Run-On & Run-Off Control System Plan

R.M. SCHAHFER GENERATING STATION

CCR LANDFILL
RUN-ON AND RUN-OFF CONTROL SYSTEM PLAN

Wheatfield, Indiana

Pursuant to 40 CFR 257.81

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

Submitted By: Golder Associates Inc.
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Manchester, New Hampshire 03101

October 2016 **1650772**

Golder Associates

CERTIFICATION

Professional Engineer Certification Statement [40 CFR 257.81(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 257.81 (40 CFR Part 257.81), I attest that this Run-On and Run-Off 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 257.81.

Golder Associates Inc.

Signature

October 5, 2016

Date of Report Certification

Richard A. Wesenberg, PE

Name

PE 11500584

Professional Engineer License Number

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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.

1.1.1 Landfill

Northern Indiana Public Service Company (NIPSCO) received an operating permit from Indiana Department of Environmental Management (IDEM) to operate a Type I, Restricted Waste Landfill (RWS I) at RMSGS in January 1984 (Operating Permit 37-1). The landfill is designed for disposal of fly ash from the R.M. Schahfer Generating Station and other NIPSCO-owned facilities and does not receive waste from disposal or waste management companies. The landfill is located east of the generating station and has a total permitted area (closed, active, and future) of waste placement of approximately 197 acres. Refer to Figure 2. The landfill footprint is divided into seven phases. Phases I and II are unlined, inactive and closed. Phases III and IV are lined, inactive and closed. Phases V and VI are lined and currently active. Phase VII is not yet constructed.

NIPSCO has determined that Phases V and VI of the landfill are subject to the CCR Rule. As such, this Run-On and Run-Off Control System Plan pertains to Phases V and VI. Phase V is an approximately 18-acre phase located in the southwestern corner of the landfill footprint. At the writing of this report, Phase V has nearly reached capacity and is expected to close in 2017. Phase VI is an approximately 15-acre phase located directly to the north of Phase V. At the writing of this report, construction of Phase VI is complete and the landfill has just begun waste placement activities within the phase.

Leachate Collection System

The landfill collects leachate within each of the lined landfill phases through a layer of granular material in combination with a series of perforated pipes placed beneath the ash and on top of the composite base liner system. The leachate is conveyed outside the landfill footprint through a network of solid piping where it is pumped through a series of manhole lift stations to the onsite leachate collection pond. Leachate remains in the pond until the level in the pond becomes too high to accept additional flow and it is pumped into water trucks and then sprayed on the active landfill area for dust control. Based on discussions with NIPSCO personnel and review of the site operation plan, stormwater that comes in contact with landfilled ash within the active phase is managed and treated as leachate.

Surface Water

The overall surface water run-off from the non-active areas of the landfill is collected in onsite drainage ditches located around the perimeter of the landfill. These ditches convey drainage to an onsite stormwater pond (Landfill Run-Off pond) located northwest of the landfill footprint. The Landfill Run-Off pond discharges through Outfall 003S (East Stormwater Outfall), regulated under the site's current NPDES permit (No. IN0053201, dated October 31, 2014). Outfall 003S discharges into Stalbaum Ditch (when the valve is opened) and ultimately to the Kankakee River.

The landfill is protected from run-on from the surrounding areas by the perimeter stormwater drainage ditches and a compacted fill perimeter dike that provides grade separation between the surrounding grade and the landfill floor.

1.2 Purpose

The purpose of the Run-On and Run-Off Control System Plan (Plan) is to provide a basis for the certification required by 40 CFR 257.81 Run-On and Run-Off Controls for Landfills. 40 CFR 257.81(a) requires the owner or operator of an existing or new CCR landfill or any lateral expansion of a CCR landfill to design, construct, operate, and maintain the following:

- A run-on control system to prevent flow onto the active portion of the CCR unit during the peak discharge from a 24-hour, 25-year storm.
- A run-off control system from the active portion of the CCR unit to collect and control at least the water volume resulting from a 24-hour, 25-year storm.
- Handle run-off from the active portion of the CCR unit in accordance with the surface water requirements under 40 CFR 257.3-3.

2.0 RUN-ON CONTROL SYSTEM

To satisfy the requirements of 40 CFR 257.81(a)(1), the run-on control system prevents flow onto the active portion of the CCR unit during the peak discharge from a 24-hour, 25-year storm. As discussed above, at the writing of this Plan, only landfill Phases V and VI are currently active. As such, this plan discusses the run-on control system for Phases V and VI.

