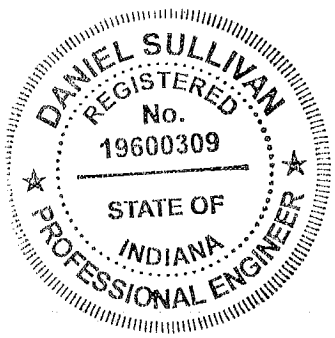
April 2024

Certification of Design and Construction of Groundwater Monitoring System (40 CFR §257.91(f))

Northern Indiana Public Service Company
R. M. Schahfer Generating Station
Wheatfield, Indiana

CCR Management Units referred to as Schahfer Landfill Phase V, VI, VII, and VIII

I, Daniel Sullivan, being a Professional Engineer in accordance with the laws of the State of Indiana, and having experience in the design, construction, and operation of groundwater monitoring systems for surface impoundments and landfills, do hereby state that I am qualified in the subject matter of CCR groundwater monitoring. I have personally examined and am familiar with the information related to design and construction of groundwater monitoring systems for CCR management units located at the Northern Indiana Public Service Company (NIPSCO) R. M. Schahfer Generating Station, as provided in the Groundwater Monitoring System Design Manual Revision 8.0, prepared by WSP USA Inc. and dated April 2024. Based on an inquiry of those individuals immediately responsible, and on supporting information which I understand to be true, accurate and complete, I believe the design and construction of the groundwater monitoring system for the Schahfer Landfill Phase V, VI, VII, and VIII meets the applicable requirements of the CCR Final Rule. In consideration of the above, I certify to the best of my knowledge, information, and belief, that the groundwater monitoring system for the regulated CCR management units referred to as the Schahfer Landfill Phase V, VI, VII, and VIII has been designed and constructed to meet the applicable requirements of 40 CFR §257.91 and corresponding State of Indiana requirements.



Daniel Sullivan
Indiana Professional Engineer
License #19600309

4-23-2024
Date

CCR Groundwater Monitoring System Design Manual

Northern Indiana Public Service Company LLC
Rollin M. Schahfer Generating Station, Wheatfield, Indiana

Submitted to:

Northern Indiana Public Service Company LLC

801 East 86th Street
Merrillville, IN 46410

Submitted by:

WSP USA Inc
10 Al Paul Lane, Suite 103, Merrimack, NH 03054

+1 603 324 0894

31406779

April 2024

Revision: 8.0

Executive Summary

On behalf of Northern Indiana Public Service Company LLC (NIPSCO), WSP USA Inc. (WSP), formerly Golder Associates USA Inc. (Golder), prepared the Groundwater Monitoring System Design Manual (GMSDM) Revision 8.0 to provide additional information supporting design of the groundwater monitoring network at the R. M. Schahfer Generating Station subsequent to the original certification on October 5, 2017. WSP found that the original monitoring network (i.e., that certified on October 5, 2017) contained an appropriate number of, and location of groundwater monitoring wells to monitor the quality of background groundwater and the quality of groundwater passing the waste boundary of each of the coal combustion residual (CCR) units. Based on changing site conditions and ongoing evaluation of additional groundwater monitoring data, NIPSCO modified the monitoring well network during calendar year 2018 (GMDSM Revision 1.0, Golder, 2019) including:

- Modification of the landfill monitoring well network due to the construction of a new landfill cell Phase VII including decommissioning of four monitoring well pairs downgradient of landfill cell Phase VI and installation of four replacement monitoring wells downgradient of landfill cell Phase VII;
- Installation of two deep wells co-located with existing shallow wells near the waste boundary of the Waste Disposal Area (WDA) and three deep wells co-located with existing shallow wells near the waste boundary of the Material Runoff Storage Basin, Metal Cleaning Waste Basin, and the Drying Area (together the Multi-Cell Unit [MCU]);
- Installation of four new well pairs downgradient of the WDA, three of which were installed along the Site property boundary; and
- Installation of six new well pairs downgradient of the MCU, one of which was located along the Site property boundary.

NIPSCO modified the monitoring well network during calendar year 2019 (GMSDM Revision 2, Golder, 2019) including:

- Installation of additional monitoring wells downgradient of the Waste Disposal Area (WDA) to further assess groundwater quality;
- Installation of a monitoring well to replace a damaged well location downgradient of the MCU; and
- Decommissioning of the damaged well.

NIPSCO modified the monitoring well network during calendar year 2020 (GMSDM Revision 3, Golder, 2020) including:

- Decommissioning of a monitoring well pair damaged during on-Site construction activities;
- Installation of a monitoring well pair to replace the damaged well pair located downgradient of the MCU;
- Installation of a background monitoring well pair located upgradient of the WDA; and
- Installation of three piezometers to further assess groundwater flow direction northwest of the WDA.

In 2022, WSP revised the GMSDM (Revision 4.0), to include further information related to the design and installation of the slurry walls (Golder, 2022).

NIPSCO modified the monitoring well network during calendar year 2023 (GMSDM Revisions 5.0, 6.0, and 7.0 including:

- As part of the Indiana Department of Environmental Management (IDEM)-approved Closure Application, in 2023 NIPSCO replaced the existing background monitoring well network for the MCU (installed as close as possible to the upgradient boundary of the MCU) with two existing well pairs located upgradient of the WDA (the WDA and MCU will now share the same background well network). The new background well network is expected to be unimpacted by Facility operations (GMDSM Revision 5.0, WSP, 2023).
- Modification of the landfill monitoring well network due to the construction of a new landfill cell Phase VIII, which involved decommissioning of six monitoring well pairs downgradient of landfill cell Phase VII and installation of three replacement monitoring well pairs downgradient of landfill cell Phase VIII (GMSDM Revision 6.0, WSP, 2023).
- Installation of one additional monitoring well and one piezometer downgradient of the WDA to further assess groundwater quality and flow direction (GMSDM Revision 7.0, WSP, 2023).

In 2024, WSP revised the GMSDM (Revision 8.0) to change the status of landfill background monitoring well GAMW-20 to downgradient due to seasonal variations in flow direction, and that groundwater quality may be impacted by the varying flow direction.

Based upon a review of the above-referenced monitoring system updates and recently discovered supporting information relative to the 2017, 2019, 2020, 2023, and 2024 designs, WSP finds that the modified monitoring network contains an appropriate number of, and location of groundwater monitoring wells to monitor the quality of background groundwater, the quality of groundwater passing the waste boundary, and the rate and extent of migration at each of the CCR units, as applicable. In summary, this report reaffirms WSP's understanding of the appropriate design and construction of the groundwater monitoring system based on historical information regarding the role and construction of slurry trench cores and their impact on the monitoring network.

Table of Contents

1.0 INTRODUCTION AND APPLICABILITY 1

2.0 CONCEPTUAL SITE MODEL 2

2.1 Slurry Trench Core Information 2

2.2 Regional and Site Geology 4

2.3 Regional and Site Hydrogeology 4

2.3.1 Description of the Site Uppermost Aquifer 5

2.3.2 Hydraulic Conductivity Testing 5

2.3.3 Horizontal Component of Flow 6

2.3.4 Vertical Component of Flow 6

2.4 CCR Units Relationship to Uppermost Aquifer 6

3.0 DESIGN OF THE GROUNDWATER MONITORING SYSTEM 7

3.1 Special Conditions 7

3.2 Monitoring Well Placement 8

3.2.1 Impoundments - WDA, Drying Area, MSRB, and MCWB - Monitoring Approach 8

3.2.1.1 Waste Disposal Area 9

3.2.1.2 Drying Area, MSRB, and MCWB 10

3.2.2 Landfill Monitoring Approach 12

3.3 Well Development 14

3.4 Well Decommissioning 14

4.0 FUTURE REVISIONS 14

5.0 REFERENCES 14

TABLES

Table 1 Monitoring Well Construction Details
Table 2 Vertical Groundwater Flow Calculation

FIGURES

Figure 1 Site Location Map
Figure 2 Monitoring Well Location Map

APPENDICES

APPENDIX A
Boring Logs

APPENDIX B
Slug Tests Results

APPENDIX C
RMSGS AT-01 Pumping Test Report

APPENDIX D
Well Development Records

APPENDIX E
Abandonment Logs

1.0 INTRODUCTION AND APPLICABILITY

40 Code of Federal Regulations (CFR) Parts 257 and 261, “Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities; Final Rule” (CCR Rule), as amended, requires groundwater monitoring at subject coal combustion residuals (CCR) management units. In addition, the State of Indiana Department of Environmental Management (IDEM) has adopted by reference part of the CCR Rule, in 329 Indiana Administrative Code (IAC) 10-9-1. As such, this document only references those Federal regulations applicable, with the proviso that analogous Indiana regulations should be consulted for any inconsistencies or additional requirements. In conformance with the applicable requirements of the CCR Rule, this Groundwater Monitoring System Design Manual (GMSDM) addresses the placement, construction and/or decommissioning, and development of the CCR Rule groundwater monitoring well networks at NIPSCO’s regulated CCR management units.

On behalf of NIPSCO, WSP USA Inc. (WSP), formerly Golder Associates USA Inc. (Golder), prepared the GMSDM specifically for the CCR management units at the NIPSCO Rollin M. Schahfer Generating Station (RMSGS or Site), which occupies an area of approximately four-square miles located at 2723 E 1500 N Road, Wheatfield, Jasper County, Indiana (Latitude 41° 12' 36" and Longitude 87° 01' 48", see Figure 1). WSP developed the GMSDM Revision 8.0 to meet the requirements of 40 CFR, §257.90(e) which states that the owner or operator (i.e., NIPSCO, RMSGS) of an existing CCR surface impoundment or CCR landfill will document the design, installation, development, and decommissioning of any monitoring wells, piezometers, and other sampling devices and give access to such documentation to the qualified professional engineer for the purposes of groundwater monitoring system certification.

The GMSDM provides the basis for and explanation of the monitoring system for each unit at the Site subject to the CCR Rule. This document includes figures showing each regulated unit and the locations of all CCR monitoring wells at the Site. It provides the requisite information upon which NIPSCO’s qualified professional engineer is relying to certify the design and construction of the monitoring well system pursuant to 40 CFR, §257.91(f).

A complementary document, the Groundwater Monitoring Program Implementation Manual (GMPIM) addresses the construction, operation, maintenance, and sampling of, and the management and evaluation of field and analytical information from, CCR Rule groundwater monitoring well systems at the regulated RMSGS CCR management units. The GMPIM also provides the requisite information upon which NIPSCO’s qualified professional engineer is relying to certify the appropriateness of the statistical method chosen for evaluating groundwater monitoring data pursuant to 40 CFR, §257.93(f)(6). Together, the GMSDM and the GMPIM serve as the foundation for the groundwater monitoring program design, construction, and operation activities at each of the RMSGS regulated units.

Following a review of historical Site operations and applicable regulations, NIPSCO determined that RMSGS includes four surface impoundments and one landfill that are subject to the groundwater monitoring requirements of the CCR Rule. The CCR management units at RMSGS for which groundwater monitoring systems design and construction are addressed in the GMSDM (see Figure 2) include:

- Waste Disposal Area (WDA) – approximate 80-acre unlined impoundment that is formed by an approximately 17-foot high perimeter earth-fill berm with an approximate 18-inch slurry trench core and located in the southwest corner of RMSGS
- Drying Area – approximate 5.5-acre unlined impoundment that is surrounded by an earth-fill berm with an approximate 18-inch slurry trench core and located north-northeast of the WDA

- Material Storage Runoff Basin (MSRB) – approximate 15-acre rectangular unlined impoundment that is surrounded by an earth-fill berm with an approximate 18-inch slurry trench core and located north of the Drying Area and adjacent to and west of the Metal Cleaning Waste Basin
- Metal Cleaning Waste Basin (MCWB) – approximate 15-acre rectangular unlined impoundment that is surrounded by an earth-fill berm with an approximate 18-inch slurry trench core and located north of the Drying Area and adjacent to and east of the MSRB
- Landfill – Four Cells
  - Phase V - approximately 18-acre lined cell that closed April 1, 2017.
  - Phase VI - approximately 15-acre lined cell located due north of Phase V, which began receiving waste on August 1, 2016 and stopped receiving waste in early 2021.
  - Phase VII – approximate 14-acre IDEM-permitted lined cell located due north of Phase VI. Construction completed in the fourth quarter of 2018 and began receiving waste in the first quarter of 2021.
  - Phase VIII – approximate 20-acre IDEM-permitted lined cell located due north of Phase VII. Construction is anticipated to be completed in 2024 and is anticipated to begin receiving waste in 2025.

WSP completed Site groundwater monitoring for background purposes consistent with the requirements of 40 CFR, §257.90 by October 17, 2017 and has performed additional groundwater monitoring in accordance with the CCR Rule. This document represents the eighth revision to the GMSDM and includes a modification to the monitoring well network for the Landfill.

2.0 CONCEPTUAL SITE MODEL

To guide design and construction of CCR Rule compliant groundwater monitoring systems, WSP developed a conceptual site model (CSM) based on historical boring logs completed for use in construction of the Site infrastructure, location, and operation of historical ash management units at the Site, historical groundwater monitoring reports for the landfill, and literature review. Select information from these resources is summarized in the following sections.

2.1 Slurry Trench Core Information

According to recently discovered historical files, NIPSCO's contractors constructed the surface impoundment perimeter berm slurry trench cores in two Phases including:

- Phase 1: MSRB, MCWB, Drying Area, Inactive Waste Disposal Area (non-CCR unit), and Final Settling Basin (non-CCR unit)
  - Sargent and Lundy designed the specifications for the slurry trench cores for Phase I (Specification A-2987, dated April 1, 1974). Sargent and Lundy prepared four addenda with Addendum #4 completed on August 28, 1974. Addendum #4 included the final slurry trench core installation methods and specifications for the slurry trench core mixture.
  - Calumet Trucking Company (CTC) was the prime contractor for the project.
  - CTC began construction of Phase I on September 9, 1974 and completed the project on March 3, 1976 (includes Final Settling Basin and Inactive Waste Disposal Area – both non-CCR Units)

- According to design specifications provided in Addendum #4 and quality assurance/quality control (QA/QC) documentation completed throughout the construction of the slurry trench cores, the slurry trench core installation and design information included:
  - NIPSCO's contractor installed the slurry trench cores within the approximate midline of the above grade earthen berms surrounding the surface impoundments. Each berm provided a surficial cover of at least two feet above the top of the slurry trench cores. The berms were constructed of native sand excavated from the impoundment areas.
  - Each slurry trench core was installed using a vibrating-beam injection method (Section 2-7 of Specification A-2987). Per Specification 2-703.1c – "beam shall be "keyed" a minimum of six inches to clay or shale and checked by noting resistance to pressure indicating penetration of vibrating beam into impervious zone." Thatcher-Holzmann was the vibrating beam contractor.
  - Slurry characteristics include (Specification 2-704): "shall consist of a stable colloidal suspension of pulverized natural Wyoming sodium-cation bentonite and cement in water; Bentonite included high quality such as Ultra Gel 180 supplied by American Colloid Company or equal. Written certification shall be supplied by American Colloid specifying the quality and yield per carload shipment of bentonite received; cement will be Portland Cement ASTM C150 Type 1. A written certificate specifying cement quality shall be given by cement supplier for each tank load shipment of cement."
  - General Slurry Requirements (Specification 2-704.2):
    - Minimum 60 kilograms (kg) bentonite, 120 kg cement per 1 cubic meter of slurry
    - Maximum permeability of 1 x 10-7 centimeters per second (cm/sec)
    - Minimum viscosity of 40 march cone seconds
    - Minimum strength of 50 pounds per square inch (psi) after 28 days unless otherwise requested by the Consulting Engineers (i.e., Hanson Engineers, Inc. lead engineer – subcontracted A. H. Engineering Corporation to perform field testing services)
    - Minimum specific gravity of 1.07 grams per cubic centimeter (g/cc) and maximum specific gravity of 1.5 g/cc or as approved by the Consulting Engineer
    - Maximum water loss of 17 cubic centimeters in 30 minutes when tested in accordance with "Low Temperature Filtration Test" API RP-13B
    - Minimum width is 18-inches (Section 2-202.1)
    - Slurry trench core wall shall be cut as near vertical as practicable (Section 2-203.3)

- Phase II – Waste Disposal Area (WDA), Intake settling Basin (ISB), and Recycle Basin (the latter two impoundments being non-CCR units)
  - Sargent and Lundy designed the slurry trench core and subcontracted Salisbury Engineering to perform independent testing services.
  - Townsend and Bottum. Inc.- prime contractor – subcontracted construction of the slurry trench core to ICOS Corporation of America (Contract SC-00034)

- ICOS completed work on 8-30-82 – 11,000 linear feet of slurry wall – ISB, WDA, and Recycle Basin – Started WDA construction on April 1, 1982 – started both ISB and RB on June 1, 1982 using two crews
- ICOS used a slurry trench cutoff method to construct the slurry trench core and used a soil/sand-bentonite slurry mixture that had similar characteristics as the Phase I slurry trench core
- Slurry trench core approximately 2 feet 6 inches thick, keyed into the bedrock, maximum permeability of 3.76 x 10-6 cm/sec

2.2 Regional and Site Geology

RMSGS is in the physiographic region of Indiana known as the Northern Moraine and Lake Region (Indiana Handbook of Geology). This region is covered by deposits from Wisconsin glaciations and has variable topographic relief. The Site is in the Lowland Kankakee River Valley and is bounded by the Valparaiso and Iroquois moraines to the north and south, respectively. The region is characterized by broad marshes, which mark lacustrine plains, separated by low sand ridges. These lacustrine deposits make up a thin veneer which covers thick till deposits from the Wisconsin glacial epoch. Guthrie et al. of the Indiana Department of Conservation note that there are almost no bedrock outcrops in northern Jasper County, and that glacial drift thickness is frequently measured in hundreds of feet.

Underlying the unconsolidated sediments, sedimentary bedrock dips relatively uniformly to the northeast and is characterized by a transgressive marine sequence of angular non-conformities formed by several dissimilar dipping sedimentary layers. According to Fennelon, more than 4,000 feet of sedimentary rocks overlie Precambrian granitic bedrock. This assemblage is part of the north side of the Kankakee Arch, the major structural feature in the Kankakee River Basin. The first 3,500 feet of sedimentary rocks overlying the granitic bedrock are Cambrian and Ordovician in age. The uppermost 300 feet of Ordovician rocks are composed of shale and minor limestones and are referred to as the Maquoketa Group. The Maquoketa Group underlies Silurian, Devonian and Mississippian rocks and consist of a wide variety of sedimentary layers ranging from shaley to coarse-grained carbonate rocks. This carbonate sequence is overlain by a series of shales including the Antrim Shale, a brownish-black, noncalcareous shale (Fennelon, 1994).

The Site is underlain by unconsolidated, upper-Pleistocene (post-Wisconsin) fine-grained sand and silt and outwash deposits of the Atherton Formation, occasionally overlain by alluvial and lacustrine deposits of the Martinsville Formation (Schneider and Keller, 1970). According to Fraser and Bleur (1991), during the late Pleistocene, the Site was occupied by a post-glacial lake followed by a broad, low-gradient outwash stream that deposited sand uniformly across the basin to form the Kankakee-Valparaiso Formation. WSP's interpretation of the Site geology is based on soil borings, attached in Appendix A, bedrock geology maps, prior reports, and CCR Rule-related well installation activities and includes:

- Brown fine to medium-gained sand from the ground surface to approximately 14 ft bgs.
- Grayish-brown fine to medium sand from approximately 14 ft bgs to 36 ft bgs (coarsens with depth).
- Black to dark gray shale with planar cleavage. Depth to bedrock is approximately 36 ft bgs near the impoundments and approximately 34 ft bgs near the landfill.

2.3 Regional and Site Hydrogeology

The Kankakee Aquifer System is an unconfined deposit of fine- to medium-grained sand, which is interbedded with gravel lenses in the tributary valleys. The aquifer system thickness ranges from less than 20 feet where the unit overlies bedrock highs to more than 150 feet in the tributary valleys. Based on historical boring logs, the

aquifer thickness on-Site is approximately 32 feet. The Kankakee Aquifer System discharges towards the Kankakee River (located approximately one mile north/northeast of the Site) and is recharged by infiltration of precipitation through the soils (Unconsolidated Aquifer Systems of Jasper County, Indiana, 2010).

In Jasper County, total well depths are typically 25 to 50 feet with saturated sands and gravels up to 42 feet in thickness. Well systems of such design are generally capable of meeting the needs of domestic and some high capacity users. Domestic well capacities are commonly 15 to 70 gallons per minute with static water levels from 3 to 11 feet below surface (Unconsolidated Aquifer Systems of Jasper County, Indiana, 2010).

2.3.1 Description of the Site Uppermost Aquifer

WSP identified the shallow unconfined alluvial sands that underlie all the CCR units as the uppermost aquifer based on a review of the information outlined above and an interpretation of the definition of the uppermost aquifer provided in 40 CFR, §257.53. Available groundwater elevation data indicate that groundwater in the uppermost aquifer around the WDA, Drying Area, MSRB, and MCWB locally flows radially to the northeast, north, and northwest from a potentiometric high located east of the Recycle Basin (not a CCR Rule regulated unit). Groundwater flow direction is influenced by the earth-fill berms with a minimum 18-inch thick, slurry trench cores that surround each of the CCR impoundments. Hydraulic heads measured inside the slurry trench cores that surround the CCR units are significantly higher than those measured just outside the slurry trench cores/units and indicate the slurry trench cores are functioning as a perimeter hydraulic barrier.

Based on information provided by the semi-annual groundwater reports submitted to IDEM, groundwater flow in the uppermost aquifer near the landfill is generally towards the north/northeast or towards the Kankakee River. WSP's interpretation is that the groundwater flow regime in the landfill area appears to be affected by Stahlbaum Ditch (i.e., potential localized groundwater discharge point for the upper portion of the uppermost aquifer), which is located and flows along the northern, western, and southern perimeter of the landfill.

The calculated horizontal hydraulic gradient near the CCR units ranges from approximately 0.0007 ft/ft to 0.0020 ft/ft. A review of the groundwater elevation data indicates that groundwater flow in the shallow unconfined aquifer is primarily horizontal, and that there is not a significant vertical component of groundwater flow.

2.3.2 Hydraulic Conductivity Testing

WSP performed hydraulic conductivity testing (slug testing) in eight monitoring wells (two tests per well) in accordance with procedures in the GMPIM. WSP field personnel used a pressure transducer and data logger to obtain the slug test data. WSP used Hvorslev and Bower, and Rice Methods to calculate the hydraulic conductivity values. The slug test results, measurement data, and calculations are provided in Appendix B. WSP also performed step-drawdown and 24-hour aquifer tests to assess the characteristics of the surficial unconfined aquifer in June 2019. The purpose of the aquifer test was to supplement existing groundwater data including hydraulic conductivity and storativity. The aquifer test report (AT-01 Aquifer Test, Golder, 2020) is attached in Appendix C. A summary of the arithmetic means of the calculated hydraulic conductivities, transmissivity, and storativity are provided in the embedded table below. The calculated hydraulic conductivity values appear to be consistent with anticipated values for glacial outwash deposits.

Test Method	Hydraulic Conductivity (cm/s)	Transmissivity (gpd/ft)	Storativity (dim)
Grain size analysis	1.18E-01	NC	NC
Slug tests- shallow wells	3.3E-02	NC	NC

Test Method	Hydraulic Conductivity (cm/s)	Transmissivity (gpd/ft)	Storativity (dim)
Slug tests- deep wells	9.69E-03	NC	NC
Pumping tests- shallow wells	9.37E-02	5.98E+04	6.15E+00
Pumping tests- deep wells	9.44E-02	6.01E+04	5.68E-03

cm/s= centimeter per second; gpd/ft= gallons per day per foot; dim= dimensionless

2.3.3 Horizontal Component of Flow

WSP calculated the hydraulic gradient for the unconfined aquifer in the vicinity of the CCR units at 1.17E-03 foot per foot as shown below using average groundwater elevation data from June 2016 to April 2017.

$$i_{gw} = \left({}^{h_L}/_{L}\right)$$

Where: h_L = head loss (elevation difference - foot)
L = length (horizontal distance - foot)

Using an assumed effective porosity value of 30%, and the average hydraulic conductivity from slug tests for the shallow unconfined aquifer of 93.5 ft/day, and the calculated gradient, the average rate of groundwater flow (V_{gw}) in the unconfined aquifer was calculated using the algorithm below.

$$V_{gw} = K\, i \left({}^{1}/_{n_e}\right)$$

Where: V_{gw} = Groundwater velocity
K = Hydraulic conductivity
i = Hydraulic gradient
n_e = Effective porosity
V_{gw} = [(93.5 ft/day) x (1.17E-03)] / 0.30
V_{gw} = 0.365 ft/day, or 133 ft/year

As calculated above, the estimated horizontal rate of groundwater flow in the shallow unconfined aquifer beneath the study area is expected to average approximately 133 feet per year.

2.3.4 Vertical Component of Flow

WSP assessed groundwater elevation data for 16 well couplets across the Site. Vertical gradients (up or down) varied across the Site and near individual units. On average, the strongest downward gradients were observed near well pairs GAMW03/03B, GAMW09/09B, and GAMW17/17B (average $-2.86\text{x}10^{-2}$, $-2.14\text{x}10^{-2}$, and $-2.12\text{x}10^{-2}$, respectively) located on the eastern side of the WDA and near the MCWB as shown in Figure 2. Upward vertical gradients were observed in 11 of the 16 well pairs and ranged from $1.15\text{x}10^{-3}$ to $3.01\text{x}10^{-4}$. The calculated vertical gradients are including in Table 2. The groundwater flow in the shallow unconfined aquifer has a moderate vertical component of groundwater flow in both upward and downward directions, depending upon location.

2.4 CCR Units Relationship to Uppermost Aquifer

The four unlined surface impoundments and three lined landfill cells were constructed over alluvial sands that comprise the uppermost aquifer. The uppermost aquifer has a saturated thickness of approximately 32 feet based on an approximate underlying shale elevation of 628 feet msl and a water table elevation of 660 ft msl. NIPSCO has developed a monitoring well network around each CCR surface impoundment, or group of impoundments, to

assess groundwater immediately downgradient of the waste boundary with well screens set at the appropriate depths to intercept groundwater flow, if any, from the CCR units. NIPSCO decided to install well pairs based on the potential for groundwater flow through the slurry trench cores near the upper portion of the uppermost aquifer, near the contact of the slurry trench core and shale, and aquifer characteristics.

Landfill Phases V, VI, and VII are lined and will include a low permeability cap structure when filling is completed; therefore, neither design nor construction included provisions for a perimeter subsurface earth-fill berm with a minimum 18-inch thick, slurry trench core. NIPSCO has developed the monitoring well network around the CCR landfill cells to assess groundwater downgradient of the waste boundary, as practical, with well screens set at the depths likely to intercept groundwater flow from the CCR units, if any. NIPSCO decided to install well pairs based on the potential for a release through the liner near the upper portion of the uppermost aquifer, historical landfill groundwater analytical data, and to further define aquifer characteristics.

3.0 DESIGN OF THE GROUNDWATER MONITORING SYSTEM

40 CFR, §257.91 sets out the requirements for development of a groundwater monitoring system for CCR units. The performance standard in §257.91(a) states that the groundwater monitoring system will consist of a sufficient number of wells to accurately represent:

- The quality of background groundwater
- The quality of groundwater passing the waste boundary of the CCR unit

The monitoring well network includes background wells and multiple monitoring wells located around the perimeter of the CCR units, satisfying the requirements of §257.91(a) as shown in Figure 2.

Following detection of one or more Appendix IV constituents at a statistically significant level (SSL) above the groundwater protection standard(s) (GWPS), WSP installed assessment monitoring wells to characterize the nature and extent of a potential release from the WDA, Drying Area, MSRB, and MCWB in accordance with 40 CFR, §257.95(g). WSP also installed monitoring wells at the Site property boundary in accordance with 40 CFR, §257.95(g)(1)(iii). Although statistically significant increases (SSIs) were detected from wells monitoring the Landfill, an alternate source demonstration (ASD) attributed these to historical cells not regulated under the CCR Rule. Thus, assessment monitoring is not required at Landfill Phases V, VI, and VII.

A discussion of special conditions, and the well placement, construction, and development details that substantiate NIPSCO LLC's compliance with §257.91(a) and §257.95(g) are presented in the following sections. Monitoring well construction, development, and decommissioning procedures are included in the GMPIM.

3.1 Special Conditions

Special conditions are Site conditions that can affect the design of a groundwater monitoring system. Special conditions at RMSGS included:

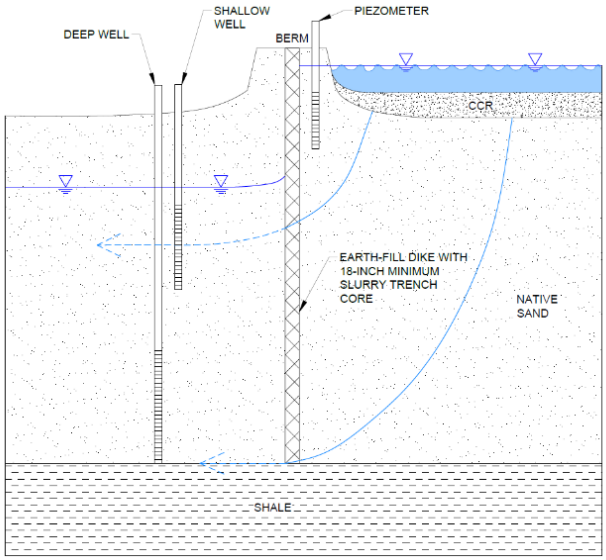
- CCR units (impoundments) located above a mounded groundwater table influenced by the design and performance of the perimeter slurry trench cores
- CCR units located within the slurry trench cores or liner systems
- Position of the surface impoundments and location of the landfill cells immediately adjacent to one another
- CCR units in areas where nearby surface water features may influence groundwater levels or expected flow directions (e.g., Davis Ditch near the WDA, Stahlbaum Ditch near the Landfill CCR units)

3.2 Monitoring Well Placement

The monitoring network described herein was designed to meet the performance standards specified in 40 CFR, §257.91. Accordingly, the monitoring network provides adequate coverage to represent the quality of groundwater upgradient and downgradient of each CCR unit. The following sections provide the rationale for the monitoring well network for each CCR unit.

3.2.1 Impoundments - WDA, Drying Area, MSRB, and MCWB - Monitoring Approach

Design of a CCR Rule compliant monitoring program for the WDA, Drying Area, MSRB, and MCWB CCR units considered their size, disposal/operational history, the hydraulic influence of the slurry trench cores, position relative to one another, and the lack of historical water quality data for units other than the landfill. The surface impoundments are unlined but are surrounded by earth-fill berms with approximately 18- to 30-inch-thick slurry trench cores that extend from just below the top of the berms to the underlying shale (keyed into the shale approximately six inches) located at approximately 35 feet below ground surface (ft bgs). The slurry trench cores were designed and installed to contain contents placed within the surface impoundments. Groundwater monitoring had not historically been required nor performed at the surface impoundments.



Based on the available Site hydrogeologic information, groundwater mounding is occurring within the perimeter slurry trench cores around the four CCR surface impoundments, affecting design and installation of a monitoring program. The earth-fill berms with approximately 18- to 30-inch-thick slurry trench cores surrounding the CCR units also influence the positioning of monitoring wells at the upgradient edge of each of the CCR units. For example, monitoring wells cannot be installed immediately upgradient of the Drying Area because such wells would have to be installed within the Retired Waste Disposal Area (RWDA, non CCR Rule regulated former impoundment), the MSRB, and MCWB and would not provide a representative groundwater sample (i.e., the wells would be screened within CCR) as shown in Figure 2. In addition, the downgradient edges of the WDA, MSRB, and Drying Area cannot be monitored separately due to their position with respect to one another and the RWDA and MCWB (i.e., these units are located immediately adjacent to one another).

Slurry trench core design and field QA/QC documentation indicates that NIPSCO successfully constructed the slurry trench cores as planned (i.e., permeability approximately 1 x 10-7 cm/sec, minimum 18-inches thick (i.e., MSRB, MCWB, Drying Area, and FSB) to 30-inches (i.e., WDA, Recycle Basin, ISB), and keyed into the underlying shale). as illustrated in the graphic above, NIPSCO's monitoring approach for the CCR surface impoundments featured the installation of well pairs including shallow (approximately 15-foot deep) and deep (approximately 35 ft bgs – to the top of shale [signified with a "B" in Figure 2]) couplets at background and downgradient monitoring well locations outside of the perimeter slurry trench cores as shown in Figure 2. Deep monitoring wells, which are designed to monitor potential flow paths near the contact between the slurry trench cores and shale, supplement the shallow wells, which are located to intersect a release should the slurry trench cores not function as designed.

3.2.1.1 Waste Disposal Area

As shown in Figure 2, the WDA is an approximately 80-acre impoundment located in the southwest corner of RMSGS. The WDA receives primarily bottom ash/boiler slag slurried from two boilers. Most of the ash/slag is deposited in the northern half of the WDA where the slurry lines discharge. Due to size of the unit and settling/depositional properties of the CCR materials, very little, if any, ash/slag is present in the southern half of the WDA. Therefore, NIPSCO's approach to monitor groundwater quality downgradient of the WDA focuses on the northern portion of the unit.

A channelized surface water feature referred to Davis Ditch transects the southern and western parts of the Site. The ditch, which discharges to the Kankakee River, flows east-to-west approximately 200 feet south of the WDA, then makes a 90-degree turn and flows south-to-north approximately 200 feet west of the WDA. To the west-northwest of the WDA, Davis Ditch is a potential localized groundwater discharge point for the upper portion of the uppermost aquifer. Groundwater flow obtained from the newly installed CCR wells and piezometers indicates that groundwater near the WDA flows towards the north/northwest.

The monitoring well network contains the following wells:

- Existing Wells: Two previously existing monitoring wells (GAMW01 and GAMW03) installed for other purposes prior to the effective date and requirements of the CCR Rule that are appropriately located and constructed to serve as CCR Rule-compliant monitoring wells.
- 2016 Wells: Installation of six monitoring wells designated GAMW03B, GAMW12, GAMW13, GAMW13B, GAMW14, and GAMW14B upgradient and/or at the WDA waste boundary.
- 2018 Wells: Installation of two deep wells (GAMW01B and GAMW12B) to supplement the monitoring network near the WDA. The new deep wells were co-located with existing shallow wells (GAMW01 and GAMW12) near the waste boundary. In addition, WSP installed one new assessment monitoring well pair designated GAMW51/51B further downgradient of the WDA and RWDA to assess the extent of potential groundwater impacts detected during Assessment Monitoring and to monitor for potential releases from the non-regulated RWDA and installed three assessment monitoring well pairs designated GAMW42/42B, GAMW43/43B, and GAMW44/44B along the Site property boundary in accordance with §257.95(g).
- 2019 Wells: Installation of nine new assessment monitoring wells to further assess the nature and extent and overall groundwater quality downgradient of the WDA and the RWDA including; two well pairs designated GAMW59/59B and GAMW60/60B downgradient of existing assessment monitoring well pair GAMW51/51B; five new wells including a deep monitoring well screened in the shale designated GAMW42C and installed adjacent to existing well pair GAMW42/42B; and two new well pairs designated GAMW57/57B and GAMW58/58B on the northern side of the of the existing Site property boundary wells.
- 2020 Wells: WSP installed an additional well pair (GAMW68 and GAMW68B) south of the WDA in August 2020 to supplement the existing background monitoring well network. WSP installed three piezometers designated GAMW65B, GAMW66B, and GAMW67B to the north of the existing groundwater network in April 2020. These three piezometers were installed to further assess groundwater flow direction northwest of the WDA.
- 2023 Wells: WSP installed one additional monitoring well (GAMW77) and one additional piezometer (GAMW78) west of the WDA along the western Site property boundary in November 2023. GAMW77 and GAMW78 were installed to further assess groundwater conditions and flow direction at the property boundary northwest of the WDA.

Prior to collecting any groundwater samples, WSP measures water levels to assess groundwater flow direction and calculate hydraulic gradients from each monitoring well and piezometers as described on the following table:

	WDA
Background Monitoring Wells	GAMW03, GAMW03B, GAMW68, and GAMW68B
Downgradient Monitoring Wells	GAMW01, GAMW01B, GAMW12, GAMW12B, GAMW13, GAMW13B, GAMW14, and GAMW14B
Assessment Monitoring Wells	GAMW42, GAMW42B, GAMW42C, GAMW43, GAMW43B, GAMW44, GAMW44B, GAMW51, GAMW51B, GAMW57, GAMW57B, GAMW58, GAMW58B, GAMW59, GAMW59B, GAMW60, GAMW60B, and GAMW77
Piezometers (non-CCR Monitoring Wells)	GAMW02, GAMW05, GAMW65B, GAMW66B, GAMW67B, and GAMW78

A summary of the well construction information is provided in Table 1. The boring and well construction logs are provided in Appendix A. The monitoring well locations are shown in Figure 2.

3.2.1.2 Drying Area, MSRB, and MCWB

The Drying Area is an approximately 5.5-acre impoundment that has been filled with CCR (see Figure 2). Previously, CCR-containing wastewaters from the RWDA flowed through the Drying Area and then discharged to the MSRB or MCWB. Items considered by NIPSCO in the design of the groundwater monitoring program for the Drying Area include the following:

- The Drying Area is bordered by the RWDA to the south and west and by the MSRB and the MCWB to the north.
- Available groundwater elevation data indicate that groundwater flows in a southwest to northeast direction beneath the Drying Area.
- A portion of the RWDA is located upgradient of the Drying Area. Therefore, any potential groundwater impacts detected in the Drying Area may be difficult to discern from impacts resulting from the non-CCR regulated RWDA.
- The RWDA extends approximately 1,500 feet upgradient of the Drying Area. There are no adjacent upgradient locations to install monitoring wells that are not within the RWDA.

The MSRB and MCWB consist of two rectangular, approximately 14-acre unlined impoundments located adjacent to one another as shown in Figure 2. The ponds are separated by a narrow berm. Although there is a perimeter earth-fill berm with an approximate 18-inch thick, slurry trench core around the basins, there is no slurry trench core within the narrow berm between the basins. Factors considered by NIPSCO in the design of the groundwater monitoring program for the MSRB and MCWB include the following:

- Available groundwater elevation data suggest that groundwater beneath the MSRB and MCWB flows from the southwest to the north/northeast

- Similar to the Drying Area, groundwater downgradient of the MSRB and MCWB is potentially impacted by the RWDA
- Groundwater upgradient of the MSRB and MCWB is potentially impacted by the Drying Area

The CCR Rule allows for monitoring of two or more units as a single unit, provided that the monitoring program is equally capable of detecting a release at the waste boundary as single-unit monitoring systems [40 CFR, §257.91(d)]. Due to the locations and proximity of the MSRB, MCWB, Drying Area, and unregulated former CCR waste management areas to one another, and because there is no practical means of monitoring between the adjacent units, NIPSCO's approach for these CCR surface impoundments is monitoring the three separate CCR Units as one individual unit (the MCU). The monitoring well network contains the following wells:

- Existing Wells: Four previously existing monitoring wells designated GAMW04, GAMW07, GAMW08, and GAMW09 that are appropriately located and constructed to serve as CCR Rule-compliant monitoring wells.
- 2016 Wells: Installation of eight additional wells designated GAMW09B, GAMW15, GAMW15B, GAMW16, GAMW16B, GAMW17, GAMW17B, and GAMW18 upgradient and/or at the CCR Unit waste boundary.
- 2018 Wells: Installation of three additional deep wells designated GAMW07B, GAMW08B, and GAMW18B to supplement the monitoring network. The new deep wells are co-located with existing shallow wells GAMW07, GAMW08, and GAMW18 near the waste boundary. In addition, WSP installed five assessment monitoring well pairs designated GAMW52/52B, GAMW53/53B, GAMW54/54B, GAMW55/55B, and GAMW56/56B to assess the nature and extent of groundwater impacts downgradient of the CCR Unit and one assessment well pair designated GAMW46/46B on the northern side of the property boundary in accordance with §257.95(g)(1)(iii).
- 2019 Wells: Installation of replacement monitoring well GAMW55R. During the April 2019 groundwater monitoring event, WSP field personnel noted that monitoring well GAMW-55 sustained damage, which prohibited the collection of a groundwater sample. In June 2019, WSP installed monitoring well GAMW-55R to replace well GAMW-55, which is located approximately 10 ft east of the original GAMW-55. During the same mobilization, WSP installed two piezometers designated GAMW63B and GAMW64B located east of the CCR Unit to assess groundwater flow direction in this portion of the Site.
- 2020 Wells: Installation of replacement monitoring wells GAMW16R and GAMW16BR. NIPSCO completed a re-piping project north of the CCR Unit that included the construction of a new concrete sump in 2020. During the sump construction activities, the contractor excavated near and destabilized monitoring wells GAMW16 and GAMW16B. Following the construction activities, WSP installed replacement wells GAMW16R and GAMW16BR approximately 10 feet south of the original wells in September 2020.

In 2023, as part of the IDEM-approved Closure Application, the prior background monitoring wells (GAMW04, GAMW07, GAMW07B, GAMW15, and GAMW15B) were replaced with existing monitoring wells GAMW03, GAMW03B, GAMW68, and GAMW68B. Because monitoring wells GAMW03, GAMW03B, GAMW68, and GAMW68B are currently part of the WDA monitoring well system, NIPSCO is not required to collect additional background samples. Existing monitoring wells GAMW04, GAMW07, GAMW07B, GAMW15, and GAMW15B will be used as piezometers to continue to collect water level data on the upgradient edge of the MCU.

Prior to collecting any groundwater samples, WSP measures water levels to assess groundwater flow direction and calculate hydraulic gradient from each monitoring well and piezometers as described on the following table:

	Drying Area, MSRB, MCWB
Background Monitoring Wells	GAMW03, GAMW03B, GAMW68, and GAMW68B
Downgradient Monitoring Wells	GAMW08, GAMW08B, GAMW09, GAMW09B, GAMW16R, GAMW16BR, GAMW17, GAMW17B, GAMW18, and GAMW18B
Assessment Monitoring Wells	GAMW46, GAMW46B, GAMW52, GAMW52B, GAMW53, GAMW53B, GAMW54, GAMW54B, GAMW55R, GAMW55B, GAMW56, and GAMW56B
Piezometers (non-CCR Monitoring Wells)	GAMW-04, GAMW06, GAMW07, GAMW07B, GAMW15, GAMW15B, GAMW63B, and GAMW64B

A summary of the well construction information is provided in Table 1. The boring and well construction logs are provided in Appendix A and the well decommissioning logs are provided in Appendix D. The monitoring well locations are shown in Figure 2.

3.2.2 Landfill Monitoring Approach

NIPSCO received an operating permit from IDEM to operate a multi-phase Type I, Restricted Waste Landfill (RWS I) at RMSGS in January 1984 (Operating Permit 37-1). CCR Rule-regulated waste streams are transported to the Site's landfill for disposal and managed in accordance with applicable permitting requirements.

NIPSCO LLC has determined that the following four lined landfill cells are subject to the CCR Rule:

- Landfill – Four Cells
  - Phase V – approximately 18-acre lined cell that closed April 1, 2017.
  - Phase VI – approximately 15-acre lined cell located due north of Phase V, which began receiving waste on August 1, 2016 and stopped receiving waste in early 2021.
  - Phase VII – approximate 14-acre IDEM-permitted lined cell located due north of Phase VI. Construction completed in the fourth quarter of 2018 and began receiving waste in Q2 2021.
  - Phase VIII – approximate 20-acre IDEM-permitted lined cell located due north of Phase VII. Construction is anticipated to be completed during 2024 and begin receiving waste in 2025.

Closed non-regulated Landfill Phases I through IV are located east of the CCR Rule regulated landfill units. Phases I and II are unlined and Phases III through VIII are lined. None of the landfill phases were designed or constructed with perimeter earth-fill berms with a minimum 18-inch-thick slurry trench cores (see Figure 2).

NIPSCO has been performing routine semi-annual groundwater monitoring to satisfy the Solid Waste permit requirements since 2005. The monitoring reports submitted to IDEM provide a summary of the groundwater quality data and groundwater flow direction from wells installed upgradient and downgradient of the landfill. WSP reviewed the semi-annual reports historically prepared for and submitted to IDEM to obtain groundwater flow direction and groundwater quality information for the landfill area. The existing landfill compliance wells are not located at the downgradient waste boundary of the CCR Rule regulated landfill units (Phases V, VI, VII, and VIII); therefore, these wells do not meet the requirements of 40 CFR, §257.91(a)(2) to monitor groundwater quality near the waste boundary and will not be used to establish compliance with the CCR Rule.

According to the semi-annual groundwater reports, groundwater flow in the uppermost aquifer near the landfill is generally towards the north/northeast. WSP's interpretation of the groundwater flow regime in the area of the landfill is that Stahlbaum Ditch, which flows along the northern, western, and southern portions of the landfill boundaries, can influence groundwater flow direction (i.e., a potential localized flat to upward gradient, acting as a groundwater discharge point for the upper portion of the uppermost aquifer). Groundwater flow obtained from the newly installed CCR unit wells indicates that groundwater near Landfill Phases V, VI, VII, and VIII flows towards the north/northwest.

Due to the design, construction, and proximity of historical landfill cells (i.e., Phases II and III) and because there is no practical means of monitoring between the CCR unit landfill cells, NIPSCO's approach for the landfill CCR units includes monitoring Phases V, VI, VII, and VIII as a single CCR unit. Based on the historical groundwater data, NIPSCO determined that future landfill groundwater monitoring should include multi-depth wells (similar to the CCR impoundments).

The well pairs consist of one shallow well that is constructed to an approximate depth of 18 ft bgs and a deep well installed to an approximate depth of 35 ft bgs or to the top of the shale. NIPSCO began construction of a new landfill cell (Phase VII) immediately north of Phase VI in 2018 as shown in Figure 2. Due to the proximity of Phase VII to Phase VI, WSP decommissioned monitoring wells GAMW-21/21B, GAMW-22/22B, GAMW-23/23B, and GAMW-28/28B that were part of the original landfill monitoring network from 2016 to 2018. WSP installed monitoring wells GAMW-38/38B, GAMW-39/39B, GAMW-40/40B, and GAMW-41/41B downgradient and along the waste boundary of Phase VII to replace the decommissioned wells in 2018.

Due to the proximity of Phase VII to Phase VIII, WSP decommissioned monitoring wells GAMW-38/38B, GAMW-39/39B, GAMW-40/40B, and GAMW-41/41B and piezometers GAMW-29/29B and GAMW-30/30B in April 2023. WSP installed monitoring wells GAMW-72/72B, GAMW-73/73B, and GAMW-74/74B downgradient and along the waste boundary of Phase VIII to replace the decommissioned wells. Phase VIII of the landfill is expected to begin receiving waste in 2025.

WSP observed that background well GAMW-20, which was installed in 2016 and is generally upgradient of the landfill, is at times cross-gradient to the landfill due to seasonal fluctuations, and that groundwater quality results indicate GAMW-20 may be impacted due to the seasonal fluctuations. Therefore, the status of GAMW-20 has been changed from background to downgradient.

The updated groundwater monitoring system is adequate to monitor Phases V, VI, VII, and VIII as a single CCR unit. As appropriate, NIPSCO will revise the landfill groundwater monitoring well network as the sequencing of the landfill operation and future development is finalized.

Prior to collecting any groundwater samples, WSP measures water levels to assess groundwater flow direction and hydraulic from each monitoring well and piezometers as described on the following table:

	Phase V, VI, VII, and VIII
Background Monitoring Well	GAMW24, GAMW24B, GAMW25, and GAMW25B
Downgradient Monitoring Well	GAMW20, GAMW26, GAMW26B, GAMW27, GAMW27B, GAMW72, GAMW72B, GAMW73, GAMW73B, GAMW74, GAMW74B
Piezometers (non-CCR Monitoring Wells)	MW-1S/1D, MW-2S/2D, WM-3S/3D, MW-4S/4D, MW-5S/5D, MW-6S/6D, MW-7S/7D, MW-8S/8D, MW-9S/9D, MW-10S/10D, MW-11S/11D, MW-12S/12D, MW-13S/13D, MW-14S/14D, GAMW10, GAMW11, GAPIEZ07, GAMW20B, , GAMW31/31B, GAMW32/32B, GAMW33/33B, GAMW34/34B,

	Phase V, VI, VII, and VIII
	GAMW35B, GAMW36/36B, GAMW37B, GAMW48/48B, GAMW49/49B, GAMW50/50B

A summary of the well construction information is provided in Table 1. The boring and well construction logs are provided in Appendix A and the well decommissioning log is provided in Appendix D. The monitoring well locations are shown in Figure 2.

3.3 Well Development

WSP developed the newly constructed wells using an electric submersible pump (whale pump) that also served as a surge block (1.82 inches in diameter x 27-inches long) to remove particulates that are present in the well casing, filter pack, and adjacent aquifer matrix due to construction activities. Wells were developed using the pump as a surge block and continuous cycles of over-pumping and recovery until relatively clear water is produced, and field parameters (pH, specific conductance, ORP, temperature, and turbidity) stabilize indicating good hydraulic communication with the surrounding water bearing zone in accordance with the GMPIM. The well development logs are provided in Appendix D.

3.4 Well Decommissioning

As discussed in Section 3.2, WSP abandoned monitoring wells GAMW21/21B, GAMW22/22B, GAMW23/23B, GAMW28/28B, GAMW29/29B, GAMW30/30B, GAMW38/38B. GAMW39/39B, GAMW40/40B, GAMW41/41B and GAMW55 in accordance with the well decommissioning procedures provided in the GMPIM. NIPSCO damaged monitoring wells GAMW16/16B during construction activities. Monitoring well GAMW16 was completely removed by the construction excavation activities and the approximate upper 15 feet of PVC casing for GAMW16B was cut off and a licensed driller grouted the remainder of the well. This well could not be overdrilled due to the depth and steep slopes of the excavation (i.e., no drill rig access). The well decommissioning logs are provided in Appendix E.

4.0 FUTURE REVISIONS

In conformance with the applicable requirements of the CCR Rule, this GMSDM addresses the design, placement, construction, and development of the groundwater monitoring wells at the CCR management units at RMSGS. In addition, the GMSDM provides other historical and supporting information relevant to the design basis of the monitoring system. In the event that future amendments to the Federal CCR Rule and/or the Indiana regulations create additional or different requirements, and/or Site changes occur that require modifications to the existing program, WSP, on behalf of NIPSCO, will modify the GMSDM and implement appropriate procedural modifications to the existing program.

5.0 REFERENCES

Applied Geology and Environmental Services (AGES), Semi-annual Groundwater Monitoring Report (April 2016 Sampling) Restricted Waste Landfill (RWS I) RM Schahfer Generating Station, May 2016.

Bugliosi, E. F., 1999. The Midwestern Basins and Arches Regional Aquifer System in Parts of Indiana, Ohio, Michigan, and Illinois-Summary; U.S. Geological Survey Professional Paper 1423-A.

DEQ. 2008. Draft Data Analysis Guidelines for Solid Waste Facilities. Office of Waste Programs. March.

EPA. 1986. RCRA Groundwater Monitoring Technical Enforcement Document. Office of Solid Waste and Emergency Response (OSWER). OSWER-9950.1. September.

EPA. 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance. Office of Resource Conservation and Recovery – Program Implementation and Information Division. March.

EPA. 2014. Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities. [RIN-2050-AE81; FRL-9149-4]. Prepublication Copy. Unofficial Version. December.

EPA. 2014. National Functional Guidelines for Inorganic Data Review (EPA 540-R-013-001, August 2014).

EPA. Various. Test Methods for Evaluating Solid Waste - Physical/Chemical Methods, SW-846 available from URL https://www.epa.gov/hw-sw846/sw-846-compendium

Fenelon, J.M., K.E. Bombay, et al., 1994. Hydrogeologic Atlas of Aquifers in Indiana. U.S. Geological Survey, Water Resources Investigations, Report 92-4142, 1994.

Fraser, G. S., Bleuer, N. K. Fraser, G.S., Bleuer, N.K., 1991, Geologic framework of the aquifers in the Kankakee River lowland: Indiana Geological Survey Occasional Paper 60, 10 p., 9 fig.

Golder, CCR Groundwater Monitoring Program Implementation Manual, October 2017.

Golder, CCR Groundwater Monitoring System Design Manual, October 2017.

Golder, CCR Groundwater Monitoring System Design Manual Revision 1.0, January 2019.

Golder, CCR Groundwater Monitoring System Design Manual Revision 2.0, December 2019.

Golder, CCR Groundwater Monitoring System Design Manual Revision 3.0, November 2020.

Golder, CCR Groundwater Monitoring System Design Manual Revision 4.0, May 2022.

WSP, CCR Groundwater Monitoring System Design Manual Revision 5.0, April 2023.

WSP, CCR Groundwater Monitoring System Design Manual Revision 6.0, July 2023.

WSP, CCR Groundwater Monitoring System Design Manual Revision 7.0, November 2023.

IDNR, 1990, 1994. Bedrock Aquifer Systems of Jasper County, Indiana. Indiana Department of Natural Resources, Division of Water. 2010

IDNR, 1990, 1994. Unconsolidated Aquifer Systems of Jasper County, Indiana. Indiana Department of Natural Resources, Division of Water. 2010

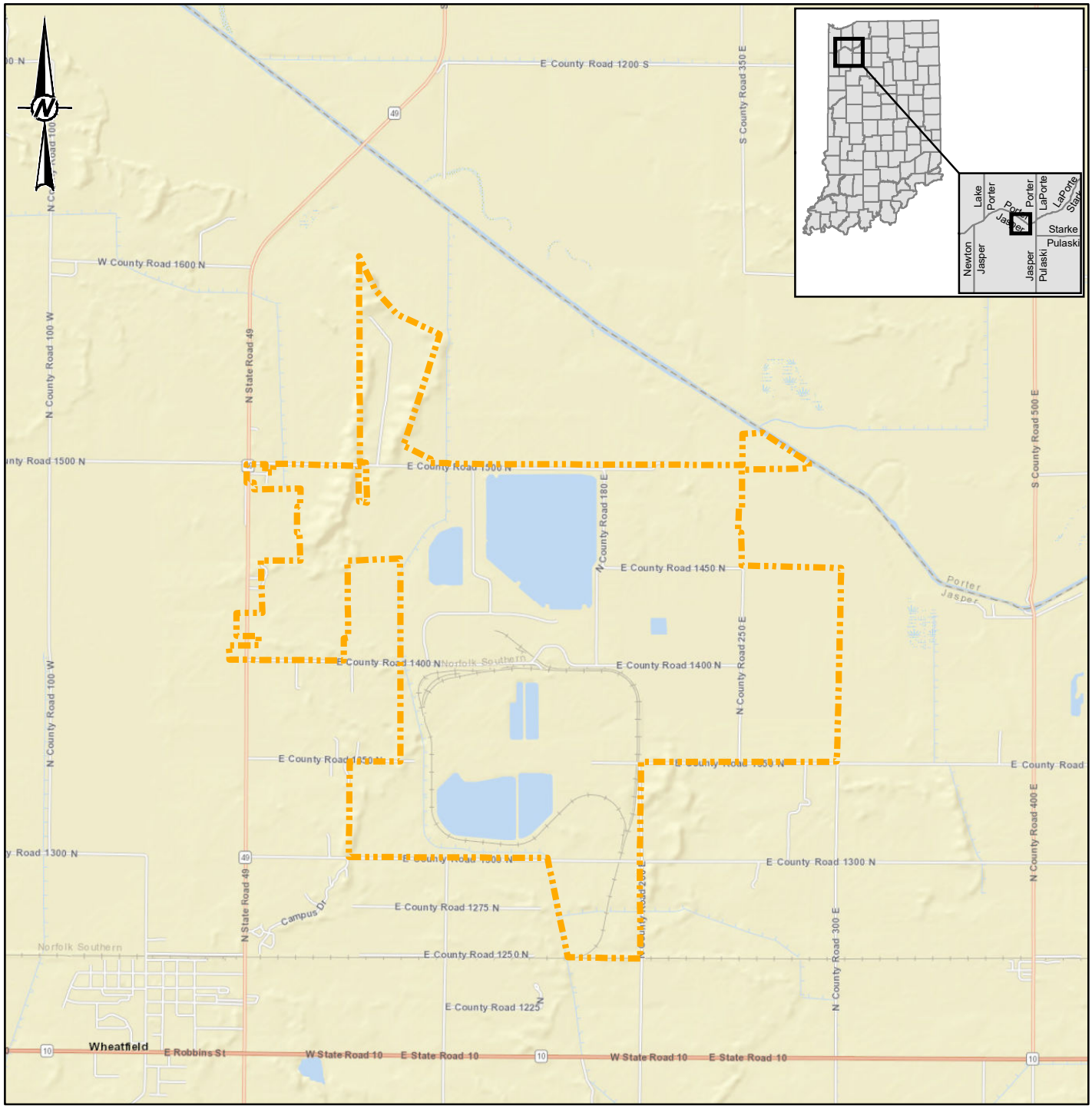
Kearl, P.M., Korte, N.E., and Cronk, T.A. 1992. Suggested modifications to groundwater sampling procedures based on observations from the colloidal borescope: Groundwater Monitoring Review, v.12, No. 2, pp.155-161.

Logan, W.N., Visher, S.S., Cumings, E.R., Tucker, W.M., Malott, C.A., Reeves, J.R., Handbook of Indiana Geology: The Department of Conservation, Division of Geology, 1922

Sanders, Laura L. 1998. A Manual of Field Hydrogeology, 1st Ed., Prentice Hall, 1998. p. 196.

Schneider and Keller, 1970. Schneider, A.F. and Keller, S.J., Geologic Map of the Chicago Quadrangle, Indiana, Illinois, and Michigan; Indiana Geologic Survey, Bloomington. 1970.

U.S. Environmental Protection Agency. 2015. 40 CFR Parts 257 and 261; Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule. April 17, 2015.



LEGEND

Approximate Property Line

0 0.75 1.5

1 " = 0.75 miles Miles

REFERENCE(S)

SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

SITE LOCATION MAP

CONSULTANT

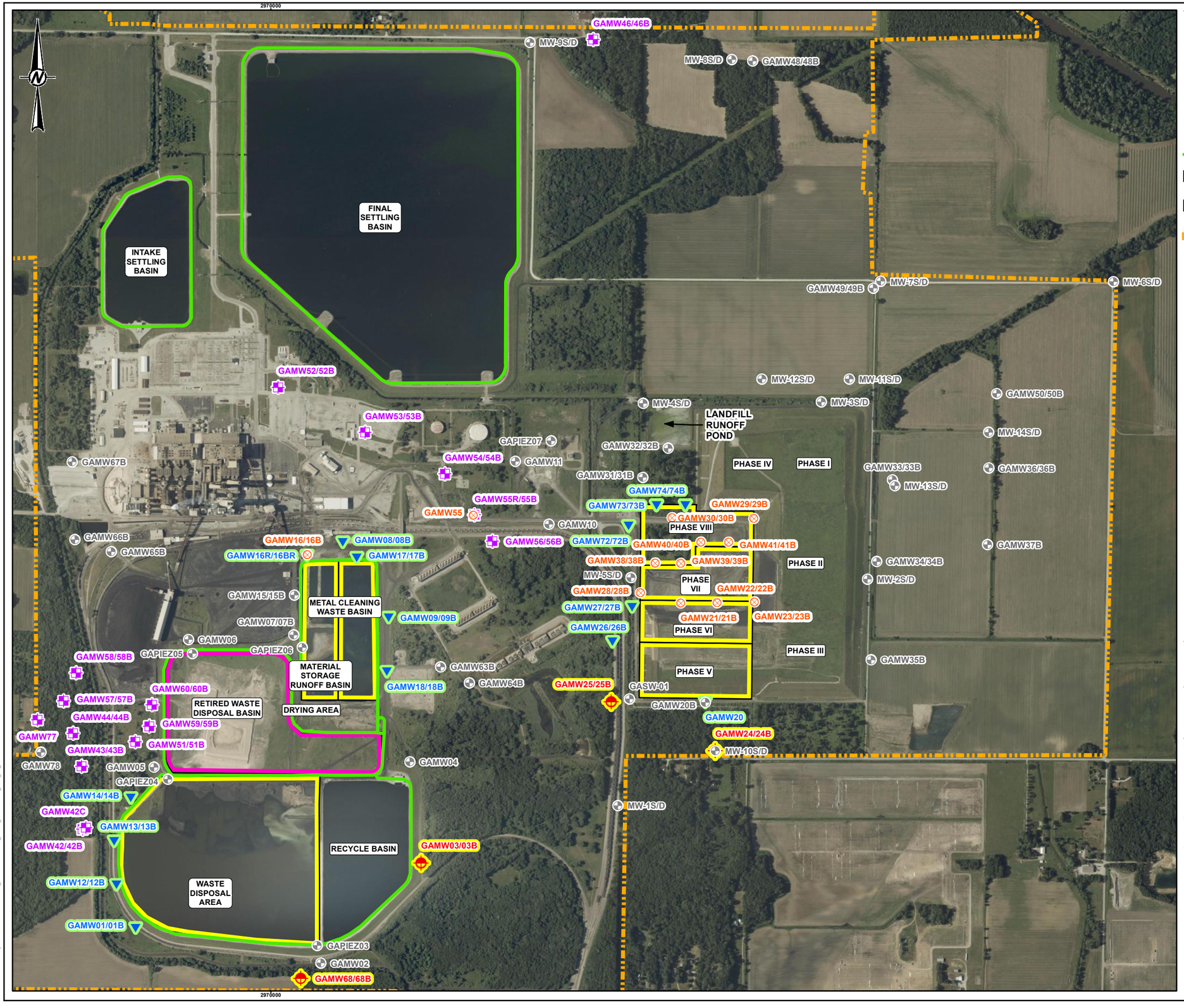
wsp

YYYY-MM-DD	1/04/2021
DESIGNED	DFSC
PREPARED	SHL
REVIEWED	DFSC
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
31406779	A	0	1

PATH: V:\001 GIS Projects\NIPSCO\Schahfer\09_PROJ\18121567_2019Support\40_PROD\0002_Annual_Report\18121567-0002-HS-0001.mxd PRINTED ON: 2019-12-31 AT 12:30:17 PM

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



LEGEND

- Assessment Monitoring Well
- Background Monitoring Well
- Decommissioned CCR Monitoring Well
- Downgradient Monitoring Well
- Non-CCR
- Earth-Fill Dike with One-Foot Slurry Trench Core
- CCR Units
- Approximate Extent of Retired Waste Disposal Basin
- Approximate Property Line

0 1,000 2,000

1 " = 1,050 feet Feet

NOTE(S)

REFERENCE(S)

1. SERVICE LAYER CREDITS: SOURCE: ESRI, USDA FSA

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

MONITORING WELL LOCATION MAP

CONSULTANT

wsp

YYYY-MM-DD	4/17/2024
DESIGNED	DFS
PREPARED	EMM
REVIEWED	TDH
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
31406779	A	0	2

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

PATH: V:\001 GIS Projects\NIPSCO\Schahfer\99_PROJ\164817101_EA\40_PROD\0018_Well_As_Builts\164817101-0018-HS-0002.mxd PRINTED ON: 2024-04-17 AT: 1:59:48 PM

Table 1 Monitoring Well Construction Details
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

CCR Unit	Monitoring Well ID	Ground Surface Elevation (ft-NAVD88)	Total Borehole Depth (ft)	Top of Casing Elevation (ft-NAVD88)	Sounded Well Depth (ft-btoc)	Well Material	Screen Length (ft)	Screen Depth		Screen Elevation		
								Top (ft-bgs)	Bottom (ft-bgs)	Top (ft-NAVD88)	Middle (ft-NAVD88)	Bottom (ft-NAVD88)
WDA	GAMW01	664.90	15.00	668.19	18.86	2" Sch 40 PVC	10.00	5.00	15.00	659.90	654.90	649.90
	GAMW01B	665.20	36.00	667.87	37.80	2" Sch 40 PVC	10.00	26.00	36.00	639.20	634.20	629.20
	GAMW02	666.08	15.00	669.57	19.00	2" Sch 40 PVC	10.00	5.00	15.00	661.08	656.08	651.08
	GAMW03	665.14	15.00	668.77	18.30	2" Sch 40 PVC	10.00	5.00	15.00	660.14	655.14	650.14
	GAMW03B	665.29	35.00	668.16	37.79	2" Sch 40 PVC	10.00	25.00	35.00	640.29	635.29	630.29
	GAMW05	666.69	17.00	669.75	20.01	2" Sch 40 PVC	10.00	7.00	17.00	659.69	654.69	649.69
	GAMW12	664.35	15.00	667.29	18.17	2" Sch 40 PVC	10.00	5.00	15.00	659.35	654.35	649.35
	GAMW12B	664.23	35.00	666.81	37.82	2" Sch 40 PVC	10.00	25.00	35.00	639.23	634.23	629.23
	GAMW13	664.31	15.00	667.24	18.45	2" Sch 40 PVC	10.00	5.00	15.00	659.31	654.31	649.31
	GAMW13B	664.23	35.00	667.12	38.86	2" Sch 40 PVC	10.00	25.00	35.00	639.23	634.23	629.23
	GAMW14	664.76	15.00	667.96	18.43	2" Sch 40 PVC	10.00	5.00	15.00	659.76	654.76	649.76
	GAMW14B	664.62	35.00	667.94	39.19	2" Sch 40 PVC	10.00	25.00	35.00	639.62	634.62	629.62
	GAMW42	663.12	15.00	665.80	17.97	2" Sch 40 PVC	10.00	5.00	15.00	658.12	653.12	648.12
	GAMW42B	663.15	36.00	665.66	36.70	2" Sch 40 PVC	10.00	26.00	36.00	637.15	632.15	627.15
	GAMW42C	663.20	50.00	666.28	52.91	2" Sch 40 PVC	10.00	40.00	50.00	623.20	618.20	613.20
	GAMW43	663.14	15.00	665.59	16.29	2" Sch 40 PVC	10.00	5.00	15.00	658.14	653.14	648.14
	GAMW43B	663.12	26.00	665.53	32.28	2" Sch 40 PVC	10.00	16.00	26.00	647.12	642.12	637.12
	GAMW44	664.11	15.00	666.31	16.02	2" Sch 40 PVC	10.00	5.00	15.00	659.11	654.11	649.11
	GAMW44B	664.11	36.00	666.25	38.82	2" Sch 40 PVC	10.00	26.00	36.00	638.11	633.11	628.11
	GAMW51	666.15	15.00	668.77	18.58	2" Sch 40 PVC	10.00	5.00	15.00	661.15	656.15	651.15
	GAMW51B	666.03	37.00	668.79	39.99	2" Sch 40 PVC	10.00	27.00	37.00	639.03	634.03	629.03
	GAMW57	670.46	15.00	672.97	25.55	2" Sch 40 PVC	10.00	5.00	15.00	665.46	660.46	655.46
	GAMW57B	670.45	45.00	672.88	47.45	2" Sch 40 PVC	10.00	35.00	45.00	635.45	630.45	625.45
	GAMW58	664.99	15.00	667.54	17.58	2" Sch 40 PVC	10.00	5.00	15.00	659.99	654.99	649.99
	GAMW58B	664.88	35.00	667.59	37.81	2" Sch 40 PVC	10.00	25.00	35.00	639.88	634.88	629.88
	GAMW59	665.93	15.00	668.49	17.22	2" Sch 40 PVC	10.00	5.00	15.00	660.93	655.93	650.93
	GAMW59B	665.95	40.00	668.55	42.38	2" Sch 40 PVC	10.00	30.00	40.00	635.95	630.95	625.95
	GAMW60	665.08	15.00	667.50	17.39	2" Sch 40 PVC	10.00	5.00	15.00	660.08	655.08	650.08
	GAMW60B	665.06	40.00	667.50	42.59	2" Sch 40 PVC	10.00	30.00	40.00	635.06	630.06	625.06
	GAMW65B	665.45	35.00	668.67	37.95	2" Sch 40 PVC	10.00	25.00	35.00	640.45	635.45	630.45
	GAMW66B	669.20	44.00	672.99	47.80	2" Sch 40 PVC	10.00	34.00	44.00	635.20	630.20	625.20
	GAMW67B	664.65	40.50	667.97	43.75	2" Sch 40 PVC	10.00	30.50	40.50	634.15	629.15	624.15
	GAMW68	665.93	17.00	665.53	17.03	2" Sch 40 PVC	10.00	7.00	17.00	658.93	653.93	648.93
	GAMW68B	666.00	34.50	665.72	34.78	2" Sch 40 PVC	10.00	24.50	34.50	641.50	636.50	631.50
	GAMW77	665.98	20.00	668.25	21.82	2" Sch 40 PVC	10.00	9.50	19.50	656.48	651.48	646.48
	GAMW78	672.33	20.00	674.71	22.30	2" Sch 40 PVC	10.00	10.00	20.00	662.33	657.33	652.33
MSRB, MCWB, and Drying Area	GAMW03	665.14	15.00	668.77	18.30	2" Sch 40 PVC	10.00	5.00	15.00	660.14	655.14	650.14
	GAMW03B	665.29	35.00	668.16	37.79	2" Sch 40 PVC	10.00	25.00	35.00	640.29	635.29	630.29
	GAMW04	665.81	15.00	669.21	17.86	2" Sch 40 PVC	10.00	5.00	15.00	660.81	655.81	650.81
	GAMW06	667.50	15.00	670.81	18.82	2" Sch 40 PVC	10.00	5.00	15.00	662.50	657.50	652.50
	GAMW07	666.55	15.00	669.89	18.89	2" Sch 40 PVC	10.00	5.00	15.00	661.55	656.55	651.55
	GAMW07B	666.83	40.00	669.39	42.40	2" Sch 40 PVC	10.00	30.00	40.00	636.83	631.83	626.83
	GAMW08	665.95	15.00	669.66	18.78	2" Sch 40 PVC	10.00	5.00	15.00	660.95	655.95	650.95
	GAMW08B	665.92	36.00	668.47	38.79	2" Sch 40 PVC	10.00	26.00	36.00	639.92	634.92	629.92
	GAMW09	665.10	15.00	668.99	18.48	2" Sch 40 PVC	10.00	5.00	15.00	660.10	655.10	650.10
	GAMW09B	665.35	35.00	668.29	37.42	2" Sch 40 PVC	10.00	25.00	35.00	640.35	635.35	630.35
	GAMW15	665.01	15.00	668.25	18.71	2" Sch 40 PVC	10.00	5.00	15.00	660.01	655.01	650.01
	GAMW15B	665.14	35.00	668.05	38.86	2" Sch 40 PVC	10.00	25.00	35.00	640.14	635.14	630.14
	GAMW16*	665.20	15.00	668.37	18.20	2" Sch 40 PVC	10.00	5.00	15.00	660.20	655.20	650.20
	GAMW16R	664.35	20.00	667.17	21.75	2" Sch 40 PVC	10.00	10.00	20.00	654.35	649.35	644.35
	GAMW16B*	665.16	35.00	667.76	40.13	2" Sch 40 PVC	10.00	25.00	35.00	640.16	635.16	630.16
	GAMW16BR	664.39	40.00	667.32	42.45	2" Sch 40 PVC	10.00	30.00	40.00	634.39	629.39	624.39
	GAMW17	668.81	15.00	671.93	18.00	2" Sch 40 PVC	10.00	5.00	15.00	663.81	658.81	653.81
	GAMW17B	668.86	35.00	670.60	40.34	2" Sch 40 PVC	10.00	25.00	35.00	643.86	638.86	633.86
	GAMW18	666.04	15.00	669.07	18.51	2" Sch 40 PVC	10.00	5.00	15.00	661.04	656.04	651.04
	GAMW18B	665.94	35.00	668.47	35.89	2" Sch 40 PVC	10.00	25.00	35.00	640.94	635.94	630.94
	GAMW46	661.99	15.00	664.80	17.50	2" Sch 40 PVC	10.00	5.00	15.00	656.99	651.99	646.99
	GAMW46B	661.98	32.00	664.79	33.00	2" Sch 40 PVC	10.00	22.00	32.00	639.98	634.98	629.98
	GAMW52	664.07	15.00	666.79	18.50	2" Sch 40 PVC	10.00	5.00	15.00	659.07	654.07	649.07
	GAMW52B	664.50	37.00	666.90	39.34	2" Sch 40 PVC	10.00	27.00	37.00	637.50	632.50	627.50
	GAMW53	664.68	15.00	667.24	17.49	2" Sch 40 PVC	10.00	5.00	15.00	659.68	654.68	649.68
	GAMW53B	664.62	36.00	667.29	40.10	2" Sch 40 PVC	10.00	26.00	36.00	638.62	633.62	628.62
	GAMW54	663.87	15.00	666.37	15.46	2" Sch 40 PVC	10.00	5.00	15.00	658.87	653.87	648.87
	GAMW54B	663.98	32.00	666.47	36.41	2" Sch 40 PVC	10.00	22.00	32.00	641.98	636.98	631.98
	GAMW55*	665.06	15.00	667.64	18.68	2" Sch 40 PVC	10.00	5.00	15.00	660.06	655.06	650.06
	GAMW55R	665.36	15.00	667.71	16.31	2" Sch 40 PVC	10.00	5.00	15.00	660.36	655.36	650.36
	GAMW55B	665.18	35.00	667.53	37.60	2" Sch 40 PVC	10.00	25.00	35.00	640.18	635.18	630.18
	GAMW56	665.43	15.00	667.91	15.56	2" Sch 40 PVC	10.00	5.00	15.00	660.43	655.43	650.43
	GAMW56B	665.33	35.00	667.82	36.84	2" Sch 40 PVC	10.00	25.00	35.00	640.33	635.33	630.33
	GAMW63B	666.31	33.00	668.74	35.43	2" Sch 40 PVC	10.00	23.00	33.00	643.31	638.31	633.31
	GAMW64B	664.42	31.00	666.83	33.26	2" Sch 40 PVC	10.00	21.00	31.00	643.42	638.42	633.42
	GAMW68	665.93	17.00	665.53	17.03	2" Sch 40 PVC	10.00	7.00	17.00	658.93	653.93	648.93
	GAMW68B	666.00	34.50	665.72	34.78	2" Sch 40 PVC	10.00	24.50	34.50	641.50	636.50	631.50

