



Inflow Design Flood Control System Plan

R.M. SCHAHFER GENERATING STATION

CCR SURFACE IMPOUNDMENT INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN

Wheatfield, Indiana

Pursuant to 40 CFR 257.82

Submitted To: Northern Indiana Public Service Company
2755 Raystone Drive
Valpariso, IN 46383

Submitted By: Golder Associates Inc.
670 North Commercial Street, Suite 103
Manchester, New Hampshire 03101

October 2016

1650772





CERTIFICATION

Professional Engineer Certification Statement [40 CFR 257.82(c)(5)]

I hereby certify that, having reviewed the attached documentation and being familiar with the provisions of Title 40 of the Code of Federal Regulations Section 257.82 (40 CFR Part 257.82), I attest that this Inflow Design Flood Control System Plan is accurate and has been prepared in accordance with good engineering practices, including the consideration of applicable industry standards, and with the requirements of 40 CFR Part 257.82.

Golder Associates Inc.



Signature

10-12-2016

Date of Report Certification

Richard A. Wesenberg, PE

Name

PE 11500584

Professional Engineer License Number





Table of Contents

CERTIFICATION..... C-1

1.0 INTRODUCTION..... 1

 1.1 Background 1

 1.2 CCR Surface Impoundments 1

 1.2.1 Waste Disposal Area (WDA)..... 1

 1.2.2 Material Storage Runoff Basin (MSRB) & Metal Cleaning Waste Basin (MCWB) 2

 1.2.3 Drying Area (DA)..... 2

 1.3 Purpose 2

 1.3.1 Hazard Classification 3

2.0 FLOOD CONTROL SYSTEM 4

 2.1 WDA Analysis..... 4

 2.1.1 WDA Conclusions and Recommendations 4

 2.2 MSRB, MCWB, & DA Analysis..... 5

 2.2.1 MSRB, MCWB, & DA Conclusions and Operational Restrictions 6

3.0 PLAN REVISION AND RECORDKEEPING 7

4.0 REFERENCES..... 8

List of Figures

- Figure 1 Site Location Map
 Figure 2 Existing Conditions



1.0 INTRODUCTION

1.1 Background

Rollin M. Schahfer Generating Station (RMSGs, Site or Facility) is a 1,943 megawatt (MW) capacity coal-fired, steam turbine electric generating plant in Wheatfield, Jasper County, Indiana (see Figure 1). RMSGs began operations in 1976 and occupies an area of approximately four square miles centrally located at 2723 E 1500 N Road in Wheatfield, Jasper County, Indiana. The station includes an electric substation, coal storage and handling operations, bottom ash/boiler slag and fly ash ponds, a landfill, cooling towers, cooling water intake and discharge structures, infrastructure and roadways, train tracks and other support facilities.

1.2 CCR Surface Impoundments

Northern Indiana Public Service Company (NIPSCO) has determined that RMSGs has four CCR surface impoundments that are subject to the requirements of the CCR Final Rule including:

- Waste Disposal Area (WDA) – approximate 83-acre unlined impoundment located in the southwest corner of RMSGs.
- Material Storage Runoff Basin (MSRB) – approximate 13.4-acre rectangular unlined impoundment located adjacent to and west of the Metal Cleaning Waste basin.
- Metal Cleaning Waste Basin (MCWB) – approximate 13.4-acre rectangular unlined impoundment located adjacent to and east of the MSRB.
- Waste Runoff Area or “Drying Area” (DA) – approximate 5.9-acre unlined impoundment located south of the MSRB and MCWB.

The CCR unit locations identified above are shown in Figure 2.

1.2.1 Waste Disposal Area (WDA)

The WDA was designed by Sargent & Lundy Engineers of Chicago, Illinois in 1982. The WDA, located in the southwest region of RMSGs, is unlined and formed by an approximately 17-foot high perimeter earth-fill dike with slurry trench core that encloses an area of approximately 83 acres. The embankment crest has a nominal elevation of 681 feet mean sea level (msl), but surveyed crest elevations range from 680.0 to 682.3 feet msl. The WDA receives primarily bottom ash/boiler slag from the generating station through pipes located at the northern end of the unit. Most of the deposited ash/slag is located in the northern half of the WDA. Due to size of the unit and settling/depositional properties of the materials, very little, if any, ash/slag is present in the southern half of the WDA. The east side of the WDA is common with the west side of the adjacent Recycle Settling Basin (RSB). Water exits the WDA via an overflow weir (standpipe), to the RSB, or through the auxiliary spillway located at the northwest side. The overflow weir is located at the southern end of the east side of the WDA. The WDA and the RSB are hydraulically connected and the water level within these impoundments will seek equilibrium when the water level is above the invert elevation of the standpipe connecting the impoundments. The auxiliary spillway consists of two, corrugated



steel pipes with a concrete down-slope channel transitioning to a rip-rap lined downstream channel located near the northwest corner of the WDA.