Phases V and VI are surrounded by a perimeter dike that provides protection from run-on into the active area. The perimeter dike is 10 feet wide at the top with 3H:1V exterior sideslopes and 4H:1V interior sideslopes. The perimeter dike is constructed from compacted fill and provides approximately 3 to 5 feet of grade separation between the surrounding grade and the top of the dike around the southern, western, and northern limits of the active area. In addition, on the outside toe of the southern, western, and northern perimeter dike, there is a 10-foot wide, trapezoidal –shaped, grass-lined perimeter ditch to collect and divert potential run-on away from the active area. The eastern limit of Phases V and VI abuts the western limit of the currently closed Phases II and III. At its current configuration surface water run-on from the adjacent Phase II and III closed landfill sideslopes is controlled, separated and diverted from the active area by a 2 ft wide temporary ditch at the interface between active area Phase VI and closed areas Phase II and III. The eastern limit of Phase V is piggy-backed over the existing Phase III sideslope and is therefore treated as contact stormwater and managed as active area leachate as discussed below.

2.1 Run-On Engineering Design Verification

The overall landfill conceptual design for the 197 acre landfill was prepared by Sargent & Lundy in the early 1980s. The original design concepts analyzed by Sargent & Lundy (i.e., constructing the landfill in phases with perimeter flood protection dikes, managing stormwater around the perimeter of the landfill, design of the stormwater detention basin) still apply. The 1984 Operation and Management Plan written by Sargent & Lundy, states that the flood protection dikes (i.e., perimeter dikes) were originally designed to protect the active area from a 100-year 24-hour flood, which is a larger storm event than required to be evaluated under 40 CFR 257.81(a)(1). To verify that the original design assumptions are still valid for the current active areas Phase V and VI, a conservative evaluation of the existing run-on control system was performed as described below.

The current 24-hour, 25-year storm run-on volume calculation assumes that the contributing run-on areas for Phase V and VI include the closed areas of Phase II and III and the undeveloped area for future Phase VII. Run-on from Phases I and IV were not included in this volume assessment as the stormwater from these areas is collected and conveyed to the stormwater retention pond and therefore does not contribute to the active area run-on volume.

Based on point precipitation frequencies compiled by the National Oceanic and Atmospheric Administration (NOAA), the 24-hour, 25-year storm event in Wheatfield, Indiana is anticipated to generate 5.22 inches of

precipitation. The analysis conservatively assumes that all of the 5.22 inches of precipitation from the design storm is uniformly applied across the site and no infiltration or evapotranspiration occurs (i.e. all precipitation/stormwater that falls on Phases II, III and future Phase VII watersheds was assumed to contribute to the run-on volume). The analysis conservatively evaluated if the run-on volume could be maintained within the stormwater ditches around the perimeter of Phase V, Phase VI, the wetlands ditch along the west side of future Phase VII, and within the undeveloped area of the future Phase VII.

The results of the analysis indicated that the run-on stormwater volume would fill the ditches and area of future Phase VII to an elevation of approximately 663-feet. This elevation corresponds to approximately one-foot of water across the entire Phase VII area. The top of the perimeter dikes around the active areas (Phase V and VI) are at approximately elevation 666.5-feet. Therefore there would still be approximately 3.5 feet of freeboard protection between the ponded water and the active landfill. Based on this analysis, the run-on from the 24-hour, 25-year storm will not flow into the active areas and thus satisfies the requirements of 40 CFR 257.81.

3.0 RUN-OFF CONTROL SYSTEM

To satisfy the requirements of 40 CFR 257.81(a)(2), the run-off control system must control flow from the active portion of the CCR unit resulting from a 24-hour, 25-year storm. In addition, the run-off from the active portion of the CCR unit must be managed in accordance with the surface water requirements under 40 CFR 257.3-3. As discussed previously, at the writing of this Plan, only landfill Phases V and VI are currently active. Therefore this plan discusses the run-off control system for Phases V and VI.

Based on discussions with NIPSCO personnel and review of the Phase V and VI Operation Plans, we understand that precipitation that falls in the active portions of the facility and comes in contact with landfilled material, will percolate into the leachate collection system and be managed as leachate. Therefore, the active area run-off control system is actually the Phase V and VI leachate collection system and the run-off is operationally managed as leachate, not stormwater (surface water) run-off.