Table 1 Monitoring Well Construction Details
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

CCR Unit	Monitoring Well ID	Ground Surface Elevation (ft-NAVD88)	Total Borehole Depth (ft)	Top of Casing Elevation (ft-NAVD88)	Sounded Well Depth (ft-btoc)	Well Material	Screen Length (ft)	Screen Depth		Screen Elevation		
								Top (ft-bgs)	Bottom (ft-bgs)	Top (ft-NAVD88)	Middle (ft-NAVD88)	Bottom (ft-NAVD88)
Landfill Phase V, Phase VI, Phase VII, and Phase VIII	GAMW20	664.61	16.00	667.21	18.95	2" Sch 40 PVC	10.00	6.00	16.00	658.61	653.61	648.61
	GAMW20B	664.48	35.00	667.40	18.22	2" Sch 40 PVC	10.00	25.00	35.00	639.48	634.48	629.48
	GAMW21*	666.60	18.00	668.38	20.36	2" Sch 40 PVC	10.00	8.00	18.00	658.60	653.60	648.60
	GAMW21B*	666.66	37.00	669.37	36.34	2" Sch 40 PVC	10.00	27.00	37.00	639.66	634.66	629.66
	GAMW22*	666.33	18.00	668.64	20.38	2" Sch 40 PVC	13.00	5.00	18.00	661.33	654.83	648.33
	GAMW22B*	666.39	37.00	669.38	37.13	2" Sch 40 PVC	10.00	27.00	37.00	639.39	634.39	629.39
	GAMW23*	667.02	19.00	668.34	20.30	2" Sch 40 PVC	14.00	5.00	19.00	662.02	655.02	648.02
	GAMW23B*	667.03	38.00	670.02	37.92	2" Sch 40 PVC	10.00	28.00	38.00	639.03	634.03	629.03
	GAMW24	662.09	16.00	665.46	20.31	2" Sch 40 PVC	10.00	6.00	16.00	656.09	651.09	646.09
	GAMW24B	662.13	31.00	665.43	35.38	2" Sch 40 PVC	10.00	21.00	31.00	641.13	636.13	631.13
	GAMW25	665.26	16.00	668.07	19.43	2" Sch 40 PVC	10.00	6.00	16.00	659.26	654.26	649.26
	GAMW25B	665.26	35.00	667.97	37.00	2" Sch 40 PVC	10.00	25.00	35.00	640.26	635.26	630.26
	GAMW26	664.89	16.00	667.83	20.00	2" Sch 40 PVC	10.00	6.00	16.00	658.89	653.89	648.89
	GAMW26B	664.91	33.00	667.76	37.08	2" Sch 40 PVC	10.00	23.00	33.00	641.91	636.91	631.91
	GAMW27	662.68	16.00	665.57	20.00	2" Sch 40 PVC	10.00	6.00	16.00	656.68	651.68	646.68
	GAMW27B	662.65	31.00	665.52	34.73	2" Sch 40 PVC	10.00	21.00	31.00	641.65	636.65	631.65
	GAMW28*	662.24	16.00	665.56	20.15	2" Sch 40 PVC	10.00	6.00	16.00	656.24	651.24	646.24
	GAMW28B*	662.32	29.00	665.62	32.92	2" Sch 40 PVC	10.00	19.00	29.00	643.32	638.32	633.32
	GAMW29*	666.58	16.00	669.48	20.39	2" Sch 40 PVC	10.00	6.00	16.00	660.58	655.58	650.58
	GAMW29B*	666.64	36.00	669.43	40.52	2" Sch 40 PVC	10.00	26.00	36.00	640.64	635.64	630.64
	GAMW30*	664.27	16.00	666.92	20.40	2" Sch 40 PVC	10.00	6.00	16.00	658.27	653.27	648.27
	GAMW30B*	664.27	32.00	666.96	35.49	2" Sch 40 PVC	10.00	22.00	32.00	642.27	637.27	632.27
	GAMW31	662.68	16.00	665.39	19.26	2" Sch 40 PVC	10.00	6.00	16.00	656.68	651.68	646.68
	GAMW31B	662.69	30.00	665.40	32.10	2" Sch 40 PVC	10.00	20.00	30.00	642.69	637.69	632.69
	GAMW32	665.44	18.00	668.09	21.07	2" Sch 40 PVC	10.00	8.00	18.00	657.44	652.44	647.44
	GAMW32B	665.53	34.00	668.25	36.93	2" Sch 40 PVC	10.00	24.00	34.00	641.53	636.53	631.53
	GAMW33	662.63	16.00	665.24	20.33	2" Sch 40 PVC	10.00	6.00	16.00	656.63	651.63	646.63
	GAMW33B	662.43	31.00	665.25	35.35	2" Sch 40 PVC	10.00	21.00	31.00	641.43	636.43	631.43
	GAMW34	661.78	16.00	664.83	20.28	2" Sch 40 PVC	10.00	6.00	16.00	655.78	650.78	645.78
	GAMW34B	661.65	29.00	664.84	30.48	2" Sch 40 PVC	10.00	19.00	29.00	642.65	637.65	632.65
	GAMW35B	661.78	24.00	664.61	26.66	2" Sch 40 PVC	10.00	14.00	24.00	647.78	642.78	637.78
	GAMW36	662.24	16.00	664.97	20.28	2" Sch 40 PVC	10.00	6.00	16.00	656.24	651.24	646.24
	GAMW36B	662.35	25.50	665.04	35.33	2" Sch 40 PVC	1.00	24.50	25.50	637.85	637.35	636.85
	GAMW37B	662.68	25.00	665.36	27.78	2" Sch 40 PVC	10.00	15.00	25.00	647.68	642.68	637.68
	GAMW38*	660.93	15.00	663.29	17.97	2" Sch 40 PVC	10.00	5.00	15.00	655.93	650.93	645.93
	GAMW38B*	660.81	29.50	663.31	32.00	2" Sch 40 PVC	10.00	19.50	29.50	641.31	636.31	631.31
	GAMW39*	661.04	15.00	663.53	17.95	2" Sch 40 PVC	10.00	5.00	15.00	656.04	651.04	646.04
	GAMW39B*	660.96	29.50	663.49	31.15	2" Sch 40 PVC	10.00	19.50	29.50	641.46	636.46	631.46
	GAMW40*	664.11	15.00	666.56	19.94	2" Sch 40 PVC	10.00	5.00	15.00	659.11	654.11	649.11
	GAMW40B*	664.05	31.50	666.40	35.16	2" Sch 40 PVC	10.00	21.50	31.50	642.55	637.55	632.55
	GAMW41*	660.09	15.00	662.43	16.40	2" Sch 40 PVC	10.00	5.00	15.00	655.09	650.09	645.09
	GAMW41B*	660.08	27.00	662.17	30.04	2" Sch 40 PVC	10.00	17.00	27.00	643.08	638.08	633.08
	GAMW48	660.81	15.00	663.38	17.00	2" Sch 40 PVC	10.00	5.00	15.00	655.81	650.81	645.81
	GAMW48B	660.44	30.00	663.33	32.30	2" Sch 40 PVC	10.00	20.00	30.00	640.44	635.44	630.44
	GAMW49	662.00	15.00	664.64	14.18	2" Sch 40 PVC	10.00	5.00	15.00	657.00	652.00	647.00
	GAMW49B	662.12	33.00	664.52	34.82	2" Sch 40 PVC	10.00	23.00	33.00	639.12	634.12	629.12
	GAMW50	662.52	15.00	665.17	19.60	2" Sch 40 PVC	10.00	5.00	15.00	657.52	652.52	647.52
	GAMW50B	662.28	31.00	664.90	31.79	2" Sch 40 PVC	10.00	21.00	31.00	641.28	636.28	631.28
	GAMW-72	664.44	15.00	666.93	17.83	2" Sch 40 PVC	10.00	5.00	15.00	659.44	654.44	649.44
	GAMW-72B	664.47	31.00	666.88	33.68	2" Sch 40 PVC	10.00	21.00	31.00	643.47	638.47	633.47
	GAMW-73	661.85	15.00	664.26	17.62	2" Sch 40 PVC	10.00	5.00	15.00	656.85	651.85	646.85
	GAMW-73B	661.90	28.00	664.31	30.65	2" Sch 40 PVC	10.00	18.00	28.00	643.90	638.90	633.90
	GAMW-74	661.97	15.00	664.44	17.82	2" Sch 40 PVC	10.00	5.00	15.00	656.97	651.97	646.97
	GAMW-74B	661.89	28.00	664.21	30.59	2" Sch 40 PVC	10.00	18.00	28.00	643.89	638.89	633.89
	GAMW10	663.99	15.00	667.83	18.75	2" Sch 40 PVC	10.00	5.00	15.00	658.99	653.99	648.99
	GAMW11	663.60	15.00	667.17	19.18	2" Sch 40 PVC	10.00	5.00	15.00	658.60	653.60	648.60

Table 1 Monitoring Well Construction Details
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

CCR Unit	Monitoring Well ID	Ground Surface Elevation (ft-NAVD88)	Total Borehole Depth (ft)	Top of Casing Elevation (ft-NAVD88)	Sounded Well Depth (ft-btoc)	Well Material	Screen Length (ft)	Screen Depth		Screen Elevation		
								Top (ft-bgs)	Bottom (ft-bgs)	Top (ft-NAVD88)	Middle (ft-NAVD88)	Bottom (ft-NAVD88)
Landfill Phase V, Phase VI, Phase VII, and Phase VIII	MW-1D	666.36	NA	668.86	33.68	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-1S	666.43	NA	668.81	19.52	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-2S	662.10	NA	664.10	11.96	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-3D	664.84	NA	667.58	29.75	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-3S	664.82	NA	667.58	18.41	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-4D	664.13	NA	666.56	33.24	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-4S	664.26	NA	666.90	17.51	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-5D	662.75	NA	664.37	31.00	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-5S	662.72	NA	664.29	16.19	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-6D	661.79	NA	664.64	33.29	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-6S	662.01	NA	664.61	19.06	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-7D	662.01	NA	664.72	32.91	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-7S	661.99	NA	664.80	16.33	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-8D	661.34	NA	663.52	35.42	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-8S	661.42	NA	663.75	18.04	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-9D	661.84	NA	662.68	39.20	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-9S	661.83	NA	662.42	19.53	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-10D	662.20	NA	663.18	31.22	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-10S	661.95	NA	662.53	14.68	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-11D	661.51	NA	663.57	32.86	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-11S	661.46	NA	663.25	17.18	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-12D	661.58	NA	663.60	32.75	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-12S	661.54	NA	663.48	16.83	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-13D	662.03	NA	664.80	32.52	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-13S	662.22	NA	664.67	17.90	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-14D	662.64	NA	665.41	33.20	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	MW-14S	662.57	NA	665.24	17.72	2" Sch 40 PVC	NA	NA	NA	NA	NA	NA
	GAPIEZ07	665.15	15.00	668.77	18.91	2" Sch 40 PVC	10.00	5.00	15.00	660.15	655.15	650.15

Notes

ft-bgs = Feet below ground surface

ft-btoc = Feet below top of casing

ft-NAVD88 = Feet relative to the North American Vertical Datum of 1988

WDA = Waste Disposal Area

MSRB = Material Storage Runoff Basin

MCWB = Metal Cleaning Waste Basin

No highlight indicates well is not part of the CCR monitoring program, however, water levels are measured in these wells to supplement groundwater contour maps.

Yellow highlight indicates a CCR background well

Green highlight indicates a CCR downgradient well

2" Sch 40 PVC = Two-inch diameter well, constructed of schedule 40 polyvinyl chloride materials

Survey elevations for new wells obtained from Surveying and Mapping, LLC, formerly Marbach, Brady, and Weaver survey, June 2016, August 2018, June 2019, June 2020, October 2020, amd November 2023, and from DLZ in May 2023.

*Decommissioned monitoring well.

Prepared by: TDH
Checked by: DFSC
Reviewed by: MAH

Table 2 Vertical Groundwater Flow Calculation
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Monitoring Well Locations	Ground Surface Elevation (ft-NAVD88)	Top of Casing Elevation (ft-NAVD88)	Screen Interval				June 13, 2016				July 11, 2016				September 6, 2016			
			Top (ft-bgs)	Bottom (ft-bgs)	Center (ft-bgs)	Center (ft-NAVD88)	Depth To Water (ft-btoc)	Groundwater Elevation (ft-NAVD88)	Vertical Gradient (ft/ft)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-NAVD88)	Vertical Gradient (ft/ft)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-NAVD88)	Vertical Gradient (ft/ft)	Flow Direction
GAMW03	665.14	668.77	5	15	10	655.51	7.40	661.37	-2.85E-02	Down	8.43	660.34	-2.85E-02	Down	7.39	661.38	-2.80E-02	Down
GAMW03B	665.29	668.16	25	35	29.5	635.87	7.35	660.81			8.38	659.78			7.33	660.83		
GAMW09	665.10	668.99	5	15	10	655.51	9.02	659.97	-2.19E-02	Down	10.09	658.90	-2.14E-02	Down	8.41	660.58	-2.24E-02	Down
GAMW09B	665.35	668.29	24.5	34.5	29.5	635.87	8.75	659.54			9.81	658.48			8.15	660.14		
GAMW13	664.31	667.24	5	15	10	653.79	8.61	658.63	4.87E-04	Up	8.87	658.37	-4.87E-04	Down	8.25	658.99	0.00E+00	Up
GAMW13B	664.23	667.12	25	35	30	633.26	8.48	658.64			8.76	658.36			8.13	658.99		
GAMW14	664.76	667.96	5	15	10	654.53	9.47	658.49	4.81E-04	Up	9.72	658.24	0.00E+00	Up	8.83	659.13	9.62E-04	Up
GAMW14B	664.62	667.94	26	36	31	633.75	9.44	658.50			9.70	658.24			8.79	659.15		
GAMW15	665.01	668.25	5	15	10	654.54	8.59	659.66	-4.91E-04	Down	8.82	659.43	0.00E+00	Up	7.32	660.93	1.97E-03	Up
GAMW15B	665.14	668.05	27.7	37.7	32.7	634.19	8.40	659.65			8.62	659.43			7.08	660.97		
GAMW16	665.20	668.37	5	15	10	655.17	9.21	659.16	-1.33E-02	Down	9.61	658.76	4.44E-04	Up	8.08	660.29	4.44E-04	Up
GAMW16B	665.16	667.76	27.75	37.75	32.75	632.63	8.90	658.86			8.99	658.77			7.46	660.30		
GAMW17	668.81	671.93	5	15	10	658.93	13.13	658.80	4.22E-04	Up	9.72	662.21	-1.66E-01	Down	12.05	659.88	-4.22E-04	Down
GAMW17B	668.86	670.6	28	38	33	635.26	11.79	658.81			12.31	658.29			10.73	659.87		
GAMW20	664.61	667.21	6	16	11	653.26	8.70	658.51	1.24E-03	Up	8.22	658.99	6.20E-04	Up	7.18	660.03	-6.20E-04	Down
GAMW20B	664.48	667.4	22.5	32.5	27.5	637.14	8.87	658.53			8.40	659.00			7.38	660.02		
GAMW21	666.60	668.38	8	18	13	653.02	10.40	657.98	6.67E-04	Up	10.57	657.81	-5.34E-03	Down	10.20	658.18	6.67E-04	Up
GAMW21B	666.66	669.37	24	34	29	638.03	11.38	657.99			11.64	657.73			11.18	658.19		
GAMW22	666.33	668.64	8	18	13	653.26	10.56	658.08	4.37E-03	Up	10.73	657.91	6.25E-04	Up	10.18	658.46	0.00E+00	Up
GAMW22B	666.39	669.38	25	35	30	637.25	11.23	658.15			11.46	657.92			10.92	658.46		
GAMW23	667.02	668.34	9	19	14	653.04	10.10	658.24	5.65E-03	Up	10.34	658.00	1.25E-03	Up	9.73	658.61	-2.51E-03	Down
GAMW23B	667.03	670.02	25	35	30	637.10	11.69	658.33			12.00	658.02			11.45	658.57		
GAMW24	662.09	665.46	6	16	10	655.51	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA
GAMW24B	662.13	665.43	21	31	29.5	635.87	-	-			-	-			-	-		
GAMW25	665.26	668.07	6	16	11	653.79	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA
GAMW25B	665.26	667.97	25	35	30	633.26	-	-			-	-			-	-		
GAMW26	664.89	667.83	6	16	11	654.53	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA
GAMW26B	664.91	667.76	23	33	28	633.75	-	-			-	-			-	-		
GAMW27	662.68	665.57	6	16	11	654.54	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA
GAMW27B	662.65	665.52	21	31	26	634.19	-	-			-	-			-	-		
GAMW28	662.24	665.56	6	16	11	655.17	-	-	NA	NA	-	-	NA	NA	-	-	NA	NA
GAMW28B	662.32	665.62	19	29	24	632.63	-	-			-	-			-	-		

Notes:

ft-bgs = Feet below ground surface

ft-btoc = Feet below top of casing

ft-NAVD88 = Feet relative to the North American Vertical Datum of 1988

ft/ft = Feet/Foot

NA- not applicable, well was not yet installed

Table 2 Vertical Groundwater Flow Calculation
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Monitoring Well Locations	Ground Surface Elevation (ft-NAVD88)	Top of Casing Elevation (ft-NAVD88)	Screen Interval				November 7, 2016				January 4, 2017				February 27, 2017			
			Top (ft-bgs)	Bottom (ft-bgs)	Center (ft-bgs)	Center (ft-NAVD88)	Depth To Water (ft-btoc)	Groundwater Elevation (ft-NAVD88)	Vertical Gradient (ft/ft)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-NAVD88)	Vertical Gradient (ft/ft)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-NAVD88)	Vertical Gradient (ft/ft)	Flow Direction
GAMW03	665.14	668.77	5	15	10	655.51	7.27	661.50	-2.60E-02	Down	6.17	662.60	-3.11E-02	Down	6.13	662.64	-2.85E-02	Down
GAMW03B	665.29	668.16	25	35	29.5	635.87	7.17	660.99			6.17	661.99			6.08	662.08		
GAMW09	665.10	668.99	5	15	10	655.51	8.92	660.07	-2.34E-02	Down	8.95	660.04	-2.09E-02	Down	8.50	660.49	-2.09E-02	Down
GAMW09B	665.35	668.29	24.5	34.5	29.5	635.87	8.68	659.61			8.66	659.63			8.21	660.08		
GAMW13	664.31	667.24	5	15	10	653.79	7.06	660.18	-4.87E-04	Down	7.61	659.63	0.00E+00	Up	7.89	659.35	-4.87E-04	Down
GAMW13B	664.23	667.12	25	35	30	633.26	6.95	660.17			7.49	659.63			7.78	659.34		
GAMW14	664.76	667.96	5	15	10	654.53	8.40	659.56	1.44E-03	Up	8.31	659.65	-2.89E-03	Down	8.57	659.39	4.81E-04	Up
GAMW14B	664.62	667.94	26	36	31	633.75	8.35	659.59			8.35	659.59			8.54	659.40		
GAMW15	665.01	668.25	5	15	10	654.54	6.76	661.49	0.00E+00	Up	8.63	659.62	0.00E+00	Up	7.35	660.90	4.91E-04	Up
GAMW15B	665.14	668.05	27.7	37.7	32.7	634.19	6.56	661.49			8.43	659.62			7.14	660.91		
GAMW16	665.20	668.37	5	15	10	655.17	8.24	660.13	4.39E-02	Up	9.18	659.19	4.44E-04	Up	8.66	659.71	2.22E-03	Up
GAMW16B	665.16	667.76	27.75	37.75	32.75	632.63	6.64	661.12			8.56	659.20			8.00	659.76		
GAMW17	668.81	671.93	5	15	10	658.93	12.60	659.33	-4.22E-04	Down	NA	-	NA	NA	12.67	659.26	0.00E+00	Up
GAMW17B	668.86	670.6	28	38	33	635.26	11.28	659.32			11.62	658.98			11.34	659.26		
GAMW20	664.61	667.21	6	16	11	653.26	8.10	659.11	-6.20E-04	Down	8.82	658.39	6.20E-04	Up	8.85	658.36	6.20E-04	Up
GAMW20B	664.48	667.4	22.5	32.5	27.5	637.14	8.30	659.10			9.00	658.40			9.03	658.37		
GAMW21	666.60	668.38	8	18	13	653.02	9.84	658.54	-6.67E-04	Down	10.61	657.77	6.34E-02	Up	10.00	658.38	2.00E-03	Up
GAMW21B	666.66	669.37	24	34	29	638.03	10.84	658.53			10.65	658.72			10.96	658.41		
GAMW22	666.33	668.64	8	18	13	653.26	9.95	658.69	-6.25E-04	Down	9.82	658.82	7.10E-15	Up	10.18	658.46	1.25E-03	Up
GAMW22B	666.39	669.38	25	35	30	637.25	10.70	658.68			10.56	658.82			10.90	658.48		
GAMW23	667.02	668.34	9	19	14	653.04	9.60	658.74	0.00E+00	Up	9.46	658.88	0.00E+00	Up	9.78	658.56	-7.13E-15	Down
GAMW23B	667.03	670.02	25	35	30	637.10	11.28	658.74			11.14	658.88			11.46	658.56		
GAMW24	662.09	665.46	6	16	10	655.51	6.05	659.41	-1.53E-03	Down	6.28	659.18	1.53E-03	Up	6.40	659.06	2.55E-03	Up
GAMW24B	662.13	665.43	21	31	29.5	635.87	6.05	659.38			6.22	659.21			6.32	659.11		
GAMW25	665.26	668.07	6	16	11	653.79	9.28	658.79	-9.74E-04	Down	9.28	658.79	-1.95E-03	Down	9.31	658.76	-1.46E-03	Down
GAMW25B	665.26	667.97	25	35	30	633.26	9.20	658.77			9.22	658.75			9.24	658.73		
GAMW26	664.89	667.83	6	16	11	654.53	9.44	658.39	-3.37E-03	Down	9.36	658.47	-4.33E-03	Down	9.41	658.42	-4.33E-03	Down
GAMW26B	664.91	667.76	23	33	28	633.75	9.44	658.32			9.38	658.38			9.43	658.33		
GAMW27	662.68	665.57	6	16	11	654.54	7.25	658.32	2.46E-03	Up	7.15	658.42	4.91E-04	Up	7.22	658.35	9.83E-04	Up
GAMW27B	662.65	665.52	21	31	26	634.19	7.15	658.37			7.09	658.43			7.15	658.37		
GAMW28	662.24	665.56	6	16	11	655.17	7.15	658.41	-1.77E-03	Down	7.07	658.49	-4.44E-04	Down	7.31	658.25	2.66E-03	Up
GAMW28B	662.32	665.62	19	29	24	632.63	7.25	658.37			7.14	658.48			7.31	658.31		

Notes:

ft-bgs = Feet below ground surface

ft-btoc = Feet below top of casing

ft-NAVD88 = Feet relative to the North American Vertical Datum of 1988

ft/ft = Feet/Foot

NA- not applicable, well was not yet installed

Table 2 Vertical Groundwater Flow Calculation
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Monitoring Well Locations	Ground Surface Elevation (ft-NAVD88)	Top of Casing Elevation (ft-NAVD88)	Screen Interval				April 24, 2017				June 26, 2017				Average Vertical Gradient	Flow Direction
			Top (ft-bgs)	Bottom (ft-bgs)	Center (ft-bgs)	Center (ft-NAVD88)	Depth To Water (ft-btoc)	Groundwater Elevation (ft-NAVD88)	Vertical Gradient (ft/ft)	Flow Direction	Depth To Water (ft-btoc)	Groundwater Elevation (ft-NAVD88)	Vertical Gradient (ft/ft)	Flow Direction		
GAMW03	665.14	668.77	5	15	10	655.51	5.08	663.69	-2.95E-02	Down	7.62	661.15	-2.90E-02	Down	-2.86E-02	Down
GAMW03B	665.29	668.16	25	35	29.5	635.87	5.05	663.11			7.58	660.58				
GAMW09	665.10	668.99	5	15	10	655.51	7.59	661.40	-1.93E-02	Down	8.30	660.69	-2.14E-02	Down	-2.14E-02	Down
GAMW09B	665.35	668.29	24.5	34.5	29.5	635.87	7.27	661.02			8.02	660.27				
GAMW13	664.31	667.24	5	15	10	653.79	7.77	659.47	0.00E+00	Up	8.52	658.72	0.00E+00	Up	-1.22E-04	Down
GAMW13B	664.23	667.12	25	35	30	633.26	7.65	659.47			8.40	658.72				
GAMW14	664.76	667.96	5	15	10	654.53	8.39	659.57	9.62E-04	Up	9.42	658.54	9.62E-04	Up	3.01E-04	Up
GAMW14B	664.62	667.94	26	36	31	633.75	8.35	659.59			9.38	658.56				
GAMW15	665.01	668.25	5	15	10	654.54	7.00	661.25	1.47E-03	Up	8.00	660.25	0.00E+00	Up	4.30E-04	Up
GAMW15B	665.14	668.05	27.7	37.7	32.7	634.19	6.77	661.28			7.80	660.25				
GAMW16	665.20	668.37	5	15	10	655.17	7.87	660.50	8.87E-04	Up	8.72	659.65	1.33E-03	Up	4.55E-03	Up
GAMW16B	665.16	667.76	27.75	37.75	32.75	632.63	7.24	660.52			8.08	659.68				
GAMW17	668.81	671.93	5	15	10	658.93	11.75	660.18	8.45E-04	Up	12.30	659.63	1.65E-02	Up	-2.12E-02	Down
GAMW17B	668.86	670.6	28	38	33	635.26	10.40	660.20			10.58	660.02				
GAMW20	664.61	667.21	6	16	11	653.26	8.95	658.26	1.24E-03	Up	7.05	660.16	2.48E-03	Up	6.98E-04	Up
GAMW20B	664.48	667.4	22.5	32.5	27.5	637.14	9.12	658.28			7.20	660.20				
GAMW21	666.60	668.38	8	18	13	653.02	9.94	658.44	2.00E-03	Up	8.90	659.48	2.67E-03	Up	8.17E-03	Up
GAMW21B	666.66	669.37	24	34	29	638.03	10.90	658.47			9.85	659.52				
GAMW22	666.33	668.64	8	18	13	653.26	10.02	658.62	6.25E-04	Up	9.42	659.22	1.25E-03	Up	9.37E-04	Up
GAMW22B	666.39	669.38	25	35	30	637.25	10.75	658.63			10.14	659.24				
GAMW23	667.02	668.34	9	19	14	653.04	9.55	658.79	1.88E-03	Up	9.22	659.12	0.00E+00	Up	7.84E-04	Up
GAMW23B	667.03	670.02	25	35	30	637.10	11.20	658.82			10.90	659.12				
GAMW24	662.09	665.46	6	16	10	655.51	6.08	659.38	2.55E-03	Up	5.35	660.11	3.56E-03	Up	1.73E-03	Up
GAMW24B	662.13	665.43	21	31	29.5	635.87	6.00	659.43			5.25	660.18				
GAMW25	665.26	668.07	6	16	11	653.79	9.00	659.07	1.70E-02	Up	8.00	660.07	0.00E+00	Up	2.53E-03	Up
GAMW25B	665.26	667.97	25	35	30	633.26	8.55	659.42			7.90	660.07				
GAMW26	664.89	667.83	6	16	11	654.53	9.45	658.38	-3.37E-03	Down	7.70	660.13	-5.29E-03	Down	-4.14E-03	Down
GAMW26B	664.91	667.76	23	33	28	633.75	9.45	658.31			7.74	660.02				
GAMW27	662.68	665.57	6	16	11	654.54	7.34	658.23	2.46E-03	Up	5.35	660.22	-4.91E-04	Down	1.18E-03	Up
GAMW27B	662.65	665.52	21	31	26	634.19	7.24	658.28			5.31	660.21				
GAMW28	662.24	665.56	6	16	11	655.17	7.35	658.21	2.66E-03	Up	5.75	659.81	2.66E-03	Up	1.15E-03	Up
GAMW28B	662.32	665.62	19	29	24	632.63	7.35	658.27			5.75	659.87				

Notes:

ft-bgs = Feet below ground surface
ft-btoc = Feet below top of casing
ft-NAVD88 = Feet relative to the North American Vertical Datum of 1988
ft/ft = Feet/Foot
NA- not applicable, well was not yet installed

Prepared by: AMH
Checked by: DFS
Reviewed by: MAH

APPENDIX A

Boring Logs

BOREHOLE LOG: GAMW-01

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2169108.216 E: 2968518.988
GROUND SURFACE ELEV.: 664.98
TOP OF CASING ELEV.: 668.19
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: Track Mounted Diedrich D-50
START DATE/TIME: 6/26/2015
END DATE/TIME: 6/26/2015

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	dark brown to black fine SILTY SAND, some gravel		1	SS		0.25 / 2	0-2': SILTY GRAVEL, fine to coarse, poorly-graded, black, non-cohesive, dry, loose. (GM) SPTs (1-5-5-1)		Bentonite chips 0-3 ft-bgs
			2	SS		2 / 2	2-4': SILTY SAND, fine, poorly-graded, dark brown, trace gravel, non-cohesive, dry, loose. (SM) SPTs (6-3-3-4)		Filter Pack #7 Sand 3-3.5 ft-bgs
660.0									Filter Pack #5 Sand 3.5-15 ft-bgs
	reddish-brown fine to medium SILTY SAND		3	SS		1.5 / 2	5-5.75': SILTY SAND, fine, poorly-graded, dark brown, trace gravel, non-cohesive, dry, loose. (SM) 5.75-7': SAND, fine, poorly-graded, reddish-brown, trace silt, wet, compact. (SP) SPTs (7-7-5-8)		2" PVC Screen slot 0.010" 5-15 ft-bgs
655.0									
	gray to brown medium to coarse SAND, trace silt		4	SS		2 / 2	10-11': SAND, fine, poorly-graded, reddish-brown, trace silt, wet, compact. (SP) 11-12': SAND, medium to coarse, well-graded, gray to brown, trace silt, wet, loose. (SP) SPTs (5-4-5-8)		
650.0									
645.0									
640.0									
635.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: Track Mounted Diedrich D-50

LOGGED BY: AP
CHECKED BY: CEM
DATE: 7/27/15

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-01B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 41
DEPTH TO BEDROCK: 36

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2169107.374 E: 2968525.2
GROUND SURFACE ELEV.: 665.2
TOP OF CASING ELEV.: 667.85
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/31/2018 11:00:00 AM
END DATE/TIME: 7/31/2018 11:30:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	light brown fine SAND and rounded GRAVEL, some silt			RS			0-1.3': SAND and rounded GRAVEL <2 inch, fine, poorly-graded, light brown, some silt, dry. (SP)		Bentonite Grout 0-22 ft bgs
	dark brown fine SILTY SAND			RS			1.3-2.5': SILTY SAND, fine, poorly-graded, dark brown, cohesive, wet. (SM)		
660.0	light gray fine to coarse SAND			RS			5-5.2': SAND, fine to medium, well-graded, light and dark gray, wet. (SW)		
				RS			5.2-7': SAND, fine to coarse, well-graded, light gray, wet. (SW)		
655.0				RS			10-13.75': SAND, fine to coarse, well-graded, light gray, wet. (SW)		
650.0	light gray fine to coarse SAND, trace to some gravel			RS			16-20': SAND, coarse, poorly-graded, light gray, some fine to medium sand, trace rounded gravel <1 cm, wet. (SP)		
645.0									Bentonite Chips 22-24 ft bgs #5 Sand Filter Pack 24-36 ft bgs

LITHOLOGY LEGEND

USCS Poorly-graded Gravelly Sand (SPG)
Shale
USCS Silty Sand (SM)
USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/13/18

BOREHOLE LOG: GAMW-01B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 41
DEPTH TO BEDROCK: 36

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2169107.374 E: 2968525.2
GROUND SURFACE ELEV.: 665.2
TOP OF CASING ELEV.: 667.85
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/31/2018 11:00:00 AM
END DATE/TIME: 7/31/2018 11:30:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
640.0	light gray fine to coarse SAND, trace to some gravel		SB-01B-25'-27'	RS			25-27': SAND, fine to coarse, well-graded, light gray, some rounded gravel <1 inch, wet. (SW)		2" PVC Screen slot 0.010 26-36 ft bgs
				RS			27-27.2': SAND, coarse, light gray. (SP) 27.2-28.7': SAND, fine to coarse, well-graded, light gray, some rounded gravel <1 inch, wet. (SW)		
635.0									
630.0	gray clayey SHALE		SB-01B-36'-37'	RS			36-37': CLAYEY SHALE, gray, wet.		#5 Sand 36-41 ft bgs
				RS			37-40': CLAYEY SHALE, gray, wet.		
625.0			SB-01B-40'-41'	RS			40-41': CLAYEY SHALE, gray, wet.		
620.0									

LITHOLOGY LEGEND

USCS Poorly-graded Gravelly Sand (SPG)
Shale
USCS Silty Sand (SM)
USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/13/18

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-02

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2168720.879 E: 2970548.504
GROUND SURFACE ELEV.: 666.08
TOP OF CASING ELEV.: 669.57
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 75
START DATE/TIME: 6/26/2015
END DATE/TIME: 6/26/2015

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	light brown fine SAND, trace silt		1	SS		2 / 2	0-0.58': ORGANIC SILT, some sand, low-plasticity, dark brown, plant roots, non-cohesive, dry, loose. (OL) 0.58-2': SAND, fine, poorly-graded, light brown, trace gravel, trace silt, moist, loose. (SP) SPTs (2-4-3-5)		Cement and bentonite grout mix 0-1.5 ft-bgs
									Bentonite chips 1.5-3.5 ft-bgs
									Filter Pack #7 Sand 3.5-4 ft-bgs
660.0	reddish-brown fine to medium SILTY SAND		2	SS		2 / 2	5-6': SAND, fine, poorly-graded, trace gravel, trace silt, light brown, moist, loose. (SP) 6-7': SILTY SAND, fine to medium, poorly-graded, reddish-brown, non-cohesive, wet, loose. (SM) SPTs (7-6-4-7)		Filter Pack #5 Sand 4-15 ft-bgs
									2" PVC Screen slot 0.010" 5-15 ft-bgs
655.0	gray to brown fine SAND		3	SS		2 / 2	10-11': SILTY SAND, fine to medium, poorly-graded, reddish-brown, non-cohesive, wet, loose. (SM) 11-12': SAND, fine, poorly-graded, gray to brown, wet, compact. (SP) SPTs (4-5-7-9)		
650.0									
645.0									
640.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

USCS Silty Sand (SM)

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 75

LOGGED BY: AP
CHECKED BY: CEM
DATE: 7/27/15

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-03

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2169821.527 E: 2971646.342
GROUND SURFACE ELEV.: 665.11
TOP OF CASING ELEV.: 668.77
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 75
START DATE/TIME: 6/27/2015
END DATE/TIME: 6/27/2015

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	dark brown fine SILTY SAND		1	SS		1.83 / 2	0-2': SILTY SAND, fine, poorly-graded, dark brown, plant roots, trace gravel, trace silt, moist, loose. (SM) SPTs (2-2-2-3)		Cement and bentonite grout mix 0-1.5 ft-bgs Bentonite chips 1.5-3.5 ft-bgs Filter Pack #7 Sand 3.5-4 ft-bgs Filter Pack #5 Sand 4-15 ft-bgs 2" PVC Screen slot 0.010" 5-15 ft-bgs
660.0	gray to brown fine SAND, trace silt		2	SS		2 / 2	5-5.83': SILTY SAND, fine, poorly-graded, trace gravel, dark brown, plant roots, non-cohesive, moist, loose. (SM) 5.83-7': SAND, fine, poorly-graded, light brown, orange stained ribbons, trace silt, wet, compact. (SP) SPTs (5-5-5-5)		
655.0			3	SS		2 / 2	10-12': SAND, fine, poorly-graded, gray to brown, trace silt, wet, loose. (SP) SPTs (3-3-4-3)		
650.0									
645.0									
640.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Earth Exploration
DRILLER: John
DRILL RIG: CME 75

LOGGED BY: AP
CHECKED BY: CEM
DATE: 7/27/15

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-03B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 37
DEPTH TO BEDROCK: 36.8

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2169813.708 E: 2971647.06
GROUND SURFACE ELEV.: 665.29
TOP OF CASING ELEV.: 668.20
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/24/2016 8:05:00 AM
END DATE/TIME: 5/24/2016 10:42:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	FILL- light brown fine to medium SAND, occasional organics, fly ash/ boiler slag, trace silt		1	SS		1.6 / 2	0-1.7': SAND, organics, light brown medium sand lenses; dark brown; trace fly ash/ boiler slag, trace silt, loose. (FILL) 1.7-2': SAND, oxidized, fine, poorly-graded; trace silt, loose (FILL). SPTs (3-2-5-5)		Bentonite grout mix 0-23 ft-bgs
660.0			2	SS		1.7 / 2	5-5.75': SAND, fine, poorly-graded; light brown to brown; trace organics, trace silt, loose. (FILL) 5.75-7': SAND, medium, poorly-graded; brown; trace silt, wet, loose. (FILL) SPTs (3-4-4-5)		
655.0			3	SS		2 / 2	10-12': SAND, fine, poorly-graded; brown; trace oxides, trace silt, wet, very loose. (FILL) SPTs (2-2-2-2)		
650.0	brown, fine to medium SAND, trace gravel and oxides, trace silt		4	SS		0.9 / 2	15-17': SAND, fine, well-graded; brown; trace gravel, trace silt, moist, very loose. (SW) SPTs (1-2-2-3)		
645.0			5	SS		1 / 2	21-22': SAND, medium, well-graded; brown; trace gravel, trace silt, moist, loose. (SP) SPTs (2-2-4-4)		Bentonite chips 23-25 ft-bgs Filter Pack #5 Sand 25-37 ft-bgs

LITHOLOGY LEGEND

Fill | USCS Well-graded Sand (SW) | Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-03B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 37
DEPTH TO BEDROCK: 36.8

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2169813.708 E: 2971647.06
GROUND SURFACE ELEV.: 665.29
TOP OF CASING ELEV.: 668.20
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/24/2016 8:05:00 AM
END DATE/TIME: 5/24/2016 10:42:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
640.0	brown, fine to medium SAND, trace gravel and oxides, trace silt		6	SS		1.5 / 2	25-27': SAND, medium, well-graded; brown; trace oxides, trace silt, moist, compact. (SW) SPTs (4-5-7-7)		2 PVC Screen slot 0.010 27-37 ft-bgs
635.0			7	SS		0.9 / 2	30-32': SAND, medium, well-graded; brown; trace gravel, trace silt, wet, loose.(SP) SPTs (3-5-4-5)		
630.0	dark grey to black SHALE		8	SS		2 / 2	35-35.7': SAND, fine, poorly-graded; trace silt, moist, loose.(SP) 35.7': auger refusal in SHALE; dark grey to black.		
625.0									
620.0									

LITHOLOGY LEGEND

Fill | USCS Well-graded Sand (SW) | Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-04

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2170737.635 E: 2968871.614
GROUND SURFACE ELEV.: 665.73
TOP OF CASING ELEV.: 669.21
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 75
START DATE/TIME: 6/27/2015
END DATE/TIME: 6/27/2015

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	brown to black fine SILTY SAND, trace gravel		1	SS		2 / 2	0-0.92': SAND, fine, poorly-graded, some organic silt in top 4 inches, light reddish-brown, plant roots, non-cohesive, wet, loose. (SP) 0.92-2': SILTY SAND, fine, poorly-graded, brown to black, trace gravel, non-cohesive, moist, loose. (SM) SPTs (2-3-4-3)		Cement and bentonite grout mix 0-1 ft-bgs Bentonite chips 1-3 ft-bgs Filter Pack #7 Sand 3-3.5 ft-bgs Filter Pack #5 Sand 3.5-15 ft-bgs 2" PVC Screen slot 0.010" 5-15 ft-bgs
660.0	gray to reddish-brown fine to medium SILTY SAND		2	SS		1.83 / 2	5-5.67': SILTY SAND, fine, poorly-graded, trace gravel, brown to black, non-cohesive, moist, loose. (SM) 5.67-6.17': SAND, fine, poorly-graded, light reddish-brown, trace silt, wet, loose. (SP) 6.17-7': SILTY SAND, fine, poorly-graded, gray to brown, non-cohesive, moist, loose. (SM) SPTs (2-3-4-5)		
655.0	gray fine SAND, trace silt		3	SS		1.58 / 2	10-12': SAND, fine, poorly-graded, gray, trace silt, wet, loose. (SP) SPTs (3-3-4-3)		
650.0									
645.0									
640.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Earth Exploration
DRILLER: John
DRILL RIG: CME 75

LOGGED BY: AP
CHECKED BY: CEM
DATE: 7/27/15

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-05

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 17
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2170870.001 E: 2968721.916
GROUND SURFACE ELEV.: 666.69
TOP OF CASING ELEV.: 669.75
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 75
START DATE/TIME: 6/27/2015
END DATE/TIME: 6/27/2015

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	FILL- brown to black fine to medium SAND, BOILER SLAG		1	SS		0.83 / 2	0-2': SAND, BOILER SLAG, medium, poorly-graded, black, trace silt, dry, very loose. (FILL) SPTs (1-0-1-0)		Cement and bentonite grout mix 0-3 ft-bgs
			2	SS		1.33 / 2	5-7': SAND, fine, poorly-graded, brown, trace silt, moist, loose. (FILL) SPTs (1-2-2-2)		Bentonite chips 3-5 ft-bgs Filter Pack #7 Sand 5-6 ft-bgs
660.0									Filter Pack #5 Sand 6-17 ft-bgs 2" PVC Screen slot 0.010" 7-17 ft-bgs
			3	SS		1.25 / 2	10-12': SAND, fine, poorly-graded, brown, lenses of black angular BOILER SLAG, trace silt, wet, loose. (FILL) SPTs (2-3-5-6)		
655.0									
	grayish brown fine SAND, trace silt		4	SS		1.67 / 2	15-17': SAND, fine, poorly-graded, gray-brown, trace silt, wet, loose. (SP) SPTs (3-2-3-5)		
650.0									
645.0									
640.0									

LITHOLOGY LEGEND

Fill

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Earth Exploration
DRILLER: John
DRILL RIG: CME 75

LOGGED BY: AP
CHECKED BY: CEM
DATE: 7/27/15

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-06

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172320.062 E: 2969128.6
GROUND SURFACE ELEV.: 667.50
TOP OF CASING ELEV.: 670.81
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 75
START DATE/TIME: 6/29/2015
END DATE/TIME: 6/29/2015

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	FILL- BOILER SLAG and FLY ASH, gray clayey SAND		1	SS		1.92 / 2	0-1.42': BOILER SLAG and ASH, black, loose, wet, non-cohesive. (FILL) 1.42-2': CLAYEY SAND, gray, cohesive, stiff, W>PL. (FILL) SPTs (3-5-5-6)		Cement and bentonite grout mix 0-1 ft-bgs
665.0			2	SS		2 / 2	5-5.83': BOILER SLAG and ASH, black, loose, moist, non-cohesive. (FILL) 5.83-6.67': CLAYEY SAND, gray, cohesive, stiff W>PL. (FILL) 6.67-7': SAND, medium, poorly-graded, dark brown to light brown, trace silt, moist, loose. (SP) SPTs (3-4-4-6)		Bentonite chips 1-3 ft-bgs Filter Pack #7 Sand 3-4 ft-bgs Filter Pack #5 Sand 4-15 ft-bgs 2" PVC Screen slot 0.010" 5-15 ft-bgs
660.0	light brown medium SAND, trace silt		3	SS		2 / 2	10-11': CLAYEY SAND, dark gray, cohesive, wet, W>PL. (SC) 11-12': SAND, medium, poorly-graded, light brown, trace silt, wet, loose. (SP) SPTs (2-3-3-4)		
655.0									
650.0									
645.0									
640.0									

LITHOLOGY LEGEND

Fill

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 75

LOGGED BY: HMV
CHECKED BY: CEM
DATE: 7/27/15

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-07

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172327.533 E: 2970256.339
GROUND SURFACE ELEV.: 666.60
TOP OF CASING ELEV.: 669.89
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 75
START DATE/TIME: 6/29/2015
END DATE/TIME: 6/29/2015

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	FILL- BOILER SLAG and black FLY ASH, brown medium SAND, trace gravel, trace silt		1	SS		2 / 2	0-0.83': SAND, medium, poorly-graded, dark brown, organics, trace gravel, trace silt, moist, loose. (FILL) 0.83-1.5': FLY ASH, black, non-cohesive, moist, loose. (FILL) 1.5-2': SAND, medium, poorly-graded, brown, trace silt, moist, loose. (FILL) SPTs (4-4-5-7)		Cement and bentonite grout mix 0-1 ft-bgs Bentonite chips 1-3 ft-bgs Filter Pack #7 Sand 3-4 ft-bgs Filter Pack #5 Sand 4-15 ft-bgs 2" PVC Screen slot 0.010" 5-15 ft-bgs
660.0	light brown to black fine to medium SAND, trace gravel, trace silt		2	SS		1.66 / 2	5-6.25': FLY ASH, black, trace gravel, trace silt, moist, loose. (FILL) 6.25-7': SAND, poorly-graded medium, brown, trace gravel, trace silt, loose, wet. (SP) SPTs (7-5-3-3)		
655.0			3	SS		1.42 / 2	10-11.08': SAND, fine to medium, poorly-graded, black, trace gravel, trace organics, trace silt, wet, very loose. (SP) 11.08-12': SAND, medium, poorly-graded, light brown, trace silt, wet, very loose. (SP) SPTs (5-2-2-7)		
650.0									
645.0									
640.0									

LITHOLOGY LEGEND

Fill

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 75

LOGGED BY: HMV
CHECKED BY: CEM
DATE: 7/27/15

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-07B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 41
DEPTH TO BEDROCK: 40

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172318.589 E: 2970251.363
GROUND SURFACE ELEV.: 666.83
TOP OF CASING ELEV.: 669.37
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/25/2018 11:40:00 AM
END DATE/TIME: 7/25/2018 12:10:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	FILL- black BOILER SLAG and light to dark brown SILTY SAND, trace gravel			RS			0-0.8': SILTY SAND, fine, poorly-graded, light to dark brown, trace rounded gravel <1 cm, trace organics, dry. (SM)		Bentonite Grout 0-26 ft bgs
				RS					
				RS			0.8-1.4': SILTY SAND, fine, poorly-graded, dark brown, moist. (SM)		
665.0	dark brown fine SILTY SAND			RS			1.4-1.8': BOILER SLAG, black, moist. (FILL)		
	light gray fine GRAVELLY SAND, trace clay			RS			1.8-2.7': SILTY SAND, fine, poorly-graded, dark brown, moist. (SM)		
	light gray to orange-brown fine to medium SAND			RS			2.7-3.2': GRAVELLY SAND, fine, poorly-graded, light gray, rounded gravel up to 2 inch, some clay, cohesive, wet. (SP)		
							3.2-3.4': SAND, fine to medium, well-graded, orange-brown, wet. (SW)		
660.0				RS			5-5.5': SAND, fine to medium, well-graded, orange-brown, wet. (SW)		
							5.5-7.8': SAND, fine to medium, well-graded, light gray to light brown, wet. (SW)		
							7.8-7.9': SAND, fine to medium, well-graded, orange, wet. (SW)		
				RS			7.9-9': SAND, fine to medium, well-graded, light gray to light brown, wet. (SW)		
							10-11.3': SAND, fine to medium, well-graded, light brown to light gray, wet. (SW)		
655.0	light brown to light gray fine to coarse SAND, trace to some gravel			RS			11.3-13.3': SAND, fine to coarse, well-graded, light brown to light gray, trace rounded gravel <1 cm, wet. (SW)		

BOREHOLE LOG: GAMW-07B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 41
DEPTH TO BEDROCK: 40

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172318.589 E: 2970251.363
GROUND SURFACE ELEV.: 666.83
TOP OF CASING ELEV.: 669.37
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/25/2018 11:40:00 AM
END DATE/TIME: 7/25/2018 12:10:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
640.0	light brown to light gray fine to coarse SAND, trace to some gravel			RS			25-29.2': SAND, fine to coarse, well-graded, light gray, some rounded gravel <1 inch, wet. (SW)		Bentonite Chips 26-28 ft bgs
				RS			30-32': SAND, fine to coarse, well-graded, light gray, some rounded gravel <1 inch, wet. (SW)		#5 Sand Filter Pack 28-40 ft bgs
635.0				RS			32-34': SAND, fine to coarse, well-graded, light gray, some rounded gravel 1 up to 3 inch, wet. (SW)		2" PVC Screen slot 0.010 30-40 ft bgs
			SB-07B-35'-37'	RS			35-36.3': SAND, fine to coarse, well-graded, light gray, some rounded gravel <1 inch, wet. (SW) 36.3-37': SAND, fine to coarse, well-graded, light gray, little rounded gravel 1 cm to 3 inch and <1 cm, wet. (SW)		
630.0				RS			37-37.5': SAND, fine to coarse, well-graded, light gray, little rounded gravel 1 cm to 3 inch and <1 cm, wet. (SW)		
	gray clayey SHALE			RS		1 / 1	40-41': CLAYEY SHALE, gray, weathered, wet. Less weathered from 40.5-41'.		#5 Sand 40-41 ft bgs
625.0									
620.0									

LITHOLOGY LEGEND

Fill
USCS Well-graded Sand (SW)
USCS Silty Sand (SM)
Shale
USCS Poorly-graded Gravelly Sand (SPG)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/12/18

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-08

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173335.204 E: 2970799.89
GROUND SURFACE ELEV.: 666.01
TOP OF CASING ELEV.: 669.66
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 75
START DATE/TIME: 6/28/2015
END DATE/TIME: 6/28/2015

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	FILL- SANDY GRAVEL, BOILER SLAG, trace silt		1	SS		1.33 / 2	0-2': SANDY GRAVEL, poorly-graded, angular, gray-brown, lenses of black BOILER SLAG, trace silt, dry, compact. (FILL) SPTs (6-12-14-19)		Cement and bentonite grout mix 0-1 ft-bgs
									Bentonite chips 1-3 ft-bgs
									Filter Pack #7 Sand 3-4 ft-bgs
660.0	brown medium SAND, trace silt		2	SS		1.5 / 2	5-7': SAND, medium, poorly-graded, brown, trace silt, wet, very loose. (SP) SPTs (1-1-1-1)		Filter Pack #5 Sand 4-15 ft-bgs
									2" PVC Screen slot 0.010" 5-15 ft-bgs
655.0			3	SS		2 / 2	10-12': SAND, medium, poorly-graded, brown to light brown, trace silt, wet, loose. (SP) SPTs (2-2-5-9)		
650.0									
645.0									
640.0									

LITHOLOGY LEGEND

Fill

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 75

LOGGED BY: HMV
CHECKED BY: CEM
DATE: 7/27/15

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-08B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 37
DEPTH TO BEDROCK: 36

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173334.7 E: 2970790.588
GROUND SURFACE ELEV.: 665.92
TOP OF CASING ELEV.: 668.45
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/25/2018 2:35:00 PM
END DATE/TIME: 7/25/2018 3:10:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	light brown GRAVEL			RS			0-0.25': GRAVEL, rounded <2 inch, light brown, dry. (GW)		Bentonite Grout 0-22 ft bgs
	light gray fine to coarse GRAVELLY SAND			RS			0.25-0.8': GRAVELLY SAND, fine to coarse, well-graded, light gray, rounded gravel up to <2 inch, dry. (SW)		
665.0	dark brown fine SILTY SAND, some gravel			RS			0.8-1.5': SILTY SAND, fine, poorly-graded, dark brown, some rounded gravel <1 inch, moist. (SM)		
	brown fine to medium CLAYEY SAND, some gravel			RS			1.5-3': CLAYEY SAND, fine to medium, well-graded, brown, some rounded gravel <1 inch, cohesive, dry. (SC)		
	brown fine to medium SAND			RS			3-5': SAND, fine to medium, well-graded, brown, moist. (SW)		
	light gray fine to medium SAND, some silt			RS			5-7': SAND, fine to medium, well-graded, light gray, some silt, somewhat cohesive, wet. (SW)		
660.0	light gray to light brown fine to coarse SAND, trace to some gravel								
655.0									
650.0				RS			16-17.5': SAND, fine to coarse, well-graded, light gray, wet. (SW)		
				RS			17.5-19': SAND, fine to coarse, well-graded, light gray to light brown, trace rounded gravel <1 cm, wet. (SW)		
645.0				RS			20-24': SAND, fine to coarse, well-graded, light gray, wet. (SW)		Bentonite Chips 22-24 ft bgs
				RS			24-28': SAND, fine to coarse, well-graded, light gray, wet. (SW)		#5 Sand Filter Pack 24-36 ft bgs

LITHOLOGY LEGEND

- USCS Well-graded Gravel (GW)
- USCS Clayey Sand (SC)
- USCS Well-graded Gravelly Sand (SWG)
- USCS Well-graded Sand (SW)
- USCS Silty Sand (SM)
- USCS Poorly-graded Gravelly Sand (SPG)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/12/18

BOREHOLE LOG: GAMW-08B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 37
DEPTH TO BEDROCK: 36

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173334.7 E: 2970790.588
GROUND SURFACE ELEV.: 665.92
TOP OF CASING ELEV.: 668.45
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/25/2018 2:35:00 PM
END DATE/TIME: 7/25/2018 3:10:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
640.0	light gray to light brown fine to coarse SAND, trace to some gravel			RS					2" PVC Screen slot 0.010 26-36 ft bgs
				RS			28-30': SAND, fine to coarse, well-graded, light gray, wet. (SW)		
635.0			SB-08B-30-32	RS			30-31.25': SAND, fine to coarse, well-graded, light gray, wet. (SW) 31.25-32': SAND, medium to coarse, well-graded, light gray, some rounded gravel <1 inch, wet. (SW)		
	light gray coarse SAND and GRAVEL			RS			32-34': SAND and rounded GRAVEL <1 cm, coarse, poorly-graded, light gray, wet. (SP)		
630.0	gray clayey SHALE			RS		2 / 1	36-37': CLAYEY SHALE, gray, wet.		#5 Sand 36-37 ft bgs
625.0									
620.0									

LITHOLOGY LEGEND

USCS Well-graded Gravel (GW)
USCS Clayey Sand (SC)
USCS Well-graded Gravelly Sand (SWG)
USCS Well-graded Sand (SW)
USCS Silty Sand (SM)
USCS Poorly-graded Gravelly Sand (SPG)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/12/18

wsp

BOREHOLE LOG: GAMW-09

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172509.361 E: 2971291.294
GROUND SURFACE ELEV.: 665.18
TOP OF CASING ELEV.: 668.99
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 75
START DATE/TIME: 6/28/2015
END DATE/TIME: 6/28/2015

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	light brown to black medium SAND, trace silt		1	SS		1.75 / 2	0-1': SAND, medium, poorly-graded, black, organics, trace silt, moist, very loose. (SP) 1-2': SAND, medium, poorly-graded, light brown, trace silt, moist, very loose. (SP) SPTs (2-1-1-2)		Cement and bentonite grout mix 0-1 ft-bgs
660.0			2	SS		1.5 / 2	5-6': SAND, medium, poorly-graded, brown, trace silt, moist, compact. (SP) 6-7': SAND, medium, poorly-graded, light brown, trace silt, moist, compact. (SP) SPTs (4-5-5-6)		Bentonite chips 1-3 ft-bgs Filter Pack #7 Sand 3-4 ft-bgs Filter Pack #5 Sand 4-15 ft-bgs 2" PVC Screen slot 0.010" 5-15 ft-bgs
655.0			3	SS		1.92 / 2	10-10.58': SAND, medium, poorly-graded, brown, trace silt, wet, compact. (SP) 10.58-12': SAND, fine, poorly-graded, light brown, trace silt, wet, compact. (SP) SPTs (1-2-2-5)		
650.0									
645.0									
640.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Earth Exploration
DRILLER: John
DRILL RIG: CME 75

LOGGED BY: HMV
CHECKED BY: CEM
DATE: 7/27/15

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-09B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 34.5
DEPTH TO BEDROCK: 34.5

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172502.567 E: 2971291.67
GROUND SURFACE ELEV.: 665.35
TOP OF CASING ELEV.: 668.29
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/24/2016 1:10:00 PM
END DATE/TIME: 5/24/2016 3:09:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	brown fine SAND, occasional organics, trace silt		1	SS		1.9 / 2	0-1': SAND, organics, fine, poorly-graded; dark brown; trace silt, loose. (SP) 1-2': SAND, fine, poorly-graded; light brown; trace silt, dry, loose. (SP) SPTs (2-2-3-4)		Bentonite grout mix 0-20.5 ft-bgs
660.0			2	SS		1.3 / 2	5-7': SAND, fine, poorly-graded; light brown; trace organics, trace silt, dry, compact. (SP) SPTs (5-6-7-7)		
655.0			3	SS		1.2 / 2	10-12': SAND, 2" thick clayey lens, fine, poorly-graded; light brown; trace silt, dry, compact. (SP) SPTs (6-8-8-7)		
650.0			4	SS		1.9 / 2	15-17': SAND, fine, poorly-graded; light brown; trace silt, wet, loose. (SP) SPTs (2-4-3-5)		
645.0	red brown tan GRAVEL, trace silt light brown fine SAND, trace gravel, trace silt		5	SS		1.5 / 2	20-20.9': GRAVEL, rounded, well-graded; red brown tan; trace silt, wet, loose. (GW) 20.9-22': SAND, fine, poorly-graded; light brown; trace silt, wet, loose. (SP) SPTs (3-5-4-6)		Bentonite chips 20.5-22.5 ft-bgs Filter Pack #5 Sand 22.5-34.5 ft-bgs 2 PVC Screen slot

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

USCS Well-graded Gravel (GW)

Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-09B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 34.5
DEPTH TO BEDROCK: 34.5

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172502.567 E: 2971291.67
GROUND SURFACE ELEV.: 665.35
TOP OF CASING ELEV.: 668.29
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/24/2016 1:10:00 PM
END DATE/TIME: 5/24/2016 3:09:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
640.0	light brown fine SAND, trace gravel, trace silt		6	SS		1.5 / 2	25-27': SAND, fine, poorly-graded; light brown; trace gravel, trace silt, wet, compact. (SP) SPTs (5-6-6-7)		0.010 24.5-34.5 ft-bgs
635.0			7	SS		1.1 / 2	30-32': SAND, fine, poorly-graded; light brown; trace gravel, trace silt, wet, loose. (SP) 34.5': auger refusal in SHALE; dark grey to black. SPTs (3-3-5-4)		
	SHALE								
630.0									
625.0									
620.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

USCS Well-graded Gravel (GW)

Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-10

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173531.415 E: 2973046.249
GROUND SURFACE ELEV.: 663.99
TOP OF CASING ELEV.: 667.83
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 75
START DATE/TIME: 6/28/2015
END DATE/TIME: 6/28/2015

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	dark brown fine to medium SAND, organics, trace silt		1	SS		0.67 / 2	0-2': SAND, fine to medium, poorly-graded, dark brown, organics, trace silt, moist, loose. (SP) SPTs (1-2-4-7)		Cement and bentonite grout mix 0-1 ft-bgs Bentonite chips 1-3 ft-bgs Filter Pack #7 Sand 3-4 ft-bgs Filter Pack #5 Sand 4-15 ft-bgs 2" PVC Screen slot 0.010" 5-15 ft-bgs
660.0			2	SS		1.67 / 2	5-6': SAND, fine to medium, poorly-graded, dark brown, organics, trace silt, moist, loose. (SP) 6-6.5': CLAYEY SAND, gray, cohesive, hard. (SC) 6.5-7': SAND, medium, poorly-graded, light brown, trace silt, moist, loose. (SP) SPTs (2-3-4-6)		
	tan to dark gray fine to medium SAND, trace silt		3	SS		1.75 / 2	10-11': SAND, fine to medium, poorly-graded, dark gray, trace silt, wet, very loose. (SP) 11-12': SAND, fine to medium, poorly-graded, tan to brown, trace silt, wet, very loose. (SP) SPTs (2-1-1-1)		
655.0									
650.0									
645.0									
640.0									
635.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Earth Exploration
DRILLER: John
DRILL RIG: CME 75

LOGGED BY: HMV
CHECKED BY: CEM
DATE: 7/27/15

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-11

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2174218.618 E: 2972678.783
GROUND SURFACE ELEV.: 663.60
TOP OF CASING ELEV.: 667.17
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 75
START DATE/TIME: 6/25/2015
END DATE/TIME: 6/25/2015

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	dark brown ORGANIC SILT and SAND		1	SS		1.58 / 2	0-1': ORGANIC SILT and SAND, well-graded, some gravel, dark brown, plant roots, non-cohesive, moist. (OL) 1-2': SAND, fine, poorly-graded, dark brown, trace silt, moist, loose. (SP) SPTs (3-5-5-8)		Cement and bentonite grout mix 0-1 ft-bgs
	dark brown fine SAND, trace silt								Bentonite chips 1-3 ft-bgs
660.0									Filter Pack #7 Sand 3-3.5 ft-bgs
	dark brown fine SILTY SAND		2	SS		2 / 2	5-6.25': SILTY SAND, fine, poorly-graded, dark brown, trace silt, moist, compact. (SM) 6.25-7': SAND, fine, poorly-graded, reddish-brown, trace pea-sized gravel, trace silt, wet. (SP) SPTs (5-6-7-7)		Filter Pack #5 Sand 3.5-15 ft-bgs
	reddish-brown fine SAND, trace gravel, trace silt								2" PVC Screen slot 0.010" 5-15 ft-bgs
655.0									
	fine to coarse brown SAND, trace gravel, trace silt		3	SS		1.42 / 2	10-12': SAND, fine to coarse, well-graded, sub-angular to sub-rounded, brown, trace gravel, trace silt, wet, loose. (SW) SPTs (4-5-5-6)		
650.0									
645.0									
640.0									
635.0									

LITHOLOGY LEGEND

USCS Low Plasticity Organic silt or clay (OL)
USCS Well-graded Sand (SW)
USCS Poorly-graded Sand (SP)
USCS Silty Sand (SM)

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 75

LOGGED BY: AP
CHECKED BY: CEM
DATE: 7/27/15

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-12

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2169576.844 E: 2968314.48
GROUND SURFACE ELEV.: 664.35
TOP OF CASING ELEV.: 667.29
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 75
START DATE/TIME: 5/23/2016 11:45:00 AM
END DATE/TIME: 5/23/2016 12:45:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	black silty fine SAND, organics, trace gravel								Bentonite grout mix 0-1 ft-bgs
	light grey to dark brown fine SAND, trace gravel, trace silt		1	SS		1.6 / 2	0-0.8': SILTY SAND, fine, organics, poorly-graded; black; trace gravel, non-cohesive, moist, very loose. (SM) 0.8-2': SAND, poorly-graded; dark brown; trace silt, moist, very loose. (SP) SPTs (1-0-3-5)		Bentonite chips 1-3 ft-bgs
660.0			2	SS		1.5 / 2	5-7': SAND, fine, poorly-graded; grey; trace silt, wet, compact. (SP) SPTs (3-5-6-5)		Filter Pack #5 Sand 3-15 ft-bgs 2 PVC Screen slot 0.010 5-15 ft-bgs
655.0			3	SS		1.8 / 2	10-12': SAND, fine, poorly-graded; light grey; trace gravel, trace silt, saturated, loose. (SP) SPTs (1-2-4-7)		
650.0									
645.0									
640.0									

LITHOLOGY LEGEND

USCS Low Plasticity Organic silt or clay (OL)

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 75

LOGGED BY: DSD
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-12B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 36
DEPTH TO BEDROCK: 35

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2169580.32 E: 2968309.536
GROUND SURFACE ELEV.: 664.23
TOP OF CASING ELEV.: 666.79
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/31/2018 8:05:00 AM
END DATE/TIME: 7/31/2018 8:40:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	dark brown fine SILTY SAND, some gravel, some organics			RS			0-0.75': SILTY SAND, fine, poorly-graded, dark brown, some rounded gravel up to 3 inch, some organics, dry. (SM)		Bentonite Grout 0-21 ft bgs
	light brown medium SAND			RS			0.75-1.9': SAND, medium, light brown, moist. (SW)		
	dark brown fine SILTY SAND			RS			1.9-2.6': SILTY SAND, fine, poorly-graded, dark brown, cohesive, moist. (SM)		
660.0									
655.0									
650.0				RS			15-15.5': SILTY SAND, fine, poorly-graded, dark brown, cohesive, wet. (SM)		
	light gray fine to coarse SAND, some gravel						15.5-19.6': SAND, fine to coarse, well-graded, light gray, some rounded gravel <1 inch, wet. (SW)		
645.0				RS			20-23.5': SAND, fine to coarse, well-graded, light gray, some rounded gravel <1 inch, wet. (SW)		Bentonite Chips 21-23 ft bgs
				RS					#5 Sand Filter Pack 23-35 ft bgs
640.0				RS			24-27.25': SAND, fine to coarse, well-graded, light gray, some rounded gravel <1 inch, wet. (SW)		

LITHOLOGY LEGEND

USCS Silty Sand (SM)
USCS Well-graded Gravelly Sand (SWG)
USCS Poorly-graded Sand (SP)
Shale
USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/13/18

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-12B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 36
DEPTH TO BEDROCK: 35

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2169580.32 E: 2968309.536
GROUND SURFACE ELEV.: 664.23
TOP OF CASING ELEV.: 666.79
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/31/2018 8:05:00 AM
END DATE/TIME: 7/31/2018 8:40:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	light gray fine to coarse SAND, some gravel			RS					2" PVC Screen slot 0.010 25-35 ft bgs
	light gray medium to coarse SAND and rounded GRAVEL			RS			27.25-27.6': SAND and rounded GRAVEL <1 cm, coarse sand, well-graded, light gray, some medium sand, wet. (SW)		
635.0				RS			28-31.1': SAND, fine to coarse, well-graded, light gray, some rounded gravel <1 cm, wet. (SW)		
				RS			31.1-31.3': SAND and rounded GRAVEL <1 cm, coarse sand, well-graded, light gray, some medium sand, wet. (SW)		
			SB-12B-32'-34'	RS			32-33.75': SAND, medium to coarse, well-graded, light gray, some rounded gravel <4 inches, wet. (SW)		
630.0	light gray clayey SHALE			RS			35-36': CLAYEY SHALE, light gray, very weathered, wet.		#5 Sand 35-36 ft bgs
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)
USCS Well-graded Gravelly Sand (SWG)
USCS Poorly-graded Sand (SP)
Shale
USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/13/18

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-13

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK: 35

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2170059.98 E: 2968285.455
GROUND SURFACE ELEV.: 664.31
TOP OF CASING ELEV.: 667.24
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 75
START DATE/TIME: 5/24/2016 10:04:00 AM
END DATE/TIME: 5/24/2016 10:30:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	dark brown fine SAND, organics, trace gravel		1	SS		1.1 / 2	0-1.7': SAND, fine, organics, poorly-graded; dark brown; trace gravel, trace silt, very loose. (SP) 1.7-2': SAND, poorly-graded; dark brown; trace silt, very loose. (SP) SPTs (2-3-3-5)		Bentonite grout mix 0-1 ft-bgs Bentonite chips 1-3 ft-bgs Filter Pack #5 Sand 3-15 ft-bgs 2 PVC Screen slot 0.010 5-15 ft-bgs
	grey to dark brown fine SAND, trace gravel		2	SS		1.1 / 2	5-6.6': SAND, fine, poorly-graded; brown; trace silt, moist, loose. (SP) 6.6-7': SAND, fine, poorly-graded; grey; trace silt, wet, loose. (SP) SPTs (7-4-4-5)		
660.0									
655.0	GRAVEL, trace organics, trace silt		3	SS		1.8 / 2	10-10.7': GRAVEL, angular, well-graded; trace organics, trace silt, wet, very loose. (GW) 10.7-12': SAND, fine, poorly-graded; brown; trace silt, wet, very loose. (SP) SPTs (1-2-2-4)		
	gray to brown fine SAND, trace silt								
650.0									
645.0									
640.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)
USCS Poorly-graded Sand (SP)
USCS Well-graded Gravel (GW)