1.2.2 Material Storage Runoff Basin (MSRB) & Metal Cleaning Waste Basin (MCWB)

The MSRB and MCWB were designed by Sargent & Lundy Engineers of Chicago, Illinois in 1982 and consist of two rectangular, approximately 13.4-acre unlined ponds located adjacent to one another as shown in Figure 2. Both basins are formed by a 4-foot high embankment and are approximately 7 feet deep (Bottom El. 660 feet msl, Crest El. 667 feet msl). Each basin can hold up to 77,400 cubic yards of CCR material during normal operations. The ponds are separated by a narrow berm with an open channel through the southern end that creates a hydraulic connection between the two impoundments above approximate water surface elevation 665 feet msl. While there is a slurry wall around the basins, there is no slurry wall within the narrow berm between the basins.

The MSRB receives water from the yard runoff pond, from coal pile storage runoff, and from scrubber process sumps. Water is discharged to the Final Settling Basin (located north of the station) through the pump house located at the north end of the shared berm, and to the MCWB through an open channel located on the southern end of the divider berm. In addition to receiving overflow water from the MSRB, the MCWB also receives plant demineralizer waste, air heater wash water, and storm water runoff. Water is pumped from this basin to the Final Settling Basin to the northeast. Daily operations at RMSGS maintain a minimum of two feet of freeboard in these impoundments. In addition, as CCR material accumulates in the MSRB and the MCWB it is periodically removed as part of the RMSGS operations.

1.2.3 Drying Area (DA)

The DA was also designed by Sargent & Lundy Engineers of Chicago, Illinois in 1982. The Drying Area is bordered by the Inactive Retired Waste Disposal Basin (IRWDB) to the south and west and by the MSRB and the MCWB to the north. The DA, MSRB, and MCWB comprise a single larger impounding structure. This larger structure consists of an area with a slurry trench ring wall. The bottom of the DA is approximately at approximately El. 668.5 feet msl and the top of the DA is at approximately El. 671.5 feet msl. The total enclosed area of the DA, which has been completely filled with CCR, is approximately 5.9 acres. Previously, fly ash from the IRWDB flowed through the Drying Area and then discharged to the MSRB or MCWB. Outflow from the Drying Area to the MSRB and MCWB is via four CMP culverts (two into each basin) that extend through the north embankment of the DA. Currently, the DA accepts various CCR material that is moved to the area with heavy equipment. It is left to dry for a period of time before being removed by heavy equipment to the landfill to the east of the station.

1.3 Purpose

The purpose of the Inflow Design Flood Control System Plan (Plan) is to provide a basis for the certification required by 40 CFR 257.82 Hydrologic and Hydraulic Capacity Requirements for CCR



Surface Impoundments. 40 CFR 257.82(a) requires the owner or operator of a CCR surface impoundment to design, construct, operate, and maintain an inflow flood control system as follows:

- Adequately manage the flow into the CCR unit during and following the peak discharge of the inflow design flood as required by the CCR unit hazard potential determined under 40 CFR 257.(a) (2).
- Adequately manage the flow from the CCR unit to collect and control the peak discharge resulting from the inflow design flood as required by the CCR unit hazard potential determined under 40 CFR 257.(a) (2).
- Handle discharge from the CCR unit in accordance with the surface water requirements under 40 CFR 257.3-3.

1.3.1 Hazard Classification

Golder Associates prepared a Hazard Potential Classification Assessment and Visual Inspection Report for the RMSGS CCR Surface Impoundments pursuant to 40 CFR 257.73 in September 2016. The assessments performed under 40 CFR 257.73 determined that the WDA classified with a High Hazard Potential and the MSRB, MCWB, and DA classified as Low Hazard Potential.