The leachate collection system design for Phase V and VI are similar. The floor of both phases was constructed with a series of peaks and valleys running north to south. Perforated leachate collection pipes are located in the valleys and drain to the north of the phase. A layer of granular leachate collection soil is placed over the floor of the phase. A perforated leachate collection system header runs along the northern edge of the phase. The collection header drains to the west, and discharges through a solid header pipe, beneath the perimeter dike and ultimately to a leachate lift station manhole. The leachate manhole lift station for Phase V is located near the southwestern corner of the phase, outside the landfill footprint. The leachate manhole lift station for Phase VI is located near the northwestern corner of the phase, outside the footprint of the landfill. From each leachate manhole lift station, leachate is pumped to a leachate loadout structure and ultimately to the onsite leachate collection pond. Leachate is removed from the pond and applied to the active landfill face as necessary to ensure sufficient storage capacity is maintained in the pond for leachate collection. The Operation Plan indicated that daily leachate application on the landfill is required until the liquid level in the leachate collection pond is within 12 inches of the pond bottom.

3.1 Run-Off Engineering Design Verification

To verify that the leachate collection system is sufficiently designed to control run-off during a 24 hour, 25 year storm event over the active area, a conservative analysis of the leachate collection and control system was performed as described below.

Based on point precipitation frequencies compiled by the National Oceanic and Atmospheric Administration (NOAA), the 24-hour, 25 year storm event in Wheatfield, Indiana is anticipated to generate 5.22 inches of precipitation. The runoff volumes from the 24-hour, 25 year design storm event were calculated using Hydrologic Evaluation of Landfill Performance (HELP) software. The runoff volumes for Phases V and VI were analyzed independently as the landfill phases manage/operate stormwater run-off independently. The

purpose of the calculation was to evaluate if the runoff from the 24-hr, 25 year storm event for each phase could be contained entirely within the granular leachate collection soil layers and leachate collection piping associated with each area. We recognize that there is additional storage capacity for the leachate collection system within the leachate collection pond but this analysis conservatively omits this additional volume in the pond. The analysis for the two active areas is summarized in the subsequent sections.

3.1.1 Phase V Run-off Calculation

The Phase V active landfilling operation was modeled in HELP using the grades provided in the October 2015 Topographic Survey. The design storm was applied by adding 5.22-inches of rainfall over a one day (24-hour) period. The program separates infiltration and evapotranspiration volumes from the total rainfall volume to provide a total runoff volume. HELP software quantifies the total runoff volume using the Soil Conservation Service (SCS) method. The SCS method requires information about the ground surface conditions and landfill slope. The fly ash landfill surface was modeled as open space with little to no vegetation and low to near impervious infiltration rates. The runoff calculated from the program is assumed to travel to the containment berms around the perimeter of the active area and infiltrate to the drainage layer.

As stated previously, the stormwater runoff calculation evaluated if the active area run-off volume from Phase V could be contained within the granular leachate collection soil layer and leachate collection piping below the landfill. Although the top of the Phase V granular leachate collection soil layer has available storage up to elevation 664.9-feet, the top of the Phase V leachate collection sump structure at the southwest corner of Phase V is set at elevation 663-feet. The allowable storage within the active area LCS was limited to elevation 663-feet. If the leachate builds up above El. 663 within the phase there is a potential that the increased head inside the landfill could result in an unpermitted discharge of leachate through the top of the sump structure.

Based on the run-off volume calculated by the HELP software (215,635 ft^3) and the storage capacity of the granular leachate collection soil layer and leachate piping (232,196 ft^3), the available storage volume in Phase V is adequate to contain the runoff from a 24-hour, 25 year storm and thus satisfies the requirements of 40 CFR 257.81.

3.1.2 Phase VI Runoff Calculation

The Phase VI active landfilling operation was modeled in HELP using the grades provided in the Phase VI grading plan. Using the grades shown in this figure, the analysis for Phase VI was conducted with the assumption that fly ash placement has yet to begin. The design storm was applied by adding 5.22-inches of rainfall over a one day (24-hour) period. The program separates infiltration and evapotranspiration volumes from the total rainfall volume to provide a total runoff volume. HELP software quantifies the total runoff volume using the Soil Conservation Service (SCS) method. The SCS method requires information

about the ground surface conditions and landfill slope. The landfill surface (i.e. protective cover soil) was modeled as a poorly graded sand with a high rate of infiltration. The runoff calculated from the program is assumed to travel to the containment berms around the perimeter of the active area and infiltrate to the drainage layer.