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 75

LOGGED BY: DSD
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-13B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 35
DEPTH TO BEDROCK: 35

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2170055.875 E: 2968285.691
GROUND SURFACE ELEV.: 664.23
TOP OF CASING ELEV.: 667.12
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/23/2016 2:27:00 PM
END DATE/TIME: 5/23/2016 4:45:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	dark brown fine SAND, organics, trace gravel		1	SS		1.1 / 2	0-1.7': SAND, fine, organics, poorly-graded; dark brown; trace gravel, trace silt, very loose. (SP) 1.7-2': SAND, poorly-graded; dark brown; trace silt, very loose. (SP) SPTs (2-3-3-5)		Bentonite grout mix 0-21 ft-bgs
	grey to dark brown fine SAND, trace gravel								
660.0			2	SS		1.1 / 2	5-6.6': SAND, fine, poorly-graded; brown; trace silt, moist, loose. (SP) 6.6-7': SAND, fine, poorly-graded; grey; trace silt, wet, loose. (SP) SPTs (7-4-4-5)		
655.0	grey to brown fine to medium SAND, trace gravel, trace silt		3	SS		1.8 / 2	10-10.7': GRAVEL, angular, well-graded; trace organics, trace silt, wet, very loose. (GW) 10.7-12': SAND, fine, poorly-graded; brown; trace silt, wet, very loose. (SP) SPTs (1-2-2-4)		
650.0			4	SS		2 / 2	15-17': SAND, fine, poorly-graded; brown; trace gravel, trace silt, wet, loose. (SP) SPTs (3-3-5-5)		
645.0			5	SS		0.8 / 2	20-22': SAND, medium poorly-graded; grey to brown; trace silt, wet, very loose. (SP) SPTs (1-1-2-2)		Bentonite chips 21-23 ft-bgs
640.0									Filter Pack #5 Sand 23-35 ft-bgs

LITHOLOGY LEGEND

USCS Silty Sand (SM) | USCS Poorly-graded Sand (SP) | Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-13B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 35
DEPTH TO BEDROCK: 35

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2170055.875 E: 2968285.691
GROUND SURFACE ELEV.: 664.23
TOP OF CASING ELEV.: 667.12
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/23/2016 2:27:00 PM
END DATE/TIME: 5/23/2016 4:45:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	grey to brown fine to medium SAND, trace gravel, trace silt		6	SS		1.4 / 2	25-26': SAND, fine, poorly-graded; brown; trace silt, wet, loose. (SP) 26-27': SAND, medium, poorly-graded; grey to brown; trace silt, moist, loose. (SP) SPTs (2-5-4-6)		2 PVC Screen slot 0.010 25-35 ft-bgs
	grey to brown medium SAND, clay lens, trace silt								
635.0			7	SS		1.8 / 2	30-30.4': SAND, medium, poorly graded; grey to brown; trace silt, moist, compact. (SP) 30.4-30.7': CLAY; grey to dark brown; cohesive, w~PL, stiff. (CL) 30.7-32': SAND, medium, well-graded; grey to brown; trace silt, moist, compact. (SW) 35': auger refusal in SHALE; dark grey to black. SPTs (2-5-7-9)		
630.0	SHALE								
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM) | USCS Poorly-graded Sand (SP) | Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-14

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK: 36

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2170532.489 E: 2968467.959
GROUND SURFACE ELEV.: 664.76
TOP OF CASING ELEV.: 667.96
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 75
START DATE/TIME: 5/23/2016 3:25:00 PM
END DATE/TIME: 5/23/2016 4:40:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	dark brown fine SAND, organics, trace silt		1	SS		1.5 / 2	0-1.4': SAND, organics, fine, poorly-graded; dark brown; trace silt, loose. (SP) 1.4-2': SAND, fine, poorly-graded; brown; trace silt, loose. (SP) SPTs (3-4-4-3)		Bentonite grout mix 0-1 ft-bgs Bentonite chips 1-3 ft-bgs Filter Pack #5 Sand 3-15 ft-bgs 2 PVC Screen slot 0.010 5-15 ft-bgs
	brown fine SAND, trace organics, trace silt								
660.0	brown fine SAND, trace silt		2	SS		1.1 / 2	5-7': SAND, fine, poorly-graded; brown; trace silt, moist, compact. (SP) SPTs (4-6-6-2)		
655.0			3	SS		1.3 / 2	10-11.6': SAND, fine, poorly-graded; brown; trace organics, trace silt, moist, compact. (SP) 11.6-12': SAND, fine, poorly-graded; brown; trace silt, wet, compact. (SP) SPTs (5-7-7-4)		
650.0									
645.0									
640.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 75

LOGGED BY: DSD
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-14B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 36
DEPTH TO BEDROCK: 36

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2170534.66 E: 2968471.602
GROUND SURFACE ELEV.: 664.62
TOP OF CASING ELEV.: 667.94
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/23/2016 11:07:00 AM
END DATE/TIME: 5/23/2016 1:43:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	dark brown fine SAND, organics		1	SS		1.5 / 2	0-1.4': SAND, organics, fine, poorly-graded; dark brown; trace silt, loose. (SP) 1.4-2': SAND, fine, poorly-graded; brown; trace silt, loose. (SP) SPTs (3-4-4-3)		Bentonite grout mix 0-22 ft-bgs
	brown fine SAND, trace organics, trace silt								
660.0									
	brown fine SAND, 3" angular gravel layer at 20 ft, trace silt		2	SS		1.1 / 2	5-7': SAND, fine, poorly-graded; brown; trace silt, moist, compact. (SP) SPTs (4-6-6-2)		
655.0			3	SS		1.3 / 2	10-11.6': SAND, fine, poorly-graded; brown; trace organics, trace silt, moist, compact. (SP) 11.6-12': SAND, fine, poorly-graded; brown; trace silt, wet, compact. (SP) SPTs (5-7-7-4)		
650.0			4	SS		1.2 / 2	15-17': SAND, fine, poorly-graded; brown; trace silt, wet, very loose. (SP) SPTs (1-2-1-2)		
645.0			5	SS		2 / 2	20-20.25': GRAVEL, angular, well-graded; grey; trace silt, wet, compact. (GW) 20.25-22': SAND, fine, poorly-graded; brown; trace silt, wet, compact. (SP) SPTs (5-5-6-9)		Bentonite chips 22-24 ft-bgs
640.0									Filter Pack #5 Sand 24-36 ft-bgs

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-14B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 36
DEPTH TO BEDROCK: 36

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2170534.66 E: 2968471.602
GROUND SURFACE ELEV.: 664.62
TOP OF CASING ELEV.: 667.94
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/23/2016 11:07:00 AM
END DATE/TIME: 5/23/2016 1:43:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	brown fine SAND, 3" angular gravel layer at 20 ft, trace silt		6	SS		1.3 / 2	25-27': SAND, fine, poorly-graded; brown; trace silt, wet, loose. (SP) SPTs (3-3-5-4)		2 PVC Screen slot 0.010 26-36 ft-bgs
635.0			7	SS		0.9 / 2	30-32': SAND, fine, poorly-graded; brown; trace silt, wet, loose. (SP) 36': auger refusal in SHALE; dark grey to black. SPTs (3-3-5-6)		
630.0	SHALE								
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-15

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK: 37

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172753.762 E: 2970258.353
GROUND SURFACE ELEV.: 665.01
TOP OF CASING ELEV.: 668.25
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 75
START DATE/TIME: 5/25/2016 8:37:00 AM
END DATE/TIME: 5/25/2016 9:20:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	FILL- black FLY ASH, grey SAND, some boiler slag, some fine to coarse gravel, trace silt		1	SS		1.8 / 2	0-1.4': FLY ASH, some boiler slag, poorly-graded; black; trace medium angular gravel, trace silt, moist, compact. (FILL) 1.4-2': FLY ASH, some fine to coarse angular gravel, poorly-graded; black; trace silt, moist, compact. (FILL) SPTs (3-9-12-13)		Bentonite grout mix 0-1 ft-bgs Bentonite chips 1-3 ft-bgs Filter Pack #5 Sand 3-15 ft-bgs 2 PVC Screen slot 0.010 5-15 ft-bgs
660.0			2	SS		2 / 2	5-5.8': FLY ASH, some slag, poorly-graded; black; trace fine rounded gravel, trace silt, moist, loose. (FILL) 5.8-7': SAND; fine, poorly-graded, light grey; trace silt, moist, loose. (FILL) SPTs (1-3-4-4)		
655.0			3	SS		1.8 / 2	10-10.2': FLY ASH; black; trace silt, wet, loose. (FILL) 10.2-10.8': SAND, little coarse rounded gravel, poorly-graded; grey; trace silt, wet, loose. (FILL) 10.8-12': SAND, little fine rounded gravel, poorly-graded; light grey; trace silt, wet, loose. (FILL) SPTs (1-1-4-4)		
650.0									
645.0									

LITHOLOGY LEGEND

Fill

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 75

LOGGED BY: DSD
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-15B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 37.7
DEPTH TO BEDROCK: 37

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172749.68 E: 2970258.917
GROUND SURFACE ELEV.: 665.14
TOP OF CASING ELEV.: 668.05
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 75
START DATE/TIME: 5/24/2016 11:15:00 AM
END DATE/TIME: 5/24/2016 4:00:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	FILL- black FLY ASH, grey SAND, some boiler slag, some fine to coarse gravel, trace silt		1	SS		1.8 / 2	0-1.4': FLY ASH, some boiler slag, poorly-graded; black; trace medium angular gravel, trace silt, moist, compact. (FILL) 1.4-2': FLY ASH, some fine to coarse angular gravel, poorly-graded; black; trace silt, moist, compact. (FILL) SPTs (3-9-12-13)		Bentonite grout mix 0-23.7 ft-bgs
660.0			2	SS		2 / 2	5-5.8': FLY ASH, some slag, poorly-graded; black; trace fine rounded gravel, trace silt, moist, loose. (FILL) 5.8-7': SAND; fine, poorly-graded, light grey; trace silt, moist, loose. (FILL) SPTs (1-3-4-4)		
655.0			3	SS		1.8 / 2	10-10.2': FLY ASH; black; trace silt, wet, loose. (FILL) 10.2-10.8': SAND, little coarse rounded gravel, poorly-graded; grey; trace silt, wet, loose. (FILL) 10.8-12': SAND, little fine rounded gravel, poorly-graded; light grey; trace silt, wet, loose. (FILL) SPTs (1-1-4-4)		
650.0			4	SS		1.6 / 2	15-16.2': SAND, some fine angular gravel, some boiler slag, poorly-graded; grey; trace silt, wet, loose. (FILL) 16.2-17': SAND, some fine subrounded gravel, poorly-graded; light tan; trace silt, wet, loose. (FILL) SPTs (1-3-6-8)		
645.0			5	SS		0.3 / 2	20-22': GRAVEL and BOILER SLAG, some sand, fine, subrounded and angular, poorly-graded; light grey; trace silt, wet, compact. (FILL) SPTs (1-6-12-15)		Bentonite chips 23.7-25.7 ft-bgs

LITHOLOGY LEGEND

Fill
Shale
USCS Poorly-graded Sand (SP)
USCS Low Plasticity Clay (CL)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 75

LOGGED BY: DSD
CHECKED BY: JMR
DATE: 3/22/17

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-15B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 37.7
DEPTH TO BEDROCK: 37

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172749.68 E: 2970258.917
GROUND SURFACE ELEV.: 665.14
TOP OF CASING ELEV.: 668.05
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 75
START DATE/TIME: 5/24/2016 11:15:00 AM
END DATE/TIME: 5/24/2016 4:00:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
640.0	light grey fine to medium SAND, some gravel, trace silt		6	SS		1.1 / 2	25-26.5': SAND, fine, poorly-grade; light grey; trace silt, wet, loose. (SP) 26.5-27': SAND, some fine angular gravel, medium, poorly-graded; light grey; trace silt, wet, loose. (SP) SPTs (1-3-4-7)		Filter Pack #5 Sand 25.7-37.7 ft-bgs
635.0			7	SS		2 / 2	30-31.25': SAND, fine to medium, poorly-graded; light grey; trace silt, wet, loose. (SP) 31.25-31.4': SAND and GRAVEL, fine, subrounded, well-graded; light grey; trace silt, wet, dense. (SW) 31.4-32': SAND, some silt, fine, poorly-graded; light grey; non-cohesive, wet, dense. (SP) SPTs (4-12-23-27)		2 PVC Screen slot 0.010 27.7-37.7 ft-bgs
630.0			8	SS		1.3 / 2	35-36.6': SAND, fine to medium, poorly-graded; light grey; trace silt, wet, compact. (SP) 36.6-36.9': SAND, fine subrounded gravel, poorly-graded; light grey; trace silt, wet, compact. (SP) 36.9-37': CLAY, some fine rounded gravel, poorly-graded; light grey; cohesive, wet, very stiff. (CL) SPTs (3-11-12-22)		
	light grey CLAY, some fine rounded gravel grey SHALE		9	SS		0.7 / 0.7	37-37.7': SHALE; grey; cohesive, moist, dense. SPTs (30-50/2)		
625.0									
620.0									

LITHOLOGY LEGEND

Fill
Shale
USCS Poorly-graded Sand (SP)
USCS Low Plasticity Clay (CL)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 75

LOGGED BY: DSD
CHECKED BY: JMR
DATE: 3/22/17

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-16

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK: 37.75

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173199.798 E: 2970398.723
GROUND SURFACE ELEV.: 665.20
TOP OF CASING ELEV.: 668.37
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 75
START DATE/TIME: 5/26/2016 1:26:00 PM
END DATE/TIME: 5/26/2016 1:45:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	FILL- black FLY ASH, some dark brown sand, little gravel, trace silt		1	SS		2 / 2	0-0.25': FLY ASH; black; trace silt, dry, compact. (FILL) 0.25-0.4': SAND, poorly-graded; dark brown; trace silt, moist, compact. (FILL) 0.4-0.9': FLY ASH, little medium angular gravel, poorly-graded; black; trace silt, moist, compact. (FILL) 0.9-2': SAND, 1" dark brown silt seam; fine, poorly-graded: brown; trace silt, moist, compact. (FILL) SPTs (3-7-7-8)		Bentonite grout mix 0-1 ft-bgs Bentonite chips 1-3 ft-bgs Filter Pack #5 Sand 3-15 ft-bgs 2 PVC Screen slot 0.010 5-15 ft-bgs
660.0	light orange to dark brown fine to medium SAND, some silt, some gravel		2	SS		2 / 2	5-5.4': FLY ASH; black; trace silt, dry, very loose. (FILL) 5.4-5.7': SAND; fine, poorly-graded; dark brown; trace silt, moist, very loose. (SP) 5.7-7': SAND, little orange mottling, fine, poorly-graded; light brown; trace silt, wet very loose. (SP) SPTs (1-1-1-1)		
655.0			3	SS		1.2 / 2	10-11.25': SAND, fine, well-graded; grey; trace silt, wet, very loose. (SW) 11.25-11.7': SAND, some silt, poorly-graded; black; non-cohesive, wet, very loose. (SP) 11.7-12': SAND, fine rounded, some gravel, medium, poorly-graded; light orange; trace silt, wet, very loose. (SP) SPTs (0-0-0-3)		
650.0									
645.0									

LITHOLOGY LEGEND

Fill

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 75

LOGGED BY: DSD
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-16B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 37.75
DEPTH TO BEDROCK: 37.75

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173203.857 E: 2970398.828
GROUND SURFACE ELEV.: 665.16
TOP OF CASING ELEV.: 667.76
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 75
START DATE/TIME: 5/25/2016 1:10:00 PM
END DATE/TIME: 5/25/2016

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	FILL- black FLY ASH, some dark brown sand, little gravel, trace silt		1	SS		2 / 2	0-0.25': FLY ASH; black; trace silt, dry, compact. (FILL) 0.25-0.4': SAND, poorly-graded; dark brown; trace silt, moist, compact. (FILL) 0.4-0.9': FLY ASH, little medium angular gravel, poorly-graded; black; trace silt, moist, compact. (FILL) 0.9-2': SAND, 1" dark brown silt seam; fine, poorly-graded: brown; trace silt, moist, compact. (FILL) SPTs (3-7-7-8)		Bentonite grout mix 0-23.75 ft-bgs
660.0	light orange to dark brown fine to medium SAND, some silt, some gravel		2	SS		2 / 2	5-5.4': FLY ASH; black; trace silt, dry, very loose. (FILL) 5.4-5.7': SAND; fine, poorly-graded; dark brown; trace silt, moist, very loose. (SP) 5.7-7': SAND, little orange mottling, fine, poorly-graded; light brown; trace silt, wet very loose. (SP) SPTs (1-1-1-1)		
655.0			3	SS		1.2 / 2	10-11.25': SAND, fine to medium, well-graded; grey; trace silt, wet, very loose. (SW) 11.25-11.7': SAND, some silt, poorly-graded; black; non-cohesive, wet, very loose. (SP) 11.7-12': SAND, fine rounded, some gravel, medium, poorly-graded; light orange; trace silt, wet, very loose. (SP) SPTs (0-0-0-3)		
650.0	light to dark brown fine to medium SAND, trace silt		4	SS		1.8 / 2	15.4-16': SAND, fine, poorly-graded; light brown; trace silt, wet, compact. (SP) 16-17': SAND, fine to medium, poorly-graded; dark brown; trace silt, wet, compact. (SP) SPTs (3-4-6-9)		
645.0			5	SS		1.4 / 2	20-21.3': SAND, fine to medium, poorly-graded; brown; trace silt, wet, compact. (SP) 21.3-22': SAND, some fine rounded gravel, fine to medium, well-graded; dark brown; trace silt, wet, compact. (SW) SPTs (4-7-9-12)		
	brown fine to coarse SAND, some gravel, trace silt								Bentonite chips 23.75-25.75 ft-bgs

LITHOLOGY LEGEND

Fill
USCS Low Plasticity Clay (CL)
USCS Poorly-graded Sand (SP)
Shale
USCS Well-graded Sand (SW)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 75

LOGGED BY: DSD
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-16B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 37.75
DEPTH TO BEDROCK: 37.75

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173203.857 E: 2970398.828
GROUND SURFACE ELEV.: 665.16
TOP OF CASING ELEV.: 667.76
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 75
START DATE/TIME: 5/25/2016 1:10:00 PM
END DATE/TIME: 5/25/2016

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
640.0	brown fine to coarse SAND, some gravel, trace silt		6	SS		0 / 2	25-27': No recovery. SPTs (4-7-10-14)		Filter Pack #5 Sand 25.75-37.75 ft-bgs
635.0	grey to brown medium to coarse SAND, little gravel, trace silt		7	SS		1.3 / 2	30-31.6': SAND, fine to medium, well-graded; brown; trace silt, wet, compact. (SW) 31.6-32': SAND, little small subrounded gravel, fine to medium, poorly-graded; grey; trace silt, wet, compact. (SP) SPTs (1-3-10-12)		2 PVC Screen slot 0.010 27.75-37.75 ft-bgs
630.0	grey CLAY		8	SS		2 / 2	34-34.6': SAND, fine, poorly-graded; brown; trace silt, wet, dense. (SP) 34.6-35': SAND, some fine rounded gravel, medium, poorly-graded; dark grey; trace silt, wet, dense. (SP)		
			9	SS		0 / 0.25	35-36': CLAY; grey; cohesive, dry, hard. (CL) SPTs (12-15-22-7)		
	SHALE						37.75': auger refusal in SHALE; dark grey to black. SPTs (50/3")		
625.0									
620.0									

LITHOLOGY LEGEND

Fill
USCS Low Plasticity Clay (CL)
USCS Poorly-graded Sand (SP)
Shale
USCS Well-graded Sand (SW)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 75

LOGGED BY: DSD
CHECKED BY: JMR
DATE: 3/22/17

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-16BR

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 150
DEPTH TO BEDROCK: 37

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173189.526 E: 2970399.45
GROUND SURFACE ELEV.: 664.39
TOP OF CASING ELEV.: 667.32
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: Geoprobe 7822 DT
START DATE/TIME: 9/23/2020 11:40:00 AM
END DATE/TIME: 9/23/2020 4:10:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	FILL - sand backfill						0-10' Augered without sampling (sand backfill)		Cement-bentonite Grout 0-25 ft bgs
660.0				SS					
655.0	fine brown SAND, some medium, trace gravel, trace silt		1	SS		0.6 / 2	10-10.6': (SP) fine SAND, poorly graded, trace gravel, sub-angular to sub-rounded, trace silt, non cohesive, wet, very loose SPTs (WR-WR-WR-WR)		
			2	SS		1.7 / 2	12-13.7': (SP) medium SAND, poorly graded, sub angular to sub rounded, non cohesive, wet, very loose SPTs (1-1-2-2)		
650.0			3	SS		1 / 2	14-15': (SP) fine to medium SAND, poorly graded, sub angular to sub rounded, trace gravel, trace silt, dark gray staining, non cohesive, wet, very loose SPTs (1-1-2-3)		
			4	SS		0.9 / 2	16-16.9': (SP) fine SAND, poorly graded, sub angular, trace gravel, trace silt, non cohesive, wet, very loose to loose SPTs (2-4-4-5)		
645.0			5	SS		1.2 / 2	18-19.2': (SP) fine to medium SAND, poorly graded, sub angular, trace silt, orange staining, non cohesive, wet, loose SPTs (4-5-5-6)		
	brown fine to coarse SAND, some gravel, trace silt		5	SS		1.4 / 2	20-21.3': (SP) SAND, fine to medium, poorly-graded; brown; trace silt, wet, compact 21.3-22': (SW) SAND, some fine rounded gravel, fine to medium, well-graded; dark brown; trace silt, wet, compact SPTs (4-7-9-12)		
640.0									

LITHOLOGY LEGEND

Fill
USCS Low Plasticity Clay (CL)
USCS Poorly-graded Sand (SP)
Shale
USCS Well-graded Sand (SW)

DRILLING COMPANY: Strata Earth Services, LLC
DRILLER: Scott Komen
DRILL RIG: Geoprobe 7822 DT

LOGGED BY: KB
CHECKED BY: KJ
DATE: 10/19/20

BOREHOLE LOG: GAMW-16BR

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 150
DEPTH TO BEDROCK: 37

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173189.526 E: 2970399.45
GROUND SURFACE ELEV.: 664.39
TOP OF CASING ELEV.: 667.32
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: Geoprobe 7822 DT
START DATE/TIME: 9/23/2020 11:40:00 AM
END DATE/TIME: 9/23/2020 4:10:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	brown fine to coarse SAND, some gravel, trace silt		6	SS		0 / 2	25-27': No recovery SPTs (4-7-10-14)		1/4" Coated Bentonite Pellets 25-28 ft-bgs
635.0			7	SS		1.3 / 2	30-31.6': (SW) SAND, fine to medium, well-graded; brown; trace silt, wet, compact 31.6-32': (SP) SAND, little small subrounded gravel, fine to medium, poorly-graded; grey; trace silt, wet, compact SPTs (1-3-10-12)		#5 Sand Filter Pack 28-40 ft-bgs 2 PVC Screen slot 0.010 30-40 ft-bgs
	grey to brown medium to coarse SAND, little gravel, trace silt								
630.0			8	SS		2 / 2	34-34.6': (SP) SAND, fine, poorly-graded; brown; trace silt, wet, dense 34.6-35': (SP) SAND, some fine rounded gravel, medium, poorly-graded; dark grey; trace silt, wet, dense		
	grey CLAY		9	SS		0.3 / 2	35-36': CLAY; grey; cohesive, dry, hard. (CL) SPTs (12-15-22-7)		
	weathered gray clayey SHALE						37-37.3': weathered gray clayey SHALE		
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

Fill
USCS Low Plasticity Clay (CL)
USCS Poorly-graded Sand (SP)
Shale
USCS Well-graded Sand (SW)

DRILLING COMPANY: Strata Earth Services, LLC
DRILLER: Scott Komen
DRILL RIG: Geoprobe 7822 DT

LOGGED BY: KB
CHECKED BY: KJ
DATE: 10/19/20

wsp

BOREHOLE LOG: GAMW-16R

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 20
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173189.507 E: 2970396.681
GROUND SURFACE ELEV.: 664.35
TOP OF CASING ELEV.: 667.17
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: Geoprobe 7822 DT
START DATE/TIME: 9/23/2020 7:35:00 AM
END DATE/TIME: 9/23/2020 8:58:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	FILL - sand backfill						0-10' Augered without sampling (sand backfill)		Cement-bentonite Grout 0-5 ft-bgs
660.0									1/4" Coated Bentonite Pellets 5-7 ft-bgs
									#5 Sand Filter Pack 7-20 ft-bgs
655.0	fine brown SAND, some medium, trace gravel, trace silt		1	SS		0.6 / 2	10-10.6': (SP) fine SAND, poorly graded, trace gravel, sub-angular to sub-rounded, trace silt, non cohesive, wet, very loose SPTs (WR-WR-WR-WR)		2 PVC Screen slot 0.010 10-20 ft-bgs
			2	SS		1.7 / 2	12-13.7': (SP) medium SAND, poorly graded, sub angular to sub rounded, non cohesive, wet, very loose SPTs (1-1-2-2)		
650.0			3	SS		1 / 2	14-15': (SP) fine to medium SAND, poorly graded, sub angular to sub rounded, trace gravel, trace silt, dark gray staining, non cohesive, wet, very loose SPTs (1-1-2-3)		
			4	SS		0.9 / 2	16-16.9': (SP) fine SAND, poorly graded, sub angular, trace gravel, trace silt, non cohesive, wet, very loose to loose SPTs (2-4-4-5)		
645.0			5	SS		1.2 / 2	18-19.2': (SP) fine to medium SAND, poorly graded, sub angular, trace silt, orange staining, non cohesive, wet, loose SPTs (4-5-5-6)		
640.0									

LITHOLOGY LEGEND

Fill

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Strata Earth Services, LLC
DRILLER: Scott Komen
DRILL RIG: Geoprobe 7822 DT

LOGGED BY: KB
CHECKED BY: KJ
DATE: 10/19/20

BOREHOLE LOG: GAMW-17

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK: 38

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173164.442 E: 2970944.074
GROUND SURFACE ELEV.: 668.81
TOP OF CASING ELEV.: 671.93
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/25/2016
END DATE/TIME: 5/25/2016

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	FILL- SAND, GRAVEL, ORGANICS, trace fly ash/ boiler slag, trace silt		1	SS		1.6 / 2	0-1.1': SAND, organics, fine, poorly-graded; light brown; trace silt, dry, loose. (FILL) 1.1-2': SAND, fine, poorly-graded; light brown; trace fly ash, trace silt moist, loose. (FILL) SPTs (1-3-2-2)		Bentonite grout mix 0-1 ft-bgs Bentonite chips 1-3 ft-bgs
665.0			2	SS		0.9 / 2	5-6.6': SAND, fine, poorly-graded; light brown; trace silt, moist, loose. (FILL) 6.6-6.7': GRAVEL, fly ash/ boiler slag, angular, medium, well-graded; trace silt, loose. (FILL) 6.7-7': SAND, fine, poorly-graded; light brown; trace fly ash/ boiler slag, trace silt, moist, loose. (FILL) SPTs (3-7-3-5)		Filter Pack #5 Sand 3-15 ft-bgs 2 PVC Screen slot 0.010 5-15 ft-bgs
660.0	dark brown to grey fine SAND, trace iron oxides, trace organics, trace silt		3	SS		1.6 / 2	10-11.1': SAND, fine, well-graded; light brown to brown; trace organics, trace fly ash/boiler slag, trace silt, wet, loose. (FILL) 11.1-12': SAND, fine, poorly-graded; dark brown to grey; trace iron oxides, trace silt, wet, loose. (SP) SPTs (3-5-1-2)		
655.0									
650.0									
645.0									

LITHOLOGY LEGEND

Fill

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-17B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 38
DEPTH TO BEDROCK: 38

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173164.838 E: 2970947.442
GROUND SURFACE ELEV.: 668.86
TOP OF CASING ELEV.: 670.60
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/25/2016 8:23:00 AM
END DATE/TIME: 5/25/2016 9:13:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	FILL- SAND, GRAVEL, ORGANICS, trace fly ash/ boiler slag, trace silt		1	SS		1.6 / 2	0-1.1': SAND, organics, fine, poorly-graded; light brown; trace silt, dry, loose. (FILL) 1.1-2': SAND, fine, poorly-graded; light brown; trace fly ash, trace silt moist, loose. (FILL) SPTs (1-3-2-2)		Bentonite grout mix 0-24 ft-bgs
665.0			2	SS		0.9 / 2	5-6.6': SAND, fine, poorly-graded; light brown; trace silt, moist, loose. (FILL) 6.6-6.7': GRAVEL, fly ash/ boiler slag, angular, medium, well-graded; trace silt, loose. (FILL) 6.7-7': SAND, fine, poorly-graded; light brown; trace fly ash/ boiler slag, trace silt, moist, loose. (FILL) SPTs (3-7-3-5)		
660.0	dark brown to grey fine SAND, trace iron oxides, trace organics, trace silt		3	SS		1.6 / 2	10-11.1': SAND, fine, well-graded; light brown to brown; trace organics, trace fly ash/boiler slag, trace silt, wet, loose. (FILL) 11.1-12': SAND, fine, poorly-graded; dark brown to grey; trace iron oxides, trace silt, wet, loose. (SP) SPTs (3-5-1-2)		
655.0			4	SS		1.8 / 2	15-17': SAND, fine, poorly-graded; dark brown to grey; trace organics, trace silt, wet, very loose. (SP) SPTs (1-2-2-3)		
650.0	dark brown fine to medium SAND, trace silt		5	SS		1 / 2	20-22': SAND, fine to medium, well-graded; dark brown; trace silt, wet, loose. (SW) SPTs (2-4-4-6)		
645.0									Bentonite chips 24-26 ft-bgs

LITHOLOGY LEGEND

Fill
Shale
USCS Poorly-graded Sand (SP)
USCS Well-graded Sand (SW)

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-17B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 38
DEPTH TO BEDROCK: 38

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173164.838 E: 2970947.442
GROUND SURFACE ELEV.: 668.86
TOP OF CASING ELEV.: 670.60
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/25/2016 8:23:00 AM
END DATE/TIME: 5/25/2016 9:13:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	dark brown fine to medium SAND, trace silt		6	SS		1.6 / 2	25-27': SAND, fine to medium, well-graded; dark brown; trace silt, wet, very loose. (SW) SPTs (1-1-2-2)		Filter Pack #5 Sand 26-38 ft-bgs
640.0			7	SS		1.3 / 2	30-32': SAND, fine to medium, well-graded; dark brown; trace silt, wet, loose. (SW) 38': auger refusal in SHALE; dark grey to black. SPTs (3-4-4-5)		2 PVC Screen slot 0.010 28-38 ft-bgs
635.0									
	SHALE								
630.0									
625.0									
620.0									

LITHOLOGY LEGEND

Fill
Shale
USCS Poorly-graded Sand (SP)
USCS Well-graded Sand (SW)

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-18

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171919.782 E: 2971272.405
GROUND SURFACE ELEV.: 666.04
TOP OF CASING ELEV.: 669.07
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/24/2016 11:12:00 AM
END DATE/TIME: 5/24/2016 11:28:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	FILL- dark brown SAND, trace fly ash/ boiler slag, trace organics, trace silt		1	SS		2 / 2	0-2': SAND, fine to medium; poorly-graded; dark brown; trace fly ash/boiler slag, trace organics, trace silt, moist, loose. (FILL) SPTs (3-3-3-3)		Bentonite grout mix 0-1 ft-bgs Bentonite chips 1-3 ft-bgs Filter Pack #5 Sand 3-15 ft-bgs 2 PVC Screen slot 0.010 5-15 ft-bgs
660.0	brown fine SAND, trace silt		2	SS		2 / 2	5-6.1': SAND, fine to medium, poorly-graded; dark brown; trace fly ash/ boiler slag, trace organics, trace silt, moist, loose. (FILL) 6.1-7': SAND; fine, poorly-graded; brown; trace silt, moist, loose. (SP) SPTs (2-4-5-6)		
655.0			3	SS		1.3 / 2	10-12': SAND; fine, poorly-graded; brown; trace silt, wet, loose. (SP) SPTs (2-4-4-7)		
650.0									
645.0									

LITHOLOGY LEGEND

Fill

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-18B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 36
DEPTH TO BEDROCK: 35

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171910.003 E: 2971272.53
GROUND SURFACE ELEV.: 665.94
TOP OF CASING ELEV.: 668.45
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/26/2018 9:35:00 AM
END DATE/TIME: 7/26/2018 10:35:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	dark brown SILTY SAND, some organics			RS			0-1.7': SILTY SAND, well-graded, dark brown, some organics, dry. (SM)		Bentonite Grout 0-21 ft bgs
	orange to dark brown fine SAND, some silt			RS			1.7-2.3': SAND, fine, poorly-graded, orange to dark brown, some silt, moist. (SP)		
	light brown fine to medium SAND			RS			2.3-4.2': SAND, fine to medium, well-graded, light brown, moist. (SW)		
660.0				RS			5-7.4': SAND, fine to medium, well-graded, light brown, wet. (SW)		
	light brown fine CLAYEY SAND			RS			7.4-8.75': CLAYEY SAND, fine, poorly-graded, light brown, cohesive, wet. (SC)		
655.0				RS			10-13': CLAYEY SAND, fine, poorly-graded, light brown, cohesive, wet. (SC)		
	light brown to light gray fine to coarse SAND, trace to some gravel			RS			13-13.7': SAND, fine to coarse, well-graded, light brown, wet. (SW)		
				RS			13.7-14.8': SAND, medium to coarse, well-graded, light brown, some rounded gravel <1 inch, some fine sand, wet. (SW)		
650.0				RS			16-20': SAND, fine to coarse, well-graded, light brown, some rounded gravel <1 inch, wet. (SW)		
645.0				RS			20-23.7': SAND, medium to coarse, well-graded, light brown, some rounded gravel <1 inch, little fine sand, wet. (SW)		Bentonite Chips 21-23 ft bgs #5 Sand Filter Pack 23-35 ft bgs
				RS					

LITHOLOGY LEGEND

USCS Silty Sand (SM)
USCS Clayey Sand (SC)
USCS Poorly-graded Sand (SP)
Shale
USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/12/18

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-18B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 36
DEPTH TO BEDROCK: 35

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171910.003 E: 2971272.53
GROUND SURFACE ELEV.: 665.94
TOP OF CASING ELEV.: 668.45
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/26/2018 9:35:00 AM
END DATE/TIME: 7/26/2018 10:35:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
640.0	light brown to light gray fine to coarse SAND, trace to some gravel			RS			24-24.9': SAND, medium to coarse, well-graded, light brown, some rounded gravel <1 inch, some fine sand, wet. (SW)		2" PVC Screen slot 0.010 25-35 ft bgs
				RS			24.9-25.3': SAND, medium to coarse, well-graded, light gray, some rounded gravel <1 inch, trace fine sand, wet. (SW)		
							25.3-28': SAND, fine to coarse, well-graded, light gray, trace rounded gravel, wet. (SW)		
635.0				RS			28-32': SAND, fine to coarse, well-graded, light gray, trace rounded gravel, wet. (SW)		
			SB-18B-32'-34'	RS			32-33.75': SAND, fine to coarse, well-graded, light gray, wet. (SW)		
	light gray SHALE			RS		2 / 1	35-35.5': SHALE, light gray, wet, little weathering.		#5 Sand 35-36 ft bgs
630.0	light gray clayey SHALE						35.5-36': CLAYEY SHALE, light gray, wet, little weathering.		
625.0									
620.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)
USCS Clayey Sand (SC)
USCS Poorly-graded Sand (SP)
Shale
USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/12/18

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-19

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 16
DEPTH TO BEDROCK: 33.2

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171634.271 E: 2974035.798
GROUND SURFACE ELEV.: 663.77
TOP OF CASING ELEV.: 666.71
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 75
START DATE/TIME: 5/27/2016 1:00:00 PM
END DATE/TIME: 5/27/2016 1:46:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	FILL- dark brown SAND, some silt, some organics, little gravel		1	SS		1.7 / 2	0-1.1': SAND, some silt, some organics, little angular medium gravel, fine, poorly-graded; dark brown; non-cohesive, dry, loose. (FILL) 1.1-1.75': SAND, some silt, poorly-graded; dark brown; non-cohesive, dry, loose. (FILL) 1.75-2': CLAYEY SAND; dark brown; trace silt, dry, loose. (FILL) SPTs (4-4-5-5)		Bentonite grout mix 0-2 ft-bgs Bentonite chips 2-4 ft-bgs
660.0			2	SS		0 / 2	5-7': No Recovery. Notes: Groundwater fills borehole to ground surface		Filter Pack #5 Sand 4-16 ft-bgs 2 PVC Screen slot 0.010 6-16 ft-bgs
655.0			3	SS		1.2 / 2	10-11': SAND, little medium angular gravel, fine to medium, poorly-graded; dark brown; trace silt, wet, loose. (FILL) 11-12': SAND, fine to medium, poorly-graded; dark brown; trace silt, saturated, loose. (FILL) SPTs (2-2-2-2)		
650.0									
645.0									
640.0									

LITHOLOGY LEGEND

Fill

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 75

LOGGED BY: DSD
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-19B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 33.25
DEPTH TO BEDROCK: 33.2

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171632.026 E: 2974037.912
GROUND SURFACE ELEV.: 663.64
TOP OF CASING ELEV.: 666.74
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 75
START DATE/TIME: 5/27/2016 10:33:00 AM
END DATE/TIME: 5/27/2016 12:11:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	FILL- dark brown SAND, some silt, some organics, some fly ash/ boiler slag, little gravel		1	SS		1.7 / 2	0-1.1': SAND, some silt, some organics, little angular medium gravel, fine, poorly-graded; dark brown; non-cohesive, dry, loose. (FILL) 1.1-1.75': SAND, some silt, poorly-graded; dark brown; non-cohesive, dry, loose. (FILL) 1.75-2': CLAYEY SAND; dark brown; trace silt, dry, loose. (FILL) SPTs (4-4-5-5)		Bentonite grout mix 0-19 ft-bgs
660.0			2	SS		0 / 2	5-7': No Recovery. Notes: Groundwater fills borehole to ground surface		
655.0			3	SS		1.2 / 2	10-11': SAND, little medium angular gravel, fine to medium, poorly-graded; dark brown; trace silt, wet, loose. (FILL) 11-12': SAND, fine to medium, poorly-graded; dark brown; trace silt, saturated, loose. (FILL) SPTs (2-2-2-2)		
650.0			4	SS		0 / 2	15-17': No Recovery. HDPE fragments returned. SPTs (1-2-2-5)		
645.0			5	SS		1.6 / 2	20-20.25': SAND, fine to medium, poorly-graded; light brown; trace silt, wet, loose. (FILL) 21.25-22': SAND, some fine to medium subrounded gravel, some fly ash/ boiler slag, medium to coarse, poorly-graded; grey; trace silt, saturated, loose. (FILL) SPTs (2-3-5-7)		Bentonite chips 19-21 ft-bgs Filter Pack #5 Sand 21-33 ft-bgs 2 PVC Screen slot 0.010 23-33 ft-bgs
640.0									

LITHOLOGY LEGEND

Fill
Shale
USCS Poorly-graded Sand (SP)
USCS Low Plasticity Clay (CL)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 75

LOGGED BY: DSD
CHECKED BY: JMR
DATE: 3/22/17

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-19B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 33.25
DEPTH TO BEDROCK: 33.2

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171632.026 E: 2974037.912
GROUND SURFACE ELEV.: 663.64
TOP OF CASING ELEV.: 666.74
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 75
START DATE/TIME: 5/27/2016 10:33:00 AM
END DATE/TIME: 5/27/2016 12:11:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	brown fine to medium SAND, some gravel, trace silt		6	SS		2 / 2	25-25.3': SAND, some fine subrounded gravel, some fly ash/ boiler slag, fine to medium, poorly-graded; brown; trace silt, saturated, compact. (FILL) 25.3-25.8': SAND, some fine to medium subrounded to rounded gravel, medium, poorly-graded; grey; trace silt, saturated, compact. (SP) 25.8-27': SAND, little fine rounded gravel, fine to medium, poorly-graded; brown; trace silt, saturated, compact. (SP) SPTs (2-5-13-16)		
635.0	grey fine to medium SAND, little gravel, trace silt		7	SS		2 / 2	30-31.3': SAND, fine to medium, poorly-graded; grey; trace silt, saturated, compact. (SP) 31.3-31.5': fine gravelly SAND, little organics, little fly ash/ boiler slag, medium, well-graded; grey; trace silt, saturated, compact. (SP) 31.5-31.8': SAND, fine to medium, poorly-graded; grey; trace silt, saturated, compact. (SP) 31.8-32': CLAY; grey; cohesive, moist, very stiff. (CL) 33.3': auger refusal in SHALE; dark grey to black. SPTs (12-12-13-13)		
	grey CLAY								
630.0	SHALE								
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

Fill
Shale
USCS Poorly-graded Sand (SP)
USCS Low Plasticity Clay (CL)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 75

LOGGED BY: DSD
CHECKED BY: JMR
DATE: 3/22/17

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-20

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 16
DEPTH TO BEDROCK: 32.5

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171579.615 E: 2974761.601
GROUND SURFACE ELEV.: 664.61
TOP OF CASING ELEV.: 667.21
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/27/2016
END DATE/TIME: 5/27/2016

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	FILL- SAND, trace gravel, trace fly ash/boiler slag, trace silt		1	SS		1.7 / 2	0-1.8': SAND, organics, fine, poorly-graded; dark brown; trace fly ash/ boiler slag, trace silt, dry, loose. (FILL) 1.8-2': FLY ASH/ BOILER SLAG, moist, loose. (FILL) SPTs (3-4-4-5)		Bentonite grout mix 0-2 ft-bgs Bentonite chips 2-4 ft-bgs
660.0			2	SS		2 / 2	5-5.9': SAND, fine, poorly-graded; dark brown; trace fly ash/ boiler slag, trace silt, dry, loose. (FILL) 5.9-6.2': FLY ASH/ BOILER SLAG, moist, loose. (FILL) 6.2-6.3': SAND, fine, poorly-graded; brown; trace gravel, trace fly ash/ boiler slag, trace silt, dry, loose. (FILL) 6.3-6.7': FLY ASH/ BOILER SLAG, moist, loose. (FILL) 6.7-7': SAND, fine, poorly-graded; brown; trace silt, moist, loose. (FILL) (SP) SPTs (2-2-4-3)		Filter Pack #5 Sand 4-16 ft-bgs 2 PVC Screen slot 0.010 6-16 ft-bgs
655.0	grey fine SAND, trace silt		3	SS		1.5 / 2	10.8-11.1': SAND, clay lens, fine, poorly-graded; grey; trace fly ash/ boiler slag, trace silt, moist, loose. (FILL) 11.1-12': SAND, fine, poorly-graded; grey; trace silt, wet, loose. (SP) SPTs (7-3-3-4)		
650.0									
645.0									
640.0									

LITHOLOGY LEGEND

Fill

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-20B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 32.5
DEPTH TO BEDROCK: 32.5

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171579.945 E: 2974757.369
GROUND SURFACE ELEV.: 664.48
TOP OF CASING ELEV.: 667.40
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/27/2016 8:48:00 AM
END DATE/TIME: 5/27/2016 9:39:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	FILL- SAND, trace gravel, trace fly ash/boiler slag, trace silt		1	SS		1.7 / 2	0-1.8': SAND, organics, fine, poorly-graded; dark brown; trace fly ash/ boiler slag, trace silt, dry, loose. (FILL) 1.8-2': FLY ASH/ BOILER SLAG, moist, loose. (FILL) SPTs (3-4-4-5)		Bentonite grout mix 0-18.5 ft-bgs
660.0			2	SS		2 / 2	5-5.9': SAND, fine, poorly-graded; dark brown; trace fly ash/ boiler slag, trace silt, dry, loose. (FILL) 5.9-6.2': FLY ASH/ BOILER SLAG, moist, loose. (FILL) 6.2-6.3': SAND, fine, poorly-graded; brown; trace gravel, trace fly ash/ boiler slag, trace silt, dry, loose. (FILL) 6.3-6.7': FLY ASH/ BOILER SLAG, moist, loose. (FILL) 6.7-7': SAND, fine, poorly-graded; brown; trace silt, moist, loose. (FILL) (SP) SPTs (2-2-4-3)		
655.0	grey fine SAND, trace silt		3	SS		1.5 / 2	10.8-11.1': SAND, clay lens, fine, poorly-graded; grey; trace fly ash/ boiler slag, trace silt, moist, loose. (FILL) 11.1-12': SAND, fine, poorly-graded; grey; trace silt, wet, loose. (SP) SPTs (7-3-3-4)		
650.0			4	SS		1.8 / 2	15-17': SAND, fine, poorly-graded; grey; trace silt, wet, loose. (SP) SPTs (2-2-3-4)		
645.0			5	SS		2 / 2	20-22': SAND, fine, poorly-graded; grey; trace silt, wet, loose. (SP) SPTs (6-3-5-4)		Bentonite chips 18.5-20.5 ft-bgs Filter Pack #5 Sand 20.5-32.5 ft-bgs 2 PVC Screen slot 0.010 22.5-32.5 ft-bgs
640.0									

LITHOLOGY LEGEND

Fill
USCS Low Plasticity Clay (CL)
USCS Poorly-graded Sand (SP)
Shale
USCS Well-graded Sand (SW)

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-20B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 32.5
DEPTH TO BEDROCK: 32.5

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171579.945 E: 2974757.369
GROUND SURFACE ELEV.: 664.48
TOP OF CASING ELEV.: 667.40
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/27/2016 8:48:00 AM
END DATE/TIME: 5/27/2016 9:39:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	grey fine to medium SAND, trace gravel, trace silt		6	SS		1.2 / 2	25-27': SAND, fine to medium, well-graded; grey; trace gravel, trace silt, wet, loose. (SW) SPTs (2-4-4-5)		
635.0			7	SS		1.8 / 2	30-30.9': SAND, fine, poorly-graded; grey; trace silt, moist, loose. (SP) 30.9-31.3': SAND, medium, well-graded; grey; trace silt, wet, loose. (SW) 31.3-31.6': SAND, fine, poorly-graded; grey; trace silt, wet, loose. (SP) 31.6-31.9': GRAVEL, angular, well-graded; grey; poorly-graded, fine sand, trace fine sand, trace silt, moist, loose. (GP) 31.9-32': CLAY, trace gravel; grey; cohesive, plastic, soft, moist. (CL) 32.5': auger refusal in SHALE; dark grey to black. SPTs (4-4-5-5)		
	grey CLAY, trace gravel								
	SHALE								
630.0									
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

Fill
USCS Low Plasticity Clay (CL)
USCS Poorly-graded Sand (SP)
Shale
USCS Well-graded Sand (SW)

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-21

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 18
DEPTH TO BEDROCK: 34

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172668.506 E: 2974488.987
GROUND SURFACE ELEV.: 666.60
TOP OF CASING ELEV.: 668.38
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/31/2016
END DATE/TIME: 5/31/2016

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	FILL- SAND, occasional lenses of fly ash/ boiler slag and organics, trace silt		1	SS		2 / 2	0-1.7': SAND, organics, fine, poorly-graded; black; trace fly ash/boiler slag, trace silt. loose, dry. (FILL) 1.7-2': SAND, fine, poorly-graded; light to dark brown; trace silt. loose, dry. (FILL) SPTs (2-3-5-6)		Bentonite grout mix 0-4 ft-bgs
660.0			2	SS		1.8 / 2	5-6.25': SAND, fine, poorly-graded; dark brown; trace fly ash/ boiler slag, trace organics, trace silt, loose, dry. (FILL) 6.25-7': SAND, 2" thick lens fly ash/ boiler slag, fine poorly-graded; grey; trace silt, moist, compact. (FILL) SPTs (6-6-7-8)		Bentonite chips 4-6 ft-bgs Filter Pack #5 Sand 6-18 ft-bgs 2 PVC Screen slot 0.010 8-18 ft-bgs
655.0	grey fine to medium SAND, trace gravel, trace silt		3	SS		1.3 / 2	10-11': SAND, 1" thick lens fly ash/ boiler slag, fine, poorly-graded; light brown, trace silt, moist, loose. (FILL) 11-11.3': SAND, fine to medium, poorly-graded; light brown; trace silt, wet, loose. (FILL) 11.3-12': SAND, fine to medium, well-graded; grey; trace silt, moist, loose. (SW) SPTs (2-2-3-4)		
650.0			4	SS		2 / 2	15-16.1': SAND, medium, well-graded; grey; trace silt, moist, compact. (SW) 16.1-17': SAND, fine, well-graded; grey; trace gravel, trace silt, wet, compact. (SW) SPTs (5-5-6-5)		
645.0									

LITHOLOGY LEGEND

Fill

USCS Well-graded Sand (SW)

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-21B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 34
DEPTH TO BEDROCK: 34

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172668.924 E: 2974493.241
GROUND SURFACE ELEV.: 666.66
TOP OF CASING ELEV.: 669.37
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/31/2016 10:10:00 AM
END DATE/TIME: 5/31/2016 12:11:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	FILL- SAND, occasional lenses of fly ash/ boiler slag and organics, trace silt		1	SS		2 / 2	0-1.7': SAND, organics, fine, poorly-graded; black; trace fly ash/boiler slag, trace silt. loose, dry. (FILL) 1.7-2': SAND, fine, poorly-graded; light to dark brown; trace silt. loose, dry. (FILL) SPTs (2-3-5-6)		Bentonite grout mix 0-20 ft-bgs
660.0			2	SS		1.8 / 2	5-6.25': SAND, fine, poorly-graded; dark brown; trace fly ash/ boiler slag, trace organics, trace silt, loose, dry. (FILL) 6.25-7': SAND, 2" thick lens fly ash/ boiler slag, fine poorly-graded; grey; trace silt, moist, compact. (FILL) SPTs (6-6-7-8)		
655.0	grey fine to medium SAND, trace gravel, trace silt		3	SS		1.3 / 2	10-11': SAND, 1" thick lens fly ash/ boiler slag, fine, poorly-graded; light brown, trace silt, moist, loose. (FILL) 11-11.3': SAND, fine to medium, poorly-graded; light brown; trace silt, wet, loose. (FILL) 11.3-12': SAND, fine to medium, well-graded; grey; trace silt, moist, loose. (SW) SPTs (2-2-3-4)		
650.0			4	SS		2 / 2	15-16.1': SAND, medium, well-graded; grey; trace silt, moist, compact. (SW) 16.1-17': SAND, fine, well-graded; grey; trace gravel, trace silt, wet, compact. (SW) SPTs (5-5-6-5)		
645.0			5	SS		2 / 2	20-22': SAND, fine, poorly-graded; grey, trace gravel, trace silt, wet, loose. (SP) SPTs (4-4-5-7)		Bentonite chips 20-22 ft-bgs Filter Pack #5 Sand 22-34 ft-bgs 2 PVC Screen slot 0.010 24-34 ft-bgs

LITHOLOGY LEGEND

Fill | USCS Well-graded Sand (SW) | Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-21B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 34
DEPTH TO BEDROCK: 34

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172668.924 E: 2974493.241
GROUND SURFACE ELEV.: 666.66
TOP OF CASING ELEV.: 669.37
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/31/2016 10:10:00 AM
END DATE/TIME: 5/31/2016 12:11:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
640.0	grey fine to medium SAND, trace gravel, trace silt		6	SS		1.1 / 2	25-27': SAND, fine, poorly graded; grey; trace organics, trace silt, wet, compact. (SP) SPTs (7-8-9-12)		
635.0			7	SS		1.5 / 2	30-32': SAND, fine, poorly graded; grey; trace gravel, trace silt, wet, compact. (SP) 34': auger refusal in SHALE; dark grey to black. SPTs (7-8-11-12)		
630.0	SHALE								
625.0									
620.0									

LITHOLOGY LEGEND

Fill | USCS Well-graded Sand (SW) | Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-22

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 18
DEPTH TO BEDROCK: 35

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172668.965 E: 2974888.857
GROUND SURFACE ELEV.: 666.33
TOP OF CASING ELEV.: 668.64
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/31/2016 3:19:00 PM
END DATE/TIME: 5/31/2016 4:15:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	FILL- SAND, organics, trace fly ash/boiler slag, trace silt		1	SS		1.6 / 2	0-2': SAND, organics, fine, poorly-graded; brown to dark brown; trace fly ash/ boiler slag, trace silt, moist, very loose. (FILL) SPTs (3-4-4-4)		Bentonite grout mix 0-4 ft-bgs
660.0			2	SS		2 / 2	5-5.9': SAND, fine, poorly-graded; dark brown to black; trace fly ash/ boiler slag, trace silt, moist, compact. (FILL) 5.9-6.1': SAND, fine, poorly-graded; light brown; trace silt, moist, compact. (FILL) 6.1-7': SAND, fine, poorly-graded; dark brown to black; trace fly ash/ boiler slag, trace silt, moist, compact. (FILL) SPTs (4-5-5-6)		Bentonite chips 4-6 ft-bgs Filter Pack #5 Sand 6-18 ft-bgs 2 PVC Screen slot 0.010 8-18 ft-bgs
655.0	dark grey to light brown fine SAND, trace silt		3	SS		1.9 / 2	10-10.25': SAND, fine, poorly-graded; light brown to dark brown; trace silt, dry, loose. (FILL) 10.25-11': SAND, fine, poorly-graded; dark grey; trace silt, wet, loose. (SP) 11-12': SAND, fine, poorly-graded; light brown; trace silt, wet, loose. (SP) SPTs (4-4-5-5)		
650.0	grey to light brown fine to medium SAND, trace gravel, trace silt		4	SS		2 / 2	15-16.1': SAND, fine, well-graded; grey to light brown; trace silt, wet, compact. (SW) 16.1-17': SAND, fine to medium, well-graded; grey to light brown; trace gravel, trace silt, wet, compact.(SW) SPTs (8-8-8-9)		
645.0									

LITHOLOGY LEGEND

Fill | USCS Poorly-graded Sand (SP) | USCS Well-graded Sand (SW)

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-22B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 35
DEPTH TO BEDROCK: 35

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172669.323 E: 2974894.389
GROUND SURFACE ELEV.: 666.39
TOP OF CASING ELEV.: 669.38
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 6/2/2016 8:03:00 AM
END DATE/TIME: 6/2/2016 9:45:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	FILL- SAND, organics, trace fly ash/boiler slag, trace silt		1	SS		1.6 / 2	0-2': SAND, organics, fine, poorly-graded; brown to dark brown; trace fly ash/ boiler slag, trace silt, moist, very loose. (FILL) SPTs (3-4-4-4)		Bentonite grout mix 0-21 ft-bgs
660.0			2	SS		2 / 2	5-5.9': SAND, fine, poorly-graded; dark brown to black; trace fly ash/ boiler slag, trace silt, moist, compact. (FILL) 5.9-6.1': SAND, fine, poorly-graded; light brown; trace silt, moist, compact. (FILL) 6.1-7': SAND, fine, poorly-graded; dark brown to black; trace fly ash/ boiler slag, trace silt, moist, compact. (FILL) SPTs (4-5-5-6)		
655.0	dark grey to light brown fine SAND, trace silt		3	SS		1.9 / 2	10-10.25': SAND, fine, poorly-graded; light brown to dark brown; trace silt, dry, loose. (FILL) 10.25-11': SAND, fine, poorly-graded; dark grey; trace silt, wet, loose. (SP) 11-12': SAND, fine, poorly-graded; light brown; trace silt, wet, loose. (SP) SPTs (4-4-5-5)		
650.0	grey to light brown fine to medium SAND, trace gravel, trace silt		4	SS		2 / 2	15-16.1': SAND, fine, well-graded; grey to light brown; trace silt, wet, compact. (SW) 16.1-17': SAND, fine to medium, well-graded; grey to light brown; trace gravel, trace silt, wet, compact.(SW) SPTs (8-8-8-9)		
645.0			5	SS		2 / 2	20-22': SAND, fine to medium, well-graded; grey; trace gravel, trace silt, wet, compact. (SW) SPTs (6-10-8-9)		Bentonite chips 21-23 ft-bgs Filter Pack #5 Sand 23-35 ft-bgs

LITHOLOGY LEGEND

Fill
Shale
USCS Poorly-graded Sand (SP)
USCS Well-graded Sand (SW)

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-22B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 35
DEPTH TO BEDROCK: 35

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172669.323 E: 2974894.389
GROUND SURFACE ELEV.: 666.39
TOP OF CASING ELEV.: 669.38
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 6/2/2016 8:03:00 AM
END DATE/TIME: 6/2/2016 9:45:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
640.0	grey to light brown fine to medium SAND, trace gravel, trace silt		6	SS		1.1 / 2	25-27': SAND, fine to medium, well-graded; grey; trace gravel, trace silt, wet, compact. (SW) SPTs (6-7-6-6)		2 PVC Screen slot 0.010 25-35 ft-bgs
635.0			7	SS		1.4 / 2	30-32': SAND, fine to medium, well-graded; grey; trace gravel, trace silt, wet, compact. (SW) 35': auger refusal in SHALE; dark grey to black. SPTs (10-11-12-12)		
630.0	SHALE								
625.0									
620.0									

LITHOLOGY LEGEND

Fill
Shale
USCS Poorly-graded Sand (SP)
USCS Well-graded Sand (SW)

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-23

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 19
DEPTH TO BEDROCK: 35

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172680.878 E: 2975296.245
GROUND SURFACE ELEV.: 667.02
TOP OF CASING ELEV.: 668.34
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 6/2/2016 1:17:00 PM
END DATE/TIME: 6/2/2016 2:12:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	FILL- FLY ASH/ BOILER SLAG, SAND, gravel and clay layers, trace silt		1	SS		1.3 / 2	0-1.4': FLY ASH/ BOILER SLAG; trace silt, dry, loose. (FILL) 1.4-1.75': FLY ASH/ BOILER SLAG, clay lens; trace silt, dry, loose. (FILL) 1.75-2': GRAVEL, angular, well-graded; white to grey; trace silt, dry, loose. (FILL) SPTs (2-3-6-8)		Bentonite grout mix 0-5 ft-bgs
660.0			2	SS		1.8 / 2	5-6.4': FLY ASH/ BOILER SLAG; trace silt, dry, loose. (FILL) 6.4-6.7': CLAY; dark grey; w<PL, moist, soft. (FILL) 6.7-7': SAND, fine, poorly-graded; white to light grey; trace silt, dry, loose. (FILL) SPTs (5-4-4-2)		Bentonite chips 5-7 ft-bgs Filter Pack #5 Sand 7-19 ft-bgs 2 PVC Screen slot 0.010 9-19 ft-bgs
655.0			3	SS		1.7 / 2	10-12': FLY ASH/ BOILER SLAG, fine to medium sand, poorly-graded; black; trace gravel, trace silt, wet, loose. (FILL) SPTs (3-4-4-5)		
650.0	grey fine to medium SAND, trace fines, trace silt		4	SS		2 / 2	15-16.25': FLY ASH/ BOILER SLAG, fine to medium sand, poorly-graded; black; trace silt, loose. (FILL) 16.25-17': SAND, trace fines, fine to medium, well-graded; grey; trace silt, wet, loose. (SW) SPTs (4-4-5-7)		
645.0									

LITHOLOGY LEGEND

Fill

USCS Well-graded Sand (SW)

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

BOREHOLE LOG: GAMW-23B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 35
DEPTH TO BEDROCK: 35

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172676.249 E: 2975297.048
GROUND SURFACE ELEV.: 667.03
TOP OF CASING ELEV.: 670.02
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 6/2/2016 10:37:00 AM
END DATE/TIME: 6/2/2016 12:53:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	FILL- FLY ASH/ BOILER SLAG, SAND, gravel and clay layers, trace silt		1	SS		1.3 / 2	0-1.4': FLY ASH/ BOILER SLAG; trace silt, dry, loose. (FILL) 1.4-1.75': FLY ASH/ BOILER SLAG, clay lens; trace silt, dry, loose. (FILL) 1.75-2': GRAVEL, angular, well-graded; white to grey; trace silt, dry, loose. (FILL) SPTs (2-3-6-8)		Bentonite grout mix 0-21 ft-bgs
665.0			2	SS		1.8 / 2	5-6.4': FLY ASH/ BOILER SLAG; trace silt, dry, loose. (FILL) 6.4-6.7': CLAY; dark grey; w<PL, moist, soft. (FILL) 6.7-7': SAND, fine, poorly-graded; white to light grey; trace silt, dry, loose. (FILL) SPTs (5-4-4-2)		
660.0			3	SS		1.7 / 2	10-12': FLY ASH/ BOILER SLAG, fine to medium sand, trace gravel, poorly-graded; black; trace silt, wet, loose. (FILL) SPTs (3-4-4-5)		
655.0			4	SS		2 / 2	15-16.25': FLY ASH/ BOILER SLAG, fine to medium sand, poorly-graded; black; trace silt, loose. (FILL) 16.25-17': SAND, trace fines, fine to medium, well-graded; grey; trace silt, wet, loose. (SW) SPTs (4-4-5-7)		
	grey fine to medium SAND, trace fines, trace silt								
650.0			5	SS		2 / 2	20-22': SAND, fine to medium, poorly-graded; dark grey; trace silt, wet, compact. (SP) SPTs (4-5-7-8)		Bentonite chips 21-23 ft-bgs
645.0									Filter Pack #5 Sand 23-35 ft-bgs

LITHOLOGY LEGEND

Fill | USCS Well-graded Sand (SW) | Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-23B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 35
DEPTH TO BEDROCK: 35

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172676.249 E: 2975297.048
GROUND SURFACE ELEV.: 667.03
TOP OF CASING ELEV.: 670.02
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 6/2/2016 10:37:00 AM
END DATE/TIME: 6/2/2016 12:53:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	grey fine to medium SAND, trace fines, trace silt		6	SS		2 / 2	25-27': SAND, fine to medium, well-graded; dark grey; trace silt, wet, compact. (SW) SPTs (4-8-12-15)		2 PVC Screen slot 0.010 25-35 ft-bgs
640.0			7	SS		1.3 / 2	30-31.2': SAND, fine to medium, well-graded; dark grey; trace silt, wet, compact. (SW) 31.2-31.5': GRAVEL, rounded, poorly-graded; grey to brown; trace silt, wet, compact. (GP) 31.5-32': SAND, fine to medium, poorly-graded; light grey; trace silt, wet, compact. (SP) 35': auger refusal in SHALE; dark grey to black. SPTs (7-8-10-10)		
635.0	SHALE								
630.0									
625.0									
620.0									

LITHOLOGY LEGEND

Fill | USCS Well-graded Sand (SW) | Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

BOREHOLE LOG: GAMW-24

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 16
DEPTH TO BEDROCK: 31

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171048.7173 E: 2974868.6827
GROUND SURFACE ELEV.: 662.09
TOP OF CASING ELEV.: 665.39
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 9/26/2016 3:34:00 PM
END DATE/TIME: 9/26/2016 4:10:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	dark brown to black fine SAND, trace organics, trace silt		1	SS		1.6 / 2	0-1.58': SAND, trace organics, fine, poorly-graded; dark brown to black; trace silt, moist, loose. (SP) SPTs (1-1-1-1)		Bentonite grout mix 0-2 ft-bgs
660.0									Bentonite chips 2-4 ft-bgs
	grey to dark grey fine to medium SAND, trace silt		2	SS		2 / 2	5-7': SAND, fine to medium, poorly-graded; grey to dark grey; trace silt, moist to wet, loose. (SP) SPTs (2-3-4-4)		Filter Pack #4 Sand 4-16 ft-bgs
655.0									2" PVC Screen slot 0.010 6-16 ft-bgs
	light to dark brown fine to medium SAND, trace silt		3	SS		2 / 2	10-11.33': SAND, fine, poorly-graded; light to dark brown; trace silt, moist, compact. (SP) 11.33-12': SILT loam, very fine, light brown sand lenses, well-graded; grey; trace silt, wet, compact. (ML) SPTs (3-5-10-14)		
	grey SILT loam, light brown sand lenses, trace silt								
650.0									
	tan to dark brown SAND, trace silt								
645.0									
640.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

USCS Silt (ML)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-24B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 31
DEPTH TO BEDROCK: 31

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171050.6688 E: 2974866.8932
GROUND SURFACE ELEV.: 662.13
TOP OF CASING ELEV.: 665.33
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 9/26/2016 12:00:00 PM
END DATE/TIME: 9/26/2016 2:02:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	dark brown to black SAND, trace organics, trace silt		1	SS		1.6 / 2	0-1.58': SAND, trace organics, fine, poorly-graded; dark brown to black; trace silt, moist, loose. (SP) SPTs (1-1-1-1)		Bentonite grout mix 0-17 ft-bgs
660.0									
	grey to dark grey fine to medium SAND, trace silt		2	SS		2 / 2	5-7': SAND, fine to medium, poorly-graded; grey to dark grey; trace silt, moist to wet, loose. (SP) SPTs (2-3-4-4)		
655.0									
	light to dark brown fine to medium SAND, trace silt		3	SS		2 / 2	10-11.33': SAND, fine to medium, poorly-graded; light to dark brown; trace silt, moist, compact. (SP) 11.33-12': SILT loam, very fine, light brown sand lenses, well-graded; grey; trace silt, wet, compact. (ML) SPTs (3-5-10-14)		
	grey SILT loam, light brown sand lenses, trace silt								
650.0									
	tan to brown to dark brown fine to medium SAND, trace silt		4	SS		1.3 / 2	15-16.25': SAND, fine to medium, poorly-graded; brown to dark brown; trace silt, moist, compact. (SP) SPTs (1-3-9-12)		Bentonite chips 17-19 ft-bgs
645.0									Filter Pack #4 Sand 19-31 ft-bgs
			5	SS		1.8 / 2	20-22': SAND, fine to medium, poorly-graded; tan to brown to dark brown; trace silt, moist, dense. (SP) SPTs (3-13-24-24)		2" PVC Screen slot 0.010 21-31 ft-bgs
640.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP) | USCS Silt (ML) | Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-24B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 31
DEPTH TO BEDROCK: 31

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171050.6688 E: 2974866.8932
GROUND SURFACE ELEV.: 662.13
TOP OF CASING ELEV.: 665.33
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 9/26/2016 12:00:00 PM
END DATE/TIME: 9/26/2016 2:02:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	tan to brown to dark brown fine to medium SAND, trace silt		6	SS		1.6 / 2	25-26.58': SAND, fine to medium with trace gravel from 25'-25'6, poorly-graded; brown to dark brown; trace silt, moist, compact. (SP) SPTs (3-4-22-22)		
635.0									
			7	SS		0.3 / 2	30-30.25': SAND, fine to medium, poorly-graded; brown to dark brown; trace silt, moist, dense. (SP) 31': auger refusal in SHALE; dark grey to black. SPTs (5-15-27-50/5)		
	SHALE								
630.0									
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

USCS Silt (ML)

Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-25

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 16
DEPTH TO BEDROCK: 35

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171586.0299 E: 2973730.3404
GROUND SURFACE ELEV.: 665.26
TOP OF CASING ELEV.: 668.05
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 10/4/2016 4:17:00 PM
END DATE/TIME: 10/5/2016 9:20:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	FILL- light brown to orangey tan, fine SAND, trace fly ash, trace silt		1	SS		0.3 / 2	0-0.33': SAND, fine, poorly-graded; light brown to black; trace silt, dry, loose. (FILL) SPTs (1-2-4-3)		Bentonite grout mix 0-2 ft-bgs
									Bentonite chips 2-4 ft-bgs
									Filter Pack #4 Sand 4-16 ft-bgs
660.0			2	SS		2 / 2	5-7': SAND, fine, poorly-graded; light brown to orange-y tan; trace silt, moist, loose. (FILL) SPTs (1-3-3-3)		2" PVC Screen slot 0.010 6-16 ft-bgs
655.0			3	SS		1.8 / 2	10.25-12': SAND, fine, poorly-graded; light brown to orange-y tan; trace fly ash, trace silt, wet, very loose. (FILL) SPTs (1-1-1-1)		
650.0	light brown to orange-y tan, fine SAND, trace silt								
645.0									

LITHOLOGY LEGEND

Fill

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-25B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 35
DEPTH TO BEDROCK: 35

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171588.4863 E: 2973730.6633
GROUND SURFACE ELEV.: 665.26
TOP OF CASING ELEV.: 667.95
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 10/5/2016 9:23:00 AM
END DATE/TIME: 10/5/2016 10:20:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	FILL- light brown to orangey tan, fine SAND, trace fly ash, trace silt		1	SS		0.3 / 2	0-0.33': SAND, fine, poorly-graded; light brown to black; trace silt, dry, loose. (FILL) SPTs (1-2-4-3)		Bentonite grout mix 0-21 ft-bgs
			2	SS		2 / 2	5-7': SAND, fine, poorly-graded; light brown to orange-y tan; trace silt, moist, loose. (FILL) SPTs (1-3-3-3)		
660.0									
			3	SS		1.8 / 2	10.25-12': SAND, fine, poorly-graded; light brown to orange-y tan; trace fly ash, trace silt, wet, very loose. (FILL) SPTs (1-1-1-1)		
655.0									
			4	SS		1.3 / 2	15.67-17': SAND, fine, poorly-graded; light brown to orange-y tan; trace silt, wet, very loose. (SP) SPTs (8-1-2-2)		
650.0	light brown to orange-y tan, fine SAND, trace silt								
			5	SS		1.3 / 2	20.75-22': SAND, fine, poorly-graded; grey; trace silt, wet, loose. (SP) SPTs (1-3-4-5)		
645.0	grey, fine SAND, trace silt								Bentonite chips 21-23 ft-bgs
									Filter Pack #4 Sand 23-35 ft-bgs

LITHOLOGY LEGEND

Fill
Shale
USCS Poorly-graded Sand (SP)
USCS Well-graded Gravel (GW)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

BOREHOLE LOG: GAMW-25B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 35
DEPTH TO BEDROCK: 35

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171588.4863 E: 2973730.6633
GROUND SURFACE ELEV.: 665.26
TOP OF CASING ELEV.: 667.95
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 10/5/2016 9:23:00 AM
END DATE/TIME: 10/5/2016 10:20:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
640.0	grey, fine SAND, trace silt								2" PVC Screen slot 0.010 25-35 ft-bgs
	grey fine to medium SAND, trace gravel, trace silt		6	SS		1.2 / 2	25.83-26': SAND, fine, well-graded; grey; trace silt, wet, loose. (SW) 26-26.17': GRAVEL, well-graded; grey; trace silt, wet, loose. (GW) 26.17-27': SAND, fine to medium, well-graded; grey; trace gravel, trace silt, wet, loose. (SP) SPTs (1-2-4-8)		
635.0			7	SS		1.5 / 2	30.5-31.67': SAND, fine to medium, well-graded; grey; trace silt, wet, dense. (SW) 31.67-32': SAND, fine, poorly-graded; grey; trace silt, wet, dense.(SP) 35': auger refusal in SHALE; dark grey to black. SPTs (5-14-23-22)		
	grey fine SAND, trace silt								
630.0	SHALE								
625.0									
620.0									

LITHOLOGY LEGEND

Fill
Shale
USCS Poorly-graded Sand (SP)
USCS Well-graded Gravel (GW)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-26