As such, for the WDA, a high hazard potential classification triggers the evaluation of the combined capacity of all spillways system during a probable maximum flood (PMF) event under 40 CFR 257.73. Golder completed this hydrologic and hydraulic assessment of the WDA during a PMF event under 40 CFR 257.73 and has submitted a separate Structural Stability and Safety Factor Assessment report detailing the assessment, findings, and recommendations for the WDA in September 2016. The analysis previously performed for the WDA satisfies the requirements of 40 CFR 257.82 and will be discussed briefly in this plan, but the detail of the assessment was submitted under separate cover as part of 40 CFR 257.73.

Under 40 CFR 257.82, the MSRB, MCWB, and DA all classify as Low Hazard Potential and as such must be evaluated for a 100-year flood. This plan details the hydrologic and hydraulic analysis of the MSRB, MCWB, and DA.



2.0 FLOOD CONTROL SYSTEM

To satisfy the requirements of 40 CFR 257.82(a), the flood control system must provide flood protection to the CCR unit during the inflow design flood for two cases: 1) floodwater from outside the unit, and 2) controlling internal water levels within the unit. The sections below describe the run-on control systems in place at each CCR, describe the analysis performed to evaluate the adequacy of the existing structure, and list any operational limitations required to maintain adequate flood control measures as required by 40 CFR 257.82(a).

2.1 WDA Analysis

The WDA is classified as a high hazard potential, which requires that the flood control system must provide protection to the CCR unit during a PMF event. As discussed above, Golder completed a hydrologic and hydraulic capacity assessment for the WDA during a PMF event under 40 CFR 257.73 and has submitted a separate Structural Stability and Safety Factor Assessment report detailing the assessment, findings, and recommendations for the WDA in September 2016. A HEC-HMS and wave analysis was performed for the WDA. Since the overflow weir is an interconnecting pipe to the RSB, from which water is pumped as a discharge, the only applicable spillway for the WDA is the auxiliary spillway. Therefore, the analysis was performed using only the auxiliary spillway to manage the PMF event.

2.1.1 WDA Conclusions and Recommendations

Results of the hydrology and hydraulics analysis of the WDA are summarized below.

Hydrology and Hydraulics Analysis Results

Depth of Precipitation (in) for a PMF Event	31.9
WDA Catchment Area (acres)	83.5
WDA Lowest Crest Elevation (ft MSL, Marbach, 2011)	680
Invert Elevation of Auxiliary Spillway (ft msl)	678.9
Maximum Inflow from Direct Precipitation (cubic feet per second (cfs))	3,668
Maximum Combined Inflow (cfs) ¹	3,708
Maximum WDA Outflow through Spillway (cfs)	37.9
Maximum Water Surface Elevation (ft msl) ²	682.2
Height of Wave Action (feet)	1.28
Net Freeboard during Design Storm Event (feet) ^{3, 7}	-3.4
Maximum Water Surface Elevation to Prevent Overtopping During PMF (ft msl)	675.4

Notes:

1 Includes direct precipitation and 40 cfs from overflow weir.

2 Assumes extra storage capacity is available above embankment crest (e.g. there is no outflow from the impoundment due to overtopping)

3 Negative freeboard indicates that the embankment will overtop.



As shown in the table, the current configuration of the WDA's auxiliary spillway is not sized to manage the flow produced by a PMF event and therefore not compliant with 40 CFR 257.73(d)(1)(v). As part of the Structural Stability and Safety Factor Assessment Report, Golder recommended that NIPSCO remedy this deficiency by improving the size of the auxiliary spillway, operationally controlling the water level in the WDA, or implementing an equivalent engineering or operational control. At the writing of this Flood Control System Plan, NIPSCO is operationally controlling the level of the pond to a water surface elevation that will allow for the maximum elevation for the PMF plus wave height (i.e., El. 675.4 ft msl). NIPSCO is in the process of reviewing engineering control modifications and intends to select an option and remedy the deficiency as soon as possible. Once the repair is made, documentation detailing the corrective measures taken shall be submitted as an update to this plan. The analysis previously performed for the WDA and the intended actions by NIPSCO to operationally control the water surface elevation, satisfy the requirements of 40 CFR 257.82.

