>									
Dissolved Oxygen	mg/L	0.4	0.26	0.4	1.83	0.24	0.28	0.3	3.63
Oxidation-Reduction Potential	millivolts	-81.3	-292.5	-15.9	-87.4	-249.8	48.3	-40.1	23.5
pH	SU	7.17	7.03	6.84	8.16	7.29	7.6	8.31	7.58
Specific Conductance	uS/cm	2288	2506	1481	881	1082	954	1740	909
Temperature	deg C	11.4	13.2	19.5	7.58	16	25.3	28.3	22.4
Turbidity	NTU	3.53	1.29	1.29	1.39	0.56	0.2	0.58	0.31

Note:

mg/L = milligrams per liter  
 uS/cm = micro Siemens per centimeter  
 deg C = degrees Celsius  
 NTU = Nephelometric Turbidity Units  
 SU = Standard Units  
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 "J-" = Indicates the result was estimated and may be biased low.  
 "UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.  
 "O" = Indicates the result was identified as an outlier and removed from the background data set.

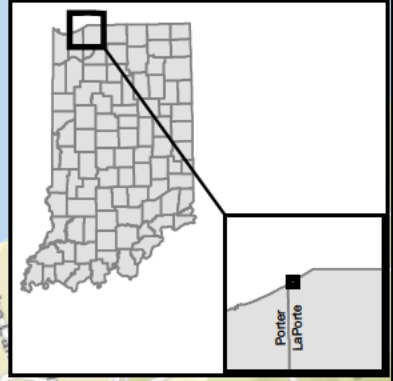
Prepared by: DFS  
 Checked by: KMC  
 Reviewed by: MAH