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 16
DEPTH TO BEDROCK: 33

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172243.8327 E: 2973744.7976
GROUND SURFACE ELEV.: 664.89
TOP OF CASING ELEV.: 667.71
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 10/4/2016 2:54:00 PM
END DATE/TIME: 10/4/2016 3:23:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	FILL- fine, light brown to black SAND, trace organics, trace silt		1	SS		1.5 / 2	0.5-1.17': SAND, fine, poorly-graded; dark brown; trace organics, trace silt, dry, loose. (FILL) 1.17-1.46': black FLY ASH/BOILER SLAG. (FILL) 1.46-2': SAND, fine, poorly-graded; light brown to black; trace silt, dry, loose. (FILL) SPTs (1-1-1-1)		Bentonite grout mix 0-2 ft-bgs
660.0			2	SS		1.5 / 2	5-5.17': SAND, fine, poorly-graded; light brown to black; trace silt, moist, compact. (FILL) 5.17-5.29': GRAVEL, angular, poorly-graded; white; trace silt, moist, compact. (FILL) 5.29-6.58': SAND, fine, poorly-graded; brown; trace silt, wet, compact. (SP) SPTs (2-7-8-9)		Bentonite chips 2-4 ft-bgs Filter Pack #4 Sand 4-16 ft-bgs 2" PVC Screen slot 0.010 6-16 ft-bgs
655.0			3	SS		1.3 / 2	10-11.33': SAND, fine, poorly-graded; brown to dark brown to black; trace fly ash, trace silt, wet, compact. (SP) SPTs (2-7-5-7)		
650.0	brown to dark grey, fine SAND, trace gravel, trace silt								
645.0									
640.0									

LITHOLOGY LEGEND

Fill

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-26B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 33
DEPTH TO BEDROCK: 33

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172245.8652 E: 2973744.6631
GROUND SURFACE ELEV.: 664.91
TOP OF CASING ELEV.: 667.75
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 10/4/2016 12:30:00 PM
END DATE/TIME: 10/4/2016 2:01:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	FILL- fine to medium, light brown to black SAND, trace organics, trace silt		1	SS		1.5 / 2	0.5-1.17': SAND, fine, poorly-graded; dark brown; trace organics, trace silt, dry, loose. (FILL) 1.17-1.46': black FLY ASH/BOILER SLAG. (FILL) 1.46-2': SAND, fine, poorly-graded; light brown to black; trace silt, dry, loose. (FILL) SPTs (1-1-1-1)		Bentonite grout mix 0-19 ft-bgs
660.0			2	SS		1.5 / 2	5-5.17': SAND, fine, poorly-graded; light brown to black; trace silt, moist, compact. (FILL) 5.17-5.29': GRAVEL, angular, poorly-graded; white; trace silt, moist, compact. (FILL) 5.29-6.58': SAND, fine, poorly-graded; brown; trace silt, wet, compact. (SP) SPTs (2-7-8-9)		
655.0			3	SS		1.3 / 2	10-11.33': SAND, fine, poorly-graded; brown to dark brown to black; trace fly ash, trace silt, wet, compact. (SP) SPTs (2-7-5-7)		
650.0	brown to dark grey, fine to medium SAND, trace gravel, trace silt		4	SS		2 / 2	15-17': SAND, fine to medium, poorly-graded; brown; trace silt, wet, compact. (SP) SPTs (5-5-8-11)		
645.0			5	SS		1.1 / 2	20.92-22': SAND, fine to medium, well-graded; brown to grey; trace gravel, trace silt, wet, compact. (SW) SPTs (1-6-10-12)		Bentonite chips 19-21 ft-bgs Filter Pack #4 Sand 21-33 ft-bgs 2" PVC Screen slot 0.010 23-33 ft-bgs
640.0									

LITHOLOGY LEGEND

Fill | USCS Poorly-graded Sand (SP) | Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-26B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 33
DEPTH TO BEDROCK: 33

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172245.8652 E: 2973744.6631
GROUND SURFACE ELEV.: 664.91
TOP OF CASING ELEV.: 667.75
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 10/4/2016 12:30:00 PM
END DATE/TIME: 10/4/2016 2:01:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	brown to dark grey, fine to medium SAND, trace gravel, trace silt		6	SS		1.8 / 2	25.25-27': SAND, fine to medium, well-graded; brown to grey; trace gravel, trace silt, wet, compact. (SW) SPTs (1-5-12-24)		
635.0			7	SS		1.4 / 2	30.58-31.5': SAND, fine, poorly-graded; light grey; trace silt, wet, compact. (SP) 31.5-32': SAND, trace gravel, fine to medium, well-graded; dark grey; trace silt, wet, compact. (SW) 33': auger refusal in SHALE; dark grey to black. SPTs (1-7-20-31)		
	SHALE								
630.0									
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

Fill | USCS Poorly-graded Sand (SP) | Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-27

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 16
DEPTH TO BEDROCK: 31

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172624.6761 E: 2973958.3233
GROUND SURFACE ELEV.: 662.68
TOP OF CASING ELEV.: 665.51
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 10/3/2016 3:48:00 PM
END DATE/TIME: 10/3/2016 4:34:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	FILL- light brown to black fine to medium SAND, FLY ASH/ BOILER SLAG, trace organics, trace silt		1	SS		1.3 / 2	0-1.08': SAND, fine, poorly-graded; dark to light brown; trace organics, trace silt, dry, very loose. (FILL) 1.08-1.17': black FLY ASH/BOILER SLAG. (FILL) 1.17-1.25': SAND, fine, poorly-graded; light brown; trace silt, dry, very loose. (FILL) SPTs (1-1-1-2)		Bentonite grout mix 0-2 ft-bgs
660.0			2	SS		2 / 2	5-5.83': SAND with FLY ASH/BOILER SLAG, fine, well-graded; dark brown to black; trace silt, moist, loose. (FILL) 5.83-7': SAND, fine to medium, well-graded; brown; trace silt, moist, loose. (FILL) SPTs (4-2-2-3)		Bentonite chips 2-4 ft-bgs Filter Pack #4 Sand 4-16 ft-bgs 2" PVC Screen slot 0.010 6-16 ft-bgs
655.0			3	SS		1.8 / 2	10-10.25': FLY ASH/ BOILER SLAG; black; wet. (FILL) 10.25-11.75': SAND, fine to medium, well-graded; dark brown; trace fly ash, trace silt, wet, very loose. (FILL) SPTs (3-1-1-1)		
650.0									
645.0									
640.0									

LITHOLOGY LEGEND

Fill

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-27B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 31
DEPTH TO BEDROCK: 31

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172624.9467 E: 2973960.2089
GROUND SURFACE ELEV.: 662.65
TOP OF CASING ELEV.: 665.44
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 10/4/2016 8:46:00 AM
END DATE/TIME: 10/4/2016 10:00:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	FILL- light brown to black fine to medium SAND, FLY ASH/ BOILER SLAG, trace organics, trace silt		1	SS		1.3 / 2	0-1.08': SAND, fine, poorly-graded; dark to light brown; trace organics, trace silt, dry, very loose. (FILL) 1.08-1.17': black FLY ASH/BOILER SLAG. (FILL) 1.17-1.25': SAND, fine, poorly-graded; light brown; trace silt, dry, very loose. (FILL) SPTs (1-1-1-2)		Bentonite grout mix 0-17 ft-bgs
660.0			2	SS		2 / 2	5-5.83': SAND with FLY ASH/BOILER SLAG, fine, well-graded; dark brown to black; trace silt, moist, loose. (FILL) 5.83-7': SAND, fine to medium, well-graded; brown; trace silt, moist, loose. (FILL) SPTs (4-2-2-3)		
655.0			3	SS		1.8 / 2	10-10.25': FLY ASH/ BOILER SLAG; black; wet. (FILL) 10.25-11.75': SAND, fine to medium, well-graded; dark brown; trace fly ash, trace silt, wet, very loose. (FILL) SPTs (3-1-1-1)		
650.0			4	SS		0 / 2	15-17': No Recovery. SPTs (1-1-1-1)		Bentonite chips 17-19 ft-bgs
645.0	dark brown to grey, fine to medium SAND, trace silt		5	SS		1.4 / 2	20.58-22': SAND, fine to medium, well-graded; dark brown to grey; trace silt, wet, loose. (SW) SPTs (2-2-5-7)		Filter Pack #4 Sand 19-31 ft-bgs 2" PVC Screen slot 0.010 21-31 ft-bgs
640.0									

LITHOLOGY LEGEND

Fill | USCS Well-graded Sand (SW) | Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-27B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 31
DEPTH TO BEDROCK: 31

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172624.9467 E: 2973960.2089
GROUND SURFACE ELEV.: 662.65
TOP OF CASING ELEV.: 665.44
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 10/4/2016 8:46:00 AM
END DATE/TIME: 10/4/2016 10:00:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	dark brown to grey, fine to medium SAND, trace silt		6	SS		1.5 / 2	25.5-27': SAND, fine to medium, well-graded; dark brown to grey; trace silt, wet, dense. (SW) SPTs (7-17-20-21)		
635.0									
			7	SS		1.5 / 2	30.5-31': SAND, fine to medium, well-graded; dark brown to grey; trace silt, wet, dense. (SW) 31': auger refusal in SHALE; dark grey to black. SPTs (6-16-23-31)		
	SHALE								
630.0									
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

Fill | USCS Well-graded Sand (SW) | Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

BOREHOLE LOG: GAMW-28

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 16
DEPTH TO BEDROCK: 31

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172777.9712 E: 2974048.467
GROUND SURFACE ELEV.: 662.24
TOP OF CASING ELEV.: 665.48
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 9/29/2016 3:34:00 PM
END DATE/TIME: 9/29/2016 3:37:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
660.0	FILL- black FLY ASH/ BOILER SLAG, fine dark brown to black SAND, some organics, trace gravel, trace silt		1	SS		1.6 / 2	0.42-0.67': SAND, some organics, fine, well-graded; dark brown to black; trace gravel, trace silt, dry, loose. (FILL) 0.67-1.75': black FLY ASH/BOILER SLAG. (FILL) 1.75-2': SAND, fine, poorly-graded; brown to dark brown; trace fly ash, trace silt, moist, loose. (FILL) SPTs (2-2-3-4)		Bentonite grout mix 0-2 ft-bgs Bentonite chips 2-4 ft-bgs
655.0			2	SS		1.9 / 2	5.08-6': FLY ASH/ BOILER SLAG, some sand, fine, poorly-graded; dark brown; trace gravel, trace silt, moist, loose. (FILL) 6-7': SAND, fine, well-graded; tan to brown; trace silt, wet, loose. (FILL) SPTs (1-3-4-5)		Filter Pack #4 Sand 4-16 ft-bgs 2" PVC Screen slot 0.010 6-16 ft-bgs
650.0	brown to grey fine to medium SAND, trace gravel, trace silt		3	SS		2 / 2	10.33-10.83': SAND, fine, poorly-graded; brown; trace fly ash, trace silt, wet, loose. (FILL) 10.83-12': SAND, fine to medium, well-graded; brown to grey; trace silt, wet, loose. (FILL) SPTs (1-2-2-4)		
645.0									
640.0									

LITHOLOGY LEGEND

Fill

USCS Well-graded Sand (SW)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-28B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 29.5
DEPTH TO BEDROCK: 31

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172779.4577 E: 2974046.8178
GROUND SURFACE ELEV.: 662.32
TOP OF CASING ELEV.: 665.6
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 9/29/2016 1:16:00 PM
END DATE/TIME: 9/29/2016 2:23:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	FILL- black FLY ASH/ BOILER SLAG, fine dark brown to black SAND, some organics, trace gravel, trace silt		1	SS		1.6 / 2	0.42-0.67': SAND, some organics, fine, well-graded; dark brown to black; trace gravel, trace silt, dry, loose. (FILL) 0.67-1.75': black FLY ASH/BOILER SLAG. (FILL) 1.75-2': SAND, fine, poorly-graded; brown to dark brown; trace fly ash, trace silt, moist, loose. (FILL) SPTs (2-2-3-4)		Bentonite grout mix 0-15 ft-bgs
660.0			2	SS		1.9 / 2	5.08-6': FLY ASH/ BOILER SLAG, some sand, fine, poorly-graded; dark brown; trace gravel, trace silt, moist, loose. (FILL) 6-7': SAND, fine, well-graded; tan to brown; trace silt, wet, loose. (FILL) SPTs (1-3-4-5)		
655.0									
	brown to grey fine to medium SAND, trace gravel, trace silt		3	SS		2 / 2	10.33-10.83': SAND, fine, poorly-graded; brown; trace fly ash, trace silt, wet, loose. (FILL) 10.83-12': SAND, fine to medium, well-graded; brown to grey; trace silt, wet, loose. (SW) SPTs (1-2-2-4)		
650.0			4	SS		0.3 / 2	15.83-16.17': SAND, fine to medium, well-graded; brown to grey; trace gravel, trace silt, wet, compact. (SW) SPTs (3-6-9-8)		Bentonite chips 15-17 ft-bgs
645.0			5	SS		1.7 / 2	20.58-22': SAND, fine to medium, well-graded; dark brown to grey; trace silt, wet, loose. (SW) SPTs (2-7-8-10)		Filter Pack #4 Sand 17-29 ft-bgs 2" PVC Screen slot 0.010 19-29 ft-bgs
640.0									

LITHOLOGY LEGEND

Fill
Shale
USCS Well-graded Sand (SW)
USCS Poorly-graded Gravel (GP)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-28B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 29.5
DEPTH TO BEDROCK: 31

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172779.4577 E: 2974046.8178
GROUND SURFACE ELEV.: 662.32
TOP OF CASING ELEV.: 665.6
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 9/29/2016 1:16:00 PM
END DATE/TIME: 9/29/2016 2:23:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	brown to grey fine to medium SAND, trace gravel, trace silt		6	SS		2 / 2	25.5-27': SAND, fine to medium, well-graded; dark brown to grey; trace silt, wet, dense. (SW) SPTs (3-5-12-17)		
635.0									
	grey medium GRAVEL, trace silt		7	SS		1.2 / 2	30.5-31': GRAVEL, medium, well-rounded, poorly sorted, grey, compact, wet. (GP) 31': auger refusal in SHALE; dark grey to black. SPTs (11-7-20-50/5)		
	clayey SHALE								
630.0									
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

Fill
Shale
USCS Well-graded Sand (SW)
USCS Poorly-graded Gravel (GP)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-29

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 16
DEPTH TO BEDROCK: 36

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173593.4072 E: 2975290.478
GROUND SURFACE ELEV.: 666.58
TOP OF CASING ELEV.: 669.49
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 10/3/2016 1:13:00 PM
END DATE/TIME: 10/3/2016 1:50:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	FILL- grey to black fine SAND with FLY ASH/BOILER SLAG, some clay, some gravel, trace silt		1	SS		1.3 / 2	0.67-2': SAND with FLY ASH/BOILER SLAG, some clay, some gravel, fine, angular, poorly-sorted; grey to black; trace silt, dry, loose. (FILL) SPTs (1-1-8-15)		Bentonite grout mix 0-2 ft-bgs Bentonite chips 2-4 ft-bgs Filter Pack #4 Sand 4-16 ft-bgs 2" PVC Screen slot 0.010 6-16 ft-bgs
660.0	grey to white CLAY, some gravel		2	SS		2 / 2	5-7': CLAY, some gravel, stiff, poorly-sorted; grey to white; cohesive, dry to moist, silt-like. (CL) SPTs (1-8-6-4)		
655.0	brown to grey, fine to medium SAND, trace coarser fragments, trace silt		3	SS		1.6 / 2	10.42-10.96': CLAY, silt-like, poorly-sorted; grey to white; trace gravel, cohesive, dry to moist, firm. (CL) 10.96-12': SAND, fine, well-graded; tan to brown; trace coarser fragments, cohesive, wet, compact. (SW) SPTs (2-4-6-7)		
650.0									
645.0									

LITHOLOGY LEGEND

Fill | USCS Low Plasticity Clay (CL) | USCS Well-graded Sand (SW)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

BOREHOLE LOG: GAMW-29B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 36
DEPTH TO BEDROCK: 36

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173594.6882 E: 2975292.8798
GROUND SURFACE ELEV.: 666.64
TOP OF CASING ELEV.: 669.45
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 10/3/2016 10:57:00 AM
END DATE/TIME: 10/3/2016 12:23:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	FILL- grey to black fine SAND with FLY ASH/BOILER SLAG, some clay, some gravel, trace silt		1	SS		1.3 / 2	0.67-2': SAND with FLY ASH/BOILER SLAG, some clay, some gravel, fine, angular, poorly-sorted; grey to black; trace silt, dry, loose. (FILL) SPTs (1-1-8-15)		Bentonite grout mix 0-22 ft-bgs
	grey to white CLAY, some gravel		2	SS		2 / 2	5-7': CLAY, some gravel, stiff, poorly-sorted; grey to white; cohesive, dry to moist, silt-like. (CL) SPTs (1-8-6-4)		
660.0									
	brown to grey, fine to medium SAND, trace coarser fragments, trace silt		3	SS		1.6 / 2	10.42-10.96': CLAY, silt-like, poorly-sorted; grey to white; trace gravel, cohesive, dry to moist, firm. (CL) 10.96-12': SAND, fine, well-graded; tan to brown; trace coarser fragments, cohesive, wet, compact. (SW) SPTs (2-4-6-7)		
655.0									
			4	SS		2 / 2	15-17': SAND, brown to grey, well-graded; fine to medium; trace silt, wet, loose. (SW) SPTs (2-2-2-4)		
650.0									
	grey GRAVEL, trace silt		5	SS		1.3 / 2	20.75-21.42': GRAVEL, well-rounded, poorly-sorted; grey; trace silt, wet, compact. (GP) 21.42-22': SAND, fine, poorly-graded; brown to grey; trace silt, wet, compact. (SP) SPTs (2-5-8-10)		
645.0	brown to grey fine SAND, trace silt								Bentonite chips 22-24 ft-bgs Filter Pack #4 Sand 24-36 ft-bgs

LITHOLOGY LEGEND

Fill
USCS Well-graded Gravel (GW)
USCS Low Plasticity Clay (CL)
Shale
USCS Well-graded Sand (SW)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-29B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 36
DEPTH TO BEDROCK: 36

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173594.6882 E: 2975292.8798
GROUND SURFACE ELEV.: 666.64
TOP OF CASING ELEV.: 669.45
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 10/3/2016 10:57:00 AM
END DATE/TIME: 10/3/2016 12:23:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	brown to grey fine SAND, trace silt		6	SS		1.3 / 2	25.75-26.38': SAND, fine, poorly-graded; brown to grey; trace silt, wet, compact. (SP) 26.38-26.67': GRAVEL, some brown sand, well-rounded, well-graded; grey; trace silt, wet, compact. (GW) 26.67-27': SAND, fine, poorly-graded; brown to grey; trace silt, wet, compact. (SP) SPTs (3-4-8-12)		2" PVC Screen slot 0.010 26-36 ft-bgs
640.0	grey fine GRAVEL, some brown sand, trace silt								
	grey GRAVEL, trace silt		7	SS		1.4 / 2	30.58-31.08': GRAVEL, well-rounded, well-graded; grey; trace silt, wet, dense. (GW) 31.08-32': SAND, fine to medium, well-graded; dark brown to grey; trace silt, wet, dense. (SW) SPTs (7-16-17-19)		
635.0	dark brown, fine to medium SAND, trace silt								
	SHALE		8	SS		0.8 / 2	35-36': No Recovery. Auger refusal in SHALE; dark grey to black. SPTs (1-7-16-22)		
630.0									
625.0									
620.0									

LITHOLOGY LEGEND

Fill
USCS Well-graded Gravel (GW)
USCS Low Plasticity Clay (CL)
Shale
USCS Well-graded Sand (SW)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-30

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 16
DEPTH TO BEDROCK: 30.92

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173602.0685 E: 2974396.0195
GROUND SURFACE ELEV.: 664.27
TOP OF CASING ELEV.: 666.92
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 9/30/2016 10:41:00 AM
END DATE/TIME: 9/30/2016 11:15:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	FILL- CLAY, SAND, FLY ASH/ BOILER SLAG, trace gravel, trace silt		1	SS		1.8 / 2	0.17-1.08': FLY ASH/ BOILER SLAG, medium, well-graded; dark brown to black; trace gravel, cohesive, dry, compact. (FILL) 1.08-2': CLAY, trace gravel, W<PL; grey; cohesive, stiff. (FILL) SPTs (3-5-10-15)		Bentonite grout mix 0-2 ft-bgs
									Bentonite chips 2-4 ft-bgs
660.0			2	SS		1.9 / 2	5-5.75': CLAY, trace gravel, trace fly ash, W<PL; grey; cohesive, stiff (FILL) 5.75-7': SAND, fine, poorly-graded; dark brown to black; trace fly ash, trace silt, moist, loose. (FILL) SPTs (1-1-3-4)		Filter Pack #4 Sand 4-16 ft-bgs
									2" PVC Screen slot 0.010 6-16 ft-bgs
655.0									
	fine to medium brown SAND, trace silt		3	SS		1.5 / 2	10-10.75': SAND, fine, poorly-graded; dark brown to grey; trace boiler slag, trace silt, moist, loose. (FILL) 10.75-11.5': SAND, fine to medium, well-graded; brown; trace silt, wet, loose. (SW) SPTs (1-2-2-5)		
650.0									
645.0									
640.0									

LITHOLOGY LEGEND

Fill

USCS Well-graded Sand (SW)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

BOREHOLE LOG: GAMW-30B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 32
DEPTH TO BEDROCK: 30.92

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173601.5341 E: 2974399.2253
GROUND SURFACE ELEV.: 664.27
TOP OF CASING ELEV.: 666.88
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 9/30/2016 8:32:00 AM
END DATE/TIME: 9/30/2016 9:22:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	FILL- CLAY, SAND, FLY ASH/ BOILER SLAG, trace gravel, trace silt		1	SS		1.8 / 2	0.17-1.08': FLY ASH/ BOILER SLAG, medium, well-graded; dark brown to black; trace gravel, cohesive, dry, compact. (FILL) 1.08-2': CLAY, trace gravel, W<PL; grey; cohesive, stiff. (FILL) SPTs (3-5-10-15)		Bentonite grout mix 0-18 ft-bgs
660.0			2	SS		1.9 / 2	5-5.75': CLAY, trace gravel, trace fly ash, W<PL; grey; cohesive, stiff (FILL) 5.75-7': SAND, fine, poorly-graded; dark brown to black; trace fly ash, trace silt, moist, loose. (FILL) SPTs (1-1-3-4)		
655.0			3	SS		1.5 / 2	10-10.75': SAND, fine, poorly-graded; dark brown to grey; trace boiler slag, trace silt, moist, loose. (FILL) 10.75-11.5': SAND, fine to medium, well-graded; brown; trace silt, wet, loose. (SW) SPTs (1-2-2-5)		
	fine to medium brown SAND, trace silt		4	SS		1.5 / 2	15-15.58': SAND, fine to medium, well-graded; brown; trace silt, wet, loose. (SW) 15.58-16.5': SAND, medium, well-graded; brown; trace silt, wet, loose. (SW) SPTs (2-2-2-2)		
650.0									Bentonite chips 18-20 ft-bgs
645.0			5	SS		0.8 / 2	21.25-21.67': GRAVEL, well-rounded, poorly-sorted; grey; trace silt, wet, compact. (GW) 21.67-22': SAND, some gravel, fine to medium, well-graded; dark brown to grey; trace silt, wet, compact. (SW) SPTs (3-4-6-8)		Filter Pack #4 Sand 20-32 ft-bgs 2" PVC Screen slot 0.010 22-32 ft-bgs
	grey GRAVEL, trace silt								
	light brown to grey fine to medium SAND, grey gravel lenses, trace silt								
640.0									

LITHOLOGY LEGEND

Fill
Shale
USCS Well-graded Sand (SW)
USCS Well-graded Gravel (GW)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-30B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 32
DEPTH TO BEDROCK: 30.92

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173601.5341 E: 2974399.2253
GROUND SURFACE ELEV.: 664.27
TOP OF CASING ELEV.: 666.88
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 9/30/2016 8:32:00 AM
END DATE/TIME: 9/30/2016 9:22:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	light brown to grey fine to medium SAND, grey gravel lenses, trace silt		6	SS		1.3 / 2	25.75-26': GRAVEL, well-rounded, well-graded; grey; trace silt, wet, compact. (GW) 26-27': SAND, trace gravel, fine to medium, well-graded; dark brown to grey; trace silt, wet, compact. (SW) SPTs (4-6-10-12)		
635.0			7	SS		1.3 / 2	30.67-30.92': SAND, trace gravel, fine to medium, well-graded; light brown to brown; trace silt, wet, compact. (SW) 30.92-31.08': GRAVEL, well-rounded, poorly-sorted; grey; trace silt, wet, compact. (GP) 31.08-32': SAND, trace gravel, fine to medium, well-graded; dark brown to grey; trace silt, wet, compact. (SW) 32': auger refusal in SHALE; dark grey to black. SPTs (7-9-15-20)		
	SHALE								
630.0									
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

Fill
Shale
USCS Well-graded Sand (SW)
USCS Well-graded Gravel (GW)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-31

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 16
DEPTH TO BEDROCK: 30

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2174043.9313 E: 2974076.4256
GROUND SURFACE ELEV.: 662.68
TOP OF CASING ELEV.: 665.4
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 10/5/2016 3:39:00 PM
END DATE/TIME: 10/5/2016 4:10:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	light brown to brown fine SAND, trace organics, trace silt		1	SS		1.6 / 2	0-1': SAND, fine, poorly-graded; light brown to brown; trace organics, trace silt, dry, very loose. (SP) 1-1.58': SAND, fine, poorly-graded; dark brown to black; trace silt, dry, very loose. (SP) SPTs (1-1-1-1)		Bentonite grout mix 0-2 ft-bgs
	tan to black fine SAND, trace silt								Bentonite chips 2-4 ft-bgs
660.0			2	SS		2 / 2	5-5.67': SAND, fine, poorly-graded; dark brown to black/grey; trace silt, dry, very loose. (SP) 5.67-7': SAND, medium, poorly-graded; brown to tan; trace silt, moist, loose. (SP) SPTs (1-1-3-4)		Filter Pack #4 Sand 4-16 ft-bgs
655.0									2" PVC Screen slot 0.010 6-16 ft-bgs
	brown to grey fine SAND, trace silt		3	SS		2 / 2	10-10.67': SAND, fine, poorly-graded; dark brown to black/grey; trace silt, wet, loose. (SP) 10.67-12': SAND, fine, poorly-graded; brown to grey; trace silt, wet, loose. (SP) SPTs (1-4-5-8)		
650.0									
645.0									
640.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-31B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 30
DEPTH TO BEDROCK: 30

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2174041.6795 E: 2974075.8315
GROUND SURFACE ELEV.: 662.69
TOP OF CASING ELEV.: 665.41
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 10/5/2016 1:38:00 PM
END DATE/TIME: 10/5/2016 2:33:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	light brown to brown fine SAND, trace organics, trace silt		1	SS		1.6 / 2	0-1': SAND, fine, poorly-graded; light brown to brown; trace organics, trace silt, dry, very loose. (SP) 1-1.58': SAND, fine, poorly-graded; dark brown to black; trace silt, dry, very loose. (SP) SPTs (1-1-1-1)		Bentonite grout mix 0-16 ft-bgs
	tan to black fine SAND, trace silt								
660.0			2	SS		2 / 2	5-5.67': SAND, fine, poorly-graded; dark brown to black/grey; trace silt, dry, very loose. (SP) 5.67-7': SAND, medium, poorly-graded; brown to tan; trace silt, moist, loose. (SP) SPTs (1-1-3-4)		
655.0			3	SS		2 / 2	10-10.67': SAND, fine, poorly-graded; dark brown to black/grey; trace silt, wet, loose. (SP) 10.67-12': SAND, fine, poorly-graded; brown to grey; trace silt, wet, loose. (SP) SPTs (1-4-5-8)		
	brown to grey fine SAND, trace silt								
650.0			4	SS		0.4 / 2	16.58-17': SAND, fine, poorly-graded; brown to grey; trace silt, wet, compact. (SP) SPTs (14-8-14-17)		Bentonite chips 16-18 ft-bgs
645.0									Filter Pack #4 Sand 18-30 ft-bgs
	grey SAND, fine gravel, trace silt		5	SS		1.8 / 2	20.25-21.33': SAND, fine, well-graded; brown to grey; trace silt, wet, compact. (SW) 21.33-21.71': SAND, fine to medium, well-graded; grey; trace silt, wet, loose. (SW) 21.71-21.8': GRAVEL, well rounded, poorly-sorted; wet, loose. (GW) 21.8-22': SAND, fine to medium, well-graded; grey; trace silt, wet, loose. (SW) SPTs (1-4-5-8)		2" PVC Screen slot 0.010 20-30 ft-bgs
640.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP) | USCS Well-graded Sand (SW) | Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-31B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 30
DEPTH TO BEDROCK: 30

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2174041.6795 E: 2974075.8315
GROUND SURFACE ELEV.: 662.69
TOP OF CASING ELEV.: 665.41
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 10/5/2016 1:38:00 PM
END DATE/TIME: 10/5/2016 2:33:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	grey SAND, fine gravel, trace silt		6	SS		1.1 / 2	25.9-26.46': SAND, fine to medium gravel, well-graded; grey; trace silt, wet, compact. (SW) 26.46-27': SAND, fine to medium, well-graded; grey; trace silt, wet, loose. 31': auger refusal in SHALE; dark grey to black. (SW) SPTs (8-13-15-18)		
635.0									
	SHALE								
630.0									
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)
USCS Well-graded Sand (SW)
Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-32

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 18
DEPTH TO BEDROCK: 31

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2174364.5854 E: 2974353.1359
GROUND SURFACE ELEV.: 665.44
TOP OF CASING ELEV.: 668.08
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 9/27/2016 5:08:00 PM
END DATE/TIME: 9/27/2016 6:01:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	light brown to black fine SAND, trace organics, trace silt		1	SS		1.7 / 2	0-1': SAND, fine, poorly-graded; dark brown to black; trace organics, trace silt, dry, very loose. (SP) 1-2': SAND, fine, poorly-graded; light brown to brown; trace organics, trace silt, dry, very loose. (SP) SPTs (1-2-2-4)		Bentonite grout mix 0-4 ft-bgs
660.0	black fine to medium SAND, trace silt		2	SS		1.8 / 2	5.17-6.33': SAND, fine, poorly-graded; light brown to brown; trace organics, trace silt, moist, loose. (SP) 6.33-7': SAND, fine to medium, poorly-graded; grey to black; trace silt, wet, loose. (SP) SPTs (1-1-2-3)		Bentonite chips 4-6 ft-bgs Filter Pack #4 Sand 6-18 ft-bgs 2" PVC Screen slot 0.010 8-18 ft-bgs
655.0	fine to medium dark brown SAND, trace silt		3	SS		1.8 / 2	10-11.25': SAND, fine, poorly-graded; light brown to black; trace silt, moist, loose. (SP) 11.25-12': SAND, fine to medium, poorly-graded; dark brown; trace silt, moist, loose. (SP) SPTs (2-4-3-6)		
650.0	grey fine to medium SAND, trace gravel, trace silt CLAY		4	SS		1.5 / 2	15.5-16.33': SAND, fine, poorly-graded; dark brown; trace silt, wet, loose. (SP) 16.33-16.83': SAND, fine to medium, well-graded; grey; trace gravel, trace silt, wet, loose. (SW) 16.83-17': CLAY, W<PL; cohesive, wet, soft. (CL) SPTs (5-4-6-8)		
645.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

USCS Well-graded Sand (SW)

USCS Low Plasticity Clay (CL)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-32B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 34
DEPTH TO BEDROCK: 31

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2174364.6987 E: 2974350.0919
GROUND SURFACE ELEV.: 665.53
TOP OF CASING ELEV.: 668.28
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 9/27/2016 2:47:00 PM
END DATE/TIME: 9/27/2016 3:47:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	light brown to black fine SAND, trace organics, trace silt		1	SS		1.7 / 2	0-1': SAND, fine, poorly-graded; dark brown to black; trace organics, trace silt, dry, very loose. (SP) 1-2': SAND, fine, poorly-graded; light brown to brown; trace organics, trace silt, dry, very loose. (SP) SPTs (1-2-2-4)		Bentonite grout mix 0-20 ft-bgs
660.0	black fine to medium SAND, trace silt		2	SS		1.8 / 2	5.17-6.33': SAND, fine, poorly-graded; light brown to brown; trace organics, trace silt, moist, loose. (SP) 6.33-7': SAND, fine to medium, poorly-graded; grey to black; trace silt, wet, loose. (SP) SPTs (1-1-2-3)		
655.0	fine to medium dark brown SAND, trace silt		3	SS		1.8 / 2	10-11.25': SAND, fine, poorly-graded; light brown to black; trace silt, moist, loose. (SP) 11.25-12': SAND, fine to medium, poorly-graded; dark brown; trace silt, moist, loose. (SP) SPTs (2-4-3-6)		
650.0	grey fine to medium SAND, trace gravel, trace silt CLAY		4	SS		1.5 / 2	15.5-16.33': SAND, fine, poorly-graded; dark brown; trace silt, wet, loose. (SP) 16.33-16.83': SAND, fine, well-graded; grey; trace gravel, trace silt, wet, loose. (SW) 16.83-17': CLAY, W<PL; cohesive, wet, soft. (CL) SPTs (5-4-6-8)		
645.0	dark brown fine to medium SAND, trace organics, trace gravel, trace silt		5	SS		0.7 / 2	20-20.67': SAND, fine, well-graded; dark brown to grey; trace organics, trace gravel, trace silt, wet, compact. (SW) SPTs (4-8-9-12)		Bentonite chips 20-22 ft-bgs Filter Pack #4 Sand 22-34 ft-bgs 2" PVC Screen slot 0.010 24-34 ft-bgs

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)
Shale
USCS Well-graded Sand (SW)
USCS Low Plasticity Clay (CL)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

BOREHOLE LOG: GAMW-32B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 34
DEPTH TO BEDROCK: 31

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2174364.6987 E: 2974350.0919
GROUND SURFACE ELEV.: 665.53
TOP OF CASING ELEV.: 668.28
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 9/27/2016 2:47:00 PM
END DATE/TIME: 9/27/2016 3:47:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
640.0	dark brown fine to medium SAND, trace organics, trace gravel, trace silt		6	SS		2 / 2	25-27': SAND, fine to medium, well-graded; dark brown to grey; trace organics, trace gravel, trace silt, wet, compact. (SW) SPTs (3-7-13-19)		
635.0	brown to grey fine to medium SAND, trace gravel, trace silt		7	SS		1.3 / 2	30-31': Not Sampled. Auger refusal in SHALE; dark grey to black. SPTs (6-14-15-14)		
	SHALE								
630.0									
625.0									
620.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)
Shale
USCS Well-graded Sand (SW)
USCS Low Plasticity Clay (CL)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-33

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 16
DEPTH TO BEDROCK: 31

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2174015.7087 E: 2976811.1491
GROUND SURFACE ELEV.: 662.63
TOP OF CASING ELEV.: 665.29
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 9/27/2016 12:16:00 PM
END DATE/TIME: 9/27/2016 12:48:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	dark brown to black fine SAND with organics, trace silt		1	SS		1.3 / 2	0-2': SAND with organics, black soil, fine, poorly-graded; dark brown to black; trace silt, moist, very loose. (SP) SPTs (1-1-1-2)		Bentonite grout mix 0-2 ft-bgs
660.0									Bentonite chips 2-4 ft-bgs
			2	SS		2 / 2	5-6': SILTY SAND, fine, poorly-graded; dark brown to black; trace silt, wet, very loose (SM). 6-7': SAND, fine, poorly-graded; light brown to brown; trace silt, wet, very loose. (SP) COMPOSITE: (SP), F=31.4° SPTs (1-1-2-2)		Filter Pack #4 Sand 4-16 ft-bgs
	light brown to brown fine SAND, trace silt								2" PVC Screen slot 0.010 6-16 ft-bgs
655.0									
			3	SS		1.5 / 2	10.5-12': SAND, fine to medium, poorly-graded; light brown to brown; trace silt, wet, loose. (SP) SPTs (1-3-4-5)		
650.0									
645.0									
640.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-33B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 31
DEPTH TO BEDROCK: 31

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2174015.8544 E: 2976814.0104
GROUND SURFACE ELEV.: 662.43
TOP OF CASING ELEV.: 665.29
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 9/27/2016 9:20:00 AM
END DATE/TIME: 9/27/2016 10:23:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	dark brown to black fine SAND with organics, trace silt		1	SS		1.3 / 2	0-2': SAND with organics, black soil, fine, poorly-graded; dark brown to black; trace silt, moist, very loose. (SP) SPTs (1-1-1-2)		Bentonite grout mix 0-17 ft-bgs
660.0			2	SS		2 / 2	5-6': SILTY SAND, fine, poorly-graded; dark brown to black; trace silt, wet, very loose (SM). 6-7': SAND, fine, poorly-graded; light brown to brown; trace silt, wet, very loose. (SP) COMPOSITE: (SP), F=31.4° SPTs (1-1-2-2)		
	light brown to brown fine SAND, trace silt								
655.0			3	SS		1.5 / 2	10.5-12': SAND, fine to medium, poorly-graded; light brown to brown; trace silt, wet, loose. (SP) SPTs (1-3-4-5)		
650.0			4	SS		1 / 2	16-17': SAND, medium, poorly-graded; light brown to grey; trace gravel, trace silt, wet, very loose. (SP) SPTs (1-2-2-3)		
	light brown to grey medium to coarse SAND, some gravel, trace silt								Bentonite chips 17-19 ft-bgs
645.0			5	SS		1 / 2	21-22': SAND, medium, well-graded; grey; trace gravel, trace silt, wet, compact. (SW) SPTs (6-4-8-10)		Filter Pack #4 Sand 19-31 ft-bgs 2" PVC Screen slot 0.010 21-31 ft-bgs
640.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-33B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 31
DEPTH TO BEDROCK: 31

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2174015.8544 E: 2976814.0104
GROUND SURFACE ELEV.: 662.43
TOP OF CASING ELEV.: 665.29
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 9/27/2016 9:20:00 AM
END DATE/TIME: 9/27/2016 10:23:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	light brown to grey medium to coarse SAND, some gravel, trace silt		6	SS		1.1 / 2	25.92-26.75': SAND, medium to coarse, poorly-graded; grey; trace gravel, trace silt, wet, compact. (SP)		
635.0	light brown to brown, fine SAND, trace silt						26.75-27': SAND, fine, poorly-graded; light brown to brown; trace silt, wet, compact. (SP) SPTs (2-11-15-18)		
			7	SS		2 / 2	30-31': Not Sampled. Auger refusal in SHALE; dark grey to black. SPTs (4-5-13-50/4)		
	SHALE								
630.0									
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-34

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 16
DEPTH TO BEDROCK: 29

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173123.8017 E: 2976637.5824
GROUND SURFACE ELEV.: 661.78
TOP OF CASING ELEV.: 664.82
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 9/28/2016 1:15:00 PM
END DATE/TIME: 9/28/2016 1:51:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
660.0	light brown to black fine SAND, trace organics, trace silt		1	SS		1.4 / 2	0.58-2': SAND, fine, poorly-graded; light brown to black; trace organics, trace silt, dry, very loose. (SP) SPTs (1-1-1-2)		Bentonite grout mix 0-2 ft-bgs Bentonite chips 2-4 ft-bgs Filter Pack #4 Sand 4-16 ft-bgs 2" PVC Screen slot 0.010 6-16 ft-bgs
655.0	brown fine SAND, trace silt		2	SS		2 / 2	5-5.88': SAND, fine, poorly-graded; light brown to black; trace silt, moist, very loose. (SP) 5.88-7': SAND, fine, poorly graded; light brown to brown; trace silt, moist, very loose. (SP) COMPOSITE: (SP), F=31.4° SPTs (1-1-3-4)		
650.0	brown to gray fine to medium SAND, trace silt		3	SS		0.9 / 2	11.08-12': SAND, fine to medium, poorly-graded; brown to grey; trace to some silt, moist, compact. (SP) SPTs (4-5-10-10)		
645.0									
640.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

USCS Well-graded Sand (SW)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

BOREHOLE LOG: GAMW-34B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 32
DEPTH TO BEDROCK: 29

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173126.747 E: 2976637.8425
GROUND SURFACE ELEV.: 661.65
TOP OF CASING ELEV.: 664.84
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 9/28/2016 11:21:00 AM
END DATE/TIME: 9/28/2016 12:20:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
660.0	light brown to black fine SAND, trace organics, trace silt		1	SS		1.4 / 2	0.58-2': SAND, fine, poorly-graded; light brown to black; trace organics, trace silt, dry, very loose. (SP) SPTs (1-1-1-2)		Bentonite grout mix 0-15 ft-bgs
			2	SS		2 / 2	5-5.88': SAND, fine, poorly-graded; light brown to black; trace silt, moist, very loose. (SP) 5.88-7': SAND, fine, poorly graded; light brown to brown; trace silt, moist, very loose. (SP) COMPOSITE: (SP), F=31.4° SPTs (1-1-3-4)		
655.0	brown fine SAND, trace silt								
			3	SS		0.9 / 2	11.08-12': SAND, fine to medium, poorly-graded; brown to grey; trace to some silt, moist, compact. (SP) SPTs (4-5-10-10)		
650.0	brown to gray fine to medium SAND, trace silt								
			4	SS		0.8 / 2	16.25-17': GRAVELLY SAND, fine to coarse, predominately medium, poorly-graded; brown to grey; trace silt, moist, compact. (SP) SPTs (1-2-2-7)		Bentonite chips 15-17 ft-bgs
645.0	brown to gray GRAVELLY SAND, trace silt								Filter Pack #4 Sand 17-29 ft-bgs
			5	SS		1.5 / 2	20.5-22': GRAVELLY SAND, fine to coarse, predominately medium, poorly-graded; brown to grey; trace silt, moist, compact. (SP) SPTs (1-3-6-11)		2" PVC Screen slot 0.010 19-29 ft-bgs
640.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP) | USCS Well-graded Sand (SW) | Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-34B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 32
DEPTH TO BEDROCK: 29

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173126.747 E: 2976637.8425
GROUND SURFACE ELEV.: 661.65
TOP OF CASING ELEV.: 664.84
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 9/28/2016 11:21:00 AM
END DATE/TIME: 9/28/2016 12:20:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
635.0	brown to gray GRAVELLY SAND, trace silt		6	SS		1.1 / 2	25.92-27': GRAVELLY SAND, fine to coarse, predominately medium, poorly-graded; brown to grey; trace silt, moist, compact. (SP) 29': auger refusal in SHALE; dark grey to black. SPTs (4-5-11-13)		
	SHALE								
630.0									
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

USCS Well-graded Sand (SW)

Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-35B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 24
DEPTH TO BEDROCK: 24

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172046.6383 E: 2976576.9707
GROUND SURFACE ELEV.: 661.78
TOP OF CASING ELEV.: 664.62
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 9/28/2016 8:57:00 AM
END DATE/TIME: 9/28/2016 9:55:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
660.0	dark brown to black, fine SAND, trace organics, trace silt		1	SS		1.6 / 2	0.33-1.92': SAND, fine, poorly-graded; dark brown to black; trace organics, trace silt, moist, very loose. (SP) SPTs (1-1-1-2)		Bentonite grout mix 0-10 ft-bgs
655.0	light brown to brown fine to medium SAND, trace silt		2	SS		2 / 2	5-5.67': SAND, fine, poorly-graded; dark brown to black; trace organics, trace silt, moist, very loose. (SP) 5.67-7': SAND, fine, poorly-graded; light brown to brown; trace silt, wet, very loose. (SP) SPTs (1-1-2-4)		
650.0	light brown to grey, fine to medium SAND, some gravel, trace silt		3	SS		1.5 / 2	10-11.42': SAND, fine to medium, poorly-graded; light brown to grey; trace silt, wet, loose. (SP) 11.42-11.5': GRAVEL, well-rounded, poorly-sorted; light brown to grey; trace silt, wet, loose. (GP) SPTs (2-3-5-5)		Bentonite chips 10-12 ft-bgs Filter Pack #4 Sand 12-24 ft-bgs 2" PVC Screen slot 0.010 14-24 ft-bgs
645.0	grey medium SAND, trace gravel, trace silt		4	SS		1.5 / 2	15.5-16.17': SAND, medium, poorly-graded; light brown to grey; trace silt, wet, compact. (SP) 16.17-17': SAND, medium, poorly-graded; grey; trace gravel, trace to some silt, wet, compact. (SP) SPTs (2-6-11-16)		
640.0	light brown to grey medium SAND, trace silt		5	SS		1.5 / 2	20-20.83': SAND, fine to medium, predominately medium, poorly-graded; grey; trace coarse sand, trace silt, wet, compact. (SW) 20.83-21.5': SAND, medium, poorly-graded; light brown to grey; trace silt, wet, loose. (SW) 24': auger refusal in SHALE; dark grey to black. SPTs (3-4-9-16)		
	SHALE								

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-35B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 24
DEPTH TO BEDROCK: 24

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2172046.6383 E: 2976576.9707
GROUND SURFACE ELEV.: 661.78
TOP OF CASING ELEV.: 664.62
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 9/28/2016 8:57:00 AM
END DATE/TIME: 9/28/2016 9:55:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	SAMPLE INFORMATION: Type	SAMPLE INFORMATION: PID (ppm)	SAMPLE INFORMATION: Soil Rec./Att. Or Core Rec. %	SAMPLE INFORMATION: Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	SHALE								
635.0									
630.0									
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-36

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 16
DEPTH TO BEDROCK: 34.5

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2174145.142 E: 2977866.7207
GROUND SURFACE ELEV.: 662.24
TOP OF CASING ELEV.: 665
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 9/29/2016 10:54:00 AM
END DATE/TIME: 9/29/2016 11:21:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	light brown to black fine SAND, trace organics, trace silt		1	SS		2 / 2	0-2': SAND, trace organics, fine, poorly-graded; light brown to black; trace silt, moist, very loose. (SP) SPTs (1-1-1-2)		Bentonite grout mix 0-2 ft-bgs
660.0									Bentonite chips 2-4 ft-bgs
			2	SS		1.9 / 2	5.08-6.08': SAND, medium, poorly-graded; light brown to black; trace organics, trace silt, moist, very loose. (SP) 6.08-7': SAND, fine, poorly-graded; light brown to brown; trace silt, wet, very loose. (SP) COMPOSITE: (SP), F=31.4° SPTs (2-1-1-1)		Filter Pack #4 Sand 4-16 ft-bgs
	light brown to brown, fine to medium SAND, trace silt								2" PVC Screen slot 0.010 6-16 ft-bgs
655.0									
			3	SS		1.9 / 2	10.08-12': SAND, fine to medium, poorly-graded; light brown to brown; trace to some silt, wet, loose. (SP) SPTs (3-5-5-6)		
650.0									
645.0									
640.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-36B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 34.5
DEPTH TO BEDROCK: 34.5

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2174142.5054 E: 2977866.949
GROUND SURFACE ELEV.: 662.35
TOP OF CASING ELEV.: 665.07
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 9/29/2016 9:14:00 AM
END DATE/TIME: 9/29/2016 10:18:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	light brown to black fine SAND, trace organics, trace silt		1	SS		2 / 2	0-2': SAND, trace organics, fine, poorly-graded; light brown to black; trace silt, moist, very loose. (SP) SPTs (1-1-1-2)		Bentonite grout mix 0-20.5 ft-bgs
660.0			2	SS		1.9 / 2	5.08-6.08': SAND, fine, poorly-graded; light brown to black; trace organics, trace silt, moist, very loose. (SP) 6.08-7': SAND, fine, poorly-graded; light brown to brown; trace silt, wet, very loose. (SP) COMPOSITE: (SP), F=31.4° SPTs (2-1-1-1)		
	light brown to brown fine to medium SAND, trace silt								
655.0			3	SS		1.9 / 2	10.08-12': SAND, fine to medium, poorly-graded; light brown to brown; trace to some silt, wet, loose. (SP) SPTs (3-5-5-6)		
650.0			4	SS		1.5 / 2	15.5-17': SAND, fine to medium, well-graded; brown to grey; trace gravel, trace silt, wet, compact. (SW) SPTs (2-4-8-9)		
	brown to grey fine to medium SAND, trace gravel, trace silt								
645.0			5	SS		1.2 / 2	20.83-21.42': GRAVELLY SAND, well-rounded, fine to coarse, predominately medium to coarse, poorly-sorted; grey; trace silt, wet, compact. (SW) 21.42-22': SAND, some gravel, fine to medium, well-graded; brown to grey; trace silt, wet, compact. (SW) SPTs (2-4-9-11)		Bentonite chips 20.5-22.5 ft-bgs
	grey GRAVELLY SAND, trace silt								
	brown to grey fine to medium SAND, trace gravel, trace silt								
640.0									Filter Pack #4 Sand 22.5-34.5 ft-bgs
									2" PVC Screen slot

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)
Shale
USCS Well-graded Sand (SW)
USCS Well-graded Gravel (GW)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-36B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 34.5
DEPTH TO BEDROCK: 34.5

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2174142.5054 E: 2977866.949
GROUND SURFACE ELEV.: 662.35
TOP OF CASING ELEV.: 665.07
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 9/29/2016 9:14:00 AM
END DATE/TIME: 9/29/2016 10:18:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	brown to grey fine to medium SAND, trace gravel, trace silt		6	SS		1.1 / 2	25.92-27': SAND, some gravel, medium to coarse, well-graded; brown to grey; trace silt, wet, loose. (SW) SPTs (4-3-4-11)		0.010 24.5-34.5 ft-bgs
635.0									
	light brown to brown fine to medium SAND, trace silt		7	SS		1.4 / 2	30.58-31.25': SAND, fine, poorly-graded; light brown to brown; trace silt, wet, compact. (SP) 31.25-31.46': GRAVEL, well-rounded, poorly-sorted; grey; trace silt, wet, compact. (SP) 31.46-32': SAND, fine, poorly-graded; light brown to brown; trace to some medium to coarse sand and fine gravel, trace silt, wet, compact. (SP) 34.5': auger refusal in SHALE; dark grey to black. SPTs (1-3-16-24)		
	grey GRAVEL, trace silt								
630.0	light brown to brown fine SAND, trace gravel, trace silt								
	SHALE								
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

- USCS Poorly-graded Sand (SP)
- Shale
- USCS Well-graded Sand (SW)
- USCS Well-graded Gravel (GW)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-37B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 25
DEPTH TO BEDROCK: 25

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173307.5408 E: 2977852.5437
GROUND SURFACE ELEV.: 662.68
TOP OF CASING ELEV.: 665.32
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 9/28/2016 3:59:00 PM
END DATE/TIME: 9/28/2016 4:44:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	light brown to black fine SAND, trace organics, trace silt		1	SS		1.8 / 2	0-1.75': SAND, fine, poorly-graded; light brown to black; trace organics, trace silt, dry, very loose. (SP) SPTs (1-1-1-1)		Bentonite grout mix 0-11 ft-bgs
660.0			2	SS		1.9 / 2	5-6.08': SILTY SAND, fine, poorly-graded; light brown to black; trace organics, trace silt, moist, very loose. (SM) 6.08-7': SAND, fine, poorly-graded; light brown to brown; trace silt, wet, very loose. (SP) COMPOSITE: (SP), F=31.4° SPTs (1-1-1-1)		
	light brown to brown fine SAND, trace silt								
655.0			3	SS		2 / 2	10-12': SAND, fine, poorly-graded; tan to brown; trace silt, wet, loose. (SP) SPTs (1-2-5-7)		Bentonite chips 11-13 ft-bgs
650.0									Filter Pack #4 Sand 13-25 ft-bgs
	brown to gray fine to medium SAND, trace gravel, trace silt		4	SS		1.3 / 2	15.67-17': SAND, fine to medium, well-graded; brown to grey; trace gravel, trace silt, wet, compact. (SW) SPTs (2-7-11-15)		2" PVC Screen slot 0.010 15-25 ft-bgs
645.0			5	SS		1.7 / 2	20.33-20.83': SAND, fine to medium, well-graded; brown to grey; trace gravel, trace silt, wet, compact. (SW) 25': auger refusal in SHALE; dark grey to black. SPTs (2-7-12-11)		
640.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP) | USCS Well-graded Sand (SW) | Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

BOREHOLE LOG: GAMW-37B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 25
DEPTH TO BEDROCK: 25

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173307.5408 E: 2977852.5437
GROUND SURFACE ELEV.: 662.68
TOP OF CASING ELEV.: 665.32
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 9/28/2016 3:59:00 PM
END DATE/TIME: 9/28/2016 4:44:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	SAMPLE INFORMATION: Type	SAMPLE INFORMATION: PID (ppm)	SAMPLE INFORMATION: Soil Rec./Att. Or Core Rec. %	SAMPLE INFORMATION: Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	SHALE								
635.0									
630.0									
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

USCS Well-graded Sand (SW)

Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-38

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK: 29.5

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173106.902 E: 2974209.725
GROUND SURFACE ELEV.: 660.93
TOP OF CASING ELEV.: 663.27
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 4/3/2018 2:25:00 PM
END DATE/TIME: 4/4/2018 8:55:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
660.0	dark brown fine SAND, some organics, some silt		1	SS		1 / 2	0-1': SAND, fine, poorly-graded; dark brown; some organics, some silt, moist, very loose. (SP) SPTs (1-2-1-2)		Bentonite Chips 0-3 ft-bgs
	light brown fine to medium SAND, trace gravel		2	SS		1.25 / 2	2-2.25': SAND, fine, poorly-graded, dark brown; some organics, some silt, moist, loose. (SP) 2.25-3.25': SAND, fine, poorly-graded, light brown; trace rounded gravel <1 inch, rounded gravel >1 inch at 3.25', wet, loose. (SP) SPTs (2-3-4-5)		#5 Sand Filter Pack 3-15 ft-bgs
			3	SS		1.58 / 2	4-5.58': SAND, fine to medium, well-graded, light brown; trace rounded gravel <1 cm, 1/2 inch thick red staining at 5', wet, loose. (SW) SPTs (3-3-3-4)		2" PVC Screen slot 0.010 5-15 ft-bgs
655.0	light brown SILT, trace fine sand gray fine to medium SAND, trace gravel, trace silt		4	SS		0.83 / 2	6-6.33': SILT, light brown; trace fine sand, wet, very loose. (ML) 6.33-6.83': SAND, fine to medium, poorly-graded, gray; trace rounded gravel <1/2 inch, trace rounded gravel >1/2 inch, trace silt, wet, very loose. (SP). SPTs (1-1-2-3)		
	light brown fine to medium SAND, trace silt light brown fine SILT and SAND gray fine to coarse SAND, trace rounded gravel, trace silt		5	SS		2 / 2	8-8.5': SAND, fine to medium, well-graded, light brown; trace silt, wet loose. (SW) 8.5-9': SILT and SAND, fine, poorly-graded, light brown; wet, loose. (ML) 9-10': SAND, fine to coarse, well-graded, gray; trace rounded gravel <1 cm, trace silt, wet, lo		
650.0			6	SS		1.83 / 2			
			7	SS		2 / 2	10-11.83': SAND, fine to coarse, well-graded, gray; trace rounded gravel <1 cm, trace silt, wet, loose. (SW) SPTs (3-5-7-7)		
	gray fine to coarse SAND and rounded GRAVEL, trace silt		8	SS		0.75 / 2	12-14': SAND, fine to coarse, well-graded, gray; trace rounded gravel <1 cm, trace silt, with brown sand and silt lenses 1/2 inch thick at 12.67' and 13', wet, loose. (SW) SPTs (3-5-7-12)		
645.0							14-14.75': SAND and GRAVEL, fine to coarse sand, rounded gravel <1 cm, well-graded, gray: trace silt, wet, loose. (SW) SPTs (2-3-3-5)		
640.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)
USCS Well-graded Gravelly Sand (SWG)
USCS Silt (ML)
USCS Well-graded Sand (SW)

DRILLING COMPANY: Earth Exploration
DRILLER: Craig Neilson
DRILL RIG: CME 55

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/13/18

wsp

BOREHOLE LOG: GAMW-38B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 29.5
DEPTH TO BEDROCK: 29.33

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173104.461 E: 2974206.659
GROUND SURFACE ELEV.: 660.81
TOP OF CASING ELEV.: 663.29
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 4/3/2018 11:30:00 AM
END DATE/TIME: 4/3/2018 1:00:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
660.0	dark brown fine SAND, some organics, some silt		1	SS		1 / 2	0-1': SAND, fine, poorly-graded; dark brown; some organics, some silt, moist, very loose. (SP) SPTs (1-2-1-2)		CETCO grout 0-15.5 ft-bgs
	light brown fine to medium SAND, trace gravel		2	SS		1.25 / 2	2-2.25': SAND, fine, poorly-graded, dark brown; some organics, some silt, moist, loose. (SP) 2.25-3.25': SAND, fine, poorly-graded, light brown; trace rounded gravel <1 inch, rounded gravel >1 inch at 3.25', wet, loose. (SP) SPTs (2-3-4-5)		
			3	SS		1.58 / 2	4-5.58': SAND, fine to medium, well-graded, light brown; trace rounded gravel <1 cm, 1/2 inch thick red staining at 5', wet, loose. (SW) SPTs (3-3-3-4)		
655.0	light brown SILT, trace fine sand gray fine to medium SAND, trace gravel, trace silt		4	SS		0.83 / 2	6-6.33': SILT, light brown; trace fine sand, wet, very loose. (ML) 6.33-6.83': SAND, fine to medium, poorly-graded, gray; trace rounded gravel <1/2 inch, trace rounded gravel >1/2 inch, trace silt, wet, very loose. (SP). SPTs (1-1-2-3)		
	light brown fine to medium SAND, trace silt light brown fine SILT and SAND gray fine to coarse SAND, trace rounded gravel, trace silt		5	SS		2 / 2			
650.0			6	SS		1.83 / 2	8-8.5': SAND, fine to medium, well-graded, light brown; trace silt, wet loose. (SW) 8.5-9': SILT and SAND, fine, poorly-graded, light brown; wet, loose. (ML)		
			7	SS		2 / 2	9-10': SAND, fine to coarse, well-graded, gray; trace rounded gravel <1 cm, trace silt, wet, loose. (SW) SPTs (1-2-4-5)		
	gray fine to coarse SAND and rounded GRAVEL, trace silt		8	SS		0.75 / 2	10-11.83': SAND, fine to coarse, well-graded, gray; trace rounded gravel <1 cm, trace silt, wet, loose. (SW) SPTs (3-5-7-7)		
645.0	gray medium to coarse SAND, trace fine sand, trace rounded gravel		9	SS		1.083 / 2	12-14': SAND, fine to coarse, well-graded, gray; trace rounded gravel <1 cm, trace silt, with brown sand and silt lenses 1/2 inch thick at 12.67' and 13', wet, loose. (SW) SPTs (3-5-7-12)		Bentonite Chips 15.5-18 ft-bgs
			10	SS		1 / 2	14-14.75': SAND and GRAVEL, fine to coarse sand, rounded gravel <1 cm, well-graded, gray: trace silt, wet, loose. (SW) SPTs (2-3-3-5)		#5 Sand Filter Pack 18-29.5 ft-bgs 2" PVC Screen slot 0.010 19.5-29.5 ft-bgs
640.0	gray to brown fine to medium SAND, trace rounded gravel, trace silt		11	SS		1 / 2	16-17.083': SAND, medium to coarse, well-graded, gray: some fine sand, trace rounded <1 cm gravel, wet, compact. (SW) SPTs (5-4-7-9)		
			12	SS		0.83 / 2	18-19': SAND, medium to coarse, well-graded, gray: some fine sand, trace rounded <1 cm gravel, wet, compact. (SW) SPTs (3-4-8-11)		
			13	SS		1.25 / 2			

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)
USCS Well-graded Gravelly Sand (SWG)
USCS Silt (ML)
Shale
USCS Well-graded Sand (SW)

DRILLING COMPANY: Earth Exploration
DRILLER: Craig Neilson
DRILL RIG: CME 55

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/13/18

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-38B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 29.5
DEPTH TO BEDROCK: 29.33

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173104.461 E: 2974206.659
GROUND SURFACE ELEV.: 660.81
TOP OF CASING ELEV.: 663.29
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 4/3/2018 11:30:00 AM
END DATE/TIME: 4/3/2018 1:00:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
635.0	gray to brown fine to medium SAND, trace rounded gravel, trace silt		13	SS		1.25 / 2	20-21': SAND, fine to medium, well-graded, gray to brown: trace rounded <1 cm gravel, trace silt, wet, compact. (SW) SPTs (3-4-8-10)		
			14	SS		0.83 / 2	22-22.83': SAND, fine to medium, well-graded, gray to brown: trace rounded <1 cm gravel, trace silt, wet, compact. (SW) SPTs (5-6-9-14)		
			15	SS		1.42 / 1.5	24-25.25': SAND, fine to medium, well-graded, gray to brown: trace rounded <1 cm gravel, trace silt, wet, loose. (SW) SPTs (1-2-7-14)		
	brown to gray SHALE						26-26.83': SAND, fine to medium, well-graded, gray to brown: trace rounded gravel, trace silt, wet, compact. (SW) SPTs (5-11-16-21)		
630.0							28-29.33': SAND, fine to medium, well-graded, gray to brown: trace rounded gravel, trace silt, wet, compact. (SW) 29.33-29.42': SHALE, brown to gray, wet, cohesive SPTs (7-11-50/6)		
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)
USCS Well-graded Gravelly Sand (SWG)
USCS Silt (ML)
Shale
USCS Well-graded Sand (SW)

DRILLING COMPANY: Earth Exploration
DRILLER: Craig Neilson
DRILL RIG: CME 55

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/13/18

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-39

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK: 29

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173099.95 E: 2974491.988
GROUND SURFACE ELEV.: 661.04
TOP OF CASING ELEV.: 663.51
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 4/4/2018 12:30:00 PM
END DATE/TIME: 4/4/2018 1:15:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
660.0	dark brown SILT and fine SAND, trace organics		1	SS		1.83 / 2	2-3.33': SILT and SAND, fine, well-graded, dark brown, trace organics, very loose, moist. (ML) 3.33-3.83': SAND, fine to medium, well-graded, light brown, trace rounded <1 cm gravel, very loose, wet. (SW) SPTs (1-1-1-1)		Bentonite Chips 0-3 ft-bgs
	light brown fine to medium SAND, trace rounded gravel								#5 Sand Filter Pack 3-15 ft-bgs
	light brown SILT and SAND		2	SS		1.83 / 2	5-5.83': SILT and SAND, fine, poorly-graded, brown, wet, loose. (ML) 5.83-6.83': SAND, fine, poorly-graded, light brown, some silt, wet, loose. (SP) SPTs (2-3-4-5)		2" PVC Screen slot 0.010 5-15 ft-bgs
655.0	light brown fine SAND, some silt								
	light brown fine SILT and SAND								
	gray fine to coarse SAND, little rounded gravel, trace silt								
	dark brown SILT and fine SAND								
650.0	gray fine to coarse SAND, some rounded gravel		3	SS		1.58 / 2	10-10.25': SILT and SAND, fine, poorly-graded, dark brown, wet, very loose. (ML) 10.25-11.58': SAND, medium to coarse, well-graded, gray, some rounded <1/2 inch gravel, trace rounded <1 cm gravel, wet, very loose. (SW) SPTs (1-2-2-2)		
645.0									
640.0									

LITHOLOGY LEGEND

USCS Silt (ML)

USCS Well-graded Sand (SW)

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Earth Exploration
DRILLER: Craig Neilson
DRILL RIG: CME 55

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/13/18

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-39B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 29.92
DEPTH TO BEDROCK: 29

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173103.206 E: 2974490.702
GROUND SURFACE ELEV.: 660.96
TOP OF CASING ELEV.: 663.47
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 4/4/2018 9:30:00 AM
END DATE/TIME: 4/4/2018 11:20:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
660.0	dark brown SILT and fine SAND, trace organics		1	SS		1.83 / 2	2-3.33': SILT and SAND, fine, well-graded, dark brown, trace organics, very loose, moist. (ML) 3.33-3.83': SAND, fine to medium, well-graded, light brown, trace rounded <1 cm gravel, very loose, wet. (SW) SPTs (1-1-1-1)		CETCO Grout 0-15 ft-bgs
	light brown fine to medium SAND, trace rounded gravel								
	light brown SILT and SAND		2	SS		1.83 / 2	5-5.83': SILT and SAND, fine, poorly-graded, brown, wet, loose. (ML) 5.83-6.83': SAND, fine, poorly-graded, light brown, some silt, wet, loose. (SP) SPTs (2-3-4-5)		
655.0	light brown fine SAND, some silt								
	light brown fine SILT and SAND		3	SS		1.58 / 2	10-10.25': SILT and SAND, fine, poorly-graded, dark brown, wet, very loose. (ML) 10.25-11.58': SAND, medium to coarse, well-graded, gray, some rounded <1/2 inch gravel, trace rounded <1 cm gravel, wet, very loose. (SW) SPTs (1-2-2-2)		
	gray fine to coarse SAND, little rounded gravel, trace silt								
	dark brown SILT and fine SAND								
650.0	gray fine to coarse SAND, some rounded gravel								
			4	SS		0.67 / 2	15-15.67': SAND, medium to coarse, well-graded, gray, some rounded <1 cm gravel, wet, loose. (SW) SPTs (3-4-5-7)		Bentonite Chips 15-17 ft-bgs
645.0									#5 Sand Filter Pack 17-29.75 ft-bgs
			5	SS		1 / 2	20-21': SAND, fine to coarse, well-graded, gray, some rounded <1 cm gravel, wet, compact. (SW) SPTs (3-5-6-9)		2" PVC Screen slot 0.010 19.75-29.75 ft-bgs
640.0									

LITHOLOGY LEGEND

USCS Silt (ML)
Shale
USCS Well-graded Sand (SW)
USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Earth Exploration
DRILLER: Craig Neilson
DRILL RIG: CME 55

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/13/18

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-39B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 29.92
DEPTH TO BEDROCK: 29

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173103.206 E: 2974490.702
GROUND SURFACE ELEV.: 660.96
TOP OF CASING ELEV.: 663.47
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 4/4/2018 9:30:00 AM
END DATE/TIME: 4/4/2018 11:20:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
635.0	gray fine to coarse SAND, some rounded gravel		6	SS		1 / 2	20-21': SAND, fine to coarse, well-graded, gray, some rounded <1 cm gravel, wet, compact. (SW) SPTs (4-8-10-14)		
	gray SHALE		7	SS		0.92 / 0.92	29-29.92': SHALE, gray, clayey. SPTs (11-50/5)		
630.0									
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

USCS Silt (ML)
Shale
USCS Well-graded Sand (SW)
USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Earth Exploration
DRILLER: Craig Neilson
DRILL RIG: CME 55

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/13/18

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-40

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 17
DEPTH TO BEDROCK: 30.25

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173336.206 E: 2974705.878
GROUND SURFACE ELEV.: 664.11
TOP OF CASING ELEV.: 666.54
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 4/5/2018 8:05:00 AM
END DATE/TIME: 4/5/2018 8:55:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	dark brown fine SAND and SILT, some organics		1	SS		1.5 / 2	0-1.5': SAND and SILT, fine, poorly-graded, dark brown, some organics, moist, very loose. (SP) SPTs (1-1-1-2)		Bentonite Chips 0-5 ft-bgs
660.0			2	SS		2 / 2	5-5.5': SILT, dark brown, some fine sand, trace organics, trace rounded <1 cm gravel, moist, loose. (ML) 5.5-6.08': SAND and SILT, fine, poorly-graded, brown, moist, loose. (SP) 6.08-7': SAND, fine to medium, well-graded, light brown, trace rounded <1 c		#5 Sand Filter Pack 5-17 ft-bgs
	light brown fine to medium SAND, trace rounded gravel								2" PVC Screen slot 0.010 7-17 ft-bgs
655.0			3	SS		1.5 / 2	10-10.83': SAND, fine to coarse, well-graded, brown to gray, trace rounded <1 cm gravel, wet, loose. (SW) 10.83-11.08': SAND and SILT, fine, poorly-graded, dark brown. (SP) 11.08-11.5': SAND, fine to coarse, well-graded, brown to gray, trace rounded <1		
	brown to gray fine to coarse SAND, trace rounded gravel								
650.0			4	SS		0.42 / 2	15-15.42': SAND, fine to coarse, well-graded, brown to gray, trace rounded <1 cm gravel, wet, very loose. (SW) SPTs (1-1-2-3)		
645.0									
640.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

USCS Well-graded Sand (SW)

DRILLING COMPANY: Earth Exploration
DRILLER: Craig Neilson
DRILL RIG: CME 55

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/13/18

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-40B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 31.5
DEPTH TO BEDROCK: 30.25

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173336.053 E: 2974709.344
GROUND SURFACE ELEV.: 664.05
TOP OF CASING ELEV.: 666.38
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 4/4/2018 3:50:00 PM
END DATE/TIME: 4/4/2018 4:50:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	dark brown fine SAND and SILT, some organics		1	SS		1.5 / 2	0-1.5': SAND and SILT, fine, poorly-graded, dark brown, some organics, moist, very loose. (SP) SPTs (1-1-1-2)		Cetgo Grout 0-17.5 ft bgs
660.0			2	SS		2 / 2	5-5.5': SILT, dark brown, some fine sand, trace organics, trace rounded <1 cm gravel, moist, loose. (ML) 5.5-6.08': SAND and SILT, fine, poorly-graded, brown, moist, loose. (SP) 6.08-7': SAND, fine to medium, well-graded, light brown, trace rounded <1 cm gravel, wet, loose. (SW) SPTs (2-5-4-5)		
	light brown fine to medium SAND, trace rounded gravel								
655.0			3	SS		1.5 / 2	10-10.83': SAND, fine to coarse, well-graded, brown to gray, trace rounded <1 cm gravel, wet, loose. (SW) 10.83-11.08': SAND and SILT, fine, poorly-graded, dark brown. (SP) 11.08-11.5': SAND, fine to coarse, well-graded, brown to gray, trace rounded <1 cm gravel, wet, loose. (SW) SPTs (1-2-3-5)		
	brown to gray fine to coarse SAND, trace rounded gravel								
650.0			4	SS		0.42 / 2	15-15.42': SAND, fine to coarse, well-graded, brown to gray, trace rounded <1 cm gravel, wet, very loose. (SW) SPTs (1-1-2-3)		
									Bentonite Chips 17.5-19.5 ft bgs
645.0									#5 Sand Filter Pack 19.5-31.5 ft bgs
	light gray fine to coarse SAND, some rounded gravel		5	SS		1.17 / 2	20-21.17': SAND, fine to medium, well-graded, light brown, trace rounded <1 cm gravel, some silt, wet, compact. (SW) SPTs (5-9-18-21)		2" PVC Screen slot 0.010 21.5-31.5 ft-bgs
640.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP) | USCS Well-graded Sand (SW) | Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Craig Neilson
DRILL RIG: CME 55

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/13/18

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-40B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 31.5
DEPTH TO BEDROCK: 30.25