2.2 MSRB, MCWB, & DA Analysis

As discussed above, the MSRB, MCWB, and DA were all classified as Low Hazard Potential and therefore must adequately manage flow into the CCR unit and flow from the CCR unit during and following the peak discharge from a 100-year flood under 40 CFR 257.82(a). To evaluate the ability of the DA, MSRB, and MCWB to adequately manage the flow during and following the peak discharge of the design storm event a hydrologic and hydraulic analysis was performed. As discussed above, the DA discharges to the MSRB/MCWB, which are hydraulically connected and have no outlet with the exception of pump house that pump liquid to the FSB. Therefore, this analysis assumed that pump house facility was non-functional (i.e., no outlet) during the storm event and evaluated the ability of the storm event to be managed within the impoundments. This analysis incorporated a HEC-HMS model and a wave action analysis for each impoundment. Due to the hydraulic integration between the DA, MSRB, and MCWB, described above, a single HEC-HMS model was created to evaluate the performance of all three structures during the 100-year storm event. The HEC-HMS model incorporated the following:

- A meteorological model to simulate the 100-year flood that combined the precipitation depth associated with the 24-hour duration, 100-year recurrence interval storm event and the Natural Resource Conservation Service (NRCS) Type II temporal rainfall distribution.
- A hydrological model to simulate the collection of surface water and conveyance to the impoundments. The following assumptions were included in the model.

DA is an unlined surface impoundment with no upland area to contribute runoff and it does not receive water from RMSGS operations. As such, the inflow into the unit is from direct precipitation only. There are four CMP culverts through the north embankment of the DA which report to the MSRB and the MCWB.

MSRB/MCWB are unlined surface impoundments with no upland area to contribute runoff. Surface water runoff from the DA is directed to the MSRB/MCWB via CMP culverts. These impoundments have standing water at all times and were conservatively modeled as an impervious area to reflect the negligible amount of infiltration that will occur. In addition,



runoff from certain operational areas is directed to the MSRB/MCWB via storm water ditches and culverts. Storm water runoff from these areas was modeled using the U.S. Soil Conservation Service (SCS) and the kinematic wave method to develop stormwater routing that could be input into the HEC-HMS model.

- Geometric models of the impoundments to simulate the water storage and the variation in water levels during and following the design storm event based on the geometries included in the construction drawings and discussed above, and
- Discharge curves to simulate the outflow of water from the impoundments during the design storm event.

In addition, a wave action analysis was performed for the combined MSRB/MCWB impoundment (which receives flow from the Drying Areas) to calculate the freeboard required above the maximum water surface elevations in these structures during the design storm event.

2.2.1 MSRB, MCWB, & DA Conclusions and Operational Restrictions

The results of the hydrology and hydraulics analysis of the DA, MSRB, and MCWB are summarized below. These include the results of HEC-HMS modelling analysis and the results of the wave action analyses.

Hydrology and Hydraulics Analysis Results

CCR Surface Impoundment	MSRB/MCWB	DA
Depth of Precipitation (in)	6.87	6.87
Maximum Rate of Inflow (cfs)	392.3	23.3
Total Inflow (Acre-feet)	26.4	1.4
Maximum Volume of Water Storage (acre-feet) ¹	96.3	0.2
Maximum Water Surface Elevation (ft msl)	666.0	668.8
Height of Wave Action (ft)	0.82	N/A
Net Freeboard during Design Storm Event (ft)	0.2	2.7

Notes:

¹ Includes water stored prior to beginning of design storm event.

The current configuration of the DA, MSRB, and MCWB is compliant with 40 CFR 257.82(a). This includes the contribution of the DA watershed and flow to the MSRB and MCWB. This conclusion is based on the assumptions and operational conditions presented herein. Specifically, it is critical that the combined MSRB/MCWB impoundment be operated such that the water surface level does not exceed 665.0 feet msl and that the amount of CCR stored in the impoundment does not exceed 77,400 cy and it is not stored above elevation 665.0 feet msl.



3.0 PLAN REVISION AND RECORDKEEPING

Per 40 CFR 257.82(c)(2): “The owner or operator of the CCR unit may amend the inflow design flood control system plan at any time provided the revised plan is placed in the facility's operating record as required by §257.105(g)(3). The owner or operator must amend the written inflow design flood control system plan whenever there is a change in conditions that would substantially affect the written plan in effect.”