As stated previously, the stormwater runoff calculation evaluated if the active area run-off volume from Phase V could be contained within the granular leachate collection soil layer and leachate collection piping below the landfill. Although the top of the Phase VI granular leachate collection soil layer has available storage up to elevation 665.6-feet, the top of the Phase VI leachate pumping station at the northwest corner of Phase VI is set at elevation 664-feet. The available storage within the active area LCS was limited to elevation 664-feet. If the leachate builds up above El. 664 within the phase there is a potential that the increased head inside the landfill could result in an unpermitted discharge of leachate through the top of the sump structure.

Based on the volume calculated by the HELP software (196,638 ft^3) and the storage capacity of the Phase VI granular leachate collection soil layer and leachate piping (255,275 ft^3), the available storage volume in Phase VI is adequate to contain the runoff from a 24-hour, 25 year storm and thus satisfies the requirements of 40 CFR 257.81.

4.0 PLAN REVISION AND RECORDKEEPING

Per 40 CFR 257.81(c)(2): “The owner or operator of the CCR unit may amend the written run-on and run-off 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 run-on and run-off 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 run-on and run-off 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 run-on and run-off 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 257.812(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).”

5.0 REFERENCES

DLZ Industrial, LLC., drawing number 8166TO titled, "Fly Ash Landfill - Phase V October 2015 Topographic Survey," dated 10/9/2015.

Hydrologic Evaluation of Landfill Performance (HELP) software version 3.07, developed by Environmental Laboratory USAE Waterways Experiment Station for USEPA Risk Reduction Engineering Laboratory, dated 11/1/1997

Sargent & Lundy, Operation and Management Plan for Flue Gas Desulfurization (FGD) Product Disposal, Rollin M. Schahfer Generating Station, March 1984.

Bonnin et al., “Point Precipitation Frequency Estimates,” NOAA Atlas 14, Volume 2, Version 3, National Oceanic and Atmospheric Administration, Silver Spring, Maryland, 2006.

Burns & McDonnell Engineering Company, Inc., Phase III – FGD/Fly Ash Landfill Construction Drawings, R.M. Schahfer Generating Station, April 1996.

Burns & McDonnell Engineering Company, Inc., Rule 5 Construction Plan and Stormwater Pollution Preventions Plan (SWP3), R.M. Schahfer Generating Station, Phase V Fly Ash Landfill Project, January 2011.

Burns & McDonnell Engineering Company, Inc., Phase V of the Fly Ash Landfill Construction Drawings – Conforming to Construction Records, R.M. Schahfer Generating Station, January 17, 2012.

Burns & McDonnell Engineering Company, Inc., Operation Plan for Phase V of the Fly Ash Landfill, R.M. Schahfer Generating Station, January 2012.