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173336.053 E: 2974709.344
GROUND SURFACE ELEV.: 664.05
TOP OF CASING ELEV.: 666.38
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 4/4/2018 3:50:00 PM
END DATE/TIME: 4/4/2018 4:50:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	light gray fine to coarse SAND, some rounded gravel		6	SS		1.08 / 2	25-26.08': SAND, fine to coarse, well-graded, gray, some rounded <1 cm gravel, wet, compact. (SW) SPTs (5-9-14-15)		
635.0	gray clayey SHALE		7	SS		1 / 2	30-30.25': SAND, fine to coarse, well-graded, gray, some rounded <1 cm gravel, wet, compact. (SW) 30.25-31': SHALE, gray, clayey SPTs (5-10-15-16)		
630.0									
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

USCS Well-graded Sand (SW)

Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Craig Neilson
DRILL RIG: CME 55

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/13/18

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-41

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK: 27

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173334.044 E: 2975014.682
GROUND SURFACE ELEV.: 660.09
TOP OF CASING ELEV.: 662.41
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/17/2018 2:10:00 PM
END DATE/TIME: 5/17/2018 2:20:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
660.0	fine dark brown SAND, some silt		1			2 / 2	0-0.33': SAND, fine, poorly-graded, dark brown, some silt, some sandstone gravel, moist, compact. (SP) 0.33-1.75': SAND, fine, poorly-graded, dark brown, some silt, moist, compact. (SP) 1.75-2': SAND, fine to medium, well-graded, light brown, moist comp		Bentonite Chips 0-3 ft-bgs
	fine to medium light brown SAND								#5 Sand Filter Pack 3-15 ft-bgs
655.0			2			1.17 / 2	5-6.17': SAND, fine to medium, well-graded, light brown, wet, loose. (SW) SPTs (3-4-4-5)		2" PVC Screen slot 0.010 5-15 ft-bgs
650.0	fine to coarse light gray SAND		3			2 / 2	10-12': SAND, fine to coarse, well-graded, light gray, wet, compact. (SW) SPTs (3-5-7-9)		
645.0									
640.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

USCS Well-graded Sand (SW)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/13/18

wsp

BOREHOLE LOG: GAMW-41B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 27.83
DEPTH TO BEDROCK: 27

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173337.097 E: 2975019.417
GROUND SURFACE ELEV.: 660.08
TOP OF CASING ELEV.: 662.15
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/17/2018 11:55:00 AM
END DATE/TIME: 5/17/2018 12:45:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
660.0	fine dark brown SAND, some silt		1			2 / 2	0-0.33': SAND, fine, poorly-graded, dark brown, some silt, some sandstone gravel, moist, compact. (SP) 0.33-1.75': SAND, fine, poorly-graded, dark brown, some silt, moist, compact. (SP) 1.75-2': SAND, fine to medium, well-graded, light brown, moist compact. (SW) SPTs (4-6-6-8)		Cetgo Grout 0-13 ft bgs
	fine to medium light brown SAND								
655.0			2			1.17 / 2	5-6.17': SAND, fine to medium, well-graded, light brown, wet, loose. (SW) SPTs (3-4-4-5)		
650.0	fine to coarse light gray SAND		3			2 / 2	10-12': SAND, fine to coarse, well-graded, light gray, wet, compact. (SW) SPTs (3-5-7-9)		Bentonite Chips 13-15 ft bgs
645.0			4			0.58 / 2	15-15.58': SAND, fine to coarse, well-graded, light gray, wet, loose. (SW) SPTs (3-3-4-5)		#5 Sand Filter Pack 15-27 ft bgs 2" PVC Screen slot 0.010 17-27 ft-bgs
640.0	fine to coarse light gray SAND, trace to some rounded gravel		5			1.33 / 2	20-21.33': SAND, fine to coarse, well-graded, light gray, trace rounded <1 inch gravel, wet, compact. (SW) SPTs (5-8-12-15)		

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP) | USCS Well-graded Sand (SW) | Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/13/18

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-41B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 27.83
DEPTH TO BEDROCK: 27

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173337.097 E: 2975019.417
GROUND SURFACE ELEV.: 660.08
TOP OF CASING ELEV.: 662.15
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/17/2018 11:55:00 AM
END DATE/TIME: 5/17/2018 12:45:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
635.0	fine to coarse light gray SAND, trace to some rounded gravel		6			1.42 / 2	25-26.42': SAND, fine to coarse, well-graded, light gray, some rounded <1.5 inch gravel, wet, compact. (SW) SPTs (5-8-12-13)		
	light gray clayey SHALE		7			0.83 / 1.17	27-27.83': SHALE, clayey, light gray SPTs (5-15-50/2)		
630.0									
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

USCS Well-graded Sand (SW)

Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/13/18

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-42

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK: 36

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2170186.913 E: 2967937.39
GROUND SURFACE ELEV.: 663.12
TOP OF CASING ELEV.: 665.78
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/24/2018 3:40:00 PM
END DATE/TIME: 7/24/2018 3:55:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	dark brown fine SILTY SAND, some organics			RS			0-1.6': SILTY SAND, fine, poorly-graded, dark brown, some organics, moist. (SP) 1.6-2': SAND, fine, poorly-graded, light gray, moist. (SP)		Bentonite Chips 0-4 ft bgs
	light gray fine SAND dark brown fine SAND, some silt						2-3.2': SAND, fine, poorly-graded, dark brown, some silt, cohesive, moist. (SP)		
660.0	light brown to light gray fine to medium SAND, trace gravel			RS			3.2-5': SAND, fine to medium, well-graded, light brown to light gray, trace rounded gravel <1 cm (0.4 inch), wet. (SW)		#5 Sand Filter Pack 4-15 ft bgs 2" PVC Screen slot 0.010 5-15 ft bgs
655.0							10.8-10.9': CLAY, light gray (CL)		
	light gray CLAY light gray fine to coarse SAND, some gravel			RS					
650.0				RS			12-12.2': SAND, medium to coarse, light gray, some rounded gravel <1 inch, trace fine sand, wet. (SW)		
645.0									
640.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)
USCS Low Plasticity Clay (CL)
USCS Poorly-graded Sand (SP)
USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 10/30/18

wsp

BOREHOLE LOG: GAMW-42B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 38
DEPTH TO BEDROCK: 36

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2170182.551 E: 2967943.169
GROUND SURFACE ELEV.: 663.15
TOP OF CASING ELEV.: 665.64
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/24/2018 12:30:00 PM
END DATE/TIME: 7/24/2018 1:50:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	dark brown fine SILTY SAND, some organics			RS			0-1.6': SILTY SAND, fine, poorly-graded, dark brown, some organics, moist. (SP) 1.6-2': SAND, fine, poorly-graded, light gray, moist. (SP)		Bentonite Grout 0-22 ft bgs
	light gray fine SAND								
	dark brown fine SAND, some silt			RS			2-3.2': SAND, fine, poorly-graded, dark brown, some silt, cohesive, moist. (SP) 3.2-5': SAND, fine to medium, well-graded, light brown to light gray, trace rounded gravel <1 cm (0.4 inch), wet. (SW)		
660.0	light brown to light gray fine to medium SAND, trace gravel								
				RS			10.8-10.9': CLAY, light gray (CL)		
655.0	light gray CLAY								
	light gray fine to coarse SAND, some gravel			RS			12-12.2': SAND, medium to coarse, light gray, some rounded gravel <1 inch, trace fine sand, wet. (SW)		
650.0				RS			16-17.5': SAND, medium to coarse, light gray, some rounded gravel <1 inch, trace fine sand, wet. (SW)		
645.0				RS			18-20': SAND, medium to coarse, light gray, some rounded gravel <1 inch, trace fine sand, wet. (SW)		
				RS			22-26': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet. (SW)		Bentonite Chips 22-24 ft bgs #5 Sand Filter Pack 24-36 ft bgs
640.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)
USCS Low Plasticity Clay (CL)
USCS Poorly-graded Sand (SP)
Shale
USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 10/30/18

wsp

BOREHOLE LOG: GAMW-42B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 38
DEPTH TO BEDROCK: 36

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2170182.551 E: 2967943.169
GROUND SURFACE ELEV.: 663.15
TOP OF CASING ELEV.: 665.64
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/24/2018 12:30:00 PM
END DATE/TIME: 7/24/2018 1:50:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	light gray fine to coarse SAND, some gravel			RS					2" PVC Screen slot 0.010 26-36 ft bgs
635.0				RS			28-30': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet. (SW)		
			SB-42B-30'-34'	RS			30-32': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet. (SW)		
630.0	light gray SHALE		SB-42B-34'-36'				34-34.25': CLAYEY SHALE, light gray, very weathered, wet.		
			SB-42B-36'-38'				36-38': SHALE, light gray, dry.		#5 Sand 36-38 ft bgs
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)
USCS Low Plasticity Clay (CL)
USCS Poorly-graded Sand (SP)
Shale
USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 10/30/18

wsp

BOREHOLE LOG: GAMW-42C

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 50
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2170207.085 E: 2967974.69
GROUND SURFACE ELEV.: 663.20
TOP OF CASING ELEV.: 666.28
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/7/2019 9:00:00 AM
END DATE/TIME: 6/7/2019 3:04:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	dark brown to light gray fine SAND		1	RS			0' to 1': SAND, fine, dark brown, dry, some silt, well graded, non cohesive, organics (SP). 1' to 5': SAND, fine, light gray to brown, dry, well graded, non cohesive (SP).		Bentonite Grout 0-36 ft bgs
660.0	gray fine SAND, some medium sand		2	RS			5' to 10': SAND, fine, gray, trace media sand, well graded, wet (SP).		
655.0			3	RS			10' to 20': SAND, fine, gray, trace media sand, well graded, wet (SP).		
650.0									
645.0			4	RS			20' to 21': SAND, fine, gray, well graded, wet (SP). 21' to 23': SAND, fine, gray, well graded, wet (SP). 23' to 24': SAND, medium, gray, some fine sand, poorly graded, wet (SP). 24' to 30': SAND, fine, gray, trace medium sand, well graded, wet (SP).		
640.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

Shale

DRILLING COMPANY: LAYNE
DRILLER: M. Backhaus
DRILL RIG: SDC500-28EA

LOGGED BY: ANB
CHECKED BY: AMH
DATE: 12/18/19

BOREHOLE LOG: GAMW-42C

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 50
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2170207.085 E: 2967974.69
GROUND SURFACE ELEV.: 663.20
TOP OF CASING ELEV.: 666.28
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/7/2019 9:00:00 AM
END DATE/TIME: 6/7/2019 3:04:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
635.0	gray fine SAND, some medium sand		4	RS					
							30' to 32.5': SAND, fine, gray, wet, well graded (SP).		
							32.5' to 38: SHALE, gray (SHALE).		
630.0	gray SHALE								Bentonite Chips 36-38 ft bgs
625.0							38' to 40': SHALE, gray (SHALE).		#5 Sand Filter Pack 38-50 ft bgs
			6	RS					
			5	RS			40' to 50" SHALE, gray (SHALE).		2" PVC Screen slot 0.010 40-50 ft bgs
620.0			7	RS					
615.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

Shale

DRILLING COMPANY: LAYNE
DRILLER: M. Backhaus
DRILL RIG: SDC500-28EA

LOGGED BY: ANB
CHECKED BY: AMH
DATE: 12/18/19

wsp

BOREHOLE LOG: GAMW-42C

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 50
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2170207.085 E: 2967974.69
GROUND SURFACE ELEV.: 663.20
TOP OF CASING ELEV.: 666.28
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/7/2019 9:00:00 AM
END DATE/TIME: 6/7/2019 3:04:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
610.0									
605.0			5	RS					
600.0									
595.0									
590.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

Shale

DRILLING COMPANY: LAYNE
DRILLER: M. Backhaus
DRILL RIG: SDC500-28EA

LOGGED BY: ANB
CHECKED BY: AMH
DATE: 12/18/19

BOREHOLE LOG: GAMW-43

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK: 36.4

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2170878.633 E: 2967926.918
GROUND SURFACE ELEV.: 663.14
TOP OF CASING ELEV.: 665.57
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/16/2018 5:10:00 PM
END DATE/TIME: 5/16/2018 5:25:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	fine dark brown SAND, some silt		1			1.75 / 2	0-0.42': SAND, fine, poorly-graded, dark brown, some silt, some organics, moist, loose. (SP) 0.42-1.5': SAND, fine, poorly-graded, brown, some silt, moist, loose. (SP) 1.5-1.75': SAND, fine to medium, well-graded, light brown, moist, loose. (SW) SPTs (		Bentonite Chips 0-3 ft bgs
	fine to medium light brown SAND								
660.0			2			1.67 / 2	5-6.67': SAND, fine to medium, well-graded, light brown, wet, very loose. (SW) SPTs (2-2-2-3)		#5 Sand Filter Pack 3-15 ft bgs 2" PVC Screen slot 0.010 5-15 ft bgs
655.0									
	light gray CLAY		3			1.83 / 2	10-11': SAND, fine to medium, well-graded, light and dark brown, some silt, wet, very loose. (SW) 11-11.5': CLAY, light gray, soft. (CL) 11.5-11.83': SAND, fine to coarse, well-graded, light gray, wet, very loose. (SW) SPTs (2-1-2-2)		
	fine to coarse light gray SAND, trace gravel								
650.0									
645.0									
640.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

USCS Well-graded Sand (SW)

USCS Low Plasticity Clay (CL)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/13/18

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-43B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 36.75
DEPTH TO BEDROCK: 36.4

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2170876.906 E: 2967926.657
GROUND SURFACE ELEV.: 663.12
TOP OF CASING ELEV.: 665.51
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/16/2018 3:15:00 PM
END DATE/TIME: 5/16/2018 4:15:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	fine dark brown SAND, some silt		1			1.75 / 2	0-0.42': SAND, fine, poorly-graded, dark brown, some silt, some organics, moist, loose. (SP) 0.42-1.5': SAND, fine, poorly-graded, brown, some silt, moist, loose. (SP) 1.5-1.75': SAND, fine to medium, well-graded, light brown, moist, loose. (SW) SPTs (3-4-4-6)		Cetgo Grout 0-22 ft bgs
	fine to medium light brown SAND								
660.0			2			1.67 / 2	5-6.67': SAND, fine to medium, well-graded, light brown, wet, very loose. (SW) SPTs (2-2-2-3)		
655.0			3			1.83 / 2	10-11': SAND, fine to medium, well-graded, light and dark brown, some silt, wet, very loose. (SW) 11-11.5': CLAY, light gray, soft. (CL) 11.5-11.83': SAND, fine to coarse, well-graded, light gray, wet, very loose. (SW) SPTs (2-1-2-2)		
	light gray CLAY								
	fine to coarse light gray SAND, trace gravel								
650.0			4			1.25 / 2	15-16.25': SAND, fine to coarse, well-graded, light gray, trace rounded <1 inch gravel, wet, very loose. (SW) SPTs (3-1-2-2)		
645.0			5			1.42 / 2	20-21.42': SAND, fine to coarse, well-graded, light gray, trace rounded <1 inch gravel, wet, compact. (SW) SPTs (1-5-6-7)		Bentonite Chips 22-24 ft bgs
640.0									# 5 Sand Filter Pack 24-36 ft bgs

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)
Shale
USCS Well-graded Sand (SW)
USCS Low Plasticity Clay (CL)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/13/18

BOREHOLE LOG: GAMW-43B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 36.75
DEPTH TO BEDROCK: 36.4

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2170876.906 E: 2967926.657
GROUND SURFACE ELEV.: 663.12
TOP OF CASING ELEV.: 665.51
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/16/2018 3:15:00 PM
END DATE/TIME: 5/16/2018 4:15:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	fine to coarse light gray SAND, trace gravel		6			2 / 2	25-27': SAND, fine to coarse, well-graded, light gray, trace rounded <1 inch gravel, wet, compact. (SW) SPTs (1-3-5-7)		2" PVC Screen slot 0.010 26-36 ft bgs
635.0			7			1.83 / 2	30-31.83': SAND, fine to coarse, well-graded, light gray, wet, compact. (SW) SPTs (4-8-12-19)		
630.0	gray clayey SHALE		8			0.58 / 1.75	35-35.25': SAND, fine to coarse, well-graded, light gray, wet, compact. (SW) 35.25-35.58': clayey SHALE, gray, dense, weathered. SPTs (8-29-15-50/3)		
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)
Shale
USCS Well-graded Sand (SW)
USCS Low Plasticity Clay (CL)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/13/18

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-44

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK: 36.2

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171240.722 E: 2967833.092
GROUND SURFACE ELEV.: 664.11
TOP OF CASING ELEV.: 666.29
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/16/2018 2:10:00 PM
END DATE/TIME: 5/16/2018 2:30:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	dark to light brown fine SAND, some silt		1	SS		1.2 / 2	0-0.3': SAND, fine, poorly-graded, dark brown, some silt, moist, very loose. (SP) 0.3-1.2': SAND, fine, poorly-graded, light brown, some silt, moist, very loose. (SP) SPTs (2-2-2-2)		Bentonite Chips 0-3 ft bgs
			2	SS		2 / 2	2-3.5': SAND, fine, poorly-graded, light brown, some orange staining, trace silt, moist, compact. (SP) 3.5-4': SAND, fine, poorly-graded, light brown, moist, compact. (SP) SPTs (4-5-7-6)		# 5 Sand 3-15 ft bgs
660.0	light brown fine to medium SAND		3	SS		1.5 / 2	4-5': SAND, fine, poorly-graded, light brown, some orange staining, moist, loose. (SP) 5-5.5': SAND, fine, poorly-graded, light brown, some orange staining, wet, loose. (SP) SPTs (2-3-3-5)		2" PVC Screen slot 0.010 5-15 ft bgs
			4	SS		1.4 / 2	6-7.4': SAND, fine to medium, well-graded, light brown, wet, compact. (SW) SPTs (4-5-7-7)		
655.0	light gray fine to coarse SAND, trace gravel		5	SS		1.8 / 2	8-9.8': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet, loose. (SW) SPTs (3-3-4-5)		
			6	SS		2 / 2	10-12': SAND, fine to coarse, well-graded, light gray, wet, loose. (SW) SPTs (3-3-5-5)		
			7	SS		1.1 / 2	12-13': SAND, fine to medium, well-graded, light gray, some silt, 1 inch clay lens at 12.5', wet, compact. (SW-SM) SPTs (1-6-7-9)		
650.0			8	SS		1.25 / 2	14-15.25': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet, compact. (SW) SPTs (3-5-6-8)		
645.0									
640.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

USCS Well-graded Sand (SW)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/14/18

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-44B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 37.3
DEPTH TO BEDROCK: 36.2

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171239.722 E: 2967834.346
GROUND SURFACE ELEV.: 664.11
TOP OF CASING ELEV.: 666.23
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/16/2018 10:50:00 AM
END DATE/TIME: 5/16/2018 12:30:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	dark to light brown fine SAND, some silt		1	SS		1.2 / 2	0-0.3': SAND, fine, poorly-graded, dark brown, some silt, moist, very loose. (SP) 0.3-1.2': SAND, fine, poorly-graded, light brown, some silt, moist, very loose. (SP) SPTs (2-2-2-2)		Cetgo Grout 0-22 ft bgs
			2	SS		2 / 2	2-3.5': SAND, fine, poorly-graded, light brown, some orange staining, trace silt, moist, compact. (SP) 3.5-4': SAND, fine, poorly-graded, light brown, moist, compact. (SP) SPTs (4-5-7-6)		
660.0	light brown fine to medium SAND		3	SS		1.5 / 2	4-5': SAND, fine, poorly-graded, light brown, some orange staining, moist, loose. (SP) 5-5.5': SAND, fine, poorly-graded, light brown, some orange staining, wet, loose. (SP) SPTs (2-3-3-5)		
			4	SS		1.4 / 2	6-7.4': SAND, fine to medium, well-graded, light brown, wet, compact. (SW) SPTs (4-5-7-7)		
	light gray fine to coarse SAND, trace gravel		5	SS		1.8 / 2	8-9.8': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet, loose. (SW) SPTs (3-3-4-5)		
655.0			6	SS		2 / 2	10-12': SAND, fine to coarse, well-graded, light gray, wet, loose. (SW) SPTs (3-3-5-5)		
			7	SS		1.1 / 2	12-13': SAND, fine to medium, well-graded, light gray, some silt, 1 inch clay lens at 12.5', wet, compact. (SW-SM) SPTs (1-6-7-9)		
650.0			8	SS		1.25 / 2	14-15.25': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet, compact. (SW) SPTs (3-5-6-8)		
			9	SS		1 / 2	16-17.8': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet, compact. (SW) SPTs (4-5-6-8)		
645.0			10	SS		0 / 2	18-20': No recovery, all gravel washout from above. SPTs (4-6-8-8)		
			11	SS		1.2 / 2	20-21.2': SAND, medium to coarse, well-graded, light gray, trace rounded gravel <1 inch, trace fine sand, wet, compact. (SW) SPTs (4-6-7-9)		
			12	SS		1.3 / 2	22-23.3': SAND, fine to coarse, well-graded, dark gray, wet, compact. (SW) SPTs (3-5-5-6)		Bentonite Chips 22-24 ft bgs
640.0			13	SS		1 / 2			#5 Sand Filter Pack 24-36 ft bgs

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP) | USCS Well-graded Sand (SW) | Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/14/18

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-44B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 37.3
DEPTH TO BEDROCK: 36.2

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171239.722 E: 2967834.346
GROUND SURFACE ELEV.: 664.11
TOP OF CASING ELEV.: 666.23
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/16/2018 10:50:00 AM
END DATE/TIME: 5/16/2018 12:30:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	light gray fine to coarse SAND, trace gravel		13	SS		1 / 2	24-25': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet, compact. (SW) SPTs (3-6-9-10)		2" PVC Screen slot 0.010 26-36 ft bgs
			14	SS		1.3 / 2	26-27.25': Same as 24-25'. 27.25-27.3': SAND, fine to medium, well-graded, dark gray, wet, compact. (SW) SPTs (5-8-9-10)		
635.0			15	SS		1 / 2	28-29': Same as 24-25'. At 28.5', 1-inch thick lens of SAND, fine to medium, well-graded, dark gray, wet, compact. (SW) SPTs (7-8-10-11)		
			16	SS		1.6 / 2	30-31.6': Same as 24-25'. SPTs (9-12-16-2)		
			17	SS		1.4 / 2	32-33.4': SAND, fine to coarse, well-graded, light gray, wet, compact. (SW) SPTs (7-8-9-9)		
630.0			18	SS		1.5 / 2	34-35.5': SAND, fine to coarse, well-graded, light gray, wet, compact. (SW) SPTs (8-9-10-12)		
	gray clayey SHALE		19	SS		0.8 / 1.3	36-36.2': SAND, fine to coarse, well-graded, light gray, wet, compact. (SW) 36.2-37.3': CLAYEY SHALE, gray, very hard. SPTs (9-30-50/2)		
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP) | USCS Well-graded Sand (SW) | Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/14/18

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-45

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK: 36.2

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2178836.292 E: 2971287.409
GROUND SURFACE ELEV.: 662.21
TOP OF CASING ELEV.: 664.48
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/15/2018 1:00:00 PM
END DATE/TIME: 5/15/2018 1:30:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
660.0	dark brown fine SAND, some silt, some organics		1	SS		1.9 / 2	0-1.9': SAND, fine, poorly-graded, dark brown, some silt, some organics, moist, loose. (SP). At 1.0', 1-inch thick lens of SAND, fine, poorly-graded, light brown, moist, loose. (SP) SPTs (3-3-4-5)		Bentonite Chips 0-3 ft bgs
	light brown SAND, some clay		2	SS		1.75 / 2	2-2.3': SAND, fine, poorly-graded, dark brown, some silt, some organics, moist, loose. (SP) 2.3-3': SAND, well-graded, light brown, some clay, moist, loose. (SW) 3-3.75': SAND, fine to medium, well-graded, light brown to orange, moist, loose. (SW) SPTs		#5 Sand Filter Pack 3-15 ft bgs
	light brown fine to medium SAND		3	SS		1.6 / 2			2" PVC Screen slot 0.010 5-15 ft bgs
655.0			4	SS		1.8 / 2	4-4.8': SAND, fine to medium, well-graded, light brown to orange, moist, loose. (SW) 4.8-5.6': SAND, fine to medium, well-graded, light brown to gray, moist, loose. (SW) SPTs (2-3-4-4)		
			5	SS		2 / 2	6-7.8': SAND, fine to medium, well-graded, light brown, wet, very loose. (SW) SPTs (2-2-2-4)		
			6	SS		2 / 2	8-10': SAND, fine to medium, well-graded, light brown, wet, loose. (SW) SPTs (2-2-3-4)		
650.0			7	SS		2 / 2	10-12': SAND, fine to medium, well-graded, light brown, wet, loose. (SW) SPTs (2-2-3-5)		
			8	SS		2 / 2	12-13': SAND, fine to medium, well-graded, light brown, wet, loose. (SW) 13-14': SAND, fine to medium, well-graded, light gray, wet, loose. (SW) SPTs (2-4-5-6)		
645.0							14-15': SAND, fine to medium, well-graded, light brown, wet, compact. (SW) 15-16': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet, compact. (SW) SPTs (5-8-9-11)		
640.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

USCS Well-graded Sand (SW)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/14/18

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-45B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 38
DEPTH TO BEDROCK: 36.2

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2178836.27 E: 2971289.227
GROUND SURFACE ELEV.: 662.23
TOP OF CASING ELEV.: 664.30
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/15/2018 9:50:00 AM
END DATE/TIME: 5/15/2018 11:50:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	dark brown fine SAND, some silt, some organics		1	SS		1.9 / 2	0-1.9': SAND, fine, poorly-graded, dark brown, some silt, some organics, moist, loose. (SP). At 1.0', 1-inch thick lens of SAND, fine, poorly-graded, light brown, moist, loose. (SP) SPTs (3-3-4-5)		CETCO Grout 0-23 ft bgs
660.0	light brown SAND, some clay		2	SS		1.75 / 2	2-2.3': SAND, fine, poorly-graded, dark brown, some silt, some organics, moist, loose. (SP) 2.3-3': SAND, well-graded, light brown, some clay, moist, loose. (SW)		
	light brown fine to medium SAND		3	SS		1.6 / 2	3-3.75': SAND, fine to medium, well-graded, light brown to orange, moist, loose. (SW) SPTs (3-4-6-6)		
655.0			4	SS		1.8 / 2	4-4.8': SAND, fine to medium, well-graded, light brown to orange, moist, loose. (SW) 4.8-5.6': SAND, fine to medium, well-graded, light brown to gray, moist, loose. (SW) SPTs (2-3-4-4)		
			5	SS		2 / 2	6-7.8': SAND, fine to medium, well-graded, light brown, wet, very loose. (SW) SPTs (2-2-2-4)		
			6	SS		2 / 2	8-10': SAND, fine to medium, well-graded, light brown, wet, loose. (SW) SPTs (2-2-3-4)		
650.0			7	SS		2 / 2	10-12': SAND, fine to medium, well-graded, light brown, wet, loose. (SW) SPTs (2-2-3-5)		
			8	SS		2 / 2	12-13': SAND, fine to medium, well-graded, light brown, wet, loose. (SW) 13-14': SAND, fine to medium, well-graded, light gray, wet, loose. (SW) SPTs (2-4-5-6)		
	light gray fine to coarse SAND, trace to some gravel		9	SS		2 / 2	14-15': SAND, fine to medium, well-graded, light brown, wet, compact. (SW) 15-16': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet, compact. (SW) SPTs (5-8-9-11)		
645.0			10	SS		1 / 2	16-17.4': SAND, fine to medium, well-graded, light brown, wet, compact. (SW) 17.4-18': SAND, fine to coarse, well-graded, light gray, some rounded gravel <1 inch, wet, compact. (SW) SPTs (5-6-8-9)		
			11	SS		1 / 2	18-19': SAND, fine to coarse, well-graded, light gray, some rounded gravel <1 inch, wet, compact. (SW) SPTs (3-5-6-6)		
640.0			12	SS		1.5 / 2			Bentonite Chips 23-25 ft bgs
			13	SS		1.5 / 2			

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP) | USCS Well-graded Sand (SW) | Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/14/18

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-45B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 38
DEPTH TO BEDROCK: 36.2

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2178836.27 E: 2971289.227
GROUND SURFACE ELEV.: 662.23
TOP OF CASING ELEV.: 664.30
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/15/2018 9:50:00 AM
END DATE/TIME: 5/15/2018 11:50:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	light gray fine to coarse SAND, trace to some gravel		13	SS		1.5 / 2	20-21': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet, loose. (SW) SPTs (3-3-4-5)		#5 Sand Filter Pack 25-38 ft bgs
635.0			14	SS		1.8 / 2	22-23.5': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet, loose. (SW) SPTs (2-4-5-8)		
			15	SS		1.7 / 2	24-25.5': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet, compact. (SW) SPTs (2-4-8-10)		2" PVC Screen slot 0.010 28-38 ft bgs
			16	SS		1.8 / 2	26-27.8': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet, compact. (SW) SPTs (9-12-16-20)		
630.0			17	SS		1.2 / 2	28-29.7': SAND, fine to medium, well-graded, light brown, wet, compact. (SW) SPTs (9-14-12-16)		
			18	SS		1.8 / 2	30-31.8': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet, compact. (SW) SPTs (10-12-14-16)		
	gray clayey SHALE		19	SS		1.2 / 2	32-33.2': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 cm, wet, dense. (SW) SPTs (22-20-18-17)		
625.0							34-35.8': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 cm, wet, dense. (SW) SPTs (7-14-16-21)		
							36-36.2': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 cm, wet, dense. (SW) 36.2-37.2': CLAYEY SHALE, light gray. SPTs (13-14-18-24)		
620.0									
615.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP) | USCS Well-graded Sand (SW) | Shale

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/14/18

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-46

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK: 31

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2178839.026 E: 2973531.388
GROUND SURFACE ELEV.: 661.99
TOP OF CASING ELEV.: 664.78
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/15/2018 4:00:00 PM
END DATE/TIME: 5/15/2018 4:20:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	dark brown fine SAND, some silt								Bentonite Chips 0-3 ft bgs
	light brown fine CLAYEY SAND		1	SS		1.7 / 2	0-0.3': SAND, fine, poorly-graded, dark brown, some silt, moist, loose. (SP) 0.3-1': CLAYEY SAND, fine, poorly-graded, light brown, moist, loose. (SC) 1-1.7': SAND, fine, poorly-graded, orange, moist, loose. (SP) SPTs (2-2-3-4)		
660.0	light brown to orange fine to medium SAND								#5 Sand Filter Pack 3-15 ft bgs
			2	SS		1.8 / 2	5-6.8': SAND, fine to medium, well-graded, light brown to orange, moist, loose. (SW) SPTs (2-2-3-4)		2" PVC Screen slot 0.010 5-15 ft bgs
655.0									
	light brown to light gray fine to coarse SAND, trace rounded gravel		3	SS		1.4 / 2	10-11.4': SAND, fine to coarse, well-graded, light brown, wet, compact. (SW) SPTs (4-5-7-8)		
650.0									
645.0									
640.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

USCS Clayey Sand (SC)

USCS Well-graded Sand (SW)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/14/18

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-46B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 32
DEPTH TO BEDROCK: 31

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2178838.974 E: 2973532.878
GROUND SURFACE ELEV.: 661.98
TOP OF CASING ELEV.: 664.77
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/15/2018 2:20:00 PM
END DATE/TIME: 5/15/2018 3:00:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	dark brown fine SAND, some silt								CETCO Grout 0-18 ft bgs
	light brown fine CLAYEY SAND		1	SS		1.7 / 2	0-0.3': SAND, fine, poorly-graded, dark brown, some silt, moist, loose. (SP) 0.3-1': CLAYEY SAND, fine, poorly-graded, light brown, moist, loose. (SC) 1-1.7': SAND, fine, poorly-graded, orange, moist, loose. (SP) SPTs (2-2-3-4)		
	light brown to orange fine to medium SAND								
660.0			2	SS		1.8 / 2	5-6.8': SAND, fine to medium, well-graded, light brown to orange, moist, loose. (SW) SPTs (2-2-3-4)		
655.0									
	light brown to light gray fine to coarse SAND, trace rounded gravel		3	SS		1.4 / 2	10-11.4': SAND, fine to coarse, well-graded, light brown, wet, compact. (SW) SPTs (4-5-7-8)		
650.0			4	SS		2 / 2	15-17': SAND, fine to coarse, well-graded, light brown, trace rounded gravel <1 inch, wet, compact. (SW) SPTs (2-4-7-6)		
645.0									Bentonite Chips 18-20 ft bgs
			5	SS		1.2 / 2	20-21.2': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet, compact. (SW) SPTs (8-10-9-10)		#5 Sand Filter Pack 20-32 ft bgs
640.0									2" PVC Screen slot 0.010 22-32 ft bgs

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)
Shale
USCS Clayey Sand (SC)
USCS Well-graded Sand (SW)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/14/18

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-46B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 32
DEPTH TO BEDROCK: 31

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2178838.974 E: 2973532.878
GROUND SURFACE ELEV.: 661.98
TOP OF CASING ELEV.: 664.77
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/15/2018 2:20:00 PM
END DATE/TIME: 5/15/2018 3:00:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	light brown to light gray fine to coarse SAND, trace rounded gravel		6	SS		1 / 2	25-26': SAND, fine to coarse, well-graded, light gray, trace rounded gravel up to 2 inches, wet, compact. (SW) SPTs (7-7-8-10)		
635.0									
			7	SS		2 / 2	30-31': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet, loose. (SW) 31-32': CLAYEY SHALE, light gray, very soft from 31-31.5'. SPTs (3-3-3-4)		
	light gray clayey SHALE								
630.0									
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)
Shale
USCS Clayey Sand (SC)
USCS Well-graded Sand (SW)

DRILLING COMPANY: Earth Exploration
DRILLER: Jeff Silcox
DRILL RIG: CME 55

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/14/18

BOREHOLE LOG: GAMW-48

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK: 30

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2178605.716 E: 2975279.248
GROUND SURFACE ELEV.: 660.81
TOP OF CASING ELEV.: 663.36
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 8/1/2018 3:20:00 PM
END DATE/TIME: 8/1/2018 3:40:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
660.0	dark brown fine SILTY SAND, some organics			RS			0-0.3': SILTY SAND, fine, poorly-graded, dark brown, some organics, moist. (SM)		Bentonite Chips 0-4 ft bgs
	light brown to brown fine to coarse SAND			RS			0.3-2.7': SAND, fine to medium, well-graded, light brown to brown, some coarse sand, wet. (SW)		
655.0				RS			2.7-7': SAND, fine to medium, well-graded, light brown to brown, some coarse sand, wet. (SW)		#5 Sand Filter Pack 4-15 ft bgs 2" PVC Screen slot 0.010 5-15 ft bgs
				RS			7-9.1': SAND, fine to medium, well-graded, light brown to brown, some coarse sand, wet. (SW)		
650.0	light gray fine to coarse SAND, trace rounded gravel			RS			9.1-11.2': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet. (SW)		
				RS			12-15.25': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet. (SW)		
645.0									
640.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)

USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/14/18

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-48B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 36
DEPTH TO BEDROCK: 30

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2178606.458 E: 2975283.237
GROUND SURFACE ELEV.: 660.44
TOP OF CASING ELEV.: 663.31
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 8/1/2018 1:20:00 PM
END DATE/TIME: 8/1/2018 2:10:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
660.0	dark brown fine SILTY SAND, some organics			RS			0-0.3': SILTY SAND, fine, poorly-graded, dark brown, some organics, moist. (SM)		Bentonite Grout 0-16 ft bgs
	light brown to brown fine to coarse SAND			RS			0.3-2.7': SAND, fine to medium, well-graded, light brown to brown, some coarse sand, wet. (SW)		
655.0				RS			2.7-7': SAND, fine to medium, well-graded, light brown to brown, some coarse sand, wet. (SW)		
				RS			7-9.1': SAND, fine to medium, well-graded, light brown to brown, some coarse sand, wet. (SW)		
	light gray fine to coarse SAND, trace rounded gravel			RS			9.1-11.2': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet. (SW)		
650.0				RS			12-15.25': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet. (SW)		
645.0				RS			16-20.8': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet. (SW)		Bentonite Chips 16-18 ft bgs #5 Sand Filter Pack 18-30 ft bgs 2" PVC Screen slot 0.010 20-30 ft bgs
640.0				RS			21-25.5': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet. (SW)		

LITHOLOGY LEGEND

USCS Silty Sand (SM) | USCS Well-graded Sand (SW) | Shale

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/14/18

wsp

BOREHOLE LOG: GAMW-48B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 36
DEPTH TO BEDROCK: 30

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2178606.458 E: 2975283.237
GROUND SURFACE ELEV.: 660.44
TOP OF CASING ELEV.: 663.31
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 8/1/2018 1:20:00 PM
END DATE/TIME: 8/1/2018 2:10:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
635.0	light gray fine to coarse SAND, trace rounded gravel			RS					
				RS			26-28.2': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet. (SW)		
				RS			29-30': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet. (SW)		
630.0	gray clayey SHALE			RS		6.5 / 6	30-36': CLAYEY SHALE, gray, very hard, with rounded gravel up to 3 in. at 30', wet.		#5 Sand 30-36 ft bgs
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM) | USCS Well-graded Sand (SW) | Shale

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/14/18

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-49

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK: 33

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2176111.214 E: 2976600.944
GROUND SURFACE ELEV.: 662.00
TOP OF CASING ELEV.: 664.62
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/31/2018 4:10:00 PM
END DATE/TIME: 7/31/2018 4:20:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
660.0	brown to dark brown fine SILTY SAND, some organics			RS			0-1': SILTY SAND, fine, poorly-graded, brown, some organics, dry. (SM)		Bentonite Chips 0-4 ft bgs
				RS			1-2.4': SILTY SAND, fine, poorly-graded, brown, moist. (SM)		
				RS			2.4-3.3': SILTY SAND, poorly-graded, dark brown, cohesive, moist. (SM)		
655.0	light gray fine to medium SAND			RS			3.3-4.2': SAND, fine to medium, well-graded, light gray, wet. (SW)		#5 Sand Filter Pack 4-15 ft bgs 2" PVC Screen slot 0.010 5-15 ft bgs
650.0									
645.0									
640.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)

USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/14/18

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-49B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 34
DEPTH TO BEDROCK: 33

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2176115.757 E: 2976600.61
GROUND SURFACE ELEV.: 662.12
TOP OF CASING ELEV.: 664.50
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/31/2018 2:35:00 PM
END DATE/TIME: 7/31/2018 3:05:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	brown to dark brown fine SILTY SAND, some organics			RS			0-1': SILTY SAND, fine, poorly-graded, brown, some organics, dry. (SM)		Bentonite Grout 0-19 ft bgs
				RS			1-2.4': SILTY SAND, fine, poorly-graded, brown, moist. (SM)		
660.0				RS			2.4-3.3': SILTY SAND, poorly-graded, dark brown, cohesive, moist. (SM)		
	light gray fine to medium SAND			RS			3.3-4.2': SAND, fine to medium, well-graded, light gray, wet. (SW)		
655.0									
650.0									
	light gray fine to coarse SAND, trace to some gravel			RS			16-16.7': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet. (SW)		
645.0							16.7-16.8': SILTY SAND, dark brown. (SM)		Bentonite Chips 19-21 ft bgs
							20-23.2': SAND, fine to coarse, well-graded, light gray, some rounded gravel <1 inch, wet. (SW)		#5 Sand Filter Pack 21-33 ft bgs
640.0				RS					2" PVC Screen slot 0.010 23-33 ft bgs
	light gray coarse SAND and rounded GRAVEL, some medium sand			RS			23.2-24.2': SAND and rounded GRAVEL <1 inch, coarse sand, poorly-graded, light gray, some medium sand, wet. (SP)		

LITHOLOGY LEGEND

- USCS Silty Sand (SM)
- USCS Poorly-graded Gravelly Sand (SPG)
- USCS Well-graded Sand (SW)
- USCS Well-graded Gravel (GW)
- USCS Well-graded Gravelly Sand (SWG)
- Shale

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/14/18

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-49B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 34
DEPTH TO BEDROCK: 33

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2176115.757 E: 2976600.61
GROUND SURFACE ELEV.: 662.12
TOP OF CASING ELEV.: 664.50
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/31/2018 2:35:00 PM
END DATE/TIME: 7/31/2018 3:05:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
635.0	light gray fine to coarse SAND, trace to some gravel			RS			25-29.3': SAND, fine to coarse, well-graded, light gray, some rounded gravel <1 inch, wet. (SW)		
				RS			30-32': SAND, fine to coarse, well-graded, light gray, some rounded gravel <1 inch, wet. (SW)		
630.0	light gray GRAVEL, some fine to coarse sand			RS			32-32.5': GRAVEL, rounded <4 inch, well-graded, light gray, some fine to coarse sand, wet. (GW)		
	gray SHALE			RS		0.4 / 1	33-34': SHALE, gray, wet, little weathering.		#5 Sand 33-34 ft bgs
625.0									
620.0									
615.0									

LITHOLOGY LEGEND


USCS Silty Sand (SM)
USCS Poorly-graded Gravelly Sand (SPG)


USCS Well-graded Sand (SW)
USCS Well-graded Gravel (GW)


USCS Well-graded Gravelly Sand (SWG)
Shale

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/14/18

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-50

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK: 31

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2174957.138 E: 2977953.352
GROUND SURFACE ELEV.: 662.52
TOP OF CASING ELEV.: 665.15
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 8/1/2018 11:15:00 AM
END DATE/TIME: 8/1/2018 11:25:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	brown to dark brown fine SILTY SAND, some organics			RS			0-1.25': SILTY SAND, fine, poorly-graded, brown, some organics, dry. (SM)		Bentonite Chips 0-4 ft bgs
				RS			1.25-2.75': SILTY SAND, fine, poorly-graded, dark brown, cohesive, moist. (SM)		
660.0	light gray fine to coarse SAND			RS			2.75-4.2': SAND, fine to coarse, well-graded, light gray, wet. (SW)		#5 Sand Filter Pack 4-15 ft bgs
	light gray fine to coarse SAND, some rounded gravel			RS			5-8': SAND, fine to coarse, well-graded, light gray, some rounded gravel up to 3 inches, wet. (SW)		2" PVC Screen slot 0.010 5-15 ft bgs
655.0									
650.0									
645.0									
640.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)

USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/14/18

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-50B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 32
DEPTH TO BEDROCK: 31

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2174961.01 E: 2977953.312
GROUND SURFACE ELEV.: 662.28
TOP OF CASING ELEV.: 664.88
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 8/1/2018 9:35:00 AM
END DATE/TIME: 8/1/2018 10:05:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	brown to dark brown fine SILTY SAND, some organics			RS			0-1.25': SILTY SAND, fine, poorly-graded, brown, some organics, dry. (SM)		Bentonite Grout 0-17 ft bgs
660.0				RS			1.25-2.75': SILTY SAND, fine, poorly-graded, dark brown, cohesive, moist. (SM)		
	light gray fine to coarse SAND			RS			2.75-4.2': SAND, fine to coarse, well-graded, light gray, wet. (SW)		
	light gray fine to coarse SAND, some rounded gravel			RS			5-8': SAND, fine to coarse, well-graded, light gray, some rounded gravel up to 3 inches, wet. (SW)		
655.0									
650.0									
				RS			15-19': SAND, fine to coarse, well-graded, light gray, some rounded gravel up to 3 inches, wet. (SW)		Bentonite Chips 17-19 ft bgs
645.0									#5 Sand Filter Pack 19-31 ft bgs
				RS			20-24.4': SAND, fine to coarse, well-graded, light gray, some rounded gravel up to 3 inches, wet. (SW)		2" PVC Screen slot 0.010 21-31 ft bgs
640.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)
Shale
USCS Well-graded Sand (SW)
USCS Well-graded Gravelly Sand (SWG)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/14/18

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-50B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 32
DEPTH TO BEDROCK: 31

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2174961.01 E: 2977953.312
GROUND SURFACE ELEV.: 662.28
TOP OF CASING ELEV.: 664.88
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 8/1/2018 9:35:00 AM
END DATE/TIME: 8/1/2018 10:05:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
635.0	light gray fine to coarse SAND, some rounded gravel								
	light gray fine to coarse SAND and rounded GRAVEL			RS			30-30.75': SAND and rounded GRAVEL <1 inch, medium to coarse sand, well-graded, light gray, some fine sand, wet. (SW)		
	gray SHALE			RS		1.2 / 1	31-32': SHALE, gray, wet, little weathering.		#5 Sand 31-32 ft bgs
630.0									
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)
Shale
USCS Well-graded Sand (SW)
USCS Well-graded Gravelly Sand (SWG)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/14/18

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-51

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK: 37

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171145.474 E: 2968512.124
GROUND SURFACE ELEV.: 666.15
TOP OF CASING ELEV.: 668.75
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/25/2018 10:30:00 AM
END DATE/TIME: 7/25/2018 10:40:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	FILL - black BOILER SLAG and dark brown fine SILTY SAND, some organics			RS			0-0.8': SILTY SAND, fine, poorly-graded, dark brown, some organics, dry. (SM)		Bentonite Chips 0-4 ft bgs
				RS			0.8-3.2': BOILER SLAG, black, moist. (FILL)		
	light to dark brown SAND, some silt			RS			3.2-4.5': SAND, fine, poorly-graded, light to dark brown, some silt, moist. (SP)		#5 Sand Filter Pack 4-15 ft bgs
660.0	light brown to light gray fine to medium SAND, trace coarse sand, trace silt			RS			6-7.8': SAND, fine to medium, well-graded, light brown, wet. (SW)		2" PVC Screen slot 0.010 5-15 ft bgs
				RS			7.8-10.5': SAND, fine to medium, well-graded, light gray, trace coarse sand, trace silt, wet. (SW)		
655.0				RS			11-14.8': SAND, fine to medium, well-graded, light gray, trace coarse sand, trace silt, wet. (SW)		
650.0									
645.0									

LITHOLOGY LEGEND

Fill

USCS Poorly-graded Sand (SP)

USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 10/30/18

wsp

BOREHOLE LOG: GAMW-51B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 40
DEPTH TO BEDROCK: 37

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171147.99 E: 2968515.783
GROUND SURFACE ELEV.: 666.03
TOP OF CASING ELEV.: 668.77
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/25/2018 8:35:00 AM
END DATE/TIME: 7/25/2018 9:00:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	FILL - black BOILER SLAG and dark brown fine SILTY SAND, some organics			RS			0-0.8': SILTY SAND, fine, poorly-graded, dark brown, some organics, dry. (SM)		Bentonite Grout 0-23 ft bgs
				RS			0.8-3.2': BOILER SLAG, black, moist. (FILL)		
	light to dark brown SAND, some silt			RS			3.2-4.5': SAND, fine, poorly-graded, light to dark brown, some silt, moist. (SP)		
660.0	light brown to light gray fine to medium SAND, trace coarse sand, trace silt			RS			6-7.8': SAND, fine to medium, well-graded, light brown, wet. (SW)		
				RS			7.8-10.5': SAND, fine to medium, well-graded, light gray, trace coarse sand, trace silt, wet. (SW)		
655.0				RS			11-14.8': SAND, fine to medium, well-graded, light gray, trace coarse sand, trace silt, wet. (SW)		
650.0	light gray to light brown fine to coarse SAND, trace gravel			RS			16-20': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet. (SW)		
645.0				RS			20-25': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet. (SW)		Bentonite Chips 23-25 ft bgs

LITHOLOGY LEGEND

Fill
Shale
USCS Poorly-graded Sand (SP)
USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 10/30/18

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-51B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 40
DEPTH TO BEDROCK: 37

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171147.99 E: 2968515.783
GROUND SURFACE ELEV.: 666.03
TOP OF CASING ELEV.: 668.77
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/25/2018 8:35:00 AM
END DATE/TIME: 7/25/2018 9:00:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
640.0	light gray to light brown fine to coarse SAND, trace gravel			RS			25-27': SAND, fine to coarse, well-graded, light brown to light gray, trace rounded gravel <1 inch, wet. (SW)		#5 Sand Filter Pack 25-37 ft bgs
				RS			27-29': SAND, fine to medium, well-graded, light gray, trace rounded gravel <1 inch, trace coarse sand, wet. (SW)		2" PVC Screen slot 0.010 27-37 ft bgs
635.0			SB-51B-30'-32'	RS			30-31.4': SAND, fine to medium, well-graded, light gray, trace rounded gravel <1 inch, trace coarse sand, wet. (SW) 31.4-32.2': SAND, fine to coarse, well-graded, light gray, some rounded gravel <1 inch, wet. (SW)		
630.0	light gray SHALE					5 / 3	37-40': SHALE, light gray, very hard, little to moderate weathering.		#5 Sand 37-40 ft bgs
625.0									
620.0									

LITHOLOGY LEGEND

Fill
Shale
USCS Poorly-graded Sand (SP)
USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 10/30/18

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-52

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK: 39

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2175030.9 E: 2970079.13
GROUND SURFACE ELEV.: 664.07
TOP OF CASING ELEV.: 666.77
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/30/2018 2:00:00 PM
END DATE/TIME: 7/30/2018 2:20:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	brown to dark brown fine SILTY SAND			RS			0-1.5': SILTY SAND, fine, poorly-graded, brown to dark brown, dry. (SM)		Bentonite Chips 0-4 ft bgs
	light gray to light brown fine to coarse SAND			RS			1.5-4': SAND, fine to coarse, well-graded, light brown, moist. (SW)		
660.0				RS			4-8': SAND, medium to coarse, well-graded, light gray, wet. (SW)		#5 Sand Filter Pack 4-15 ft bgs 2" PVC Screen slot 0.010 5-15 ft bgs
655.0									
650.0									
645.0									
640.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)

USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: TGB
CHECKED BY: KMC
DATE: 3/4/19

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-52B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 40
DEPTH TO BEDROCK: 39

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2175031.998 E: 2970073.234
GROUND SURFACE ELEV.: 664.5
TOP OF CASING ELEV.: 666.88
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/30/2018 11:30:00 AM
END DATE/TIME: 7/30/2018 12:20:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	brown to dark brown fine SILTY SAND			RS			0-1.5': SILTY SAND, fine, poorly-graded, brown to dark brown, dry. (SM)		Bentonite Grout 0-23 ft bgs
	light gray to light brown fine to coarse SAND			RS			1.5-4': SAND, fine to coarse, well-graded, light brown, moist. (SW)		
660.0				RS			4-8': SAND, medium to coarse, well-graded, light gray, wet. (SW)		
655.0									
650.0				RS			16-20': SAND, medium to coarse, well-graded, light gray, wet. (SW)		
645.0	light gray coarse SAND, some gravel			RS			20-22': SAND, coarse, poorly-graded, light gray, some rounded gravel <1 inch, wet. (SP)		
	gray fine to coarse SAND			RS			22-24': SAND, fine to coarse, well-graded, gray, wet. (SW)		Bentonite Chips 23-25 ft bgs
640.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)
Shale
USCS Well-graded Sand (SW)
USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: TGB
CHECKED BY: KMC
DATE: 11/13/18

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-52B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 40
DEPTH TO BEDROCK: 39

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2175031.998 E: 2970073.234
GROUND SURFACE ELEV.: 664.5
TOP OF CASING ELEV.: 666.88
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/30/2018 11:30:00 AM
END DATE/TIME: 7/30/2018 12:20:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	gray fine to coarse SAND			RS			25-29': SAND, fine to coarse, well-graded, gray, wet. (SW)		#5 Sand Filter Pack 25-37 ft bgs
635.0				RS			30-34': SAND, fine to coarse, well-graded, gray, wet. (SW)		2" PVC Screen slot 0.010 27-37 ft bgs. Broke PVC in well; trouble with well floating so well is set 2 feet above top of shale.
630.0			SB-52B-35'-37'	RS			35-37': SAND, fine to coarse, well-graded, gray, wet. (SW)		
				RS			37-39': SAND, fine to coarse, well-graded, gray, wet. (SW)		#5 Sand 37-40 ft bgs
	gray clayey SHALE			RS			CLAYEY SHALE, gray, wet.		
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)

Shale

USCS Well-graded Sand (SW)

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: TGB
CHECKED BY: KMC
DATE: 11/13/18

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-53

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK: 36

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2174535.339 E: 2971036.469
GROUND SURFACE ELEV.: 664.68
TOP OF CASING ELEV.: 667.22
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/30/2018 10:30:00 AM
END DATE/TIME: 7/30/2018 10:40:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	FILL- dark brown SILTY SAND, some gravel			RS			0-1': SILTY SAND, well-graded, dark brown, some angular gravel <2 inch, dry. (FILL)		Bentonite Chips 0-4 ft bgs
	dark brown SILTY SAND			RS			1-2': SILTY SAND, well-graded, dark brown, dry. (SM)		
	light brown fine to medium SAND			RS			2-2.5': SAND, fine to medium, well-graded, light brown, dry. (SW)		
	dark brown fine SILTY SAND			RS			2.5-3': SILTY SAND, fine, poorly-graded, dark brown, dry. (SM)		
	light gray to gray fine to coarse SAND			RS			3-4': SAND, fine to medium, well-graded, light gray, moist. (SW)		#5 Sand Filter Pack 4-15 ft bgs
660.0				RS			4-5.75': SAND, fine to medium, well-graded, light gray, wet. (SW)		2" PVC Screen slot 0.010 5-15 ft bgs
				RS			5.75-7': SAND, fine to coarse, well-graded, gray, wet. (SW)		
655.0									
650.0									
645.0									
640.0									

LITHOLOGY LEGEND

Fill | USCS Silty Sand (SM) | USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: TGB
CHECKED BY: KMC
DATE: 11/13/18

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-53B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 37
DEPTH TO BEDROCK: 36

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2174536.542 E: 2971032.602
GROUND SURFACE ELEV.: 664.62
TOP OF CASING ELEV.: 667.27
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/30/2018 8:40:00 AM
END DATE/TIME: 7/30/2018 9:30:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	FILL- dark brown SILTY SAND, some gravel			RS			0-1': SILTY SAND, well-graded, dark brown, some angular gravel <2 inch, dry. (FILL)		Bentonite Grout 0-22 ft bgs
	dark brown SILTY SAND			RS			1-2': SILTY SAND, well-graded, dark brown, dry. (SM)		
	light brown fine to medium SAND			RS			2-2.5': SAND, fine to medium, well-graded, light brown, dry. (SW)		
	dark brown fine SILTY SAND			RS			2.5-3': SILTY SAND, fine, poorly-graded, dark brown, dry. (SM)		
	light gray to gray fine to coarse SAND			RS			3-4': SAND, fine to medium, well-graded, light gray, moist. (SW)		
660.0				RS			4-5.75': SAND, fine to medium, well-graded, light gray, wet. (SW)		
				RS			5.75-7': SAND, fine to coarse, well-graded, gray, wet. (SW)		
655.0									
650.0							16-20': SAND, fine to coarse, well-graded, gray, wet. (SW)		
645.0				RS			20-22': SAND, fine to coarse, well-graded, gray, wet. (SW)		
	dark gray to black with black staining fine to coarse SAND			RS			22-24': SAND, fine to coarse, well-graded, dark gray to black with black staining, no odor, wet. (SW)		Bentonite Chips 22-24 ft bgs
640.0									#5 Sand Filter Pack 24-36 ft bgs

LITHOLOGY LEGEND

Fill
Shale
USCS Silty Sand (SM)
USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: TGB
CHECKED BY: KMC
DATE: 11/13/18

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-53B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 37
DEPTH TO BEDROCK: 36

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2174536.542 E: 2971032.602
GROUND SURFACE ELEV.: 664.62
TOP OF CASING ELEV.: 667.27
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/30/2018 8:40:00 AM
END DATE/TIME: 7/30/2018 9:30:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	dark gray to black with black staining fine to coarse SAND		SB-53B-25'-27'	RS			25-27': SAND, fine to coarse, well-graded, dark gray to black with black staining, no odor, wet. (SW)		2" PVC Screen slot 0.010 26-36 ft bgs
				RS			27-29': SAND, fine to coarse, well-graded, dark gray to black with black staining, no odor, wet. (SW)		
635.0	gray fine to coarse SAND, some gravel		SB-53B-30'-32'	RS			30-31': SAND, fine to coarse, well-graded, gray, some rounded gravel <2 inch, wet. (SW)		
630.0									
	gray SHALE			RS		3 / 1	36-37': SHALE, gray, weathered, wet.		#5 Sand 36-37 ft bgs
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

Fill
Shale
USCS Silty Sand (SM)
USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: TGB
CHECKED BY: KMC
DATE: 11/13/18

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-54

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK: 32

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2174080.28 E: 2971911.363
GROUND SURFACE ELEV.: 663.87
TOP OF CASING ELEV.: 666.35
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/30/2018 7:40:00 AM
END DATE/TIME: 7/30/2018 8:00:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	dark brown fine SILTY SAND, some organics			RS			0-0.8': SILTY SAND, fine, well-graded, dark brown, some organics, moist. (SM)		Bentonite Chips 0-4 ft bgs
	light brown fine to medium SAND			RS			0.8-1.5': SAND, fine to medium, well-graded, light brown, moist. (SW)		
	dark brown fine SILTY SAND			RS			1.5-2.7': SILTY SAND, fine, well-graded, dark brown, cohesive, moist. (SM)		
	light gray fine to medium SAND			RS			2.7-3.3': SAND, fine to medium, well-graded, light gray, wet. (SW)		
660.0							4-7.4': SAND, fine to medium, well-graded, light gray, wet. (SW)		#5 Sand Filter Pack 4-15 ft bgs
									2" PVC Screen slot 0.010 5-15 ft bgs
655.0									
650.0									
645.0									
640.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)

USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/13/18

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-54B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 35
DEPTH TO BEDROCK: 32

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2174081.639 E: 2971906.899
GROUND SURFACE ELEV.: 663.98
TOP OF CASING ELEV.: 666.45
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/27/2018 10:10:00 AM
END DATE/TIME: 7/27/2018 10:40:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	dark brown fine SILTY SAND, some organics			RS			0-0.8': SILTY SAND, fine, poorly-graded, dark brown, some organics, moist. (SM)		Bentonite Grout 0-18 ft bgs
	light brown fine to medium SAND			RS			0.8-1.5': SAND, fine to medium, well-graded, light brown, moist. (SW)		
	dark brown fine SILTY SAND			RS			1.5-2.7': SILTY SAND, fine, poorly-graded, dark brown, cohesive, moist. (SM)		
	light gray fine to medium SAND			RS			2.7-3.3': SAND, fine to medium, well-graded, light gray, wet. (SW)		
660.0							4-7.4': SAND, fine to medium, well-graded, light gray, wet. (SW)		
				RS					
655.0									
650.0									
	light gray fine to coarse SAND, trace to some gravel						16-20': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet. (SW)		
				RS					Bentonite Chips 18-20 ft bgs
645.0							20-23.7': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet. (SW)		#5 Sand Filter Pack 20-32 ft bgs
				RS					2" PVC Screen slot 0.010 22-32 ft bgs
640.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM) | USCS Well-graded Sand (SW) | Shale

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/13/18

wsp

BOREHOLE LOG: GAMW-54B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 35
DEPTH TO BEDROCK: 32

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2174081.639 E: 2971906.899
GROUND SURFACE ELEV.: 663.98
TOP OF CASING ELEV.: 666.45
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/27/2018 10:10:00 AM
END DATE/TIME: 7/27/2018 10:40:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
635.0	light gray fine to coarse SAND, trace to some gravel		SB-54B-30'-32'	RS			30-31.8': SAND, medium to coarse, well-graded, light gray, some rounded gravel <2 inch, some fine sand, wet. (SW)		
630.0	light gray clayey SHALE			RS		7 / 3	32-34': CLAYEY SHALE, light gray, weathered. 34-35': CLAYEY SHALE, light gray, little weathering.		#5 Sand 32-35 ft bgs
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM) | USCS Well-graded Sand (SW) | Shale

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/13/18

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-55

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK: 35

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173632.566 E: 2972217.554
GROUND SURFACE ELEV.: 665.06
TOP OF CASING ELEV.: 667.62
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/26/2018 2:40:00 PM
END DATE/TIME: 7/26/2018 3:00:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	dark brown fine SILTY SAND, some gravel			RS			0-0.8': SILTY SAND, fine, poorly-graded, dark brown, some rounded gravel up to 3 inch, trace organics, moist. (SM)		Bentonite Chips 0-4 ft bgs
				RS			0.8-2.2': SILTY SAND, fine, poorly-graded, dark brown, cohesive, moist. (SM)		
	light brown fine to medium SAND			RS			2.2-3.2': SAND, fine to medium, well-graded, light brown, moist. (SW)		
	light brown to light gray fine SAND, some silt			RS			3.2-3.75': SAND, fine, poorly-graded, light brown to light gray, some silt, cohesive, moist. (SP)		
	light brown fine to medium SAND			RS			4-4.9': SAND, fine to medium, well-graded, light brown, moist. (SW)		#5 Filter Pack Sand 4-15 ft bgs
660.0	light gray to light brown medium to coarse SAND, some fine sand, trace gravel			RS			4.9-6.8': SAND, medium to coarse, well-graded, light gray, some fine sand, trace rounded gravel <1 inch, wet. (SW)		2" PVC Screen slot 0.010 5-15 ft bgs
							6.8-6.9': SAND, medium, brown. (SP)		
							6.9-7.8': SAND, medium to coarse, well-graded, light gray, some fine sand, trace rounded gravel <1 inch, wet. (SW)		
655.0									
650.0									
645.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)

USCS Well-graded Sand (SW)

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/13/18

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-55B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 36
DEPTH TO BEDROCK: 35

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173632.338 E: 2972222.718
GROUND SURFACE ELEV.: 665.18
TOP OF CASING ELEV.: 667.51
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/26/2018 1:00:00 PM
END DATE/TIME: 7/26/2018 1:35:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	dark brown fine SILTY SAND, some gravel			RS			0-0.8': SILTY SAND, fine, poorly-graded, dark brown, some rounded gravel up to 3 inch, trace organics, moist. (SM)		Bentonite Grout 0-21 ft bgs
				RS			0.8-2.2': SILTY SAND, fine, poorly-graded, dark brown, cohesive, moist. (SM)		
	light brown fine to medium SAND			RS			2.2-3.2': SAND, fine to medium, well-graded, light brown, moist. (SW)		
	light brown to light gray fine SAND, some silt			RS			3.2-3.75': SAND, fine, poorly-graded, light brown to light gray, some silt, cohesive, moist. (SP)		
	light brown fine to medium SAND			RS			4-4.9': SAND, fine to medium, well-graded, light brown, moist. (SW)		
660.0	light gray to light brown medium to coarse SAND, some fine sand, trace gravel			RS			4.9-6.8': SAND, medium to coarse, well-graded, light gray, some fine sand, trace rounded gravel <1 inch, wet. (SW) 6.8-6.9': SAND, medium, brown. (SP) 6.9-7.8': SAND, medium to coarse, well-graded, light gray, some fine sand, trace rounded gravel <1 inch, wet. (SW)		
655.0									
650.0				RS			16-18': SAND, medium to coarse, well-graded, light brown, some fine sand, trace rounded gravel <1 inch, wet. (SW)		
	light gray coarse SAND, some rounded gravel, some medium sand			RS			18-20.7': SAND, coarse, poorly-graded, light gray, some rounded gravel <1 inch, some medium sand, wet. (SP)		
645.0	light gray fine to coarse SAND			RS			20.7-21.5': SAND, fine to coarse, well-graded, light gray, wet. (SW)		Bentonite Chips 21-23 ft bgs #5 Sand Filter Pack 23-35 ft bgs

LITHOLOGY LEGEND

USCS Silty Sand (SM)
Shale
USCS Well-graded Sand (SW)
USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/13/18

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-55B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 36
DEPTH TO BEDROCK: 35

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173632.338 E: 2972222.718
GROUND SURFACE ELEV.: 665.18
TOP OF CASING ELEV.: 667.51
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/26/2018 1:00:00 PM
END DATE/TIME: 7/26/2018 1:35:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
640.0	light gray fine to coarse SAND			RS			25-29.2': SAND, fine to coarse, well-graded, light gray, wet. (SW)		2" PVC Screen slot 0.010 25-35 ft bgs
635.0	light gray fine to coarse SAND, some gravel		SB-55B-30'-32'	RS			30-32': SAND, fine to coarse, well-graded, light gray, some rounded gravel <2 inch, wet. (SW)		
				RS			32-33.2': SAND, fine to coarse, well-graded, light gray, some rounded gravel <2 inch, wet. (SW)		
630.0	light gray SHALE			RS			35-36': SHALE, light gray, dry, very weathered.		#5 Sand 35-36 ft bgs
625.0									
620.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)
Shale
USCS Well-graded Sand (SW)
USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/13/18

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-55R

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK: 35

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173631.971 E: 2972230.541
GROUND SURFACE ELEV.: 665.36
TOP OF CASING ELEV.: 667.71
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/8/2019 11:45:00 AM
END DATE/TIME: 6/8/2019 12:30:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	dark brown fine SILTY SAND, some gravel			RS			0-0.8': SILTY SAND, fine, poorly-graded, dark brown, some rounded gravel up to 3 inch, trace organics, moist. (SM)		Bentonite Chips 0-4 ft bgs
				RS			0.8-2.2': SILTY SAND, fine, poorly-graded, dark brown, cohesive, moist. (SM)		
	light brown fine to medium SAND			RS			2.2-3.2': SAND, fine to medium, well-graded, light brown, moist. (SW)		
	light brown to light gray fine SAND, some silt			RS			3.2-3.75': SAND, fine, poorly-graded, light brown to light gray, some silt, cohesive, moist. (SP)		
	light brown fine to medium SAND			RS			4-4.9': SAND, fine to medium, well-graded, light brown, moist. (SW)		#5 Filter Pack Sand 4-15 ft bgs
660.0	light gray to light brown medium to coarse SAND, some fine sand, trace gravel			RS			4.9-6.8': SAND, medium to coarse, well-graded, light gray, some fine sand, trace rounded gravel <1 inch, wet. (SW)		2" PVC Screen slot 0.010 5-15 ft bgs
							6.8-6.9': SAND, medium, brown. (SP)		
							6.9-7.8': SAND, medium to coarse, well-graded, light gray, some fine sand, trace rounded gravel <1 inch, wet. (SW)		
655.0									
650.0									
645.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)

USCS Well-graded Sand (SW)

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: ANB
CHECKED BY: KMC
DATE: 12/3/19

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-56

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK: 35

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173343.43 E: 2972428.296
GROUND SURFACE ELEV.: 665.43
TOP OF CASING ELEV.: 667.89
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/27/2018 8:45:00 AM
END DATE/TIME: 7/27/2018 8:55:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	dark brown fine SILTY SAND, some gravel, some organics and debris			RS			0 to 0.7': SILTY SAND, fine, poorly-graded, dark brown, some rounded gravel up to 3 inch, some organics and debris, dry. (SM)		Bentonite Chips 0-4 ft bgs
				RS					
	light gray to brown fine to coarse SAND			RS			0.7' to 1.6': SILTY SAND, fine, poorly-graded, dark brown, cohesive, moist. (SM)		
				RS			1.6 to 2.4': SAND, fine to medium, well-graded, dark and light brown, moist. (SW)		
							2.4 to 3.1': SAND, fine to medium, well-graded, light gray, moist. (SW)		#5 Sand Filter Pack 4-15 ft bgs
660.0				RS			5 to 5.4' SAND, fine to medium, well-graded, light gray, moist. (SW)		2" PVC Screen slot 0.010 5-15 ft bgs
				RS			5.4 to 6.25': SAND, fine to medium, well-graded, light gray, wet. (SW)		
				RS			6.25 to 8.4': SAND, fine to coarse, well-graded, light gray, wet. (SW)		
655.0				RS			10 to 13.8': SAND, fine to coarse, well-graded, light gray, wet. (SW)		
650.0									
645.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)

USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/13/18

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-56B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 36
DEPTH TO BEDROCK: 35

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173343.227 E: 2972423.771
GROUND SURFACE ELEV.: 665.33
TOP OF CASING ELEV.: 667.80
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/27/2018 7:10:00 AM
END DATE/TIME: 7/27/2018 7:35:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	dark brown fine SILTY SAND, some gravel, some organics and debris			RS			0 to 0.7': SILTY SAND, fine, poorly-graded, dark brown, some rounded gravel up to 3 inch, some organics and debris, dry. (SM)		Bentonite Grout 0-21 ft bgs
				RS					
	light gray to brown fine to coarse SAND			RS			0.7 to 1.6': SILTY SAND, fine, poorly-graded, dark brown, cohesive, moist. (SM)		
				RS			1.6 to 2.4': SAND, fine to medium, well-graded, dark and light brown, moist. (SW)		
							2.4 to 3.1': SAND, fine to medium, well-graded, light gray, moist. (SW)		
660.0				RS			5 to 5.4' SAND, fine to medium, well-graded, light gray, moist. (SW)		
				RS			5.4 to 6.25': SAND, fine to medium, well-graded, light gray, wet. (SW)		
				RS			6.25 to 8.4': SAND, fine to coarse, well-graded, light gray, wet. (SW)		
655.0				RS			10 to 13.8': SAND, fine to coarse, well-graded, light gray, wet. (SW)		
650.0				RS			16 to 20': SAND, fine to coarse, well-graded, light gray, wet. (SW)		
645.0	light to dark gray fine to coarse SAND, trace to some gravel			RS			20 to 23.8': SAND, fine to medium, well-graded, light gray, some coarse sand, trace rounded gravel <1 inch, wet. (SW)		Bentonite Chips 21-23 ft bgs #5 Sand Filter Pack 23-35 ft bgs

LITHOLOGY LEGEND

USCS Silty Sand (SM) | USCS Well-graded Sand (SW) | Shale

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/13/18

wsp

BOREHOLE LOG: GAMW-56B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 36
DEPTH TO BEDROCK: 35

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173343.227 E: 2972423.771
GROUND SURFACE ELEV.: 665.33
TOP OF CASING ELEV.: 667.80
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/27/2018 7:10:00 AM
END DATE/TIME: 7/27/2018 7:35:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
640.0	light to dark gray fine to coarse SAND, trace to some gravel			RS			25 to 28.25': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet. (SW)		2" PVC Screen slot 0.010 25-35 ft bgs
				RS			28.25 to 29': SAND, medium to coarse, well-graded, dark gray, some rounded gravel <1 inch, some fine sand. (SW)		
635.0			SB-56B-30'-32'	RS			30 to 31.75': SAND, fine to coarse, well-graded, light gray, trace rounded gravel <1 inch, wet. (SW) 31.75 to 32': SAND, medium to coarse, well-graded, dark gray, some rounded gravel <3 inch, trace fine sand, wet. (SW)		
				RS			32 to 33.2': SAND, medium to coarse, well-graded, dark gray, some rounded gravel <3 inch, trace fine sand, wet. (SW)		
630.0	light gray SHALE			RS		1.2 / 1	35 to 36': SHALE, light gray, moist, little weathering.		#5 Sand 35-36 ft bgs
625.0									
620.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM) | USCS Well-graded Sand (SW) | Shale