Per 40 CFR 257.81(c)(4); “The owner or operator must prepare periodic inflow design flood control system plans required by paragraph (c)(1) of this section every five years. The date of completing the initial plan is the basis for establishing the deadline to complete the first subsequent plan. The owner or operator may complete any required plan prior to the required deadline provided the owner or operator places the completed plan into the facility's operating record within a reasonable amount of time. In all cases, the deadline for completing a subsequent plan is based on the date of completing the previous plan. For purposes of this paragraph (c)(4), the owner or operator has completed a periodic inflow design flood control system plan when the plan has been placed in the facility's operating record as required by §257.105(g)(3).”

Per 40 CFR 257.82(d); “The owner or operator of the CCR unit must comply with the recordkeeping requirements specified in §257.105(g), the notification requirements specified in §257.106(g), and the internet requirements specified in §257.107(g).”



4.0 REFERENCES

Golder Associates, NIPSCO RMSGS Hazard Potential Classification Assessment and Visual Inspection Report RCRA CCR Units, Pursuant to 40 CFR 257.73, Waste Disposal Area, Drying Area, Material Storage Runoff Basin, & Metal Cleaning Waste Basin – Surface Impoundments, September 28, 2016.

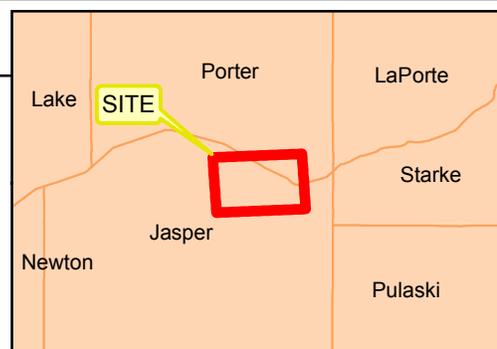
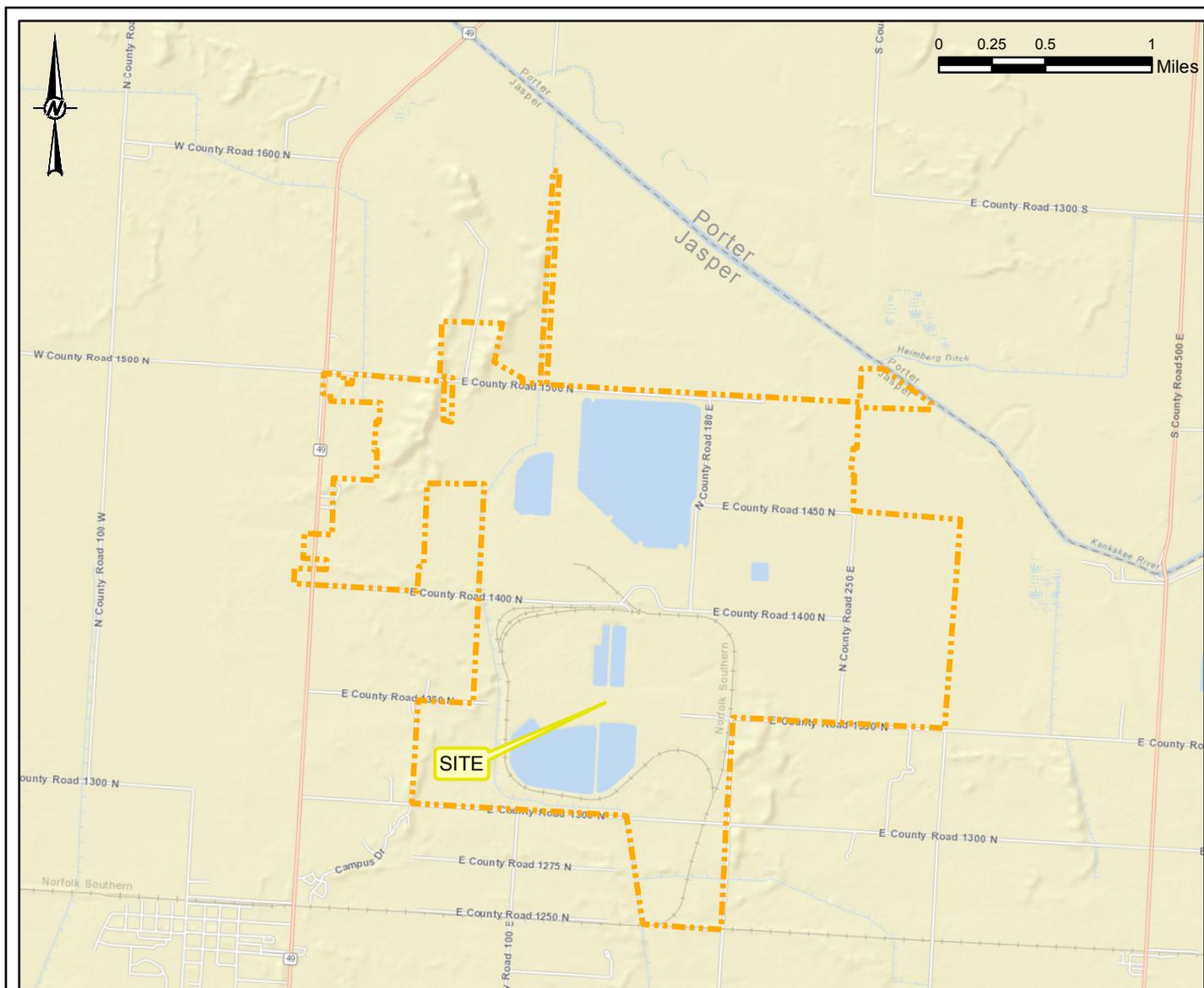
Golder Associates, NIPSCO RMSGS Waste Disposal Area Structural Stability and Safety Factor Assessment, Pursuant to 40 CFR 257.73(d) & 257.73(e), October 5, 2016.