## FIGURES

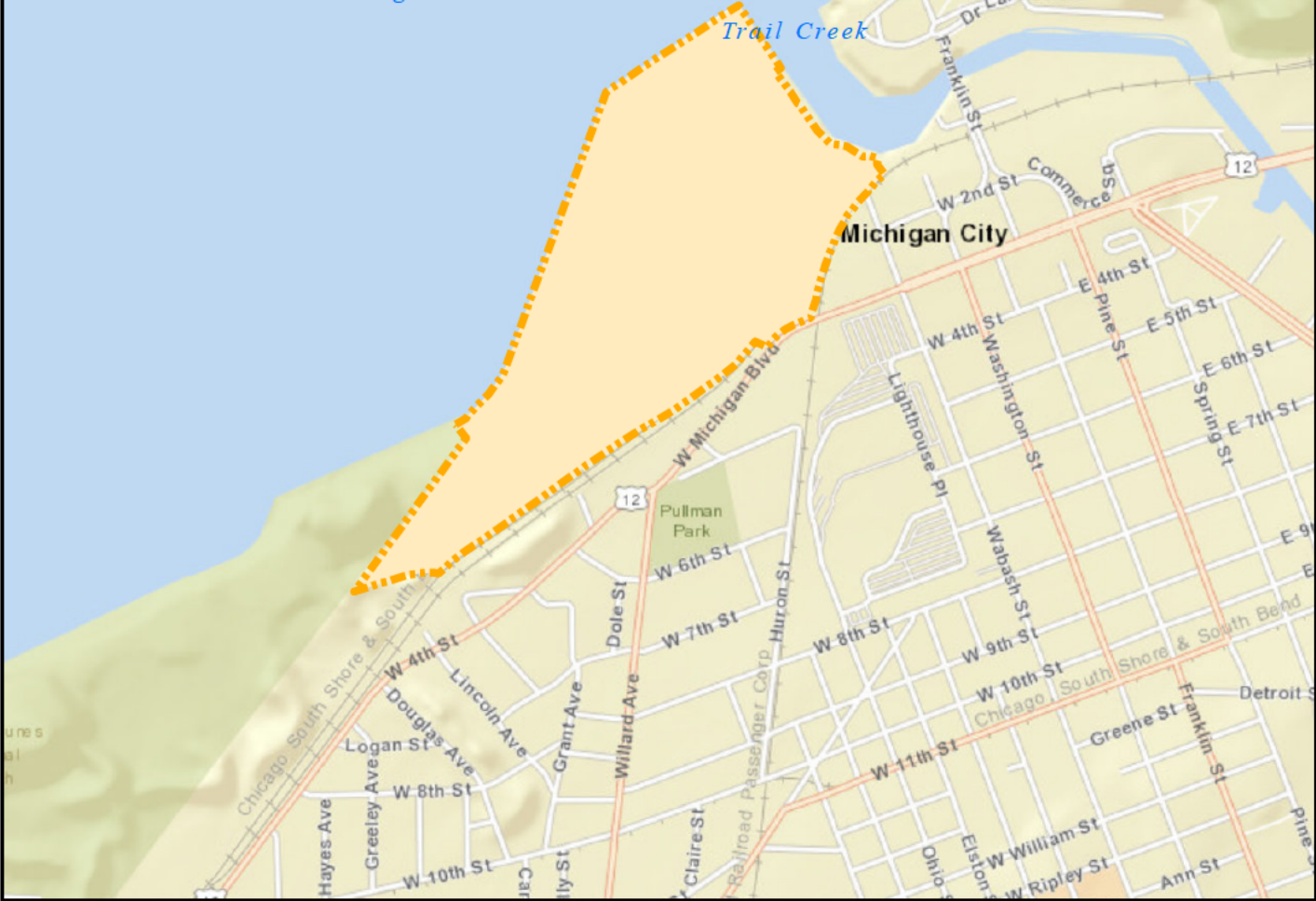


Lake Michigan

3000000



2150000



**LEGEND**



Approximate Property Line



**REFERENCE(S)**

SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, NTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CH NA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTR BUTORS, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY

PROJECT

NORTHERN INDIANA PUBLIC SERVICE COMPANY  
MICHIGAN CITY GENERATING STATION  
MICHIGAN CITY, INDIANA

TITLE

**SITE LOCATION MAP**

CONSULTANT



YYYY-MM-DD 1/30/2019

DESIGNED DFS

PREPARED SHL

REV EWED JSP

APPROVED MAH

PROJECT NO.  
164817101

CONTROL  
A

REV.  
0

FIGURE  
1

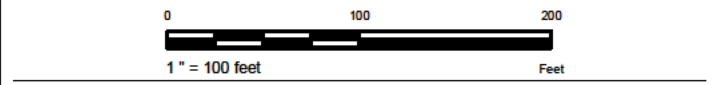
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IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MOOPIED FROM ANS/A



**LEGEND**

- Background Groundwater Monitoring Well
- Downgradient Groundwater Monitoring Well
- Generalized Groundwater Flow Direction
- Existing Sheet Piles
- Approximate Property Line
- CCR Unit



**NOTE(S)**  
 1. THIS FIGURE DEPICTS THE GENERALIZED GROUNDWATER FLOW D RECTION WITH N THE UPPER PORTION OF THE SURFICIAL AQUIFER.

**REFERENCE(S)**  
 1. MARBACH, BRADY AND WEAVER, INC. SURVEYED THE BORING LOCATIONS JUNE, 2016  
 2. SERVICE LAYER CREDITS: © 2019 MICROSOFT CORPORATION © 2019 DIGITALGLOBE © CNES (2019) DISTRIBUTION AIRBUS DS

CLIENT  
 NORTHERN INDIANA PUBLIC SERVICE COMPANY

PROJECT  
 NORTHERN INDIANA PUBLIC SERVICE COMPANY  
 MICHIGAN CITY GENERATING STATION  
 MICHIGAN CITY, INDIANA

TITLE  
**WELL LOCATION MAP  
 BOILER SLAG POND**

CONSULTANT	YYYY-MM-DD	1/31/2019
DESIGNED	DFS	
PREPARED	SHL	
REVIEWED	MAH	
APPROVED	MAH	

R:\17101\_GIS\Projects\GIS\MichiganCity\Map\_Series\164817101\_GAMW\_Plot000008\_LayoutReport164817101-14008-418-0001.mxd PRINTED ON: 2019-01-31 AT 2:20:18 PM

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**[golder.com](http://golder.com)**