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/13/18

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-57

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK: 45

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171592.091 E: 2967729.661
GROUND SURFACE ELEV.: 670.46
TOP OF CASING ELEV.: 672.97
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/7/2019 12:46:00 PM
END DATE/TIME: 6/7/2019 1:30:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
670.0	brown fine SAND, some organics			RS			0 to 1.5': SAND, fine, wet, dark brown, trace silt, organic matter, roots, poorly graded, non-cohesive (SP).		Bentonite Chips 0-3 ft bgs
				RS			1.5' to 5': SAND, fine, yellow-brown, moist, poorly graded, non-cohesive (SP).		#5 Sand Filter Pack 3-16 ft bgs
665.0	gray fine SAND.			RS			5' to 7': SAND, fine, yellow-brown, moist, poorly graded, non-cohesive (SP).		2" PVC Screen slot 0.010 5-16 ft bgs
				RS			7' to 10': SAND, fine, gray, moist, poorly graded, non-cohesive (SP).		
660.0	brown fine to medium SAND			RS			10' to 11': SAND, fine, light brown, wet, some silt, poorly graded, non-cohesive (SP-SM).		
				RS			11' to 15': SAND, fine to medium, red-brown, wet, poorly graded, non-cohesive (SP).		
655.0									
650.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

USCS Poorly-graded Sand with Silt (SP-SM)

DRILLING COMPANY: Layne
DRILLER: M. Backhaus
DRILL RIG: SDC500-28EA

LOGGED BY: ANB
CHECKED BY: AMH
DATE: 9/16/19

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-57B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 50
DEPTH TO BEDROCK: 45

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171592.279 E: 2967726.723
GROUND SURFACE ELEV.: 670.45
TOP OF CASING ELEV.: 672.88
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/7/2019 8:08:00 AM
END DATE/TIME: 6/7/2019 9:29:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
670.0	brown fine SAND, some organics			RS			0 to 1.5': SAND, fine, wet, dark brown, trace silt, organic matter, roots, poorly graded, non-cohesive (SP).		Bentonite Grout 0-21 ft bgs
				RS			1.5' to 5': SAND, fine, yellow-brown, moist, poorly graded, non-cohesive (SP).		
665.0	gray fine SAND.			RS			5' to 7': SAND, fine, yellow-brown, moist, poorly graded, non-cohesive (SP).		
				RS			7' to 10': SAND, fine, gray, moist, poorly graded, non-cohesive (SP).		
660.0	brown fine to medium SAND		SB-57B-10' - 12'	RS			10' to 11': SAND, fine, light brown, wet, some silt, poorly graded, non-cohesive (SP-SM).		
				RS			11' to 20': SAND, fine to medium, red-brown, wet, poorly graded, non-cohesive (SP).		
655.0									
650.0	light brown fine to medium SAND			RS			20' to 21': SAND, fine to medium, light brown, wet, poorly graded, non-cohesive (SW).		Bentonite Chips 21-23 ft bgs
				RS			21' to 30': SAND, fine to trace medium, light brown to gray-brown, wet, poorly graded, non-cohesive (SW).		#5 Sand Filter Pack 23-45 ft bgs

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

USCS Poorly-graded Sand with Silt (SP-SM)

USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: M. Backhaus
DRILL RIG: SDC500-28EA

LOGGED BY: ANB
CHECKED BY: AMH
DATE: 9/16/19

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-57B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 50
DEPTH TO BEDROCK: 45

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171592.279 E: 2967726.723
GROUND SURFACE ELEV.: 670.45
TOP OF CASING ELEV.: 672.88
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/7/2019 8:08:00 AM
END DATE/TIME: 6/7/2019 9:29:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
645.0	light brown fine to medium SAND			RS					
640.0	light gray fine SAND			RS			30' to 40': SAND, fine, light gray, poorly graded, non-cohesive (SP).		2" PVC Screen slot 0.010 35-45 ft bgs
635.0									
630.0	gray fine to medium SAND			RS			45' to 50': SAND, fine to medium, gray, wet, well-graded, non-cohesive		
625.0				RS			45' to 50': SHALE, wet, gray		#5 Sand 45-50 ft bgs

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

USCS Poorly-graded Sand with Silt (SP-SM)

USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: M. Backhaus
DRILL RIG: SDC500-28EA

LOGGED BY: ANB
CHECKED BY: AMH
DATE: 9/16/19

BOREHOLE LOG: GAMW-57B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 50
DEPTH TO BEDROCK: 45

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171592.279 E: 2967726.723
GROUND SURFACE ELEV.: 670.45
TOP OF CASING ELEV.: 672.88
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/7/2019 8:08:00 AM
END DATE/TIME: 6/7/2019 9:29:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	SAMPLE INFORMATION: Type	SAMPLE INFORMATION: PID (ppm)	SAMPLE INFORMATION: Soil Rec./Att. Or Core Rec. %	SAMPLE INFORMATION: Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
620.0	gray SHALE								
615.0									
610.0									
605.0									
600.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

USCS Poorly-graded Sand with Silt (SP-SM)

USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: M. Backhaus
DRILL RIG: SDC500-28EA

LOGGED BY: ANB
CHECKED BY: AMH
DATE: 9/16/19

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-58

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 16
DEPTH TO BEDROCK: 35

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 217602.754 E: 2967863.875
GROUND SURFACE ELEV.: 664.99
TOP OF CASING ELEV.: 667.54
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/6/2019 2:30:00 PM
END DATE/TIME: 6/6/2019 5:30:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	brown fine SAND, some organics			RS			0 to 1': SAND, fine, orange brown to dark brown, dry, organic matter, non-cohesive (SP)		Bentonite Chips 0-3 ft bgs
				RS			1' to 5': SAND, fine, yellow-brown, some lenses of orange-brown fine sand, dry, non-cohesive (SP).		#5 Sand Filter Pack 3-16 ft bgs
660.0	gray to yellow brown fine SAND, some clay			RS			5' to 7': SAND, fine, gray, moist, well-graded, non-cohesive (SP).		2" PVC Screen slot 0.010 5-16 ft bgs
				RS			7' to 10': SAND, fine, yellow-brown, wet (SP). 8.5': CLAY, W < PL, orange-red/black zones, 4" thick (slighly plastic)		
655.0	light brown to gray fine to medium SAND			RS			10' to 15': SAND, fine, trace medium sand, light brown to red brown, wet, poorly graded, non-cohesive (SP).		
650.0									
645.0									
640.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Layne
DRILLER: M. Backhaus
DRILL RIG: SDC500-28EA

LOGGED BY: ANB
CHECKED BY: AMH
DATE: 9/16/19

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-58B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 40
DEPTH TO BEDROCK: 35

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171900.805 E: 2967867.002
GROUND SURFACE ELEV.: 664.88
TOP OF CASING ELEV.: 667.59
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/6/2019 11:10:00 AM
END DATE/TIME: 6/6/2019 12:30:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	brown fine SAND, some organics						0 to 1': SAND, fine, orange brown to dark brown, dry, organic matter, non-cohesive (SP)		Bentonite Grout 0-21 ft bgs
				RS			1' to 5': SAND, fine, yellow-brown, some lenses of orange-brown fine sand, dry, non-cohesive (SP).		
660.0	gray to yellow brown fine SAND, some clay			RS			5' to 7': SAND, fine, gray, moist, well-graded, non-cohesive (SP).		
				RS			7' to 10': SAND, fine, yellow-brown, wet (SP). 8.5': CLAY, W < PL, orange-red/black zones, 4" thick (slighly plastic)		
655.0	light brown to gray fine to medium SAND			RS			10' to 15': SAND, fine, trace medium sand, light brown to red brown, wet, poorly graded, non-cohesive (SP).		
650.0			SB-58B-15' - 17'	RS			15' to 20': SAND, medium, some fine sand, gray, wet, poorly graded, non-cohesive (SP).		
645.0	gray fine to medium SAND			RS			20' to 21': SAND, medium, some fine sand, gray, wet, poorly graded, non-cohesive (SP).		
				RS			21' to 30': SAND, fine, gray, wet, poorly graded, non-cohesive (SP).		Bentonite Chips 21-23 ft bgs #5 Sand Filter Pack 23-35 ft bgs
640.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

Shale

DRILLING COMPANY: Layne
DRILLER: M. Backhaus
DRILL RIG: SDC500-28EA

LOGGED BY: ANB
CHECKED BY: AMH
DATE: 9/16/19

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-58B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 40
DEPTH TO BEDROCK: 35

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171900.805 E: 2967867.002
GROUND SURFACE ELEV.: 664.88
TOP OF CASING ELEV.: 667.59
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/6/2019 11:10:00 AM
END DATE/TIME: 6/6/2019 12:30:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	gray fine to medium SAND			RS					2" PVC Screen slot 0.010 25-35 ft bgs
635.0				RS			30' to 33': SAND, fine, gray, wet, poorly graded, non-cohesive (SP).		
				RS			33' to 35': SAND, medium, gray, wet, poorly graded, non-cohesive (SP).		
630.0	gray SHALE			RS			35' to 40': SHALE, gray, dry		#5 Sand 35-40 ft bgs
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)

Shale

DRILLING COMPANY: Layne
DRILLER: M. Backhaus
DRILL RIG: SDC500-28EA

LOGGED BY: ANB
CHECKED BY: AMH
DATE: 9/16/19

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-59

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK: 40

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171317.508 E: 2968668.034
GROUND SURFACE ELEV.: 668.49
TOP OF CASING ELEV.: 668.49
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/8/2019 5:20:00 PM
END DATE/TIME: 6/8/2019 5:30:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	brown fine SAND, some organics						0' to 0.2': SAND, fine, brown, trace gravel rounded <1cm, some organics, moist, non-cohesive, poorly-graded (SP).		Bentonite Chips 0-3 ft bgs
	brown fine to medium SILTY SAND						0.5' to 2': SILTY SAND, fine, brown, some fly ash, moist, non-cohesive, poorly graded (SP).		
665.0							2' to 3.75': SILTLY SAND, fine to medium, brown, moist, some fly ash,cohesive, well-graded (SM).		#5 Sand Filter Pack 3-15 ft bgs
	light brown to gray fine to medium SAND, some clay						3.75' to 4.75': SAND, fine to medium, light brown, wet, non-cohesive, well-graded (SW).		2" PVC Screen slot 0.010 5-15 ft bgs
660.0				RS			10' to 12': SAND, fine to medium, dark brown to brown, some clay, wet, non-cohesive, well-graded (SW-SC).		
655.0				RS			12.75' to 13.75': SAND, fine to coarse, brown, trace rounded gravel <1cm, wet, non-cohesive, well-graded (SW).		
				RS			13.75' to 15': SAND, fine to coarse, gray, trace rounded gravel <1cm, wet, non-cohesive, well-graded (SW).		
650.0									
645.0									

LITHOLOGY LEGEND


USCS Poorly-graded Sand (SP)


USCS Silty Sand (SM)


USCS Well-graded Sand with Clay (SW-SC)

DRILLING COMPANY: Layne
DRILLER: M. Backhaus
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: AMH
DATE: 9/16/19

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-59B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 40
DEPTH TO BEDROCK: 40

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2968668.362 E: 2171313.72
GROUND SURFACE ELEV.: 665.95
TOP OF CASING ELEV.: 668.55
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/4/2019 3:10:00 PM
END DATE/TIME: 6/6/2019 4:00:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	brown fine SAND, some organics			RS			0' to 0.2': SAND, fine, brown, trace gravel rounded <1cm, some organics, moist, non-cohesive, poorly-graded (SP).		Bentonite Grout 0-26 ft bgs
	brown fine to medium SILTY SAND			RS			0.5' to 2': SILTY SAND, fine, brown, some fly ash, moist, non-cohesive, poorly graded (SP).		
				RS			2' to 3.75': SILTLY SAND, fine to medium, brown, moist, some fly ash,cohesive, well-graded (SM).		
	light brown to gray fine to medium SAND, some clay			RS			3.75' to 4.75': SAND, fine to medium, light brown, wet, non-cohesive, well-graded (SW).		
660.0									
655.0				RS			10' to 12': SAND, fine to medium, dark brown to brown, some clay, wet, non-cohesive, well-graded (SW-SC).		
				RS			12.75' to 13.75': SAND, fine to coarse, brown, trace rounded gravel <1cm, wet, non-cohesive, well-graded (SW).		
				RS			13.75' to 15': SAND, fine to coarse, gray, trace rounded gravel <1cm, wet, non-cohesive, well-graded (SW).		
650.0				RS			16.5' to 17': SAND, some clay, fine to coarse, gray, trace rounded gravel <1cm, wet, non-cohesive, well graded (SW-SC).		
	gray fine to coarse SAND						20' to 23.25': SAND, medium to coarse, gray, trace fine sand, some rounded <2" gravel, wet, non-cohesive, well-graded (SW).		
645.0				RS					
				RS			23.25' to 23.6': SAND, fine to medium, wet, non-cohesive, well-graded (SW).		

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)
USCS Well-graded Sand (SW)
USCS Silty Sand (SM)
USCS Well-graded Sand with Clay (SW-SC)

DRILLING COMPANY: Layne
DRILLER: M. Backhaus
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: AMH
DATE: 9/16/19

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-59B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 40
DEPTH TO BEDROCK: 40

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2968668.362 E: 2171313.72
GROUND SURFACE ELEV.: 665.95
TOP OF CASING ELEV.: 668.55
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/4/2019 3:10:00 PM
END DATE/TIME: 6/6/2019 4:00:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
640.0	gray fine to coarse SAND			RS			23.6' to 26.8': SAND gray, trace rounded gravel <1cm, wet, non-cohesive, well-graded (SW).		Bentonite Chips 26-28 ft bgs
									#5 Sand Filter Pack 28-40 ft bgs
	gray fine to coarse SAND			RS			30' to 30.75': SAND, fine to coarse, gray, trace rounded gravel <1cm, wet, non-cohesive, well-graded (SW).		2" PVC Screen slot 0.010 30-40 ft bgs
635.0				RS			33.75' to 37.5': SAND, medium to coarse, gray, trace fine sand, some gravel rounded <1", wet, non-cohesive, well graded (SW).		
630.0				RS					
				RS			40': SHALE, gray, slightly weathered with some rounded gravel <1"		
625.0									
620.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand (SP)
USCS Well-graded Sand (SW)
USCS Silty Sand (SM)
USCS Well-graded Sand with Clay (SW-SC)

DRILLING COMPANY: Layne
DRILLER: M. Backhaus
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: AMH
DATE: 9/16/19

BOREHOLE LOG: GAMW-60

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK: 40

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171552.609 E: 2968698.921
GROUND SURFACE ELEV.: 665.08
TOP OF CASING ELEV.: 667.50
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/8/2019 1:40:00 PM
END DATE/TIME: 6/8/2019 2:22:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	brown fine to medium SILTY SAND, some organics			RS			0' to 0.7': SILTY SAND, fine, brown, some organics, trace gravel, dry, non-cohesive, poorly graded (SP).		Bentonite Chips 0-3 ft bgs
				RS			0.7' to 1.7': SILTY SAND, fine, dark brown, fly ash, moist (SM).		
				RS			1.7' to 2.5': SILTY SAND, fine, dark brown, moist, non-cohesive, poorly graded (SM).		
				RS			2.5' to 3.7': SAND, fine to medium, brown, moist, non-cohesive, well-graded (SW).		#5 Sand Filter Pack 3-15 ft bgs
660.0	brown to light brown fine to medium SILTY SAND			RS			5' to 5.8': SILTY SAND, fine, dark brown, trace gravel, wet, non-cohesive, poorly graded (SM).		2" PVC Screen slot 0.010 5-15 ft bgs
				RS			5.8' to 7.5': SAND, fine to medium, brown to light brown, moist, non-cohesive, well-graded (SW).		
				RS			7.5' to 8': SAND, fine to medium, light brown, wet, non-cohesive, well-graded (SW).		
655.0	brown to gray fine to coarse SAND			RS			10' to 12.5': SAND, fine to medium, brown, some coarse sand, trace rounded gravel <1cm, wet, non-cohesive, well-graded (SW).		
				RS			12.5' to 15': SAND, fine to coarse, trace gravel rounded <1cm, gray, wet, non-cohesive, well-graded (SW).		
650.0									
645.0									

LITHOLOGY LEGEND

USCS Well-graded Sand with Silt (SW-SM)

USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: M. Backhaus
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: AMH
DATE: 9/16/19

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-60B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 40
DEPTH TO BEDROCK: 40

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171549.039 E: 2968699.958
GROUND SURFACE ELEV.: 665.06
TOP OF CASING ELEV.: 667.7
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/3/2019 9:35:00 AM
END DATE/TIME: 6/4/2019 12:10:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	brown fine to medium SILTY SAND, some organics			RS			0' to 0.7': SILTY SAND, fine, brown, some organics, trace gravel, dry, non-cohesive, poorly graded (SP).		Bentonite Grout 0-26 ft bgs
				RS			0.7' to 1.7': SILTY SAND, fine, dark brown, fly ash, moist (SM).		
				RS			1.7' to 2.5': SILTY SAND, fine, dark brown, moist, non-cohesive, poorly graded (SM).		
				RS			2.5' to 3.7': SAND, fine to medium, brown, moist, non-cohesive, well-graded (SW).		
660.0	brown to light brown fine to medium SILTY SAND			RS			5' to 5.8': SILTY SAND, fine, dark brown, trace gravel, wet, non-cohesive, poorly graded (SM).		
				RS			5.8' to 7.5': SAND, fine to medium, brown to light brown, moist, non-cohesive, well-graded (SW).		
				RS			7.5' to 8': SAND, fine to medium, light brown, wet, non-cohesive, well-graded (SW).		
655.0	brown to gray fine to coarse SAND			RS			10' to 12.5': SAND, fine to medium, brown, some coarse sand, trace rounded gravel <1cm, wet, non-cohesive, well-graded (SW).		
				RS			12.5' to 15': SAND, fine to coarse, trace gravel rounded <1cm, gray, wet, non-cohesive, well-graded (SW).		
650.0				RS			15' to 17.5': SAND, fine to coarse, trace rounded gravel <1cm, gray, wet, non-cohesive, well-graded (SW).		
645.0	gray medium to coarse SAND			RS			20' to 27': SAND, medium to coarse, gray, some fine sand, some rounded gravel < 1inch, wet, non-cohesive, well-graded (SW).		

LITHOLOGY LEGEND



USCS Poorly-graded Sand with Silt (SP-SM)

Shale



USCS Well-graded Sand with Silt (SW-SM)



USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: M. Backhaus
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: AMH
DATE: 9/16/19

BOREHOLE LOG: GAMW-60B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 40
DEPTH TO BEDROCK: 40

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171549.039 E: 2968699.958
GROUND SURFACE ELEV.: 665.06
TOP OF CASING ELEV.: 667.7
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/3/2019 9:35:00 AM
END DATE/TIME: 6/4/2019 12:10:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
640.0	gray medium to coarse SAND			RS					Bentonite Chips 26-28 ft bgs
									#5 Sand Filter Pack 28-40 ft bgs
635.0	gray medium to coarse SAND						30' to 37': SAND, medium to coarse, some fine sand, some rounded gravel < 1inch, gray, wet, non-cohesive, well-graded (SW).		2" PVC Screen slot 0.010 30-40 ft bgs
				RS					
630.0									
625.0	gray clayey SHALE			RS			40' to 40.5': CLAYEY SHALE, gray, slightly weathered		#5 Sand 40-40.5 ft bgs
620.0									

LITHOLOGY LEGEND

- USCS Poorly-graded Sand with Silt (SP-SM)
- Shale
- USCS Well-graded Sand with Silt (SW-SM)
- USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: M. Backhaus
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: AMH
DATE: 9/16/19

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-63B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 33.5
DEPTH TO BEDROCK: 33.5

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171969.161 E: 2971860.966
GROUND SURFACE ELEV.: 669.02
TOP OF CASING ELEV.: 668.74
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/7/2019 8:00:00 AM
END DATE/TIME: 6/7/2019 8:50:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	brown to gray fine to medium SILTY SAND			RS			0' to 1.75': SILTY SAND, fine, trace rounded gravel <1inch, brown, non-cohesive, moist, trace organics, poorly graded (SM).		Bentonite Grout 0-19 ft bgs
	gray fine to medium SAND			RS			3' to 4.75': SAND, fine to medium, some rounded gravel <1inch, light brown, trace coarse sand, well-graded (SW).		
665.0				RS			4.75' to 11': SAND, medium to coarse, light brown, some fine sand, wet, non-cohesive, well-graded (SW).		
660.0				RS			11' to 11.5': SAND, medium to coarse, trace rounded gravel <1cm, gray, wet, non-cohesive, well graded (SW)		
655.0				RS			15' to 21.3': SAND, fine to coarse, gray, wet, non-cohesive, well-graded (SW).		Bentonite Chips 19-21 ft bgs
650.0	gray fine to coarse SAND			RS RS			21.3' to 22.8': CLAYEY SAND, fine to coarse, trace rounded gravel <1", gray, wet, non-cohesive, well-graded (SW-SC). 22.8' to 23': SAND, fine to coarse, trace gravel rounded <1", gray, wet, non-cohesive, well-graded (SW).		#5 Sand Filter Pack 21-23 ft bgs 2" PVC Screen slot 0.010 23-33 ft bgs
645.0									

LITHOLOGY LEGEND

USCS Well-graded Sand with Silt (SW-SM)
Shale
USCS Well-graded Sand (SW)
USCS Well-graded Sand with Clay (SW-SC)

DRILLING COMPANY: Layne
DRILLER: M. Backhaus
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: AMH
DATE: 9/16/19

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-63B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 33.5
DEPTH TO BEDROCK: 33.5

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171969.161 E: 2971860.966
GROUND SURFACE ELEV.: 669.02
TOP OF CASING ELEV.: 668.74
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/7/2019 8:00:00 AM
END DATE/TIME: 6/7/2019 8:50:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
640.0	gray fine to coarse SAND			RS			25' to 31.75': SAND, fine to coarse, trace rounded gravel <1 inch, gray, wet, non-cohesive, well-graded (SW).		
	gray CLAYEY SHALE			RS			33' to 33.5': CLAYEY SHALE, gray, weathered, soft		#5 Sand 33-33.5 ft bgs
635.0									
630.0									
625.0									
620.0									

LITHOLOGY LEGEND

- USCS Well-graded Sand with Silt (SW-SM)
- Shale
- USCS Well-graded Sand (SW)
- USCS Well-graded Sand with Clay (SW-SC)

DRILLING COMPANY: Layne
DRILLER: M. Backhaus
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: AMH
DATE: 9/16/19

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-64B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 30.5
DEPTH TO BEDROCK: 31

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171789.81 E: 2972174.664
GROUND SURFACE ELEV.: 664.42
TOP OF CASING ELEV.: 666.83
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/7/2019 11:30:00 AM
END DATE/TIME: 6/7/2019 12:10:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	dark brown fine SILTY SAND			RS			0' to 1': SILTY SAND, fine, dark brown, trace organics, moist, non-cohesive, poorly graded (SM).		Bentonite Grout 0-17 ft bgs
				RS			1' to 1.8': SILTY SAND, fine, trace rounded gravel <1", dark brown, moist, non-cohesive, poorly graded (SM).		
	light brown fine to medium SAND, some orange streaking			RS			1.8' to 2.8': SAND, fine to medium, light brown, some clay, some orange streaking, moist, cohesive, well-graded (SW-SC).		
660.0				RS			2.8' to 3.75': SAND, fine to coarse, light brown, some orange streaking, wet, non-cohesive, well-graded (SW).		
							7' to 8.5': SAND, fine to medium, light brown, trace coarse sand, wet, non-cohesive, well-graded (SW).		
	gray fine CLAYEY SAND, some dark gray streaks			RS			8.5' to 9': CLAYEY SAND, fine, gray with dark gray streaks, wet, non-cohesive, poorly graded (SC).		
655.0				RS			9' to 10.25': CLAYEY SAND, fine, gray, with dark gray streaks, wet, non-cohesive, poorly graded (SC).		
	gray fine to coarse SAND						10.25' to 17.5': SAND, fine to coarse, gray, wet, non-cohesive, well-graded (SW).		
				RS					Bentonite Chips 17-19 ft bgs
650.0									
							17.5' to 23.75': SAND, medium to coarse, gray, some rounded gravel <1cm, trace fine sand, non-cohesive, wet, well-graded (SW).		#5 Sand Filter Pack 19-31 ft bgs
645.0				RS					2" PVC Screen slot 0.010 21-30.5 ft bgs
640.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)
Shale
USCS Well-graded Sand (SW)
USCS Poorly-graded Sand with Clay (SP-SC)

DRILLING COMPANY: Layne
DRILLER: M. Backhaus
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: AMH
DATE: 9/16/19

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-64B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 30.5
DEPTH TO BEDROCK: 31

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171789.81 E: 2972174.664
GROUND SURFACE ELEV.: 664.42
TOP OF CASING ELEV.: 666.83
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/7/2019 11:30:00 AM
END DATE/TIME: 6/7/2019 12:10:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	gray fine to coarse SAND			RS			27' to 30.5': SAND, medium to coarse, gray, some rounded gravel <1cm, trace fine sand, non-cohesive, wet, well-graded (SW).		
635.0	gray CLAYEY SHALE			RS			30.5' to 31': CLAYEY SHALE, gray, slighty weathered, hard		#5 Sand 30.5-31 ft bgs
630.0									
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)

Shale

USCS Well-graded Sand (SW)

USCS Poorly-graded Sand with Clay (SP-SC)

DRILLING COMPANY: Layne
DRILLER: M. Backhaus
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: AMH
DATE: 9/16/19

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-65B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 37
DEPTH TO BEDROCK: 36.3

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173229.48 E: 2968253.82
GROUND SURFACE ELEV.: 665.45
TOP OF CASING ELEV.: 668.67
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 850 track
START DATE/TIME: 4/17/2020 8:45:00 AM
END DATE/TIME: 4/17/2020 11:50:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	dark brown fine clayey SILTY SAND		1	SS		1.4 / 2	0.0' to 1.3': (SM) clayey SILTY SAND, fine, low plasticity; dark brown; cohesive, w > PL, soft.		Cement-bentonite Grout 0-21 ft bgs
	brown fine SAND, trace coarse sand, trace fine to coarse gravel						1.3' to 1.4': (SP-SM) SAND, fine, some nonplastic fines; trace coarse sand, trace fine to coarse subrounded gravel; brown; non-cohesive, moist, very loose. SPTs (WOH-WOH-WOH-1)		
	gray-brown fine to medium SILTY SAND								
660.0	dark brown fine SILTY SAND		2	SS		1.3 / 2	5' to 5.4': (SM) SILTY SAND, fine to medium, trace coarse sand; gray-brown; non-cohesive, wet, loose. 5.4' to 6.3': (SM) SILTY SAND, fine; dark brown, clay pockets; non-cohesive, moist, loose. SPTs (4-4-4-5)		
	light brown fine to medium SAND, trace coarse sand, trace fine gravel		3	SS		1.4 / 2	10' to 11.4': (SP) SAND, fine to medium; light brown; non-cohesive, wet, loose; grain size decreases with depth. SPTs (2-4-4-6)		
			4	SS		1.6 / 2	12' to 13.6': (SP) SAND, fine to medium, trace coarse sand, trace fine subrounded gravel; light brown; non-cohesive, wet, loose to compact. SPTs (3-5-6-6)		
650.0	gray fine to medium SAND, some coarse sand, trace fine to coarse gravel		5	SS		1.2 / 2	15.0' to 15.7': (SP) SAND, fine, trace fine subrounded gravel; light brown; non-cohesive, wet, loose to compact. 15.7' to 16.2: (SP) SAND, fine to medium, some coarse sand, trace fine to coarse subrounded gravel; gray; non-cohesive, wet, compact. SPTs (2-4-6-8)		
	light brown fine to medium SAND, trace coarse sand, trace fine to coarse gravel								
645.0			6	SS		2.0 / 2	20.0' to 22.0': (SP) SAND, fine, some medium, trace coarse sand, trace fine to coarse subrounded gravel; light brown; non-coheisve, wet, loose. SPTs (1-2-3-5)		Bentonite Chips 21-23 ft bgs
									#5 Sand Filter Pack 23-35 ft bgs

LITHOLOGY LEGEND

USCS Silty Sand (SM)
Shale
USCS Poorly-graded Sand with Silt (SP-SM)
USCS Poorly-graded Sand (SP)

DRILLING COMPANY: DLZ
DRILLER: Z. Baehr
DRILL RIG: CME 850 track

LOGGED BY: KMC
CHECKED BY: CRH
DATE: 5/7/20

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-65B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 37
DEPTH TO BEDROCK: 36.3

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173229.48 E: 2968253.82
GROUND SURFACE ELEV.: 665.45
TOP OF CASING ELEV.: 668.67
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 850 track
START DATE/TIME: 4/17/2020 8:45:00 AM
END DATE/TIME: 4/17/2020 11:50:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
640.0	light brown fine to medium SAND, trace coarse sand, trace fine to coarse gravel		7	SS		1.4 / 2	25.0' to 26.4': (SP) SAND, fine to medium, trace coarse sand; light brown; non-cohesive, wet, compact. SPTs (2-8-12-22)		2" PVC Screen slot 0.010 25-35 ft bgs
635.0			8	SS		1.2 / 2	30.0' to 31.2': (SP) SAND, fine to medium, trace coarse sand; light brown; non-cohesive, wet, compact. SPTs (3-8-15-20)		
			9	SS		1.2 / 2	32.0' to 33.2': (SP) SAND, fine to medium, trace coarse sand; light brown; non-cohesive, wet, compact. SPTs (4-9-20-22)		
630.0			10	SS		1.4 / 2	35.0' to 36.3': (SP) SAND, fine to medium, trace coarse sand; light borwn; non-cohesive, wet, compact. 36.3' to 36.4: clayey SHALE, light gray, highly weathered; sampled as sandy gravel. SPTs (5-15-27-17)		
	highly weathered, light gray CLAYEY SHALE								
625.0									
620.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)
Shale
USCS Poorly-graded Sand with Silt (SP-SM)
USCS Poorly-graded Sand (SP)

DRILLING COMPANY: DLZ
DRILLER: Z. Baehr
DRILL RIG: CME 850 track

LOGGED BY: KMC
CHECKED BY: CRH
DATE: 5/7/20

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-66B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 45.3
DEPTH TO BEDROCK: 44.2

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173363.62 E: 2967853.2
GROUND SURFACE ELEV.: 669.20
TOP OF CASING ELEV.: 672.99
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 850 track
START DATE/TIME: 4/21/2020 7:45:00 AM
END DATE/TIME: 4/21/2020 12:00:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	brown to dark brown fine SAND, some silt, some organics		1	SS		1.0 / 2	0.0' to 0.8': (SP-SM) SAND, fine, some nonplastic fines, some organics (grass), trace fine gravel; brown to dark brown; non-cohesive, moist, very loose.		Bentonite Chips 0-2 ft bgs
	light brown to yellow brown fine SAND, trace coarse sand		2	SS		0.9 / 2	0.8'-1': (SP) SAND, fine; light brown to yellow brown; non-cohesive, moist, very loose. SPTs (1-1-1-1)		Cement-bentonite Grout 2-22.5 ft bgs
	brown to dark brown fine SAND, some silt		3	SS		1.0 / 2	2.0' to 2.9': (SP) SAND, fine, trace coarse sand; light brown, dark brown at 2.9'; non-cohesive, moist, loose. SPTs (4-2-2-4)		
665.0	yellow brown to brown fine to medium SAND		4	SS		1.6 / 2	4.0' to 4.5': (SP-SM) SAND, fine, some non-plastic fines; brown to dark brown, lenses of black fine sand, non-cohesive, moist, loose. 4.5' to 5.0': (SP) SAND, fine to medium; brown to yellow brown; non-cohesive, moist, compact. SPTs (3-4-6-10)		
			5	SS		1.0 / 2	6.0' to 6.8': (SP) SAND, fine to medium, trace organics; light gray to brown, pockets of gray/light gray; non-cohesive, moist, compact. 6.8' to 7.6': (SP) SAND, fine to medium; light yellow brown, non-cohesive, moist, compact. SPTs(3-6-8-13)		
660.0			6	SS		1.0 / 2			
			7	SS		1.1 / 2	8.0' to 9.0': (SP) SAND, fine to medium; yellow brown; non-cohesive, moist, compact. SPTs (3-6-10-11)		
			8	SS		1.5 / 2	10.0' to 11.0': (SP) SAND, fine to medium; yellow brown; non-cohesive, wet, compact. SPTs (2-4-8-6)		
655.0	light brown fine to medium SAND, trace coarse sand, trace fine gravel		9	SS		1.6 / 2	12.0' to 13.1': (SP) SAND, fine to medium, trace coarse sand; yellow brown; non-cohesive, wet, very loose. SPTs (1-2-2-2) 14.0' to 15.5': (SP) SAND, fine to medium, trace coarse sand; yellow brown; non-cohesive, wet, loose. SPTs (2-2-6-6)		
			10	SS		1.6 / 2	16.0' to 17.6': (SP) SAND, fine to medium, trace coarse sand; light brown; non-cohesive, wet, compact. SPTs (4-7-9-10)		
650.0			11	SS		1.0 / 2	18.0' to 19.6': (SP) SAND, fine to medium, trace coarse sand; light brown; non-cohesive, wet, loose. SPTs (3-2-4-6) 20.0' to 21.0': (SP) SAND, fine to medium; light brown; non-cohesive, wet, compact. SPTs (2-6-6-8)		
			12	SS		2.0 / 2	22.0' to 24.0': (SP) SAND, fine to medium, trace coarse sand, trace fine gravel, trace organics; light brown, pocket of clay at 23.4'; non-cohesive, wet, compact. SPTs (4-6-7-7)		Bentonite Chips 22.5-29 ft bgs
645.0			13	SS		1.1 / 2			

LITHOLOGY LEGEND

USCS Poorly-graded Sand with Silt (SP-SM)

USCS Poorly-graded Sand (SP)

Shale

DRILLING COMPANY: DLZ
DRILLER: Z. Baehr
DRILL RIG: CME 850 track

LOGGED BY: KMC
CHECKED BY: CRH
DATE: 5/7/20

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-66B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 45.3
DEPTH TO BEDROCK: 44.2

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173363.62 E: 2967853.2
GROUND SURFACE ELEV.: 669.20
TOP OF CASING ELEV.: 672.99
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 850 track
START DATE/TIME: 4/21/2020 7:45:00 AM
END DATE/TIME: 4/21/2020 12:00:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	light brown fine to medium SAND, trace coarse sand, trace fine gravel		13	SS		1.1 / 2	24.0' to 25.1': (SP) SAND, fine to medium, trace coarse sand, trace fine gravel, trace organics, light brown; non-cohesive, wet, loose. SPTs (2-3-4-4)		
			14	SS		2.0 / 2	26.0' to 28.0': (SP) SAND, fine to medium, trace coarse sand; light brown; non-cohesive, wet, loose. SPTs (2-3-6-8)		
640.0	light brown to gray-brown fine to medium SAND, trace coarse sand, trace fine to coarse gravel		15	SS		1.2 / 2	28.0' to 28.5': (SP) SAND, fine to medium, trace coarse sand, trace fine to coarse subrounded gravel; light brown; non-cohesive, wet, compact.		#5 Sand Filter Pack 29-44 ft bgs
			16	SS		1.9 / 2	28.5' to 29.2': (SP) SAND, fine to medium, some coarse sand, trace fine subrounded gravel; light gray to brown; non-cohesive, wet, compact. SPTs (3-6-12-14)		
			17	SS		1.2 / 2	30.0' to 31.6': (SP) SAND, fine to medium, trace coarse sand, trace fine subrounded gravel; light brown; non-cohesive, wet compact.		
635.0			18	SS		1.9 / 2	31.6' to 31.9': (SP) SAND, fine to medium, some coarse sand, trace fine subrounded gravel; light gray to brown; non-cohesive, wet, compact. SPTs (3-7-7-7)		2" PVC Screen slot 0.010 34-44 ft bgs
			19	SS		0.3 / 2	32.0' to 33.2': (SP) SAND, fine to medium, trace coarse sand; light brown to gray brown; non-cohesive, wet, loose; coarser 32.1-32.4'. SPTs (3-3-6-9)		
630.0			20	SS		1.5 / 2	34.0' to 35.9': (SP) SAND, fine to medium, trace coarse sand; light brown, gray brown from 35.8-36.0'; non-cohesive, wet, compact. SPTs (3-4-7-10)		
			21	SS		1.2 / 2	36.0' to 36.3': (SP) SAND, fine to medium, trace coarse sand, trace coarse subrounded gravel; light brown to gray brown; non-cohesive, wet, loose. SPTs (4-4-5-7)		
	light gray fine to coarse SAND		22	SS		0.9 / 2	38.0' to 39.5': (SP) SAND, fine to medium, trace coarse sand; light brown to gray brown; non-cohesive, wet, compact. SPTs (3-3-8-7)		
625.0	highly weathered, light gray CLAYEY SHALE		23	SS		1.1 / 1.3	40.0' to 41.2': (SP) SAND, fine to medium, trace coarse sand; light brown to gray brown; non-cohesive, wet, compact. SPTs (3-7-8-10)		
							42.0' to 42.8': (SP) SAND, fine to medium, trace coarse sand; light brown; non-cohesive, wet, compact.		
							42.8' to 42.9': (SW) SAND, fine to coarse, gray shale cobble; light gray; non-cohesive, wet, compact. SPTs (7-7-8-13)		
620.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand with Silt (SP-SM) | USCS Poorly-graded Sand (SP) | Shale

DRILLING COMPANY: DLZ
DRILLER: Z. Baehr
DRILL RIG: CME 850 track

LOGGED BY: KMC
CHECKED BY: CRH
DATE: 5/7/20

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-66B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 45.3
DEPTH TO BEDROCK: 44.2

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173363.62 E: 2967853.2
GROUND SURFACE ELEV.: 669.20
TOP OF CASING ELEV.: 672.99
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 850 track
START DATE/TIME: 4/21/2020 7:45:00 AM
END DATE/TIME: 4/21/2020 12:00:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
							44.0' to 44.2': (SW) SAND, fine to coarse; light gray; non-cohesive, wet, compact. 44.2' to 45.1': (CL) sandy CLAY; light gray, platey, medium to high dry strength; cohesive, w < PL, stiff to very stiff. SPTs (5-28-50/3")		
615.0									
610.0									
605.0									
600.0									
595.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand with Silt (SP-SM)

USCS Poorly-graded Sand (SP)

Shale

DRILLING COMPANY: DLZ
DRILLER: Z. Baehr
DRILL RIG: CME 850 track

LOGGED BY: KMC
CHECKED BY: CRH
DATE: 5/7/20

BOREHOLE LOG: GAMW-67B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 43
DEPTH TO BEDROCK: 40.7

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2174213.3 E: 2967604.35
GROUND SURFACE ELEV.: 664.65
TOP OF CASING ELEV.: 667.97
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 850 track
START DATE/TIME: 4/20/2020 12:05:00 PM
END DATE/TIME: 4/20/2020 4:05:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	brown to dark brown fine SILTY SAND		1	SS		0.8 / 2	0.0' to 0.2': (SM) SILTY SAND, fine, trace organics (grass); brown to dark brown; non-cohesive, moist, very loose.		Bentonite Chips 0-2 ft bgs
	light gray fine to coarse SAND, some fine to coarse gravel						0.2' to 0.7': (SP) SAND, fine to coarse, some fine to coarse subrounded gravel; light gray; non-cohesive, moist, loose.		Cement-bentonite Grout 2-19 ft bgs
	yellow brown fine SAND						0.7' to 0.8': (SP) SAND, fine, trace medium to coarse sand; yellow brown; non-cohesive, moist, loose.		
	dark brown fine SAND						SPTs(2-10-7-7)		
660.0			2	SS		0.9 / 2	5.0' to 5.9': (SP) SAND, fine; dark brown; non-cohesive, moist, loose. SPTs (4-3-5-5)		
	light brown fine to medium SAND, trace coarse sand		3	SS		0.7 / 2	10.0' to 10.7': (SP) SAND, fine, some medium sand; light brown; non-cohesive, wet, very loose. SPTs (1-1-2-3)		
655.0			4	SS		1.4 / 2	12.0' to 13.4': (SP) SAND, fine to medium, trace coarse sand, trace fine subrounded gravel; light brown; non-cohesive, wet, loose.		
650.0			5	SS		0.9 / 2	15.0' to 15.9': (SP) SAND, fine to medium, trace coarse sand, light brown; non-cohesive, wet, compact. SPTs (2-5-7-6)		
645.0			6	SS		2.0 / 2	20.0' to 22.0': (SP) SAND, fine to medium, trace coarse sand, light brown; non-cohesive, wet, loose. SPTs (1-1-4-5)		Bentonite Chips 19-28 ft bgs
640.0									

LITHOLOGY LEGEND



USCS Silty Sand (SM)
Shale
USCS Poorly-graded Sand (SP)
USCS Well-graded Sand (SW)

DRILLING COMPANY: DLZ
DRILLER: Z. Baehr
DRILL RIG: CME 850 track

LOGGED BY: KMC
CHECKED BY: CRH
DATE: 5/7/20

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-67B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 43
DEPTH TO BEDROCK: 40.7

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2174213.3 E: 2967604.35
GROUND SURFACE ELEV.: 664.65
TOP OF CASING ELEV.: 667.97
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 850 track
START DATE/TIME: 4/20/2020 12:05:00 PM
END DATE/TIME: 4/20/2020 4:05:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	light brown fine to medium SAND, trace coarse sand		7	SS		1.4 / 2	25.0' to 26.0': (SP) SAND, fine medium, trace coarse sand; light brown; non-cohesive, wet, compact.		
	light gray to brown fine to coarse SAND						26.0' to 26.4': (SW) SAND, fine to coarse, trace round fine to coarse gravel; light gray brown; non-cohesive, wet, compact; coarser 26.3-26.4'. SPTs (6-10-16-18)		
	light brown fine to medium SAND, trace fine gravel								#5 Sand Filter Pack 28-40.5 ft bgs
635.0			8	SS		2.0 / 2	30.0' to 32.0': (SP) SAND, fine to medium, trace coarse sand, trace round to subrounded fine gravel; light brown; non-cohesive, wet, compact. SPTs (6-8-8-10)		2" PVC Screen slot 0.010 30.5-40.5 ft bgs
	light gray to brown, medium to coarse SAND, some fine sand, trace fine gravel		9	SS		0.6 / 2	32.0' to 32.6': (SW) SAND, medium to coarse, some fine sand, trace fine subrounded gravel; light gray to brown; non-cohesive, wet, compact; coarser 32.3-32.6', light brown fine sand at 32.6'. SPTs (4-8-8-14)		
630.0	light brown fine to medium SAND, trace coarse sand, trace fine to coarse gravel, lenses of medium to coarse sand		10	SS		1.5 / 2	35.0' to 36.5': (SP) SAND, fine to medium, trace coarse sand, trace fine subrounded gravel; light brown; non-cohesive, wet, very dense. SPTs (15-20-33-42)		
			11	SS		2.0 / 2	37.0' to 39.0': (SP) SAND, fine to medium, trace coarse sand, trace fine to coarse round to subrounded gravel; light brown, lenses of medium to coarse sand; non-cohesive, wet, compact. SPTs (7-12-17-17)		
625.0			12	SS		1.4 / 2	39.0' to 40.0': (SP) SAND, fine to medium, trace coarse sand; light brown; non-cohesive, wet, compact.		
	highly weathered, light gray CLAYEY SHALE and light brown fine to coarse sand								
	highly weathered, light gray CLAYEY SHALE		13	SS		1.2 / 2	40.0' to 40.4': clayey SHALE, light gray, highly weathered, platey, fine to coarse sand and fine to coarse subrounded gravel; non-cohesive, wet, compact. SPTs (10-14-20-12)		
							41.0' to 42.2': (CL), SILTY CLAY, light gray; cohesive, w~PL, firm to stiff. SPTs (3-4-6-14)		
620.0									
615.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)
Shale
USCS Poorly-graded Sand (SP)
USCS Well-graded Sand (SW)

DRILLING COMPANY: DLZ
DRILLER: Z. Baehr
DRILL RIG: CME 850 track

LOGGED BY: KMC
CHECKED BY: CRH
DATE: 5/7/20

BOREHOLE LOG: GAMW-68

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 18
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2168555.544 E: 2970328.36
GROUND SURFACE ELEV.: 665.95
TOP OF CASING ELEV.: 665.53
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: Geoprobe 7822 DT
START DATE/TIME: 8/27/2020 3:25:00 PM
END DATE/TIME: 8/27/2020 6:00:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	brown fine SAND, some silt, trace organics light and dark brown fine SAND, trace organics		1	SS		1.8 / 2	0-0.5': (SP-SM) SAND, fine, some organics (roots), brown, non cohesive, dry, loose 0.5-1.5': (SP) SAND, fine, light dark, brown, non cohesive, moist, loose 1.5-1.8': (SP) SAND, fine, trace organics (roots), light and dark, brown, non cohesive, moist, loose SPTs (6-6-6-7)		Completed as flush mount Bentonite Chips 1-4 ft bgs
	orange and brown fine SAND light brown to brown fine to medium SAND		2	SS		1.4 / 2	2-2.5': (SP) SAND, fine, trace organics (roots), light and dark brown, non cohesive, moist, loose 2.5-2.8': (SP) SAND, fine, orange and brown, non cohesive, moist, loose 2.8-3.4': (SP) SAND, fine, light brown, non cohesive, moist, loose SPTs (3-3-4-3)		
			3	SS		1.2 / 2			1/4" Coated Bentonite Pellets 4-6 ft bgs
660.0			4	SS		1.2 / 2	4-5.2': (SP) SAND, fine to medium, light brown, non cohesive, moist, loose, wet at 4.4 ft-bgs SPTs (3-4-4-3)		#5 Sand Filter Pack 6-17 ft bgs 2" PVC Screen slot 0.010 7-17 ft bgs
			5	SS		1 / 2	6-7.2': (SP) SAND, fine to medium, light brown to brown, non cohesive, wet, compact SPTs (4-6-12-16)		
655.0			6	SS		1.6 / 2	8-9': (SP) SAND, fine to medium, trace coarse, brown, non cohesive, wet, compact SPTs (2-5-8-11) 10-11': (SP) SAND, fine to medium, some coarse sand and fine round gravel from 11 to 11.3 ft bgs; brown, non cohesive, wet, compact		
			7	SS		2 / 2	11.3-11.6': (SP) SAND, fine to medium, trace coarse, brown, non cohesive, wet, compact SPTs (4-7-8-11)		
			8	SS		0.7 / 2	12-14': (SP) SAND, medium, some fine and coarse sand, brown, non cohesive, wet, compact SPTs (3-7-10-12)		
650.0			9	SS		2 / 2	14-14.6': (SP) SAND, medium, some fine and coarse sand, trace fine-coarse subrounded gravel, brown, non cohesive, wet, compact 14.6-14.7': (SP) SAND, fine, brown, non cohesive, wet, compact SPTs (2-3-7-12)		Native sand collapsed to 17 ft bgs
							16-17.5': (SP) SAND, fine, some medium, brown, non cohesive, wet, loose 17.5-18': (SP) SAND, fine, brown, non cohesive, wet, compact SPTs (2-5-8-14)		
645.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand with Silt (SP-SM)

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Strata Earth Services, LLC
DRILLER: Scott Komen
DRILL RIG: Geoprobe 7822 DT

LOGGED BY: KMC
CHECKED BY: KJ
DATE: 10/19/20

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-68B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 34.7
DEPTH TO BEDROCK: 34.7

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2168557.418 E: 2970325.081
GROUND SURFACE ELEV.: 665.97
TOP OF CASING ELEV.: 665.72
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: Geoprobe 7822 DT
START DATE/TIME: 8/26/2020 11:20:00 AM
END DATE/TIME: 8/27/2020 3:15:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	brown fine SAND, some silt, trace organics light and dark brown fine SAND, trace organics		1	SS		1.8 / 2	0-0.5': (SP-SM) SAND, fine, some organics (roots), brown, non cohesive, dry, loose 0.5-1.5': (SP) SAND, fine, light dark, brown, non cohesive, moist, loose 1.5-1.8': (SP) SAND, fine, trace organics (roots), light and dark, brown, non cohesive, moist, loose SPTs (6-6-6-7)		Completed as flush mount Bentonite chips 1-6 ft bgs
	orange and brown fine SAND light brown to brown fine to medium SAND		2	SS		1.4 / 2	2-2.5': (SP) SAND, fine, trace organics (roots), light and dark brown, non cohesive, moist, loose 2.5-2.8': (SP) SAND, fine, orange and brown, non cohesive, moist, loose 2.8-3.4': (SP) SAND, fine, light brown, non cohesive, moist, loose SPTs (3-3-4-3)		
660.0			3	SS		1.2 / 2			Cement Grout 6-20 ft bgs
			4	SS		1.2 / 2	4-5.2': (SP) SAND, fine to medium, light brown, non cohesive, moist, loose, wet at 4.4 ft-bgs SPTs (3-4-4-3)		
			5	SS		1 / 2	6-7.2': (SP) SAND, fine to medium, light brown to brown, non cohesive, wet, compact SPTs (4-6-12-16)		
655.0			6	SS		1.6 / 2	8-9': (SP) SAND, fine to medium, trace coarse, brown, non cohesive, wet, compact SPTs (2-5-8-11) 10-11': (SP) SAND, fine to medium, some coarse sand and fine round gravel from 11 to 11.3 ft bgs; brown, non cohesive, wet, compact		
			7	SS		2 / 2	11.3-11.6': (SP) SAND, fine to medium, trace coarse, brown, non cohesive, wet, compact SPTs (4-7-8-11)		
			8	SS		0.7 / 2	12-14': (SP) SAND, medium, some fine and coarse sand, brown, non cohesive, wet, compact SPTs (3-7-10-12)		
650.0			9	SS		2 / 2	14-14.6': (SP) SAND, medium, some fine and coarse sand, trace fine-coarse subrounded gravel, brown, non cohesive, wet, compact 14.6-14.7': (SP) SAND, fine, brown, non cohesive, wet, compact SPTs (2-3-7-12)		
			10	SS		2 / 2	16-17.5': (SP) SAND, fine, some medium, brown, non cohesive, wet, loose 17.5-18': (SP) SAND, fine, brown, non cohesive, wet, compact SPTs (2-5-8-14)		
	brown SILT and fine SAND brown to gray-brown fine to medium SAND, some coarse sand, trace fine gravel		11	SS		1.8 / 2	18-19.4': (SP) SAND, fine to medium, brown, non cohesive, wet, loose 19.4-19.7': (ML/SP) SILT and SAND, fine, brown, non cohesive, wet, loose 19.7-20': (SP) SAND, fine to medium, brown-gray, non cohesive, wet, loose SPTs (2-4-4-7)		1/4" Coated Bentonite Pellets 20-22 ft bgs
645.0			12	SS		2 / 2			#5 Sand Filter Pack 22-34.5 ft bgs
			13	SS		2 / 2			2" PVC Screen slot

LITHOLOGY LEGEND

USCS Poorly-graded Sand with Silt (SP-SM)
Shale
USCS Poorly-graded Sand (SP)
USCS Silt (ML)

DRILLING COMPANY: Strata Earth Services, LLC
DRILLER: Scott Komen
DRILL RIG: Geoprobe 7822 DT

LOGGED BY: KMC
CHECKED BY: KJ
DATE: 10/19/20

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-68B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 34.7
DEPTH TO BEDROCK: 34.7

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2168557.418 E: 2970325.081
GROUND SURFACE ELEV.: 665.97
TOP OF CASING ELEV.: 665.72
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: Geoprobe 7822 DT
START DATE/TIME: 8/26/2020 11:20:00 AM
END DATE/TIME: 8/27/2020 3:15:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
640.0	brown to gray-brown fine to medium SAND, some coarse sand, trace fine gravel		13	SS		2 / 2	20-21': (SP) SAND, fine to medium, brown-gray, non cohesive, wet, loose 21-21.8': (SW) SAND, fine to coarse, trace fine sub rounded gravel, gray-brown, non cohesive, wet, loose SPTs (2-1-2-7)		0.010 24.5-34.5 ft bgs
			14	SS		2 / 2			
			15	SS		2 / 2	22-22.8': (SW) SAND, fine to coarse, trace fine sub rounded gravel, gray-brown, non cohesive, wet, loose 22.8-23.4': (SP) SAND, fine to medium, some coarse sand, trace fine rounded gravel, brown, non cohesive, wet, compact 23.4-24': (SP) SAND, fine to medium, trace coarse sand, trace fine rounded gravel, gray-brown, non cohesive, wet, compact SPTs (5-12-15-16)		
635.0			16	SS		1.5 / 2			
			17	SS		1.5 / 2	24-26': (SP) SAND, fine to medium, trace coarse sand, trace fine sub rounded gravel, gray-brown, non cohesive, wet, compact SPTs (4-9-16-16)		
			18	SS		0.7 / 0.7			
	slightly weathered, weak, friable light gray SHALE						26-26.3': (SW) SAND, fine to coarse, gray-brown, non cohesive, wet, loose 26.3-28': (SP) SAND, fine to medium, some coarse sand, trace fine rounded gravel, non cohesive, wet, compact to dense SPTs (7-14-19-21)		
630.0							28-30': (SP) SAND, fine to medium, some coarse sand, trace fine rounded gravel, non cohesive, wet, compact to dense SPTs (9-14-22-19)		
							30-31.5': (SW) SAND, fine to coarse, trace fine rounded gravel, gray-brown, non cohesive, wet, loose. Increasing grain size with depth SPTs (2-3-4-10)		
625.0							32-33.5': (SP) SAND, medium, some fine, some coarse sand, non cohesive, wet, compact SPTs (6-8-13-23)		
							34-34.5': (SP) SAND, medium, some fine, some coarse sand, non cohesive, wet, compact 34.5-34.7': Slightly weathered, weak, friable light gray shale		
620.0									

LITHOLOGY LEGEND

USCS Poorly-graded Sand with Silt (SP-SM)
Shale
USCS Poorly-graded Sand (SP)
USCS Silt (ML)

DRILLING COMPANY: Strata Earth Services, LLC
DRILLER: Scott Komen
DRILL RIG: Geoprobe 7822 DT

LOGGED BY: KMC
CHECKED BY: KJ
DATE: 10/19/20

BOREHOLE LOG: GAMW-72

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173514.763 E: 2973920.433
GROUND SURFACE ELEV.: 664.44
TOP OF CASING ELEV.: 666.93
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: Mobile B-57
START DATE/TIME: 4/20/2023
END DATE/TIME: 4/20/2023

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	very dark brown-black, TOPSOIL								Bentonite Chips 0-3 ft bgs
	dark gray, SILTY SAND, fine								#5 Sand Filter Pack 3-15 ft bgs
660.0									2" PVC Screen slot 0.010 4.8-14.8 ft bgs
			1	SS		1.2 / 2	8-9.2': (SM) SILTY SAND, fine, dark gray, wet, loose SPTs (8-5-8-10)		
655.0	dark gray, SILTY SAND, trace gravel								
			2	SS		1.3 / 2	13-14.3': (SM) SILTY SAND, medium to coarse, trace gravel, dark gray, wet, compact SPTs (4-8-10-12)		
650.0									
645.0									
640.0									

LITHOLOGY LEGEND

Topsoil

USCS Silty Sand (SM)

DRILLING COMPANY: Strata Earth Services
DRILLER: Bill McCarthy
DRILL RIG: Mobile B-57

LOGGED BY: TMG
CHECKED BY: TDH
DATE: 7/25/23

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-72B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 31
DEPTH TO BEDROCK: 31

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173511.12 E: 2973920.436
GROUND SURFACE ELEV.: 664.47
TOP OF CASING ELEV.: 666.88
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: Mobile B-57
START DATE/TIME: 4/20/2023
END DATE/TIME: 4/20/2023

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	very dark brown-black, TOPSOIL								Cement Bentonite Grout 0-18 ft bgs
	dark gray, SILTY SAND, fine								
660.0									
			1	SS		1.2 / 2	8-9.2': (SM) SILTY SAND, fine, dark gray, wet, loose SPTs (8-5-8-10)		
655.0	dark gray, SILTY SAND, trace gravel								
			2	SS		1.3 / 2	13-14.3': (SM) SILTY SAND, medium to coarse, trace gravel, dark gray, wet, compact SPTs (4-8-10-12)		
650.0									
			3	SS		1.3 / 2	18-19.3': (SM) SILTY SAND, medium to coarse, trace gravel, dark gray, wet, compact SPTs (6-7-9-11)		#5 Sand Filter Pack 18-32 ft bgs
645.0									
									2" PVC Screen slot 0.010 21.6-31.6 ft bgs
	dark gray, SILTY SAND		4	SS		1.0 / 2	23-24': (SM) SILTY SAND, medium to coarse, very dark gray, wet, compact SPTs (9-11-11-15)		
640.0									

LITHOLOGY LEGEND

Topsoil | USCS Silty Sand (SM) | Shale

DRILLING COMPANY: Strata Earth Services
DRILLER: Bill McCarthy
DRILL RIG: Mobile B-57

LOGGED BY: TMG
CHECKED BY: TDH
DATE: 7/25/23

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-72B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 31
DEPTH TO BEDROCK: 31

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173511.12 E: 2973920.436
GROUND SURFACE ELEV.: 664.47
TOP OF CASING ELEV.: 666.88
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: Mobile B-57
START DATE/TIME: 4/20/2023
END DATE/TIME: 4/20/2023

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
635.0	dark gray, SILTY SAND		5	SS		1.1 / 2	28-29.1': (SM) SILTY SAND, fine to medium, very dark gray, wet, compact SPTs (17-12-12)		
			6	SS		1.1 / 2	30-31': (SM) SILTY SAND, fine to medium, very dark gray, wet, dense 31-31.1': Weathered, shale, very dark gray, dense SPTs (ND)		
	very dark gray, weathered SHALE								
630.0									
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

Topsoil | USCS Silty Sand (SM) | Shale

DRILLING COMPANY: Strata Earth Services
DRILLER: Bill McCarthy
DRILL RIG: Mobile B-57

LOGGED BY: TMG
CHECKED BY: TDH
DATE: 7/25/23

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-73

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173737.289 E: 2974225.621
GROUND SURFACE ELEV.: 661.85
TOP OF CASING ELEV.: 664.26
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: Mobile B-57
START DATE/TIME: 4/19/2023
END DATE/TIME: 4/19/2023

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	very dark brown-black TOPSOIL						0-1': Topsoil, very dark brown to black, organic-rich, dry.		Bentonite Chips 0-2.5 ft bgs
	dark brown SILTY SAND						1-8': (SM) SILTY SAND, fine to medium, very dark brown, loose.		#5 Sand Filter Pack 2.5-15 ft bgs
660.0									2" PVC Screen slot 0.010 4.8-14.8 ft bgs
655.0	dark gray SILTY SAND		1	SS		1 / 2	8-9': (SM) SILTY SAND, fine, dark gray, wet, loose. SPTs (2-4-4-6)		
650.0			2	SS		1 / 2	13-14': (SM) SILTY SAND, fine to medium, dark gray, wet, compact. SPTs (7-8-8-8)		
645.0									
640.0									

LITHOLOGY LEGEND

Topsoil

USCS Silty Sand (SM)

DRILLING COMPANY: Strata Earth Services
DRILLER: Bill McCarthy
DRILL RIG: Mobile B-57

LOGGED BY: TMG
CHECKED BY: TDH
DATE: 7/25/23

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-73B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 30
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173740.935 E: 2974228.369
GROUND SURFACE ELEV.: 661.90
TOP OF CASING ELEV.: 664.31
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: Mobile B-57
START DATE/TIME: 4/19/2023
END DATE/TIME: 4/19/2023

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	very dark brown-black, TOPSOIL						0-1': Topsoil, very dark brown to black, organic-rich, dry. 1-8': (SM) SILTY SAND, fine to medium, very dark brown, loose.		Cement Bentonite Grout 0-15 ft bgs
	dark brown SILTY SAND								
660.0									
655.0	dark gray SILTY SAND		1	SS		1 / 2	8-9': (SM) SILTY SAND, fine, dark gray, wet, loose. SPTs (2-4-4-6)		
650.0			2	SS		1 / 2	13-14': (SM) SILTY SAND, fine to medium, dark gray, wet, compact. SPTs (7-8-8-8)		#5 Sand Filter Pack 15-32 ft bgs
645.0			3	SS		0.9 / 2	18-18.9': (SM) SILTY SAND, fine to medium, trace gravel, dark gray, wet, compact. SPTs (6-7-9-10)		2" PVC Screen slot 0.010 18.3-28.3 ft bgs
640.0	dark gray SILTY SAND, little gravel		4	SS		1.2 / 2	23-24.2': (SM) SILTY SAND, medium to coarse, little gravel, dark gray, wet, compact. SPTs (7-9-11-13)		

LITHOLOGY LEGEND

Topsoil | USCS Silty Sand (SM) | Shale

DRILLING COMPANY: Strata Earth Services
DRILLER: Bill McCarthy
DRILL RIG: Mobile B-57

LOGGED BY: TMG
CHECKED BY: TDH
DATE: 7/25/23

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-73B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 30
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173740.935 E: 2974228.369
GROUND SURFACE ELEV.: 661.90
TOP OF CASING ELEV.: 664.31
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: Mobile B-57
START DATE/TIME: 4/19/2023
END DATE/TIME: 4/19/2023

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
635.0	dark gray SILTY SAND, little gravel								
	gray, weathered SHALE		5	SS		0.7 / 2	28-28.7': Weathered, shale, gray, very dense. SPTs (47-30-44-50)		
630.0									
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

Topsoil | USCS Silty Sand (SM) | Shale

DRILLING COMPANY: Strata Earth Services
DRILLER: Bill McCarthy
DRILL RIG: Mobile B-57

LOGGED BY: TMG
CHECKED BY: TDH
DATE: 7/25/23

wsp

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-74

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 17
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173737.573 E: 2974539.259
GROUND SURFACE ELEV.: 661.97
TOP OF CASING ELEV.: 664.44
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: Mobile B-57
START DATE/TIME: 4/18/2023
END DATE/TIME: 4/18/2023

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	topsoil						0-1': Topsoil, very dark brown to black, organic-rich, dry.		Bentonite Chips 0-3 ft bgs
	very dark brown, poorly graded SAND with silt						1-10': (SP-SM) SAND with silt, poorly graded, very dark brown, moist, loose.		#5 Sand Filter Pack 3-15 ft bgs
660.0									2" PVC Screen slot 0.010 4.9-14.9 ft bgs
655.0									
	dark gray, SILTY SAND, trace gravel		1	SS		2.0 / 2	10-12': (SM) SILTY SAND, fine to medium, trace gravel, dark gray, wet, compact. SPTs (2-2-8-9)		
650.0			2	SS		2.0 / 2	15-16.5': (SM) SILTY SAND, fine to medium, trace gravel, dark gray, wet, loose. 16.5-17': (SP) SAND, poorly graded, trace gravel, dark gray, wet, compact.		
645.0	very dark gray, poorly graded SAND								
640.0									

LITHOLOGY LEGEND

Topsoil

USCS Poorly-graded Sand (SP)

USCS Poorly-graded Sand with Silt (SP-SM)

USCS Silty Sand (SM)

DRILLING COMPANY: Strata Earth Services
DRILLER: Bill McCarthy
DRILL RIG: Mobile B-57

LOGGED BY: TMG
CHECKED BY: TDH
DATE: 7/25/23

BOREHOLE LOG: GAMW-74B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 30
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173737.576 E: 2974542.01
GROUND SURFACE ELEV.: 661.89
TOP OF CASING ELEV.: 664.21
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: Mobile B-57
START DATE/TIME: 4/18/2023
END DATE/TIME: 4/18/2023

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	topsoil						0-1': Topsoil, very dark brown to black, organic-rich, dry.		Cement Bentonite Grout 0-16 ft bgs
	very dark brown, poorly graded SAND with silt						1-10': (SP-SM) SAND with silt, poorly graded, very dark brown, moist, loose.		
660.0									
655.0									
	dark gray, SILTY SAND, trace gravel		1	SS		2.0 / 2	10-12': (SM) SILTY SAND, fine to medium, trace gravel, dark gray, wet, compact. SPTs (2-2-8-9)		
650.0			2	SS		2.0 / 2	15-16.5': (SM) SILTY SAND, fine to medium, trace gravel, dark gray, wet, loose. 16.5-17': (SP) SAND, poorly graded, trace gravel, dark gray, wet, compact.		#5 Sand Filter Pack 16-30 ft bgs
645.0	very dark gray, poorly graded SAND		3	SS		0.0 / 2	no recovery		2" PVC Screen slot 0.010 18.2-28.2 ft bgs
640.0			4	SS		1.0 / 2	23-23.5': (SP) SAND, poorly graded, trace gravel, very dark gray, wet, loose. 23.5-24': (SP) SAND, poorly graded, trace gravel, dark gray, wet, compact.		
	dark gray, poorly graded SAND, trace gravel								

LITHOLOGY LEGEND

Topsoil
USCS Poorly-graded Sand (SP)
USCS Poorly-graded Sand with Silt (SP-SM)
Shale
USCS Silty Sand (SM)

DRILLING COMPANY: Strata Earth Services
DRILLER: Bill McCarthy
DRILL RIG: Mobile B-57

LOGGED BY: TMG
CHECKED BY: TDH
DATE: 7/25/23

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 7/28/23

BOREHOLE LOG: GAMW-74B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 30
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173737.576 E: 2974542.01
GROUND SURFACE ELEV.: 661.89
TOP OF CASING ELEV.: 664.21
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: Mobile B-57
START DATE/TIME: 4/18/2023
END DATE/TIME: 4/18/2023

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
635.0	dark gray, poorly graded SAND, trace gravel								
	very dark gray, weathered shale		5	SS		1.2 / 2	28-29.2': Weathered, shale, gray, very dense. SPTs (11-17-50+)		
630.0									
625.0									
620.0									
615.0									

LITHOLOGY LEGEND

Topsoil
USCS Poorly-graded Sand (SP)
USCS Poorly-graded Sand with Silt (SP-SM)
Shale
USCS Silty Sand (SM)

DRILLING COMPANY: Strata Earth Services
DRILLER: Bill McCarthy
DRILL RIG: Mobile B-57

LOGGED BY: TMG
CHECKED BY: TDH
DATE: 7/25/23

RECORD OF BOREHOLE: GAMW-77

CLIENT: NIPSCO LLC
PROJECT: RMSGS WDA Well Network
PROJECT NO: 31406779.011
LOCATION: Wheatfield, IN

DATE: November 07, 2023
INCLINATION: 90.0°
CONTRACTOR: Strata Earth Services

ELEVATION: 665.98 ft (Ground)
COORDINATES: N: 2171387.051 ft E: 2967443.043 ft
COORD SYS: SP IN West FIPS 1302 Ft HORZ
DATUM: NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS	CONSTRUCTION AND INSTALLATION DETAILS
0	Geoprobe	Direct Push - 2-in Hole Dia.	(TOPSOIL) Topsoil with organics.			0.0 / 665.5								Pipe Stickup: 2.27 ft Pipe Elev: 668.25 ft
1			(SP) Fine to medium sand, trace organics; pale brown; dry, medium dense.			0.5								0.0 - 1.0 ft bgs: Concrete
5			(SP) Fine to medium sand, trace organics; pale brown and brownish yellow; moist, loose.	SP		661.0 / 5.0								1.0 - 7.0 ft bgs: 3/8" Bentonite Chips
8			(SP) Medium to fine sand; pale gray to brown; wet, medium dense.			658.0 / 8.0								
10			(SW) Fine to coarse sand, trace gravel; grayish brown; wet, medium dense.			656.0 / 10.0							07Nov23 15:00	7.0 - 19.5 ft bgs: Native Sand
15			(SW) Fine to coarse sand; brown; wet, medium dense.	SW		651.0 / 15.0								9.50 - 19.50 ft bgs: Screen Interval
20			End of hole at 20.00 ft. End of boring.			646.0								

HAMMER TYPE: N/A

REV:

LOGGED: Joanna Scuteri DATE: Nov 07, 2023
CHECKED: Cody Johnson DATE: Nov 13, 2023

RECORD OF BOREHOLE: GAMW-78

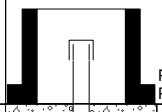
CLIENT: NIPSCO LLC
PROJECT: RMSGS WDA Well Network
PROJECT NO: 31406779.011
LOCATION: Wheatfield, IN

DATE: November 07, 2023
INCLINATION: 90.0°
CONTRACTOR: Strata Earth Services

ELEVATION: 672.33 ft (Ground)
COORDINATES: N: 2171030.907 ft E: 2967481.464 ft
COORD SYS: SP IN West FIPS 1302 Ft HORZ
DATUM: NAD83

DEPTH (ft)	DRILL RIG	DRILL METHOD	MATERIAL PROFILE: DESCRIPTION	USCS	STRATA PLOT	ELEV. / DEPTH (ft)	SAMPLES: NUMBER	TYPE	REC %	BLOWS	N-VALUE	ADDITIONAL OBSERVATIONS	GROUNDWATER OBSERVATIONS
0	Geoprobe	Direct Push - 2-in Hole Dia.	(SP) Medium to fine sand, many organics; brown; dry, medium dense.	SP		0.0 / 671.3							
1			(SP) Fine to medium sand, trace organics; yellowish brown; moist, medium dense.			1.0						1.00 - 9.50 ft: Note: Approximately 2-inch layer of orange oxidation staining at 9.5 feet bgs.	
9						662.8							
10			(SP) Fine to medium sand; grayish brown; moist, medium dense.			9.5 / 660.3							
12			(SP) Fine to medium sand; orange/brown; moist, medium dense.			12.0 / 658.8							
13			(SP) Fine to medium sand; brown; wet, medium dense.			13.5 / 652.3							07Nov23 16:00
20			End of hole at 20.00 ft. End of boring.										