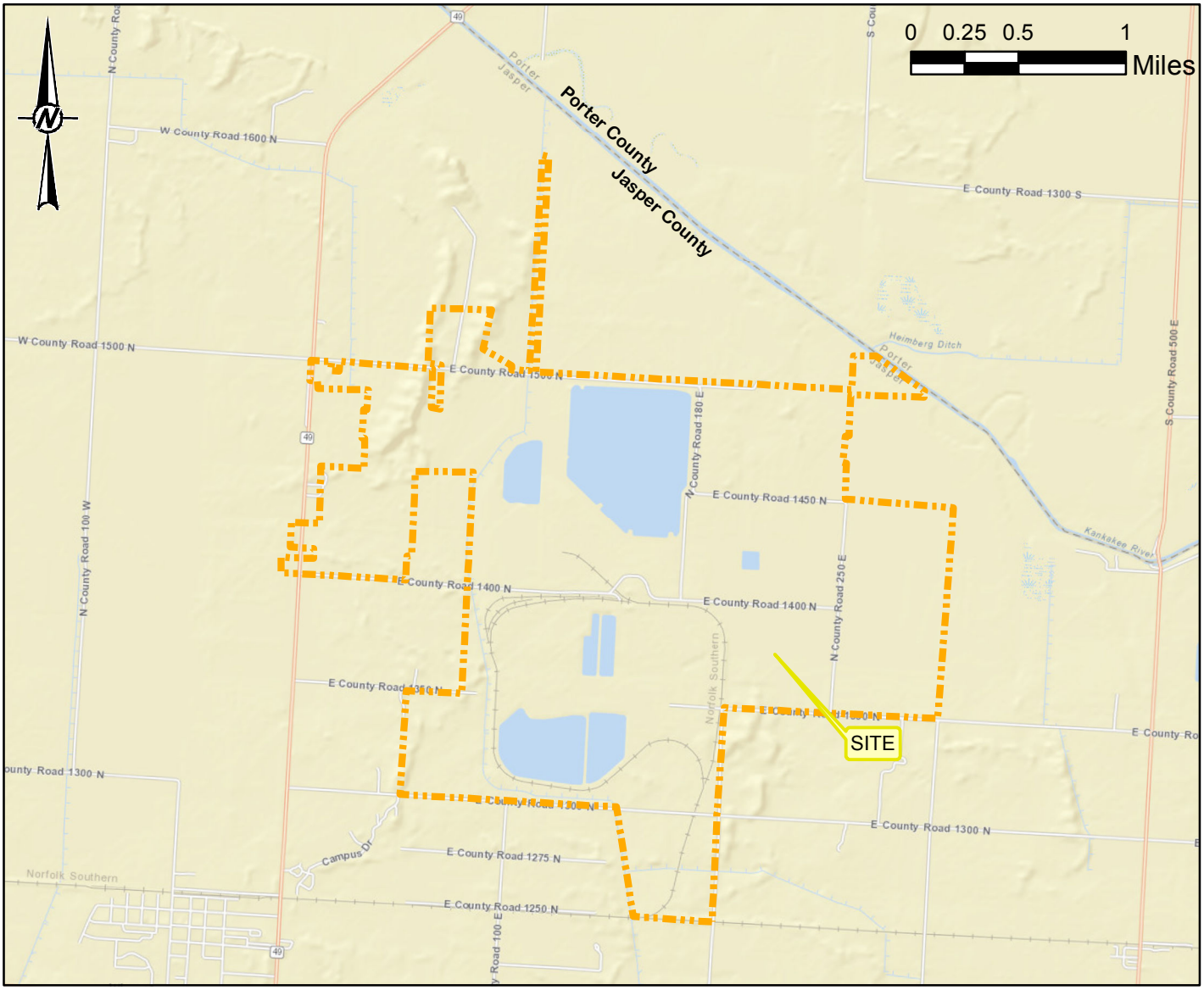
Sargent & Lundy, Phase VI Flay Ash Landfill Construction Contract Drawings – For Client Review, R.M. Schahfer Generating Station, January 29, 2014.

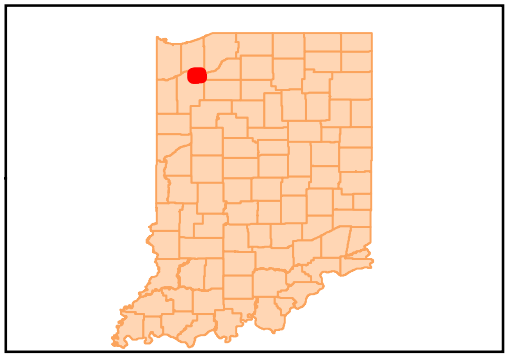
Sargent & Lundy, Operation Plan for Phase VI, R.M. Schahfer Generating Station Fly Ash Landfill, Revision 1, November 21, 2014.

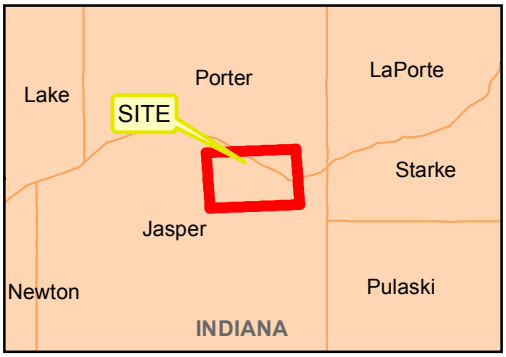
IDEM (Indiana Department of Environmental Management), Permit Renewal and Minor Modification Approval, R.M. Schahfer Generating Station RWS I FP 37-01, October 20, 2014.