Golder Associates, Hydrologic and Hydraulic Analysis for WDA Impoundment – R.M. Schahfer Generating Station, October 11, 2016.

Golder Associates, Hydrologic and Hydraulic Analysis for CCR Impoundments – R.M. Schahfer Generating Station, October 11, 2016.

USEPA (US Environmental Protection Agency). 2015. Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule. 40 CFR Part 257. Effective Date October 19, 2015.

FIGURES



REFERENCE(S)
 SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, DELORME, USGS, INTERMAP, INCREMENT P CORP., NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI (THAILAND), MAPMYINDIA, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT
 NORTHERN INDIANA PUBLIC SERVICE COMPANY

PROJECT CCR SURFACE IMPOUNDMENT
 INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN
 R.M. SCHAFER GENERATING STATION
 WHEATFIELD, INDIANA

CONSULTANT	YYYY-MM-DD	2016-10-11
	DESIGNED	CDS
	PREPARED	SHL
	REVIEWED	MCM
	APPROVED	RAW

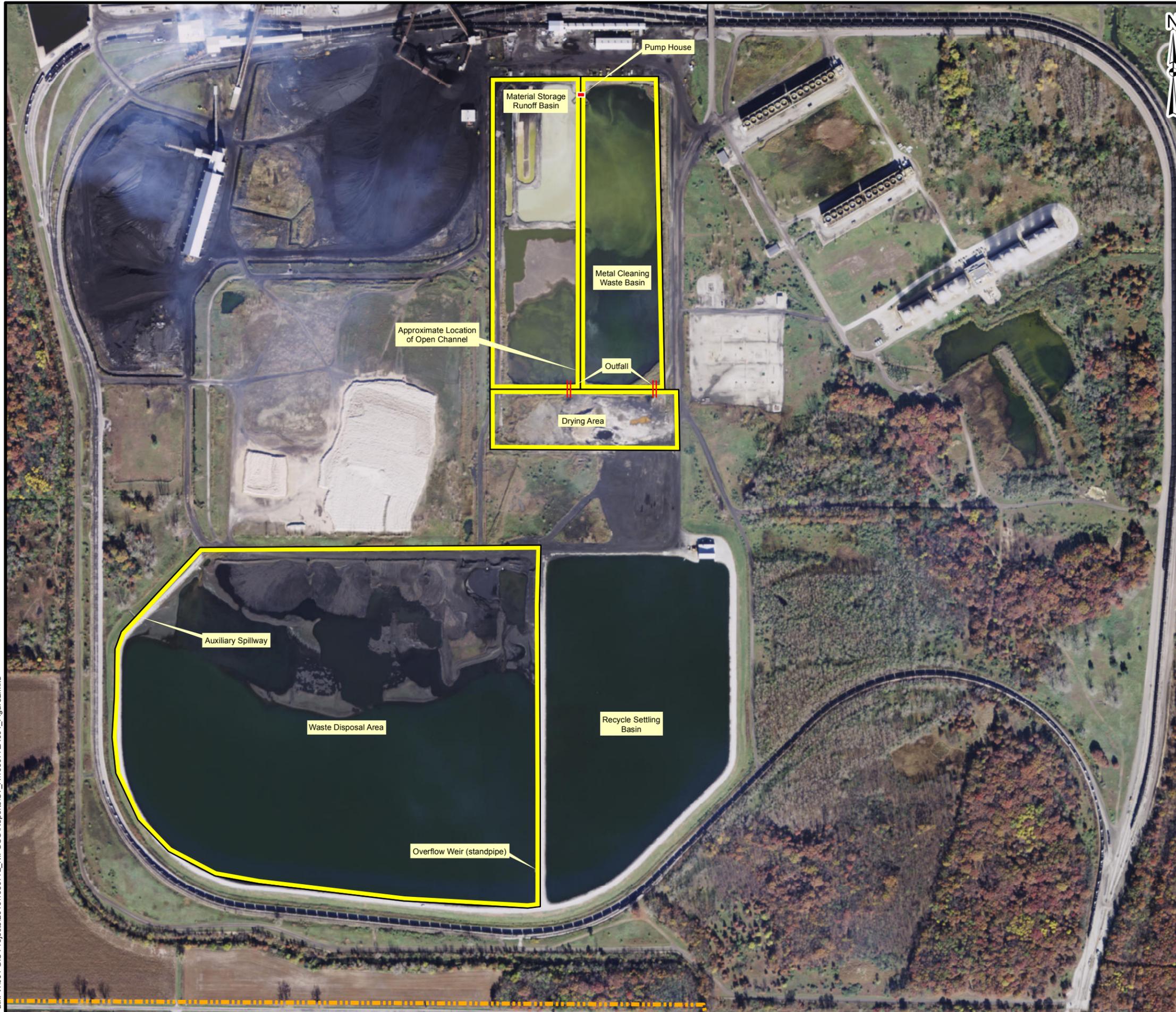


TITLE
SITE LOCATION MAP

PROJECT NO. 165-0772	CONTROL A	REV. 0	FIGURE 1
-------------------------	--------------	-----------	-------------

PATH: V:\001_GIS Projects\2016\1650772 - NIPSCO\Reports\ST_A\1650772A009_Figures1.mxd

1 in IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A



LEGEND

- Approximate Property Line
- CCR Surface Impoundment



NARRATIVE

This figure shows the approximate boundaries of the CCR units requiring submission of an inflow design control system plan for compliance with the final rule, 40 CFR, Part 257.82.

REFERENCES

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
 Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

REV.	DATE	DES.	REVISION DESCRIPTION	GIS	CHK	RWV

PROJECT
 CCR SURFACE IMPOUNDMENT
 INFLOW DESIGN FLOOD CONTROL SYSTEM PLAN
 R.M. SCHAFER GENERATING STATION
 WHEATFIELD, INDIANA

TITLE
 EXISTING CONDITIONS

 Golder Associates Manchester, New Hampshire	PROJECT No.	165-0772	FILE No.	1650772A004_Figure2
	DESIGN	JSP	10/11/2016	SCALE: AS SHOWN
	GIS	SHL	10/11/2016	REV. 0
	CHECK	JSP	10/11/2016	FIGURE 2
	REVIEW	APT	10/11/2016	

Path: V:\001 GIS Projects\2016\1650772_NIPSCO\Reports\IST_A\1650772A004_Figure2.mxd

Established in 1960, Golder Associates is a global, employee-owned organization that helps clients find sustainable solutions to the challenges of finite resources, energy and water supply and management, waste management, urbanization, and climate change. We provide a wide range of independent consulting, design, and construction services in our specialist areas of earth, environment, and energy. By building strong relationships and meeting the needs of clients, our people have created one of the most trusted professional services organizations in the world.

Africa	+ 27 11 254 4800
Asia	+ 852 2562 3658
Australasia	+ 61 3 8862 3500
Europe	+ 356 21 42 30 20
North America	+ 1 800 275 3281
South America	+ 56 2 2616 2000

solutions@golder.com
www.golder.com

Golder Associates Inc.
670 North Commercial Street, Suite 103
Manchester, NH 03101 USA
Tel: (603) 668-0880
Fax: (603) 668-1199



Engineering Earth's Development, Preserving Earth's Integrity

Golder, Golder Associates and the GA globe design are trademarks of Golder Associates Corporation