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)
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NORTHERN INDIANA PUBLIC SERVICE COMPANY

PROJECT LANDFILL RUN-ON AND RUN-OFF CONTROL SYSTEM
R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

CONSULTANT
Golder Associates

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APPROVED	RAW

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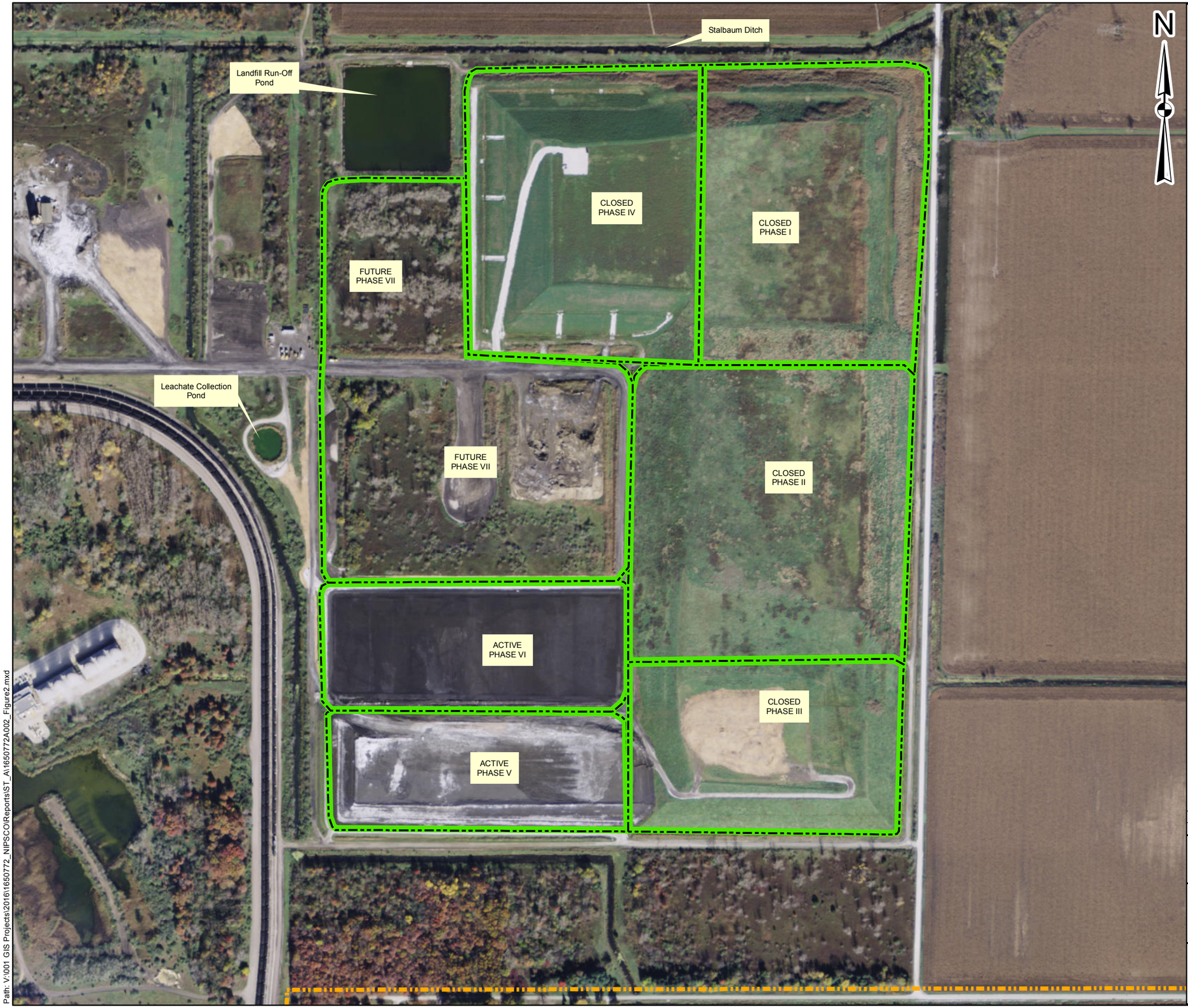

LEGEND

- Approximate Landfill Phase Boundary
- Approximate Property Line
- PHASE V — Landfill Phase Designation

NARRATIVE

This figure shows the approximate phase boundaries for the closed, active, and future phases of the landfill and accompanies the run-on and run-off control system plan submitted for the active (Phase V and VI) areas of the landfill for compliance with the final rule, 40 CFR, Part 257.81.

REFERENCES

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PROJECT
LANDFILL RUN-ON AND RUN-OFF CONTROL SYSTEM PLAN
R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE
EXISTING CONDITIONS

Golder Associates
Manchester, New Hampshire

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FIGURE 2

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Engineering Earth's Development, Preserving Earth's Integrity