CONSTRUCTION AND INSTALLATION DETAILS



Pipe Stickup: 2.38 ft
Pipe Elev: 674.71 ft

0.0 - 1.0 ft bgs: Concrete

1.0 - 8.0 ft bgs: 3/8" Bentonite Chips

8.0 - 20.0 ft bgs: Native Sand

10.00 - 20.00 ft bgs: Screen Interval

HAMMER TYPE: N/A

REV:

LOGGED: Joanna Scuteri DATE: Nov 07, 2023
CHECKED: Cody Johnson DATE: Nov 13, 2023

APPENDIX B

Slug Tests Results

Table 2: Hydraulic Conductivity Testing Results
NIPSCO LLC Schahfer Generating Station
Wheatfield, Indiana

Well	Date	Screened Interval	Type	Test Duration	Test Number	Hvorslev Method		Bouwer and Rice Method		van der Kamp Method		Hvorslev/Bouwer and Rice Arithmetic Mean	
						cm/sec	ft/day	cm/sec	ft/day	cm/sec	ft/day	cm/sec	ft/day
GAMW03	7/7/2016	5-15	Transducer (Rising)	<2 min	1	7.44E-03	2.11E+01	4.99E-03	1.42E+01	n/a	n/a	6.22E-03	1.77E+01
					2	7.45E-03	2.11E+01	5.22E-03	1.48E+01	n/a	n/a	6.34E-03	1.80E+01
GAMW13	7/7/2016	5-15	Transducer (Rising)	<2 min	1	5.75E-02	1.63E+02	3.91E-02	1.11E+02	n/a	n/a	4.83E-02	1.37E+02
					2	6.50E-02	1.84E+02	4.81E-02	1.36E+02	n/a	n/a	5.66E-02	1.60E+02
GAMW15	7/7/2016	5-15	Transducer (Rising)	<2 min	1	2.59E-02	7.34E+01	1.63E-02	4.63E+01	n/a	n/a	2.11E-02	5.99E+01
					2	1.11E-02	3.15E+01	1.08E-02	3.05E+01	n/a	n/a	1.10E-02	3.10E+01
GAMW19	7/7/2016	6-16	Transducer (Rising)	<2 min	1	3.70E-02	1.05E+02	2.25E-02	6.38E+01	n/a	n/a	2.98E-02	8.44E+01
					2	1.01E-01	2.87E+02	6.85E-02	1.94E+02	n/a	n/a	8.48E-02	2.41E+02
Average Shallow (5-15 ftbgs)						**3.90E-02**	**1.11E+02**	**2.69E-02**	**7.63E+01**	**n/a**	**n/a**	**3.30E-02**	**9.35E+01**
GAMW03B	7/8/2016	27-37	Transducer (Falling)	<2 min	1	6.78E-03	1.92E+01	5.81E-03	1.65E+01	n/a	n/a	6.30E-03	1.79E+01
					2	4.30E-03	1.22E+01	4.79E-03	1.36E+01	n/a	n/a	4.55E-03	1.29E+01
			Transducer (Rising)	<2 min	1	5.65E-03	1.60E+01	6.42E-03	1.82E+01	n/a	n/a	6.04E-03	1.71E+01
					2	1.47E-02	4.16E+01	1.25E-02	3.55E+01	1.49E-02	4.22E+01	1.36E-02	3.86E+01
GAMW13B	7/7/2016	25-35	Transducer (Falling)	<2 min	1	8.48E-03	2.40E+01	9.27E-03	2.63E+01	n/a	n/a	8.88E-03	2.52E+01
					2	8.09E-03	2.29E+01	9.27E-03	2.63E+01	n/a	n/a	8.68E-03	2.46E+01
			Transducer (Rising)	<2 min	1	1.11E-02	3.15E+01	1.16E-02	3.30E+01	2.73E-02	7.74E+01	1.14E-02	3.23E+01
					2	1.06E-02	3.00E+01	1.08E-02	3.06E+01	1.06E-02	3.01E+01	1.07E-02	3.03E+01
GAMW15B	7/7/2016	27.7-37.7	Transducer (Falling)	<2 min	1	4.50E-03	1.28E+01	3.45E-03	9.79E+00	n/a	n/a	3.98E-03	1.13E+01
					2	1.03E-02	2.91E+01	8.75E-03	2.48E+01	9.53E-03	2.70E+01	9.53E-03	2.70E+01
			Transducer (Rising)	<2 min	1	1.17E-02	3.32E+01	1.06E-02	3.02E+01	1.24E-02	3.50E+01	1.12E-02	3.17E+01
					2	1.06E-02	3.02E+01	9.79E-03	2.77E+01	1.69E-02	4.80E+01	1.02E-02	2.90E+01
GAMW19B	7/7/2016	23-33	Transducer (Falling)	<2 min	1	1.37E-02	3.88E+01	1.44E-02	4.09E+01	n/a	n/a	1.41E-02	3.99E+01
					2	6.82E-03	1.93E+01	6.31E-03	1.79E+01	n/a	n/a	6.57E-03	1.86E+01
			Transducer (Rising)	<2 min	1	1.84E-02	5.21E+01	1.83E-02	5.18E+01	1.29E-02	3.67E+01	1.84E-02	5.20E+01
					2	1.21E-02	3.43E+01	1.03E-02	2.91E+01	1.21E-02	3.43E+01	1.12E-02	3.17E+01
Average Deep (25-35 ftbgs)						**9.86E-03**	**2.80E+01**	**9.52E-03**	**2.70E+01**	**1.46E-02**	**4.13E+01**	**9.69E-03**	**2.75E+01**

Notes:
ft/day = feet per day
cm/sec = centimeters per second
n/a = not analyzed

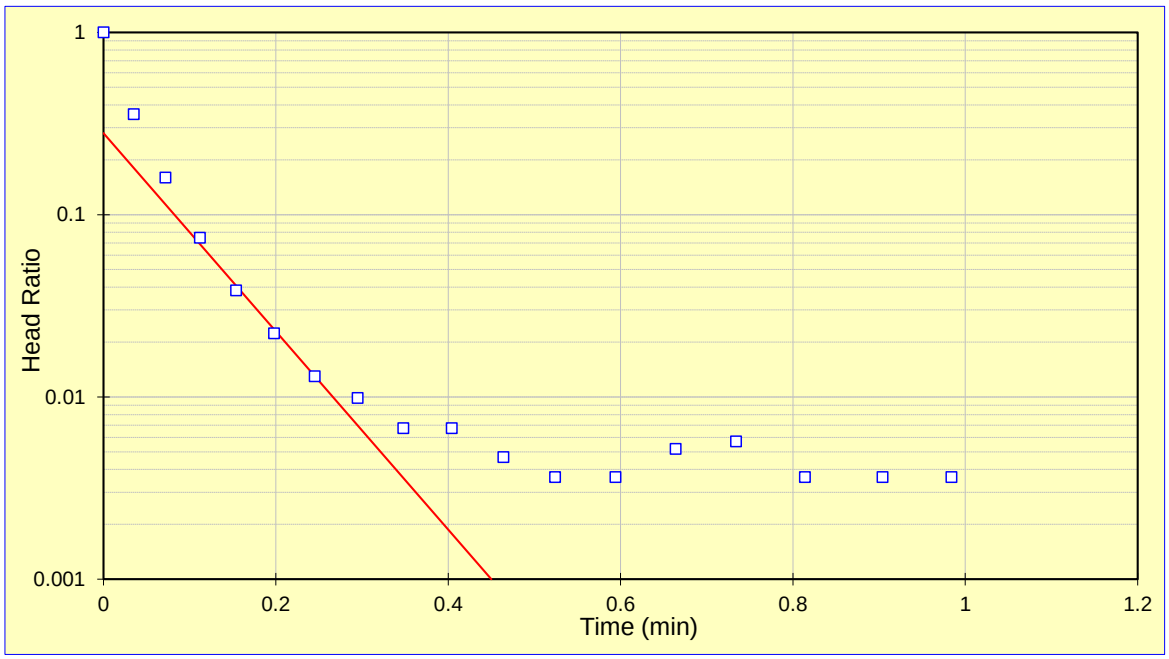
Prepared by: AMH
Checked by: DFS
Reviewed by: MAH

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03 (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	7.44E-03	cm/sec
t_1 =	0	K=	2.11E+01	ft/day
t_2 =	0.45			
h_1/h_0 =	0.28			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/25/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03 (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

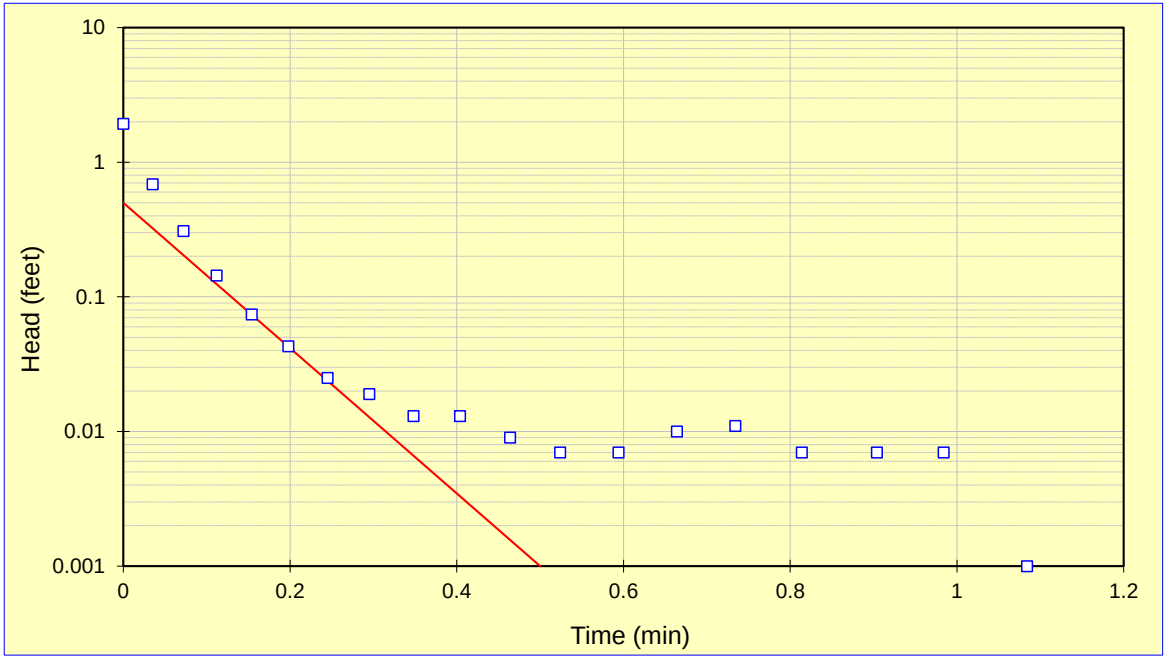
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.28
y_0 =	0.50
y_t =	0.001
t =	0.5

RESULTS

K=	4.99E-03	cm/sec
K=	1.42E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

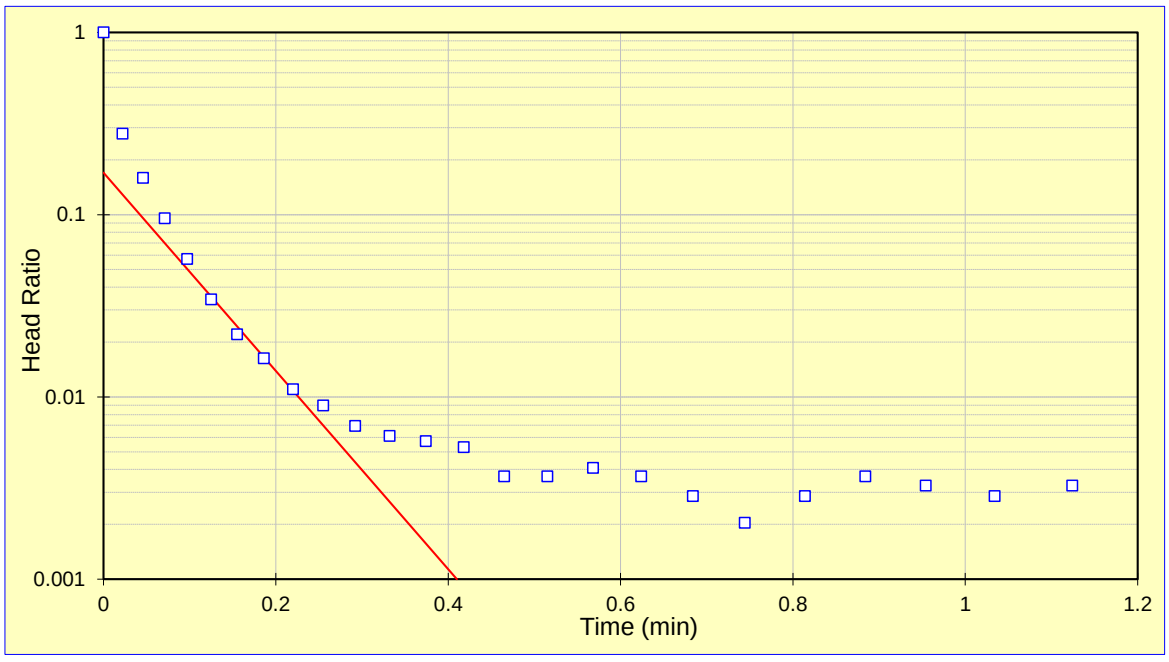
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03 (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	7.45E-03	cm/sec
t_1 =	0	K=	2.11E+01	ft/day
t_2 =	0.41			
h_1/h_0 =	0.17			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

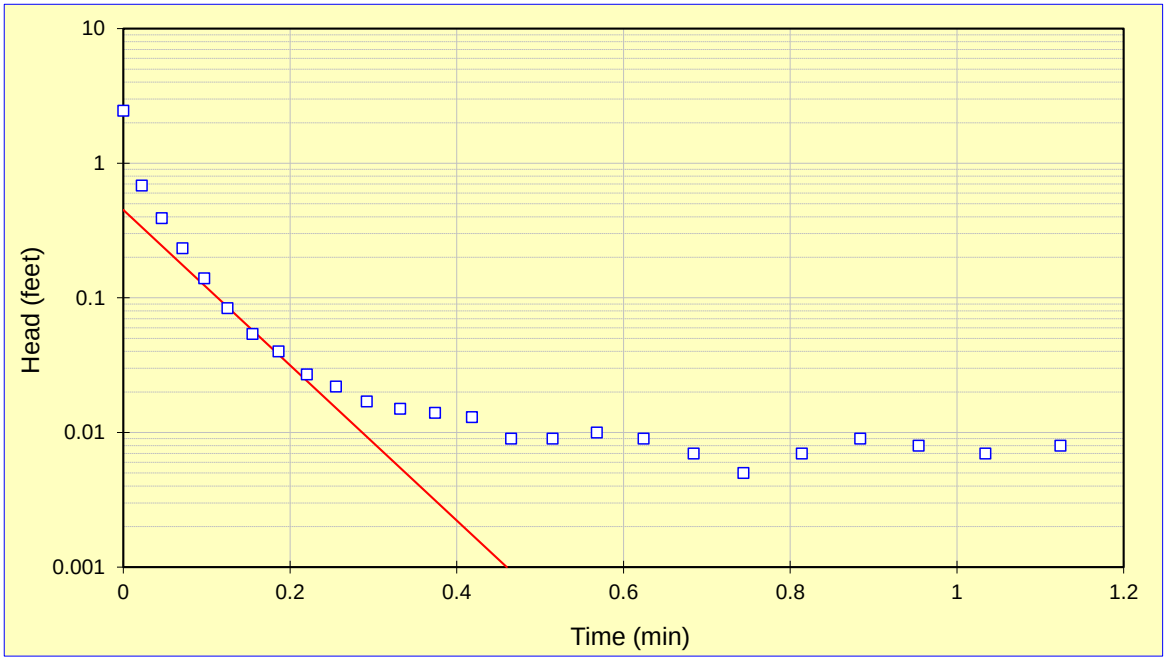
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.23
y_0 =	0.45
y_t =	0.001
t =	0.5

RESULTS

K=	5.22E-03	cm/sec
K=	1.48E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

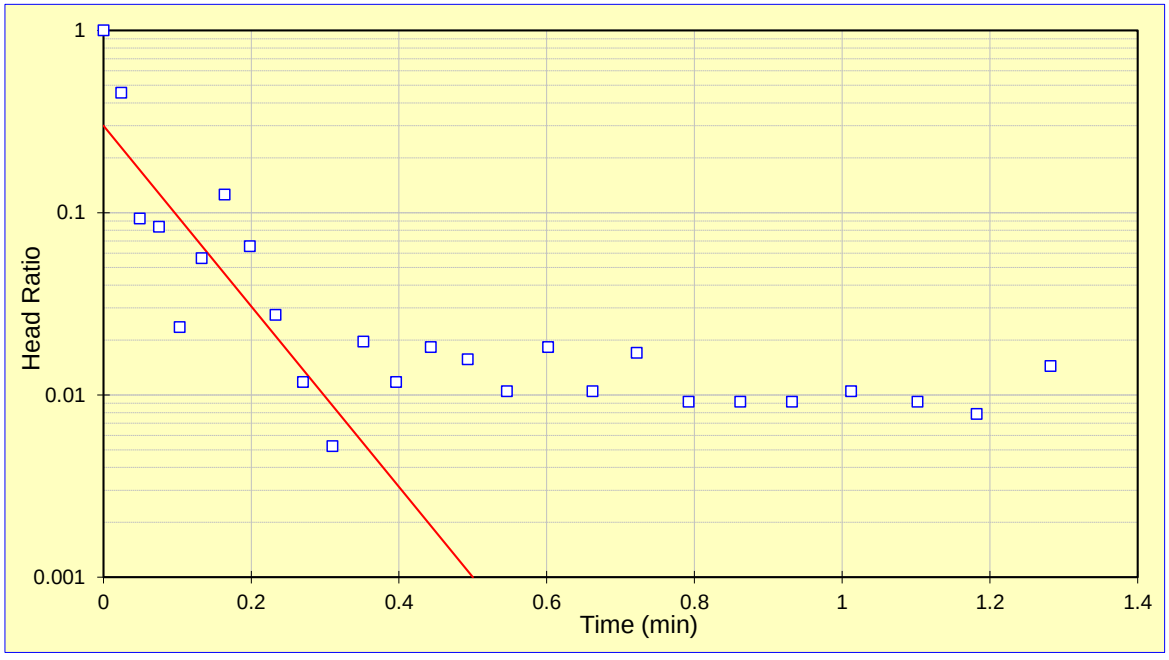
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-03B (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	6.78E-03	cm/sec
t_1 =	0	K=	1.92E+01	ft/day
t_2 =	0.5			
h_1/h_0 =	0.30			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-03B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

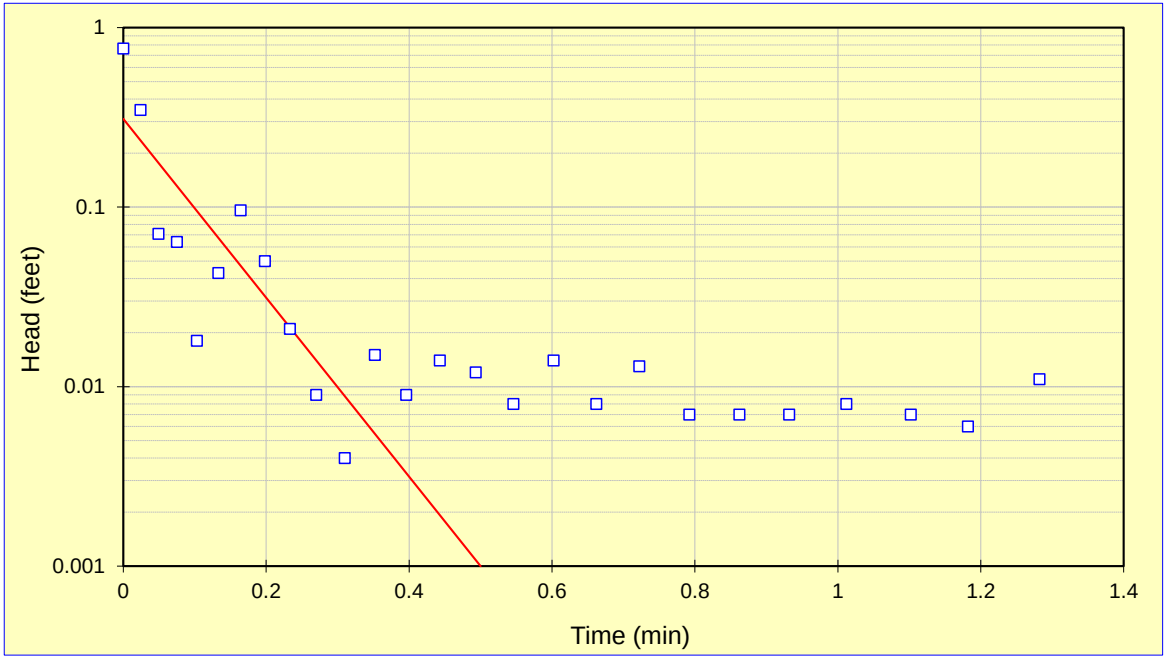
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.87
y_0 =	0.31
y_t =	0.001
t =	0.5

RESULTS

K=	5.81E-03	cm/sec
K=	1.65E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

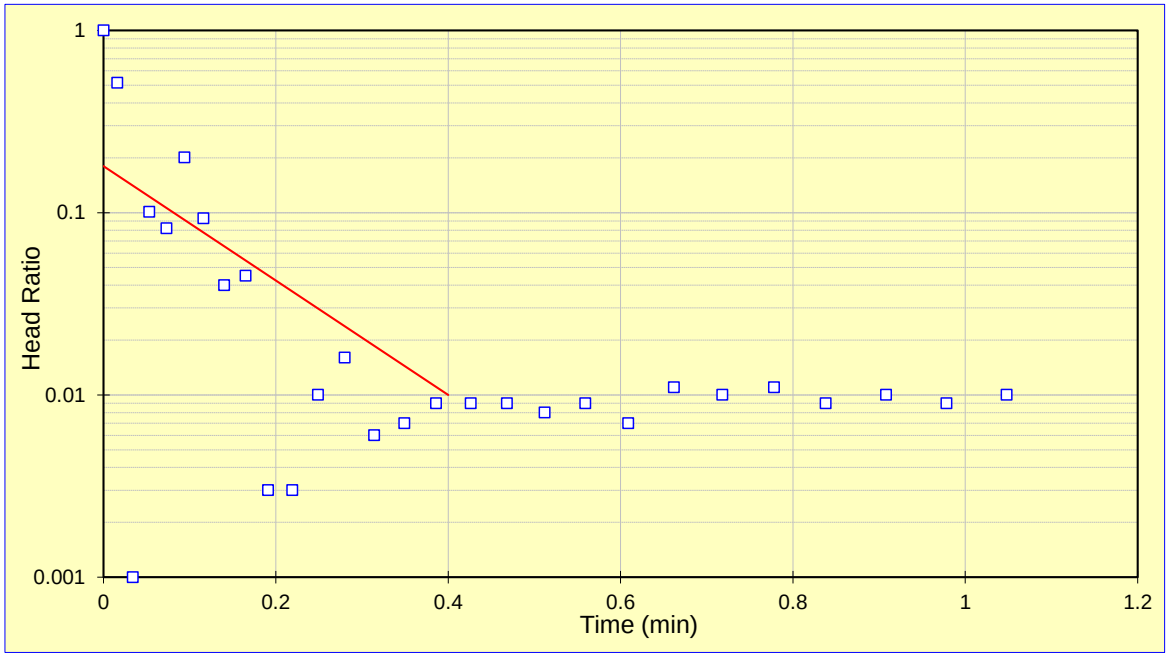
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-03B (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	4.30E-03	cm/sec
t_1 =	0	K=	1.22E+01	ft/day
t_2 =	0.4			
h_1/h_0 =	0.18			
h_2/h_0 =	0.01			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-03B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

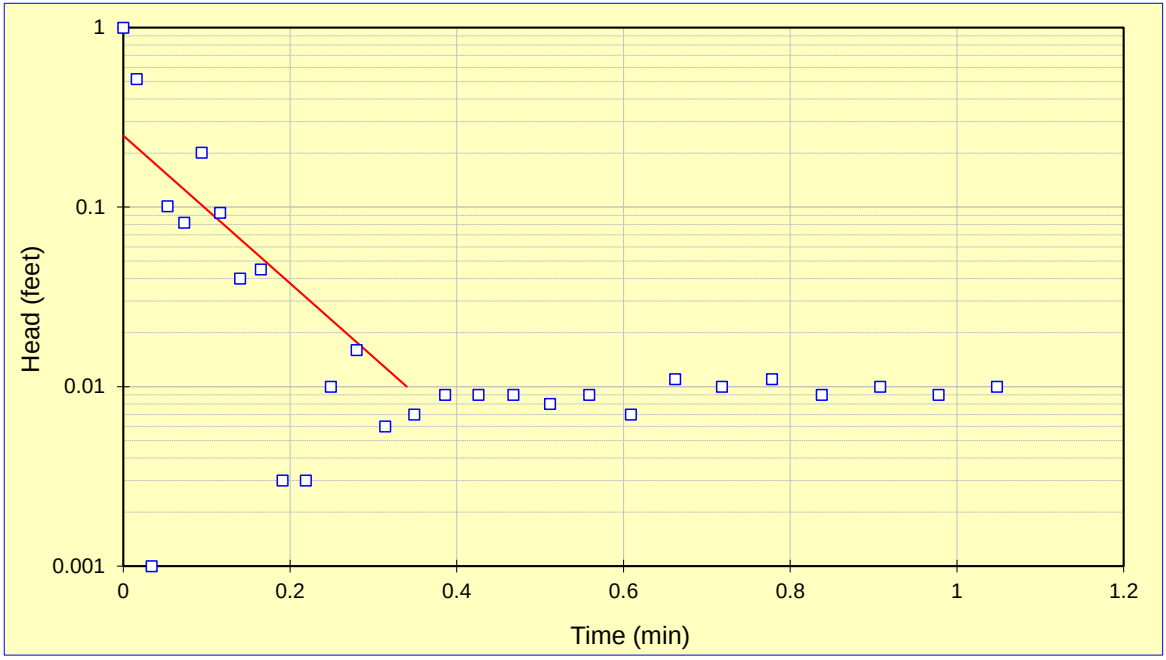
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.87
y_0 =	0.25
y_t =	0.010
t =	0.3

RESULTS

K=	4.79E-03	cm/sec
K=	1.36E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

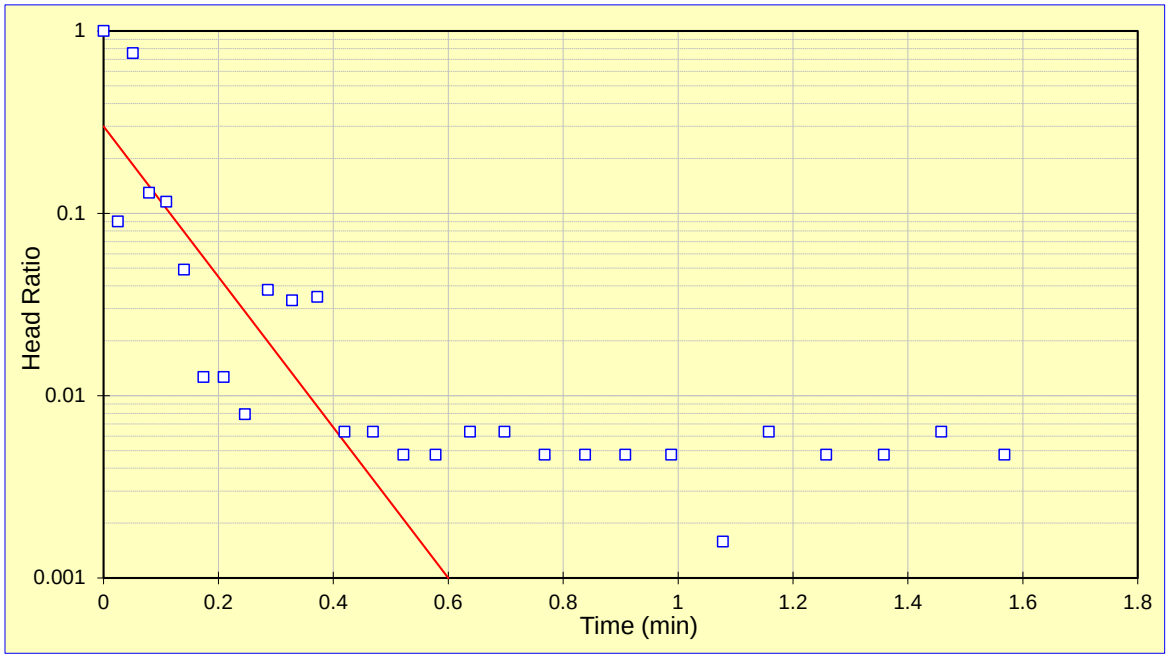
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03B (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	5.65E-03	cm/sec
t_1 =	0	K=	1.60E+01	ft/day
t_2 =	0.6			
h_1/h_0 =	0.30			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

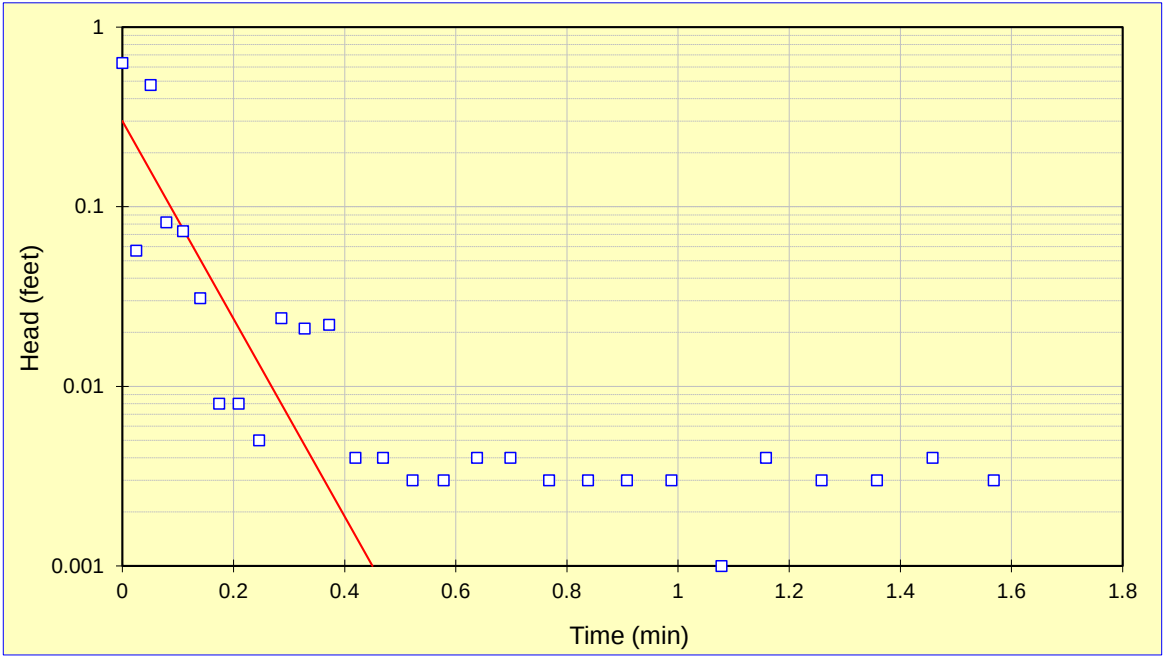
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.87
y_0 =	0.30
y_t =	0.001
t =	0.5

RESULTS

K=	6.42E-03	cm/sec
K=	1.82E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP RISING HEAD SLUG TEST ANALYSIS
UNDERDAMPED SLUG TEST GAMW-03B (TEST 2)

$$T = b + a\ln T$$

where:

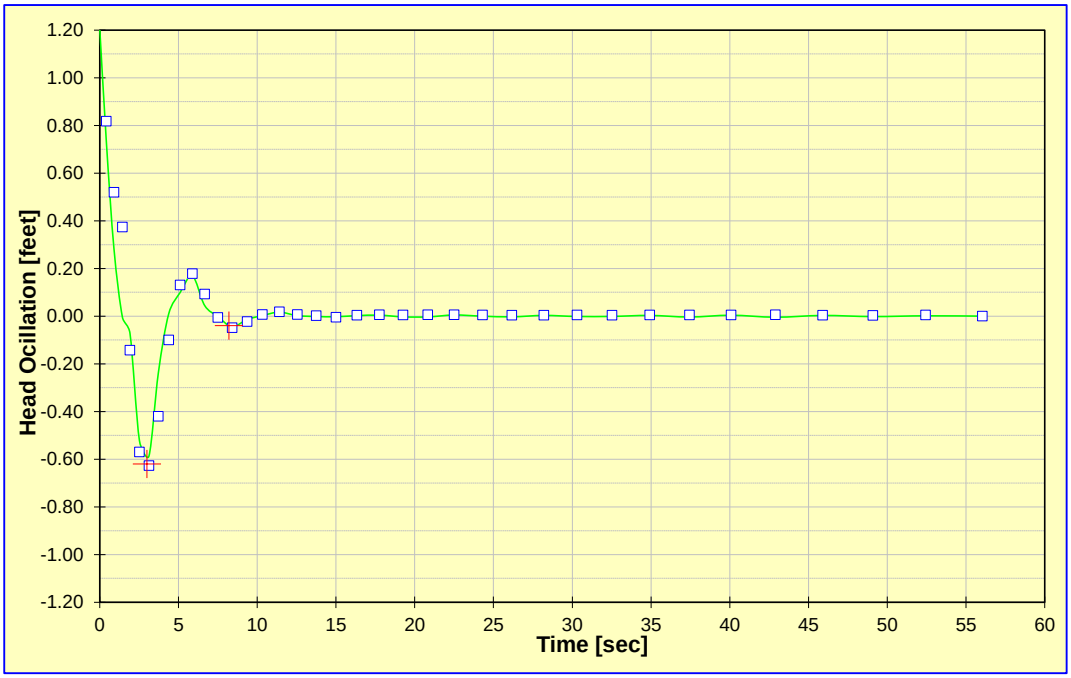
$$b = -a\ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g / L^{1/2}\right) / 8d$$
$$d = \gamma / \left(g / L\right)^{1/2}$$
$$L = g / \left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	1.31826	ft^2
r_s =	0.08	ft	d =	0.3998	ft^{-1}
L_c =	19.62	ft	a =	0.00286	ft^3
L_s =	10.00	ft	t_1 =	3.00	sec
ω =	1.2083	ft^{-1}	t_2 =	8.20	sec
γ =	0.5271	ft^{-1}	$h(t_1)$ =	0.62	ft
L =	18.52	ft^3/sec^2	$h(t_2)$ =	0.04	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	2.73E-02	ft^2/sec	α < 0.1?	YES
T =	1.53E-02	ft^2/sec	d < 0.7?	YES
T =	1.32E+03	ft^2/day	L_1 =	18.52
K =	4.22E+01	ft/day	L_2 =	24.62
K =	1.49E-02	cm/sec	L_1:L_2 Diff <20% ?	NO



Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/08/16

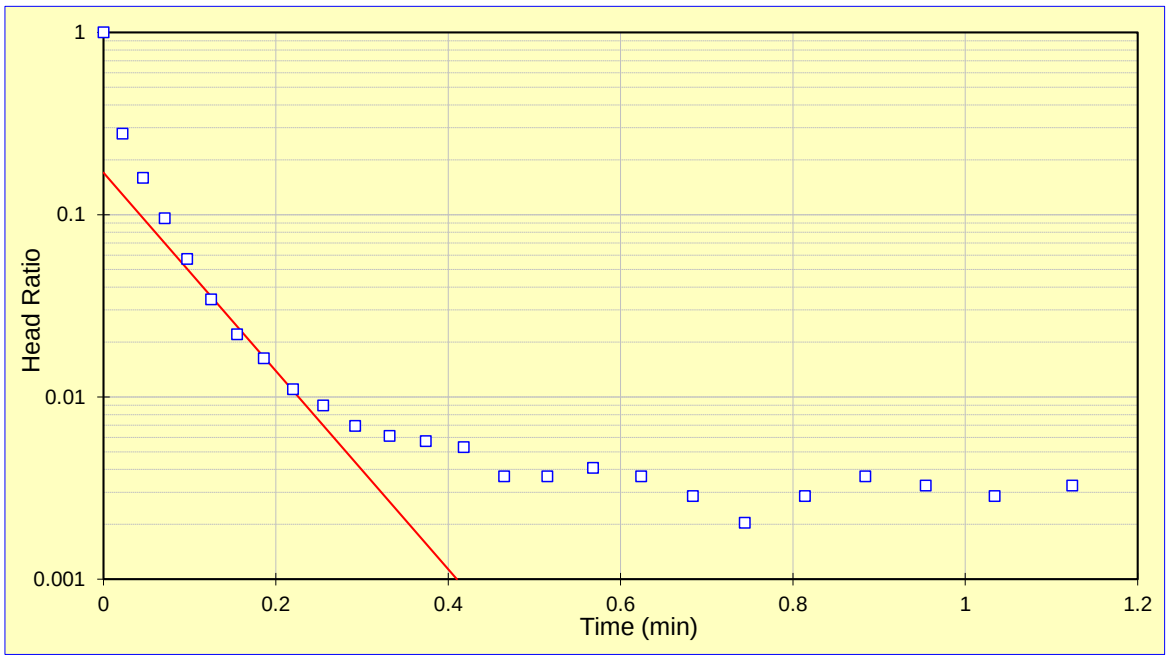
Analysis By: DFS
Checked By: JRS
Analysis Date: 8/8/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03 (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	7.45E-03	cm/sec
t_1 =	0	K=	2.11E+01	ft/day
t_2 =	0.41			
h_1/h_0 =	0.17			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

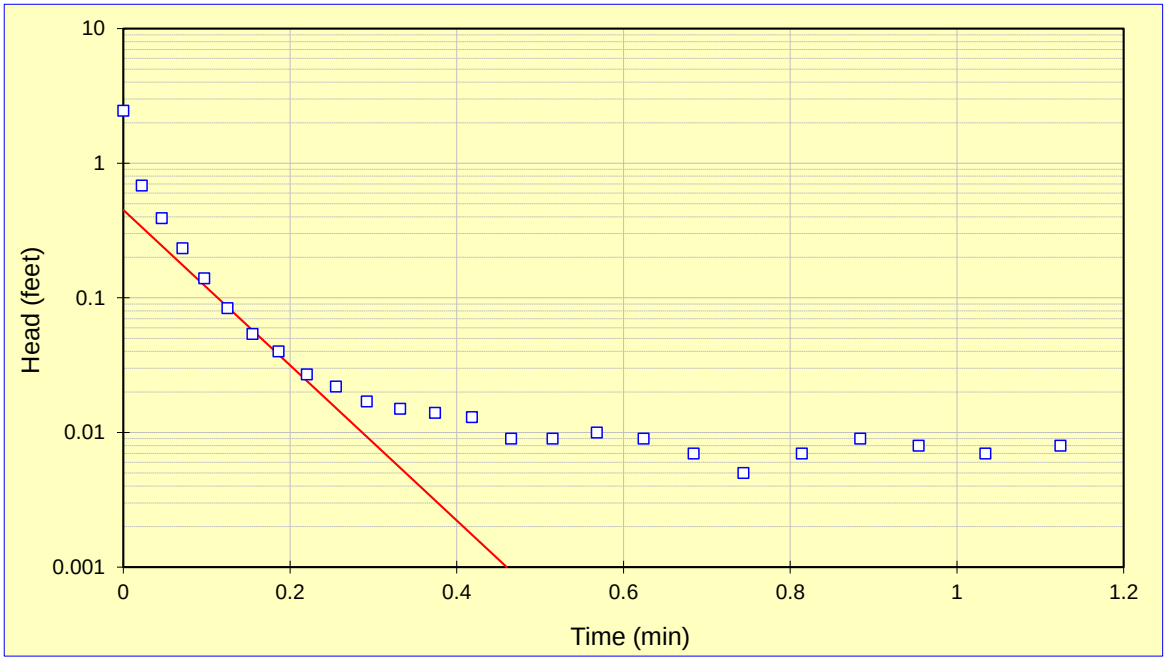
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.23
y_0 =	0.45
y_t =	0.001
t =	0.5

RESULTS

K=	5.22E-03	cm/sec
K=	1.48E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13B (TEST 1)

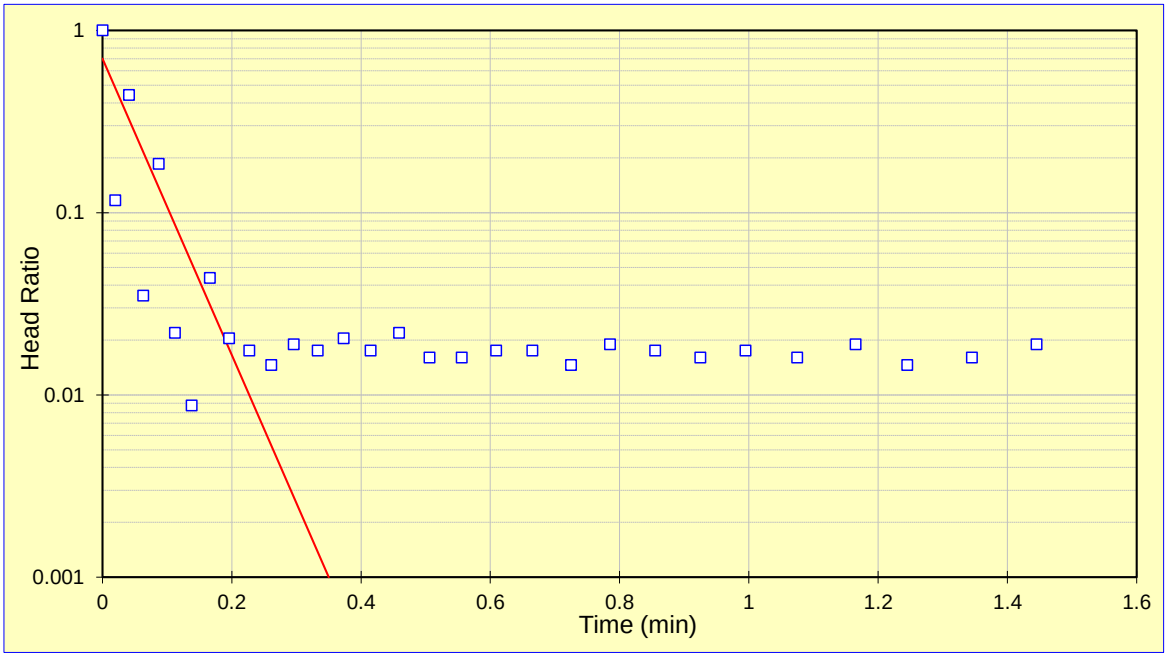
$$K = \frac{r_c^{\,2}}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	10
t_1 =	0
t_2 =	0.35
h_1/h_0 =	0.70
h_2/h_0 =	0.00

RESULTS

K=	1.11E-02	cm/sec
K=	3.15E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

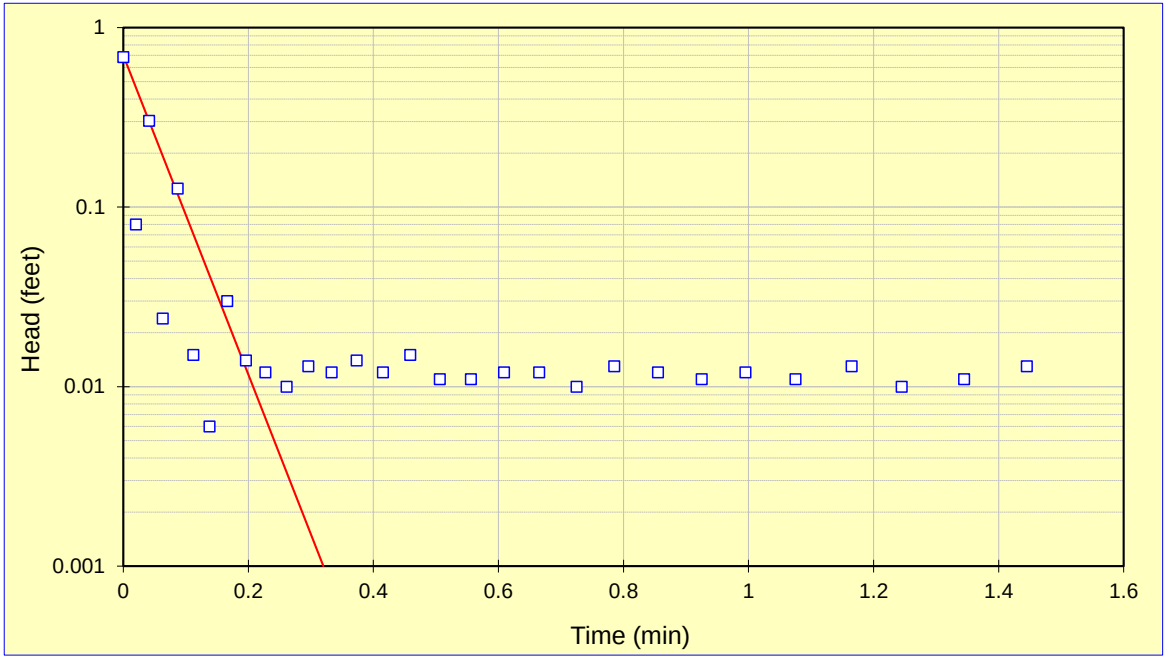
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.22
y_0 =	0.70
y_t =	0.001
t =	0.3

RESULTS

K=	1.16E-02	cm/sec
K=	3.30E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

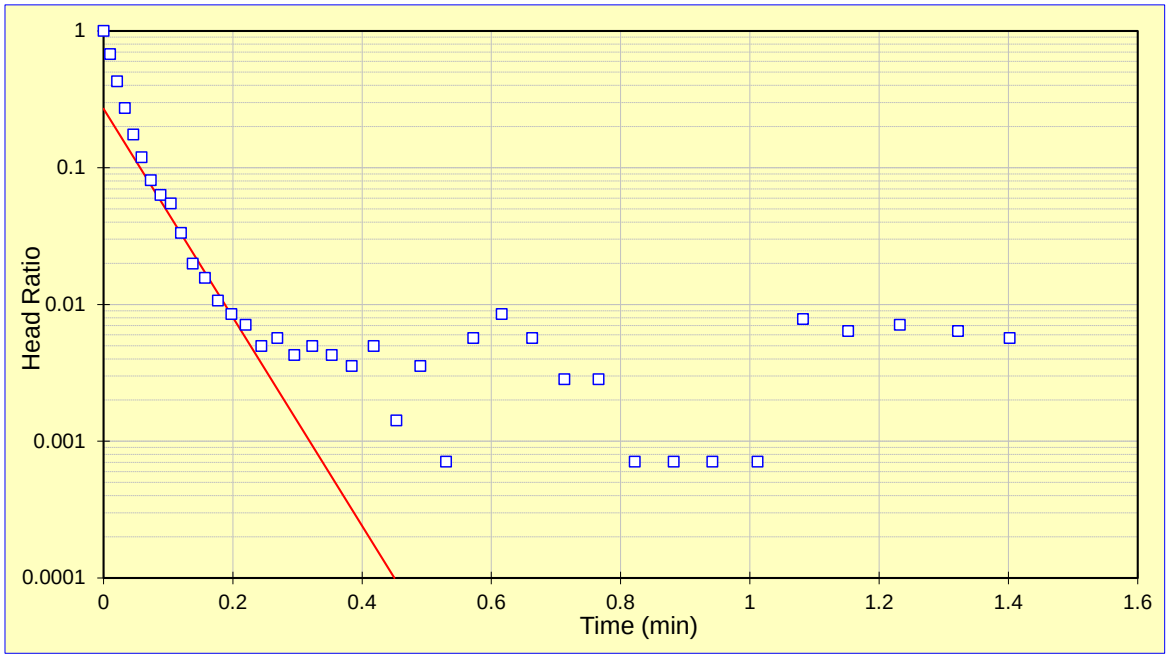
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13 (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.20			
R_e =	0.34			
L_e =	9.037	K=	6.50E-02	cm/sec
t_1 =	0	K=	1.84E+02	ft/day
t_2 =	0.45			
h_1/h_0 =	0.27			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

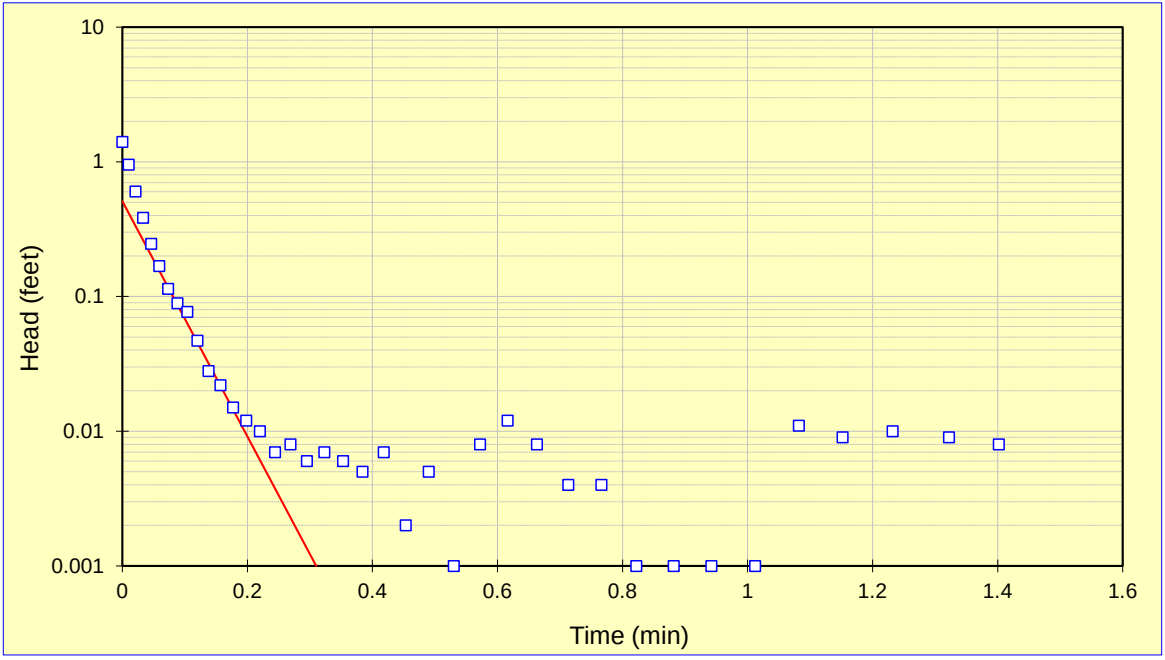
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.20
r_w =	0.34
L_e =	9.037
$\ln(R_e/r_w)$=	2.11
y_0 =	0.51
y_t =	0.001
t =	0.3

RESULTS

K=	4.81E-02	cm/sec
K=	1.36E+02	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-13B (TEST 1)

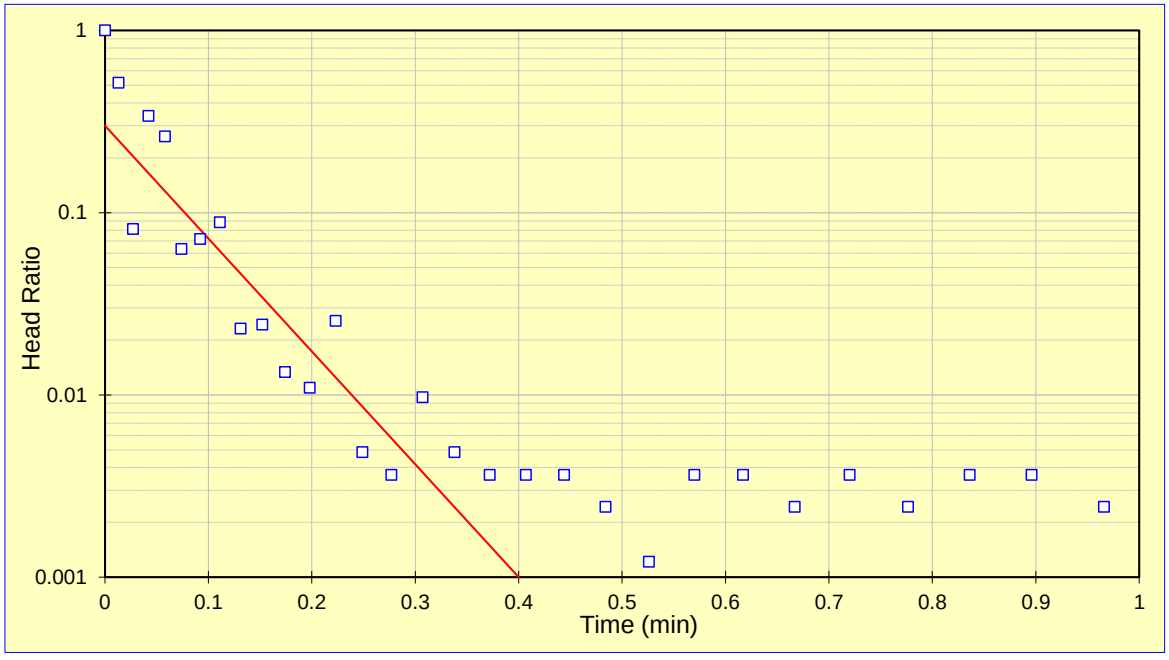
$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	10
t_1 =	0
t_2 =	0.4
h_1/h_0 =	0.30
h_2/h_0 =	0.00

RESULTS

K=	8.48E-03	cm/sec
K=	2.40E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-13B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

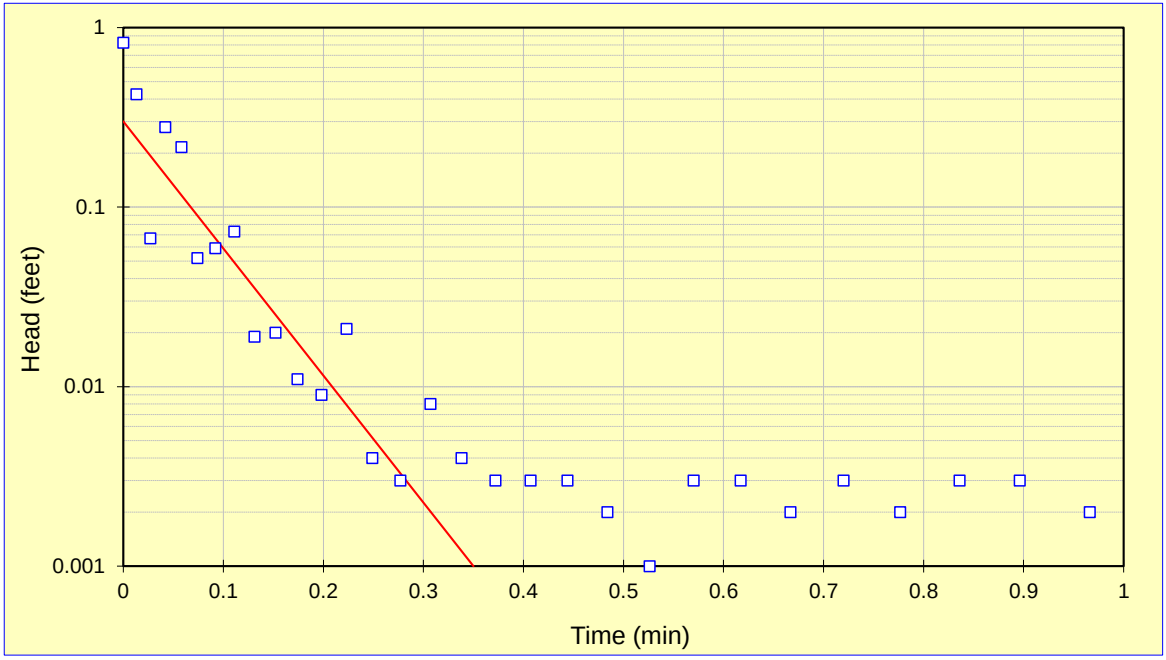
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.22
y_0 =	0.30
y_t =	0.001
t =	0.4

RESULTS

K=	9.27E-03	cm/sec
K=	2.63E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

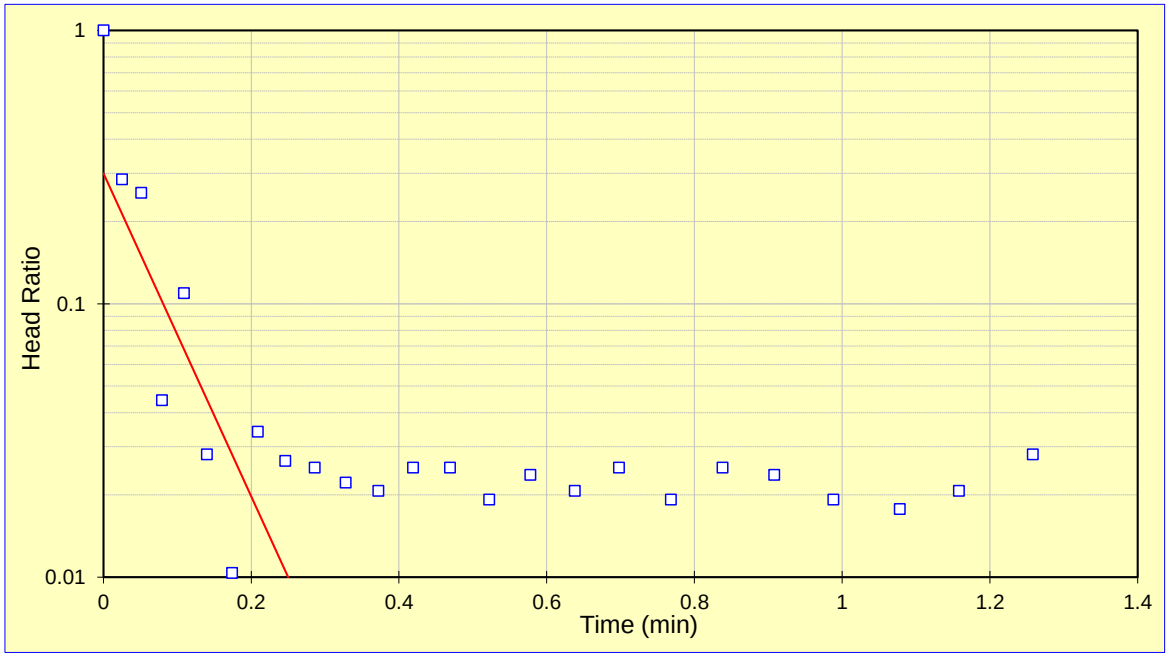
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-13B (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	8.09E-03	cm/sec
t_1 =	0	K=	2.29E+01	ft/day
t_2 =	0.25			
h_1/h_0 =	0.30			
h_2/h_0 =	0.01			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-13B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

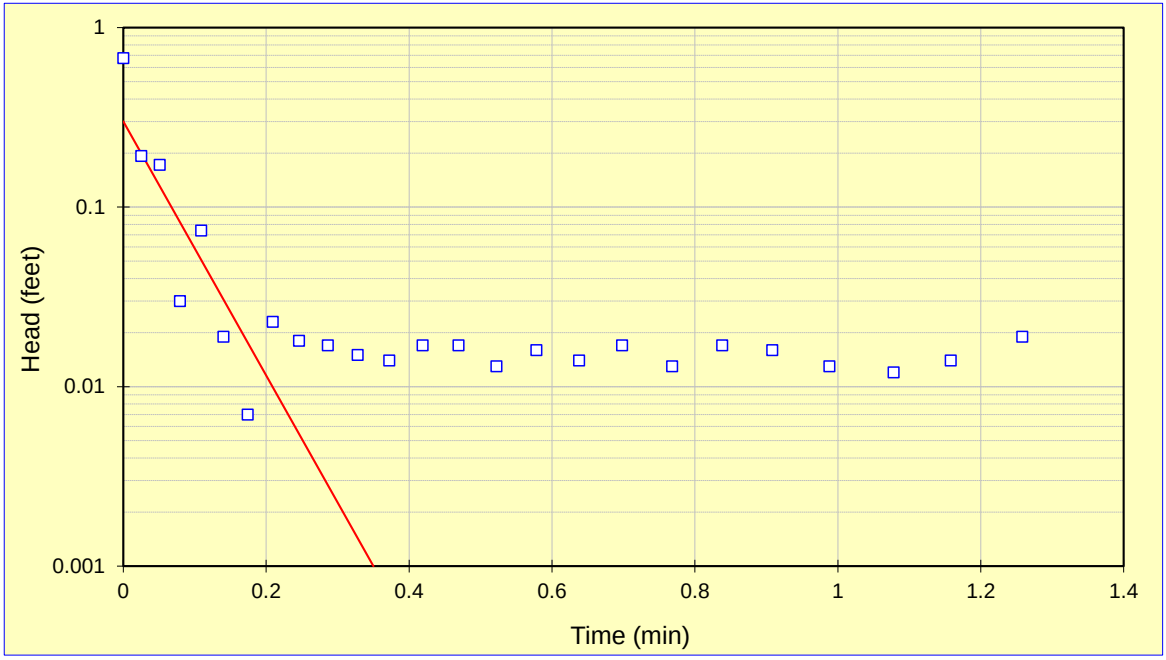
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.22
y_0 =	0.30
y_t =	0.001
t =	0.4

RESULTS

K=	9.27E-03	cm/sec
K=	2.63E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP RISING HEAD SLUG TEST ANALYSIS
UNDERDAMPED SLUG TEST GAMW-13B (TEST 1)

$$T = b + a \ln T$$

where:

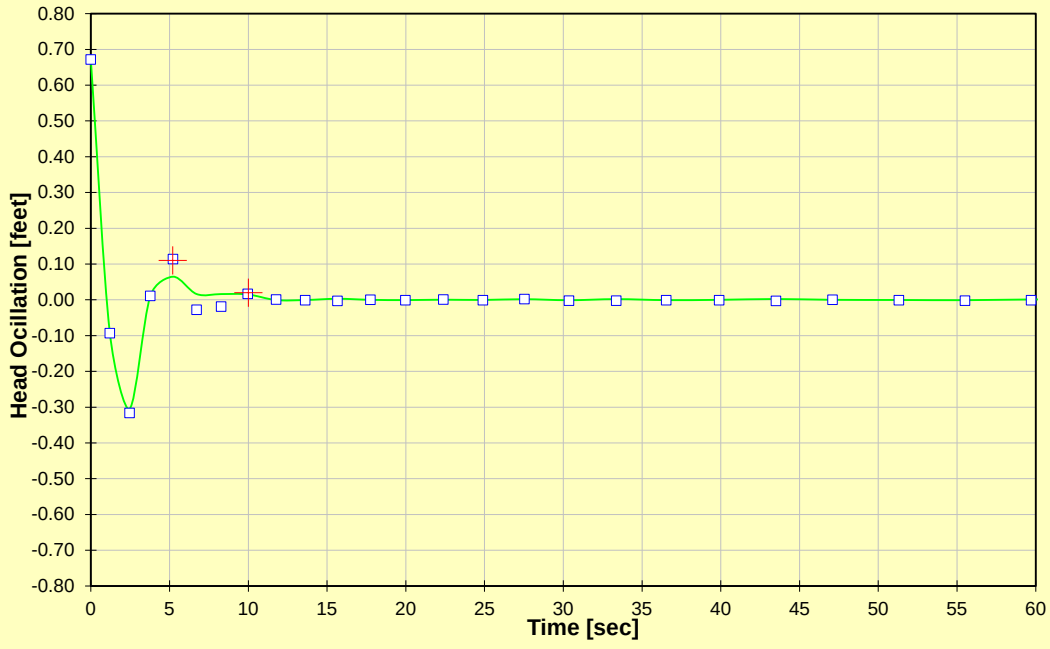
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	1.35632	ft^2
r_s =	0.08	ft	d =	0.2619	ft^{-1}
L_c =	19.45	ft	a =	0.00450	ft^3
L_s =	9.98	ft	t_1 =	5.20	sec
w =	1.3090	ft^{-1}	t_2 =	10.00	sec
g =	0.3552	ft^{-1}	$h(t_1)$ =	0.11	ft
L =	17.50	ft^3/sec^2	$h(t_2)$ =	0.02	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	4.27E-02	ft^2/sec	$a < 0.1$?	YES
T =	2.64E-02	ft^2/sec	$d < 0.7$?	YES
T =	2.28E+03	ft^2/day	L_1 =	17.50
K =	7.74E+01	ft/day	L_2 =	24.44
K =	2.73E-02	cm/sec	L_1:L_2 Diff <20% ?	NO



Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13B (TEST 1)

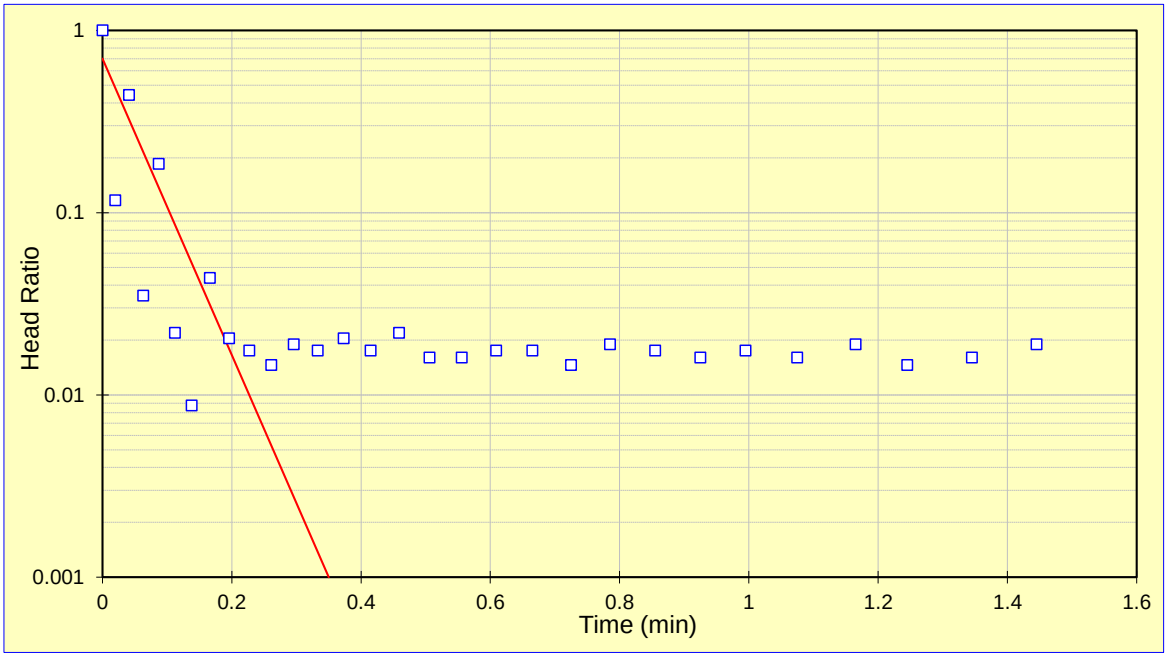
$$K = \frac{r_c^{\,2}}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	10
t_1 =	0
t_2 =	0.35
h_1/h_0 =	0.70
h_2/h_0 =	0.00

RESULTS

K=	1.11E-02	cm/sec
K=	3.15E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

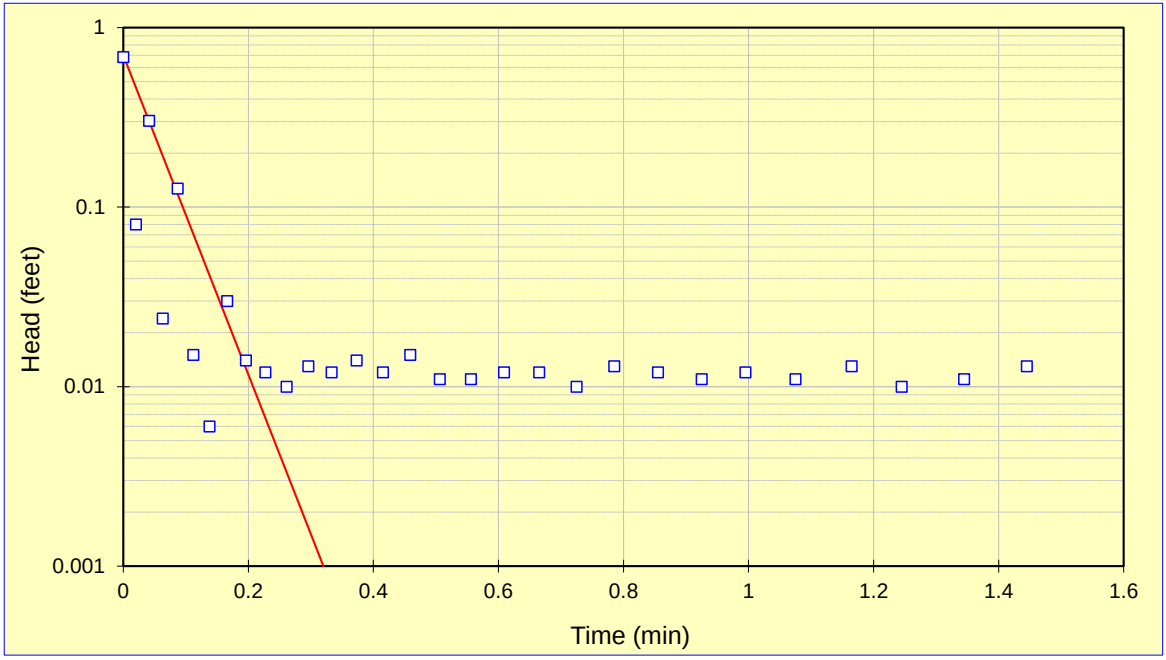
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.22
y_0 =	0.70
y_t =	0.001
t =	0.3

RESULTS

K=	1.16E-02	cm/sec
K=	3.30E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP RISING HEAD SLUG TEST ANALYSIS
UNDERDAMPED SLUG TEST GAMW-13B (TEST 2)

$$T = b + a\ln T$$

where:

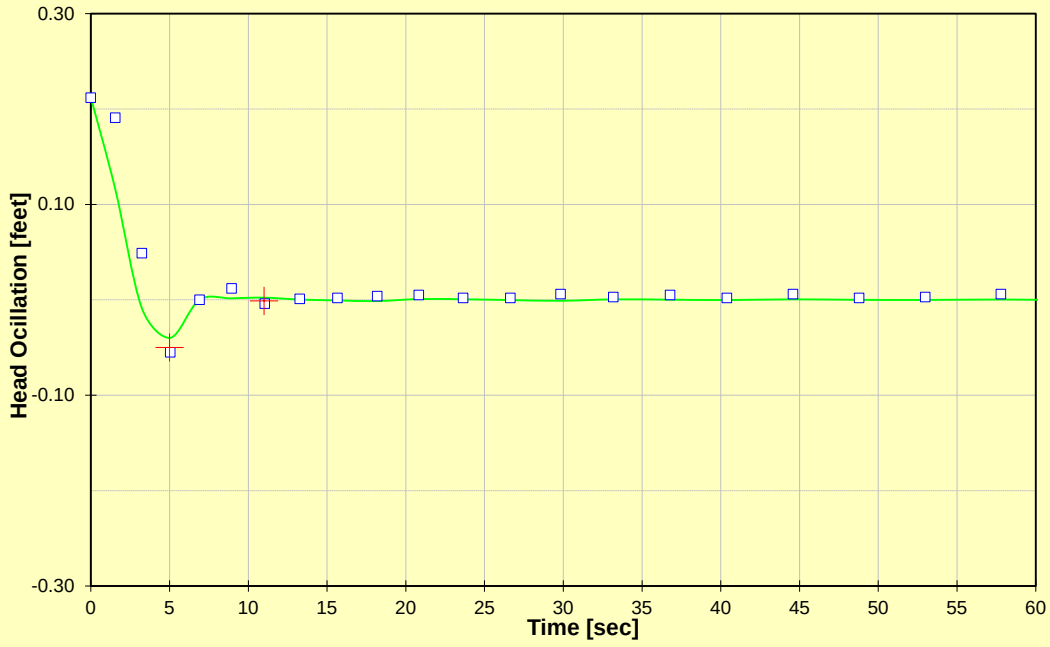
$$b = -a\ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma/(g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	1.23358	ft^2
r_s =	0.08	ft	d =	0.5285	ft^{-1}
L_c =	19.14	ft	a =	0.00203	ft^3
L_s =	9.98	ft	t_1 =	5.00	sec
w =	1.0472	ft^{-1}	t_2 =	11.00	sec
g =	0.6520	ft^{-1}	$h(t_1)$ =	0.05	ft
L =	21.15	ft^3/sec^2	$h(t_2)$ =	0.00	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	1.95E-02	ft^2/sec	a < 0.1?	YES
T =	1.02E-02	ft^2/sec	d < 0.7?	YES
T =	8.77E+02	ft^2/day	L_1 =	21.15
K =	3.01E+01	ft/day	L_2 =	24.13
K =	1.06E-02	cm/sec	L_1:L_2 Diff <20% ?	YES



Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/07/16

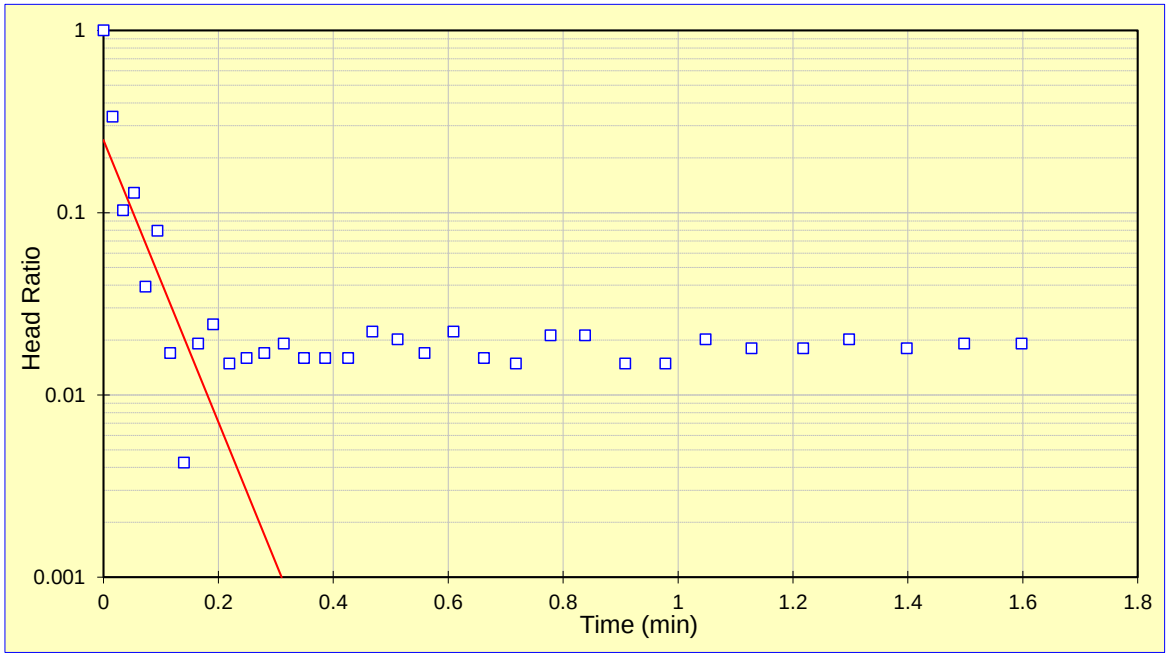
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13B (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	1.06E-02	cm/sec
t_1 =	0	K=	3.00E+01	ft/day
t_2 =	0.31			
h_1/h_0 =	0.25			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

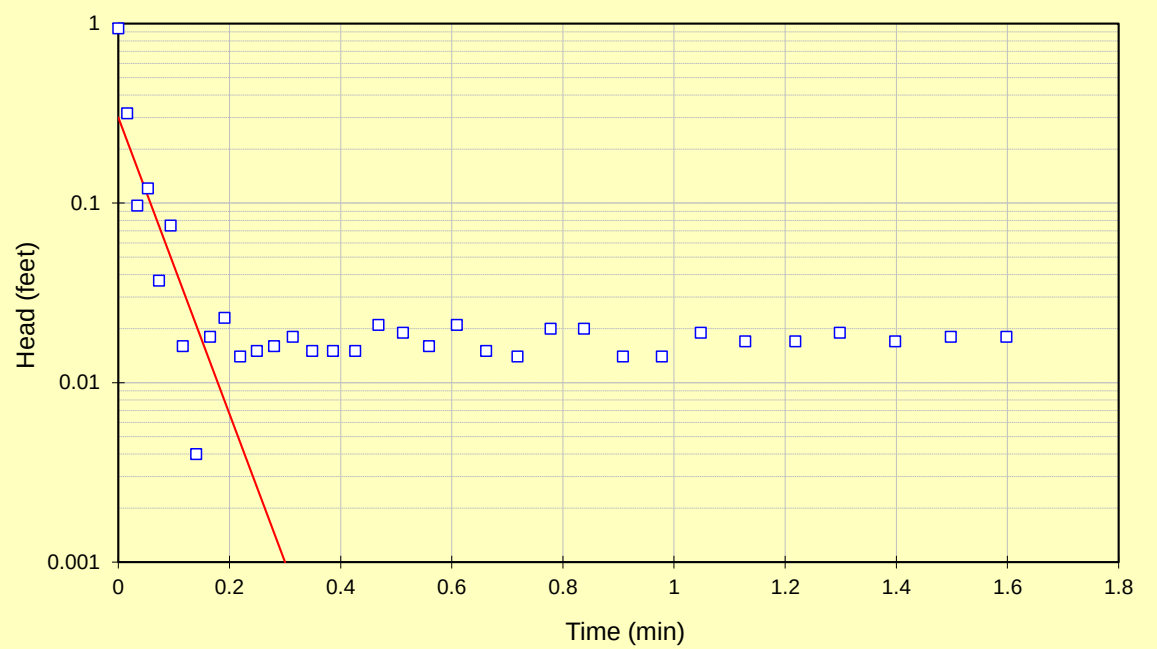
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.22
y_0 =	0.30
y_t =	0.001
t =	0.3

RESULTS

K=	1.08E-02	cm/sec
K=	3.06E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

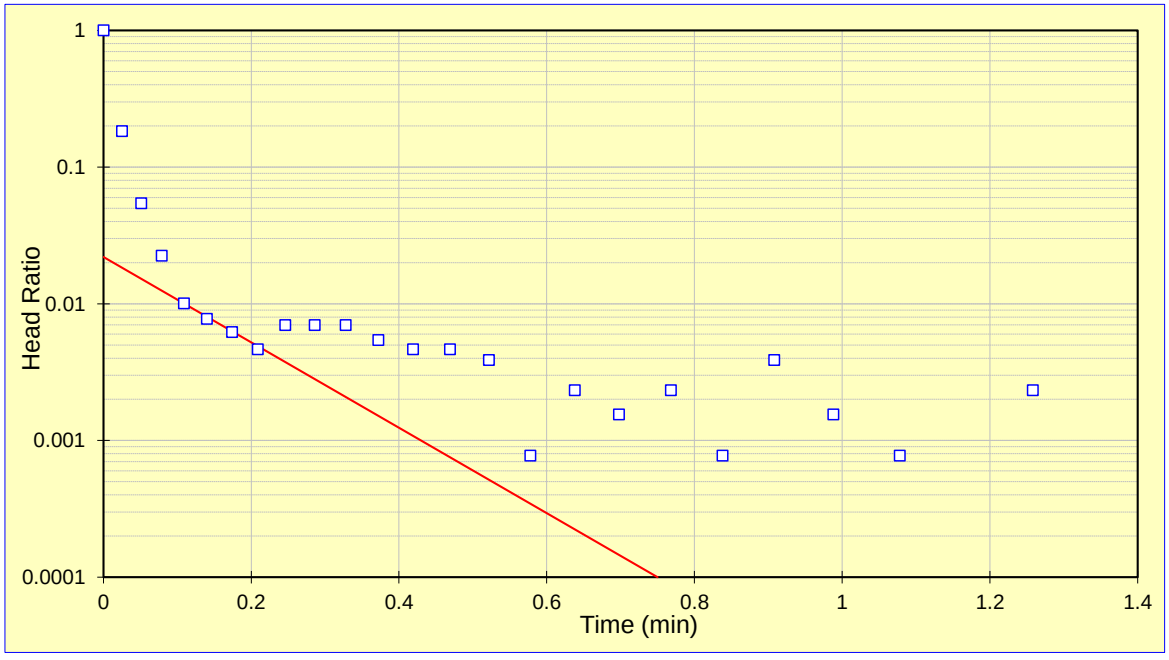
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15 (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.20			
R_e =	0.34			
L_e =	9.417	K=	2.59E-02	cm/sec
t_1 =	0	K=	7.34E+01	ft/day
t_2 =	0.75			
h_1/h_0 =	0.02			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15 (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

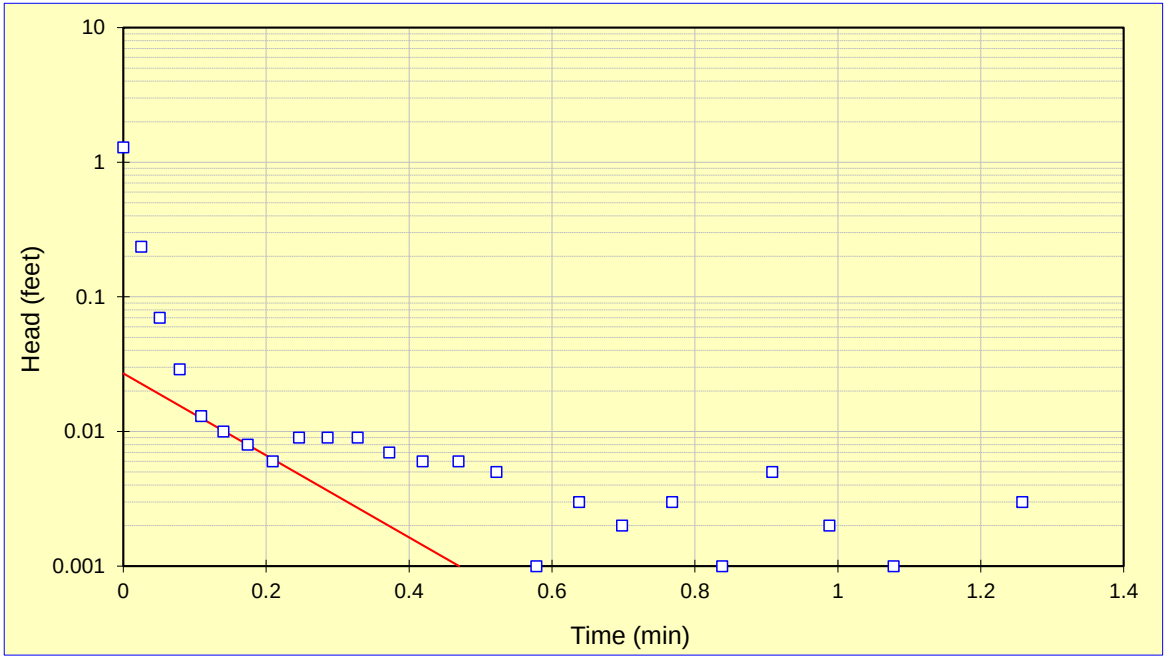
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.20
r_w =	0.34
L_e =	9.417
$\ln(R_e/r_w)$=	2.14
y_0 =	0.03
y_t =	0.001
t =	0.5

RESULTS

K=	1.63E-02	cm/sec
K=	4.63E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

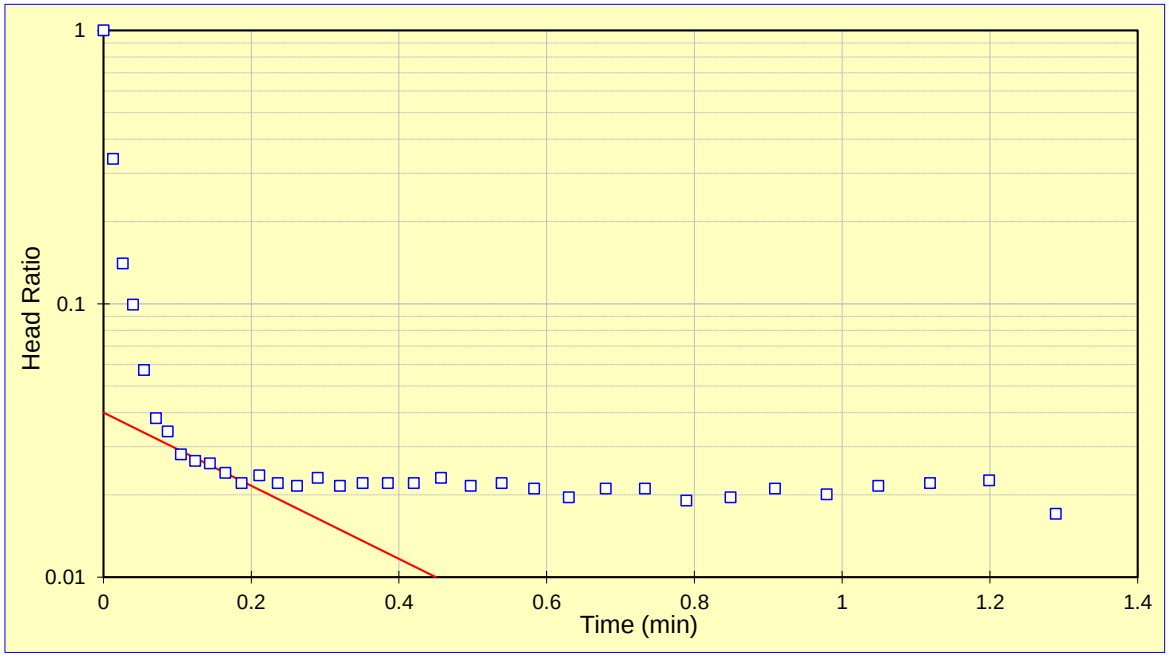
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15 (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.20			
R_e =	0.34			
L_e =	9.348	K=	1.11E-02	cm/sec
t_1 =	0	K=	3.16E+01	ft/day
t_2 =	0.45			
h_1/h_0 =	0.04			
h_2/h_0 =	0.01			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

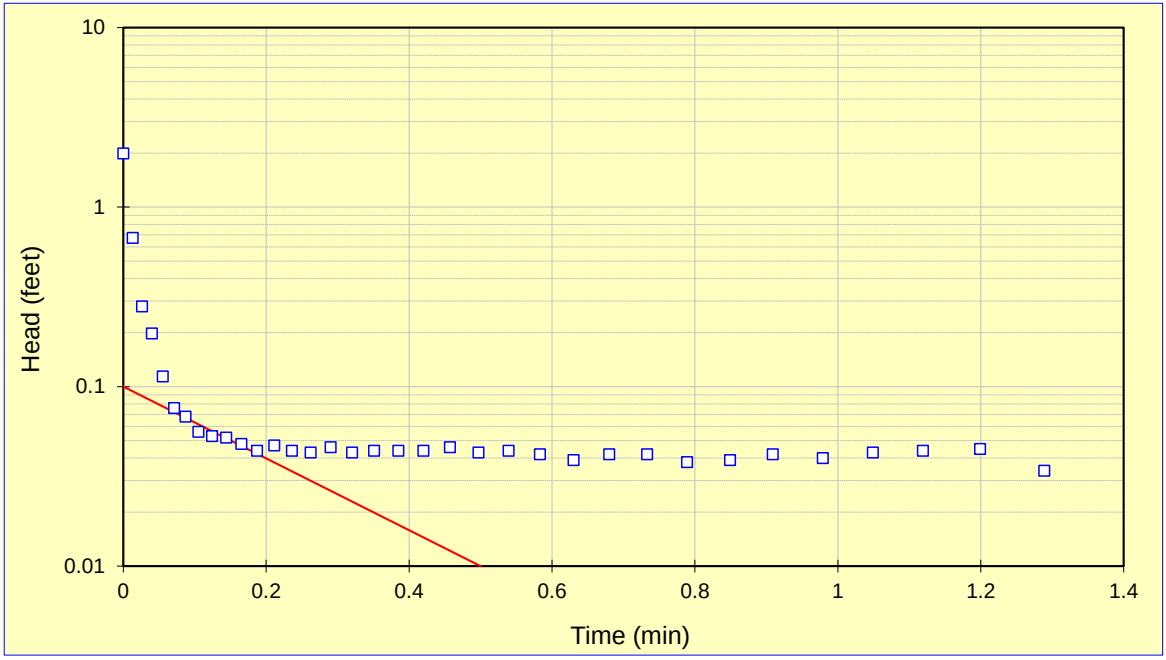
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.20
r_w =	0.34
L_e =	9.348
$\ln(R_e/r_w)$=	2.13
y_0 =	0.10
y_t =	0.010
t =	0.5

RESULTS

K=	1.08E-02	cm/sec
K=	3.05E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

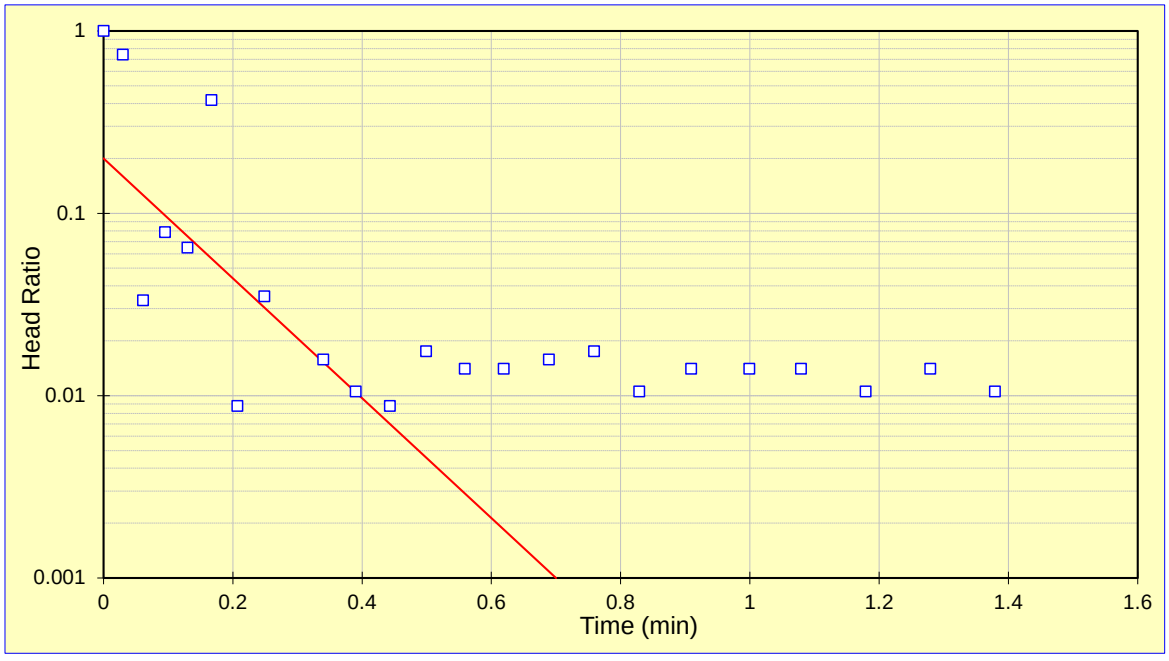
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-15B (TEST 1)

$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	4.50E-03	cm/sec
t_1 =	0	K=	1.28E+01	ft/day
t_2 =	0.7			
h_1/h_0 =	0.20			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-15B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

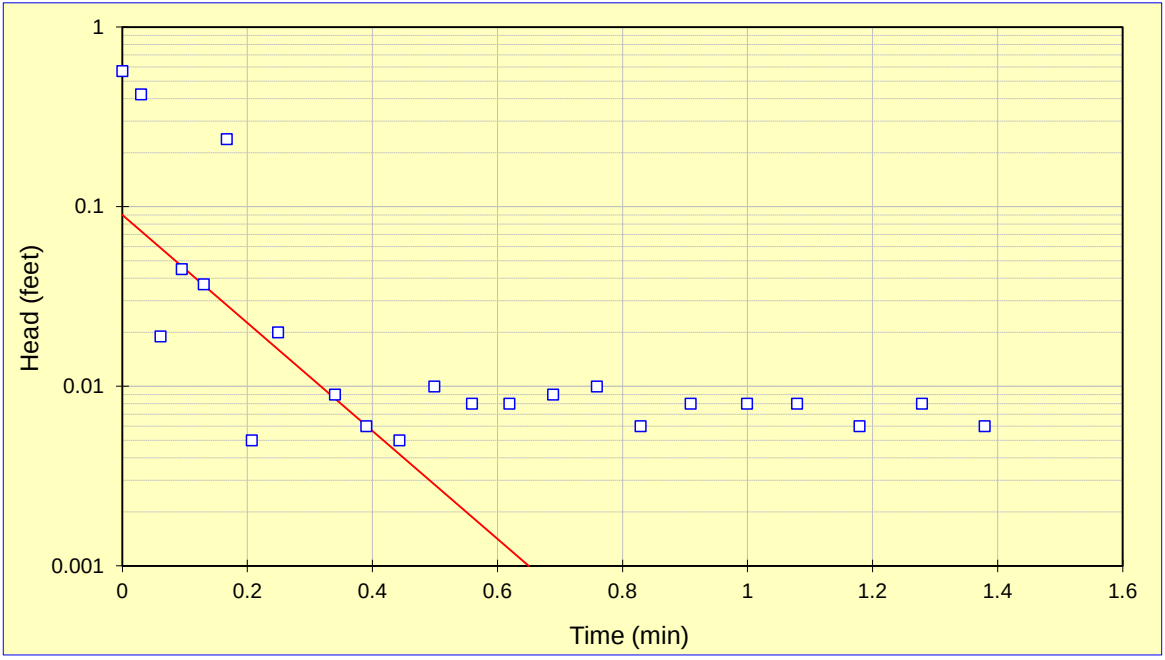
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.83
y_0 =	0.09
y_t =	0.001
t =	0.7

RESULTS

K=	3.45E-03	cm/sec
K=	9.79E+00	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP FALLING HEAD SLUG TEST ANALYSIS
UNDERDAMPED SLUG TEST GAMW-15B (TEST 2)

$$T = b + a \ln T$$

where:

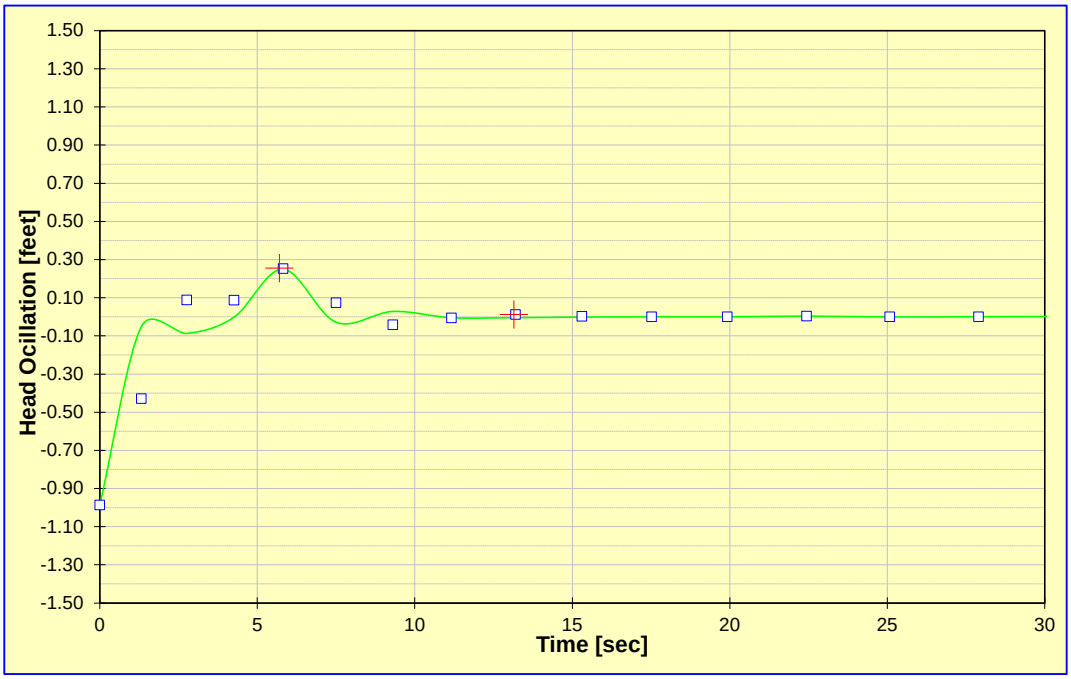
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	0.93787	ft^2
r_s =	0.08	ft	d =	0.4374	ft^{-1}
L_c =	19.23	ft	a =	0.00186	ft^3
L_s =	10.00	ft	t_1 =	5.70	sec
w =	0.8434	ft^{-1}	t_2 =	13.15	sec
g =	0.4102	ft^{-1}	$h(t_1)$ =	0.26	ft
L =	36.60	ft^3/sec^2	$h(t_2)$ =	0.01	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	1.84E-02	ft^2/sec	a < 0.1?	YES
T =	9.76E-03	ft^2/sec	d < 0.7?	YES
T =	8.44E+02	ft^2/day	L_1 =	36.60
K =	2.70E+01	ft/day	L_2 =	24.23
K =	9.53E-03	cm/sec	L_1:L_2 Diff <20% ?	NO



Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-15B (TEST 2)

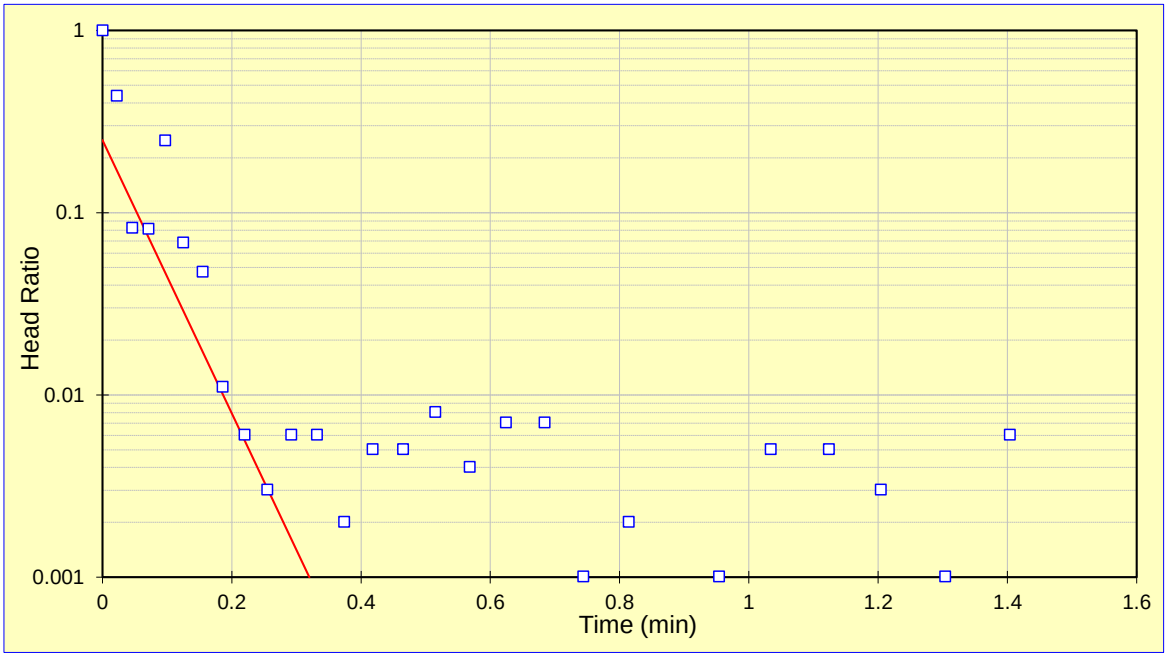
$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	10
t_1 =	0
t_2 =	0.32
h_1/h_0 =	0.25
h_2/h_0 =	0.00

RESULTS

K=	1.03E-02	cm/sec
K=	2.91E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-15B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

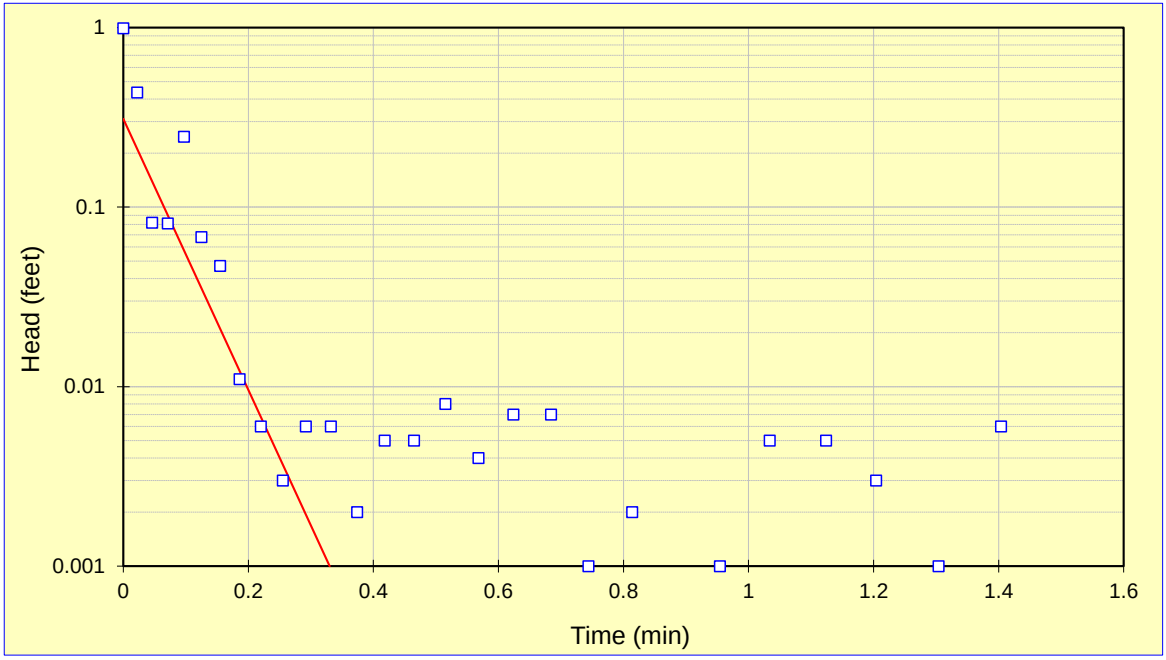
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.85
y_0 =	0.31
y_t =	0.001
t =	0.3

RESULTS

K=	8.75E-03	cm/sec
K=	2.48E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP RISING HEAD SLUG TEST ANALYSIS

UNDERDAMPED SLUG TEST GAMW-15B (TEST 1)

$$T = b + a \ln T$$

where:

$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$

$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$

$$d = \gamma / (g/L)^{1/2}$$

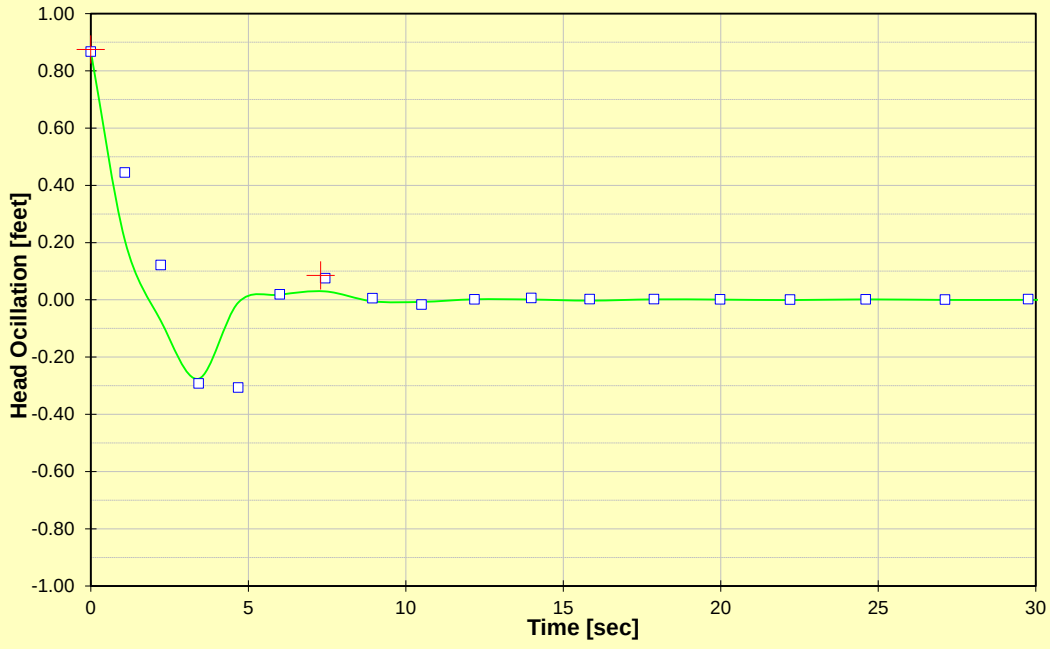
$$L = g/\left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	0.91806	ft^2
r_s =	0.08	ft	d =	0.3479	ft^{-1}
L_c =	19.23	ft	a =	0.00229	ft^3
L_s =	10.00	ft	t_1 =	0.00	sec
w =	0.8607	ft^{-1}	t_2 =	7.30	sec
g =	0.3194	ft^{-1}	$h(t_1)$ =	0.88	ft
L =	38.19	ft^3/sec^2	$h(t_2)$ =	0.09	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	2.27E-02	ft^2/sec	a < 0.1?	YES
T =	1.27E-02	ft^2/sec	d < 0.7?	YES
T =	1.09E+03	ft^2/day	L_1 =	38.19
K =	3.50E+01	ft/day	L_2 =	24.23
K =	1.24E-02	cm/sec	L_1:L_2 Diff <20% ?	NO



Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/08/16

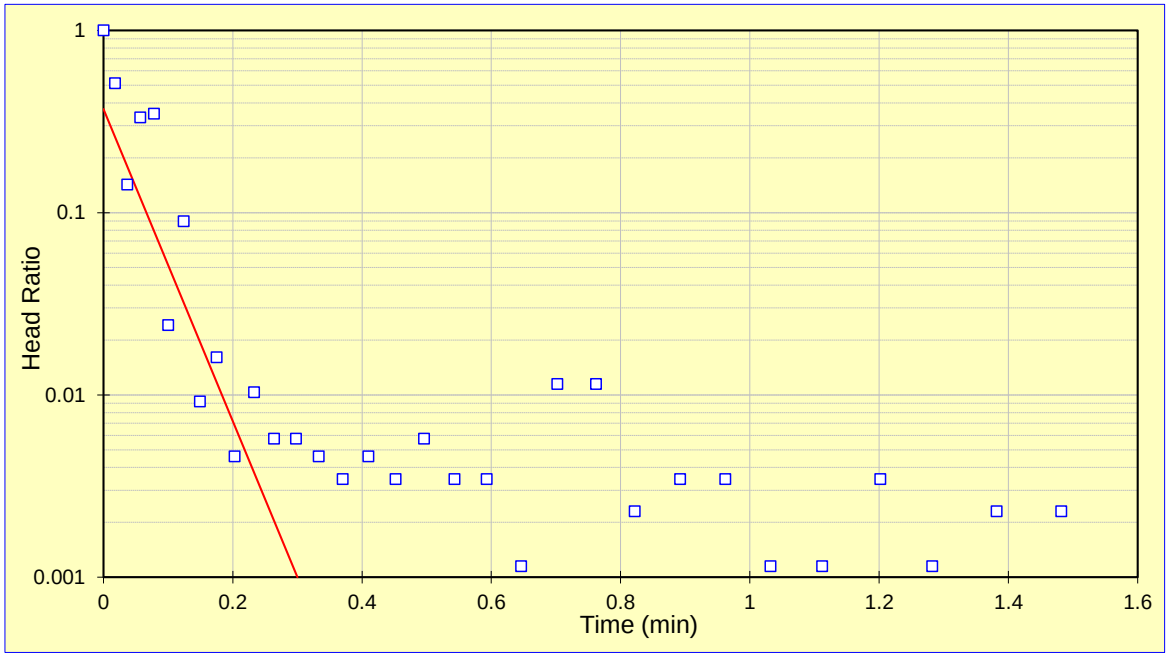
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15B (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	1.17E-02	cm/sec
t_1 =	0	K=	3.32E+01	ft/day
t_2 =	0.3			
h_1/h_0 =	0.37			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

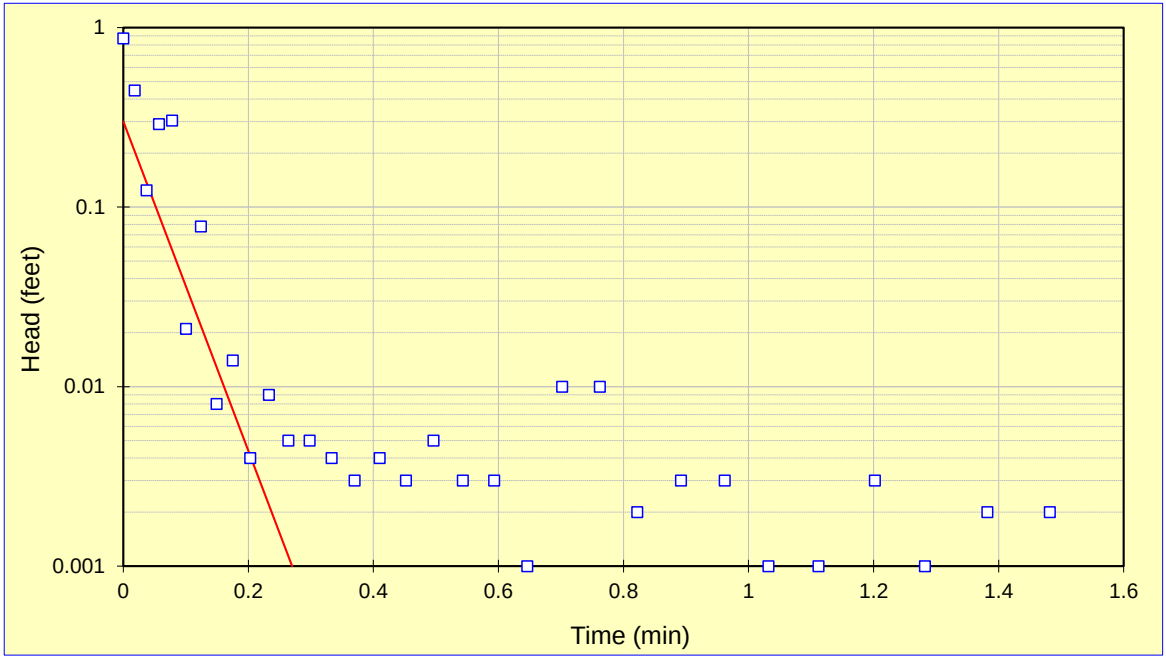
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.85
y_0 =	0.30
y_t =	0.001
t =	0.3

RESULTS

K=	1.06E-02	cm/sec
K=	3.02E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP RISING HEAD SLUG TEST ANALYSIS
UNDERDAMPED SLUG TEST GAMW-15B (TEST 2)

$$T = b + a \ln T$$

where:

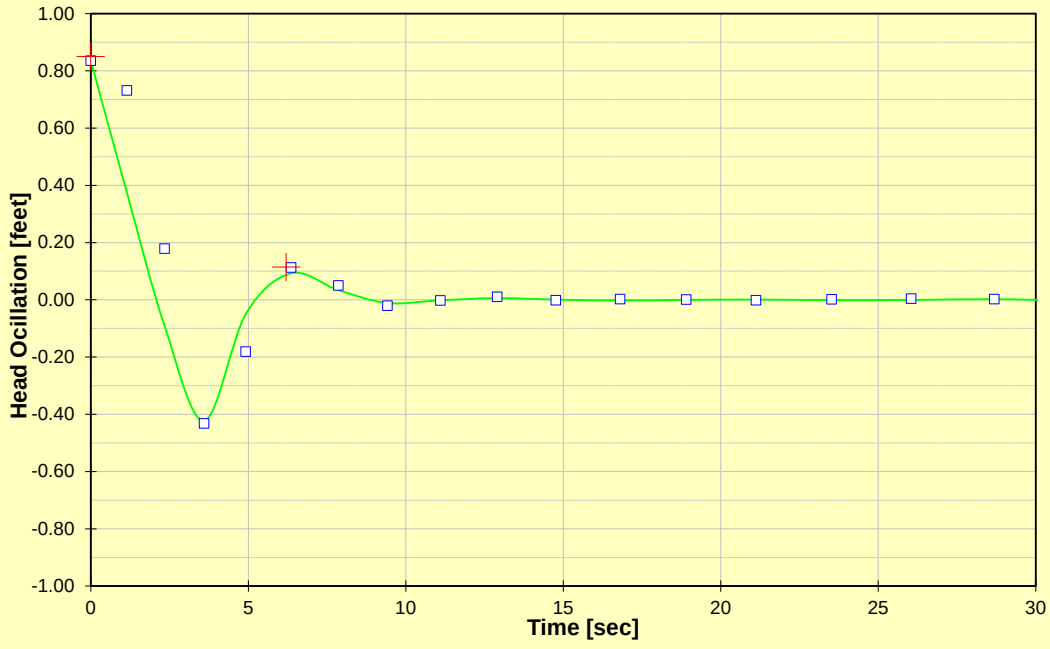
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	1.06353	ft^2
r_s =	0.08	ft	d =	0.3034	ft^{-1}
L_c =	19.22	ft	a =	0.00304	ft^3
L_s =	10.00	ft	t_1 =	0.00	sec
w =	1.0134	ft^{-1}	t_2 =	6.20	sec
g =	0.3226	ft^{-1}	$h(t_1)$ =	0.85	ft
L =	28.46	ft^3/sec^2	$h(t_2)$ =	0.12	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	2.97E-02	ft^2/sec	a < 0.1?	YES
T =	1.73E-02	ft^2/sec	d < 0.7?	YES
T =	1.50E+03	ft^2/day	L_1 =	28.46
K =	4.80E+01	ft/day	L_2 =	24.22
K =	1.69E-02	cm/sec	L_1:L_2 Diff <20% ?	YES



Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/07/16

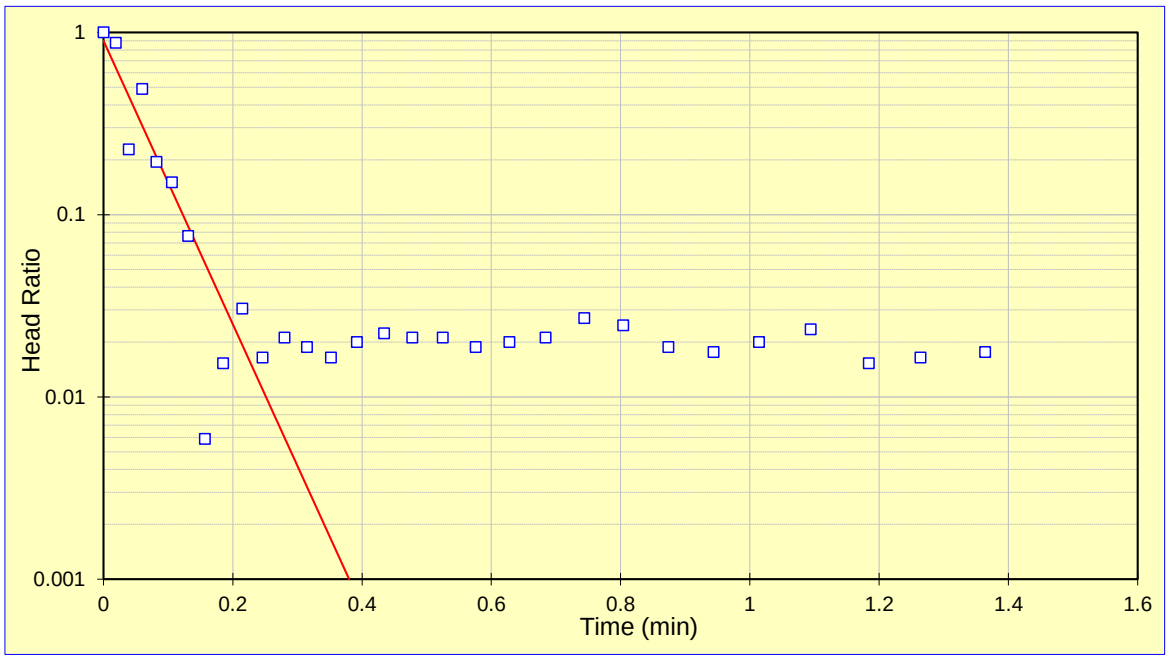
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15B (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	1.06E-02	cm/sec
t_1 =	0	K=	3.02E+01	ft/day
t_2 =	0.38			
h_1/h_0 =	0.90			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

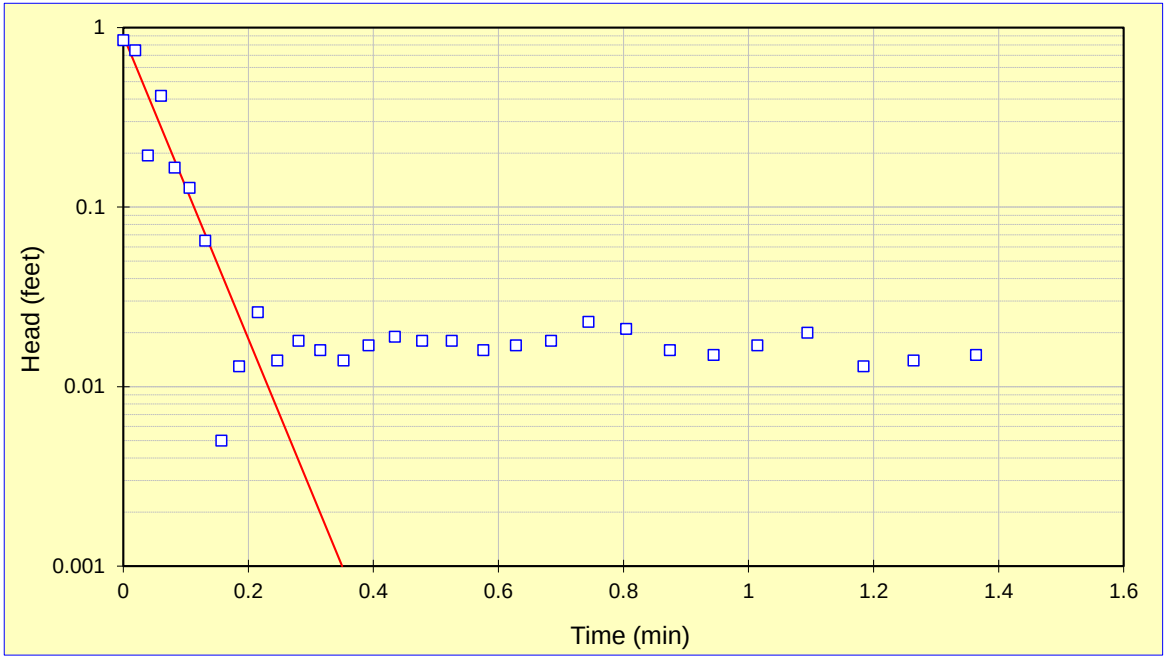
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.85
y_0 =	0.90
y_t =	0.001
t =	0.4

RESULTS

K=	9.79E-03	cm/sec
K=	2.77E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

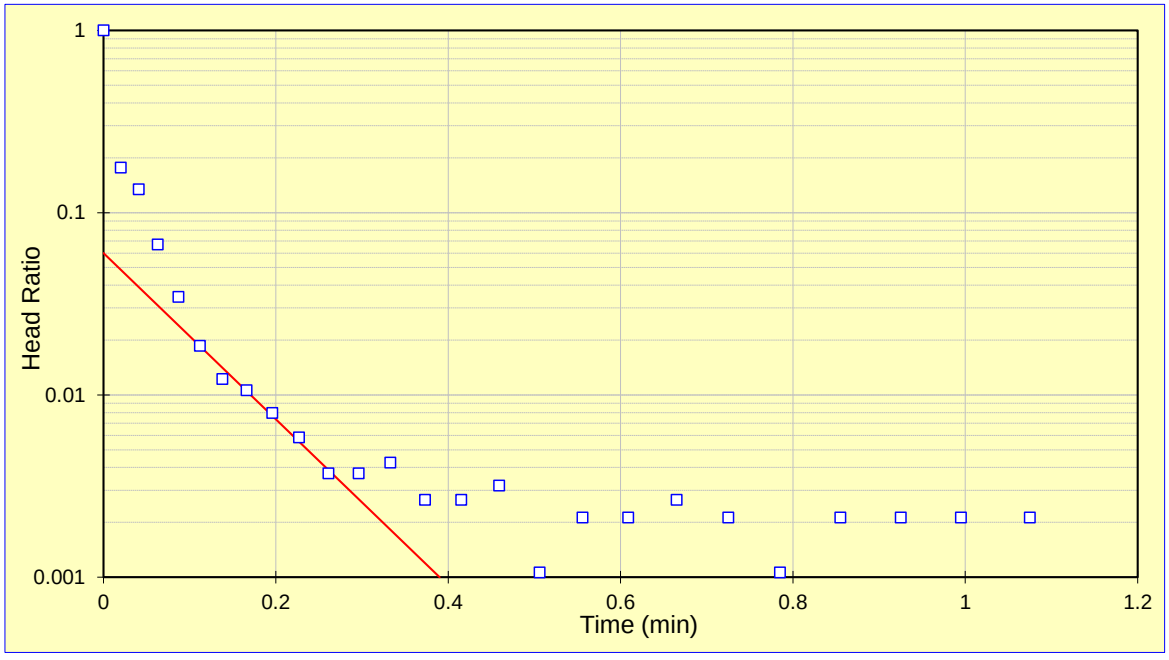
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19 (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.20			
R_e =	0.34			
L_e =	9.705	K=	3.70E-02	cm/sec
t_1 =	0	K=	1.05E+02	ft/day
t_2 =	0.39			
h_1/h_0 =	0.06			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19 (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

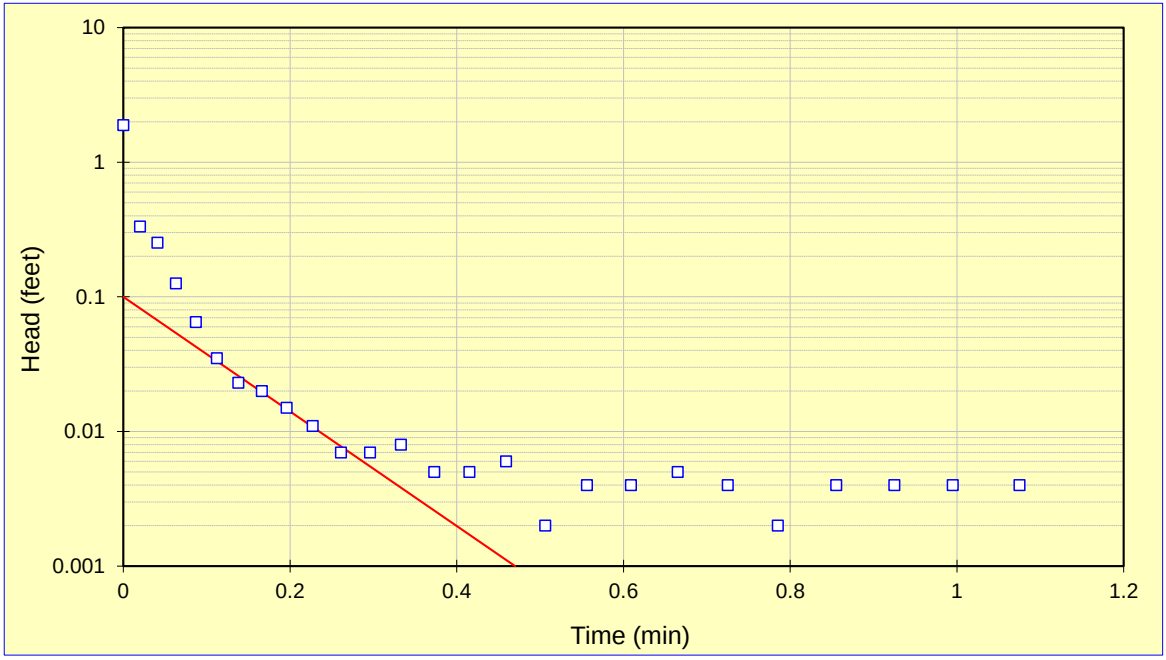
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.20
r_w =	0.34
L_e =	9.705
$\ln(R_e/r_w)$=	2.18
y_0 =	0.10
y_t =	0.001
t =	0.5

RESULTS

K=	2.25E-02	cm/sec
K=	6.38E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19 (TEST 2)

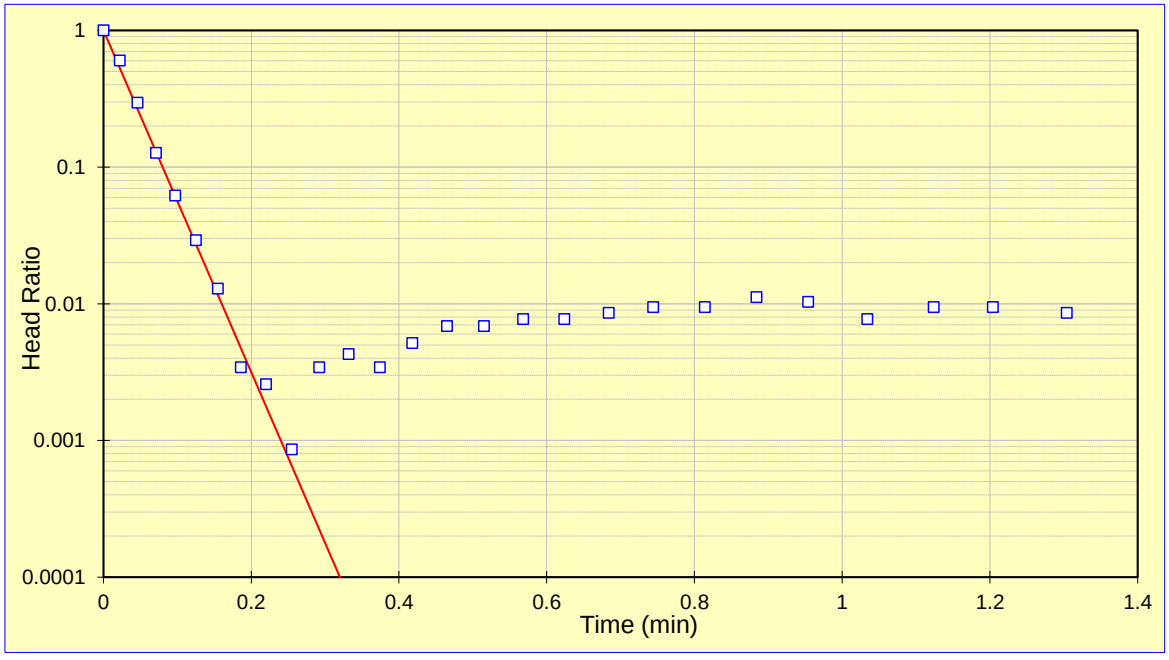
$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.20
R_e =	0.34
L_e =	9.735
t_1 =	0
t_2 =	0.32
h_1/h_0 =	1.00
h_2/h_0 =	0.00

RESULTS

K=	1.01E-01	cm/sec
K=	2.87E+02	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

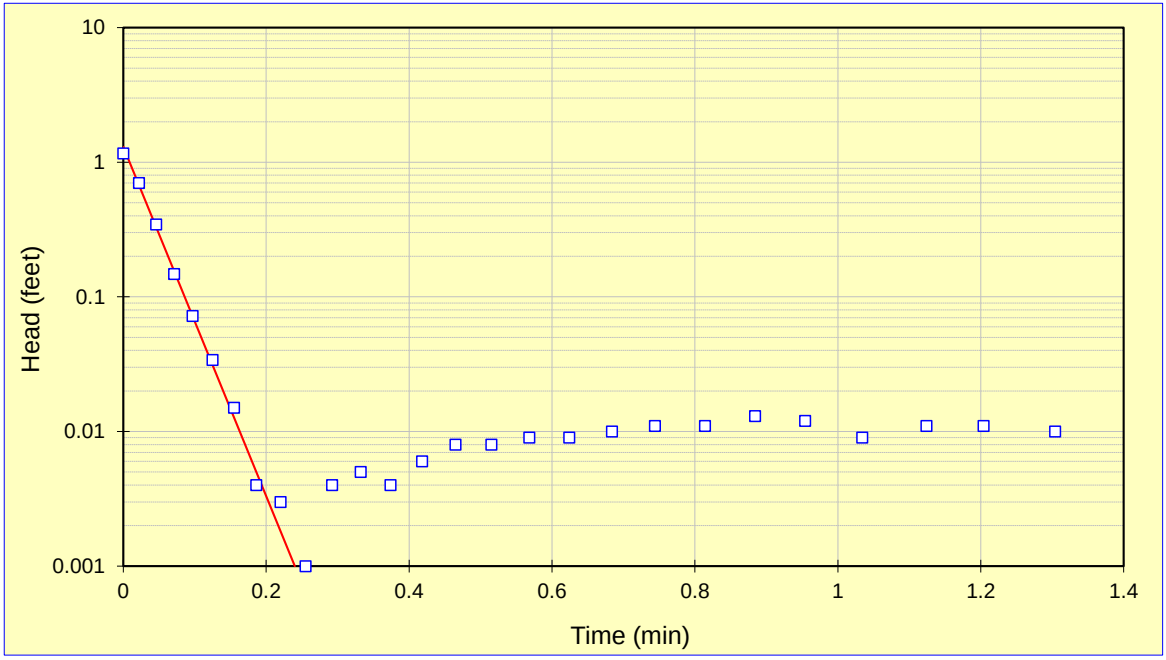
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.20
r_w =	0.34
L_e =	9.735
$\ln(R_e/r_w)$=	2.18
y_0 =	1.30
y_t =	0.001
t =	0.2

RESULTS

K=	6.85E-02	cm/sec
K=	1.94E+02	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

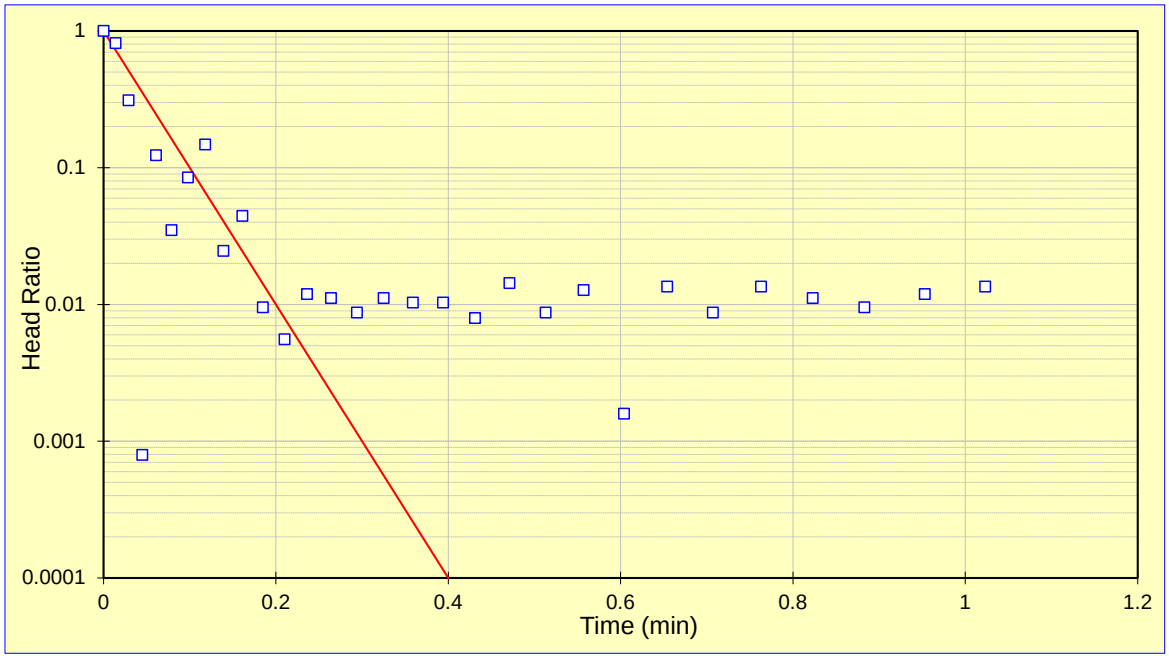
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-19B (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	1.37E-02	cm/sec
t_1 =	0	K=	3.88E+01	ft/day
t_2 =	0.4			
h_1/h_0 =	1.00			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-19B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

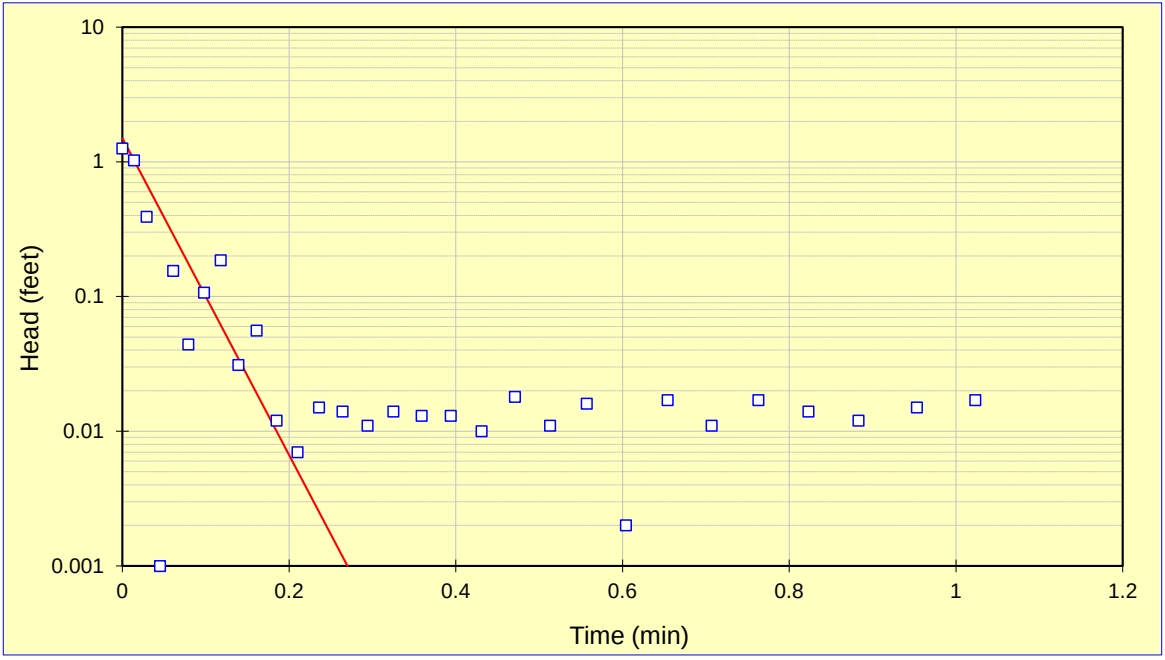
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.02
y_0 =	1.50
y_t =	0.001
t =	0.3

RESULTS

K=	1.44E-02	cm/sec
K=	4.09E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-19B (TEST 2)

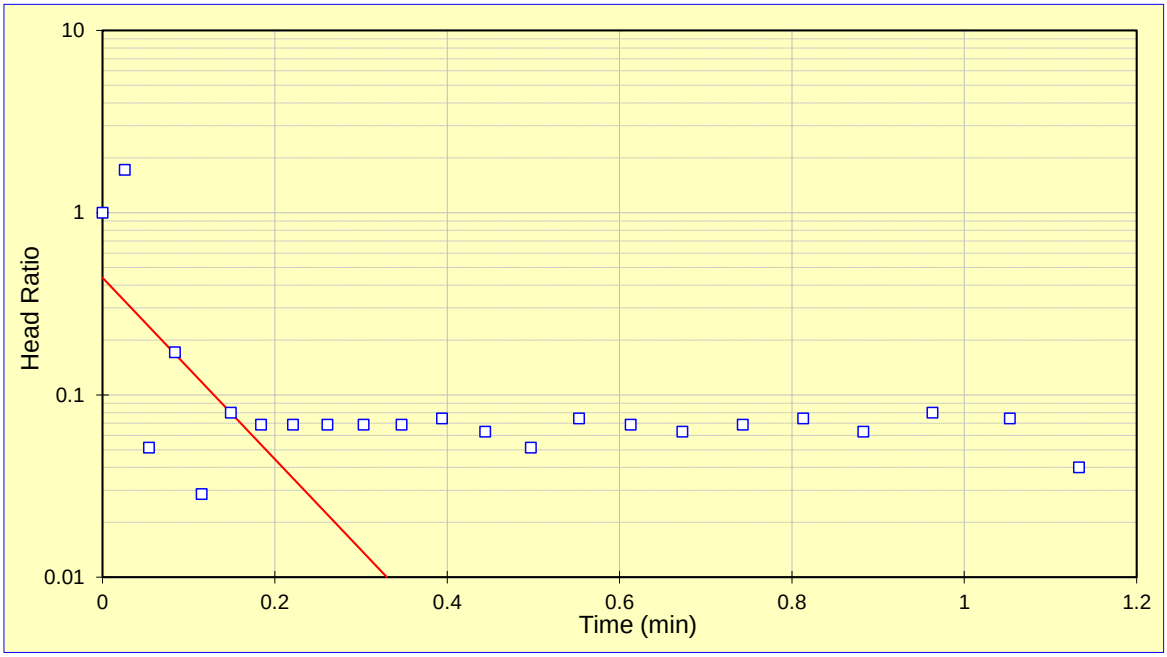
$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	10
t_1 =	0
t_2 =	0.33
h_1/h_0 =	0.44
h_2/h_0 =	0.01

RESULTS

K=	6.82E-03	cm/sec
K=	1.93E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-19B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

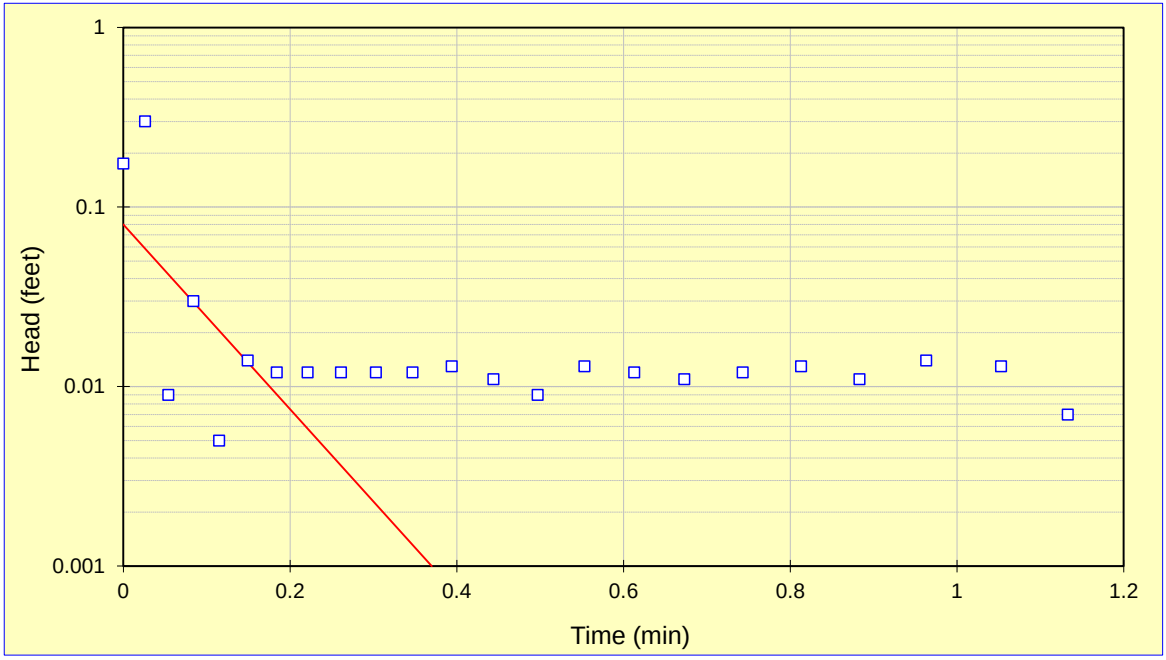
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.02
y_0 =	0.08
y_t =	0.001
t =	0.4

RESULTS

K=	6.31E-03	cm/sec
K=	1.79E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP RISING HEAD SLUG TEST ANALYSIS
UNDERDAMPED SLUG TEST GAMW-19B (TEST 1)

$$T = b + a \ln T$$

where:

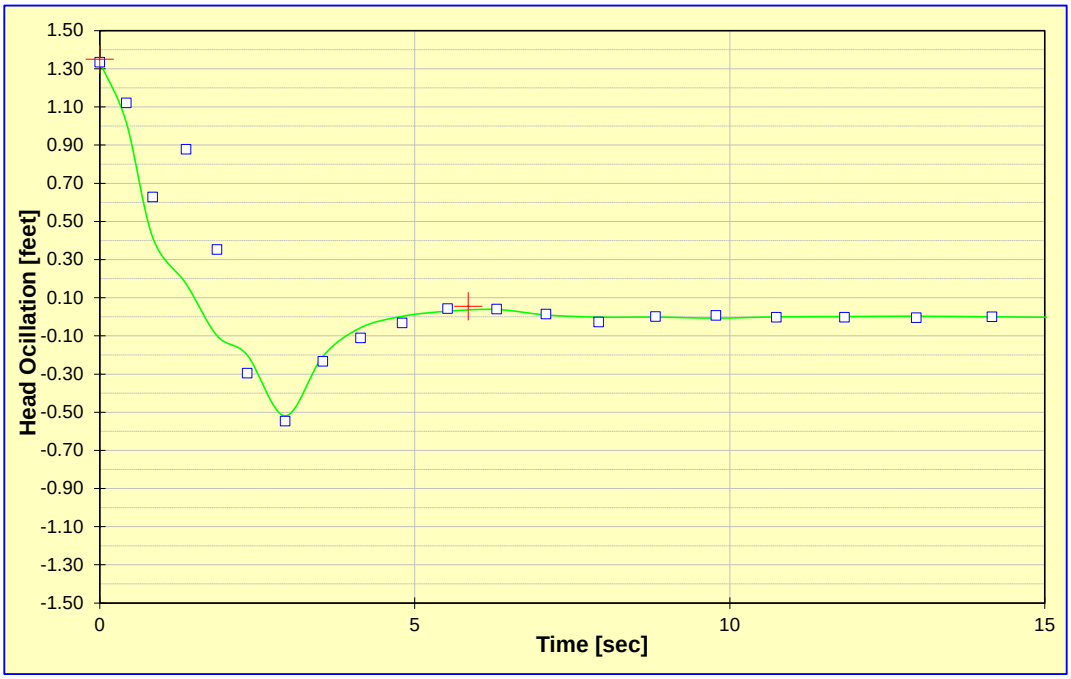
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	1.20536	ft^2
r_s =	0.08	ft	d =	0.4539	ft^{-1}
L_c =	17.92	ft	a =	0.00231	ft^3
L_s =	10.00	ft	t_1 =	0.00	sec
w =	1.0740	ft^{-1}	t_2 =	5.85	sec
g =	0.5471	ft^{-1}	$h(t_1)$ =	1.35	ft
L =	22.16	ft^3/sec^2	$h(t_2)$ =	0.06	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	2.22E-02	ft^2/sec	a < 0.1?	YES
T =	1.20E-02	ft^2/sec	d < 0.7?	YES
T =	1.04E+03	ft^2/day	L_1 =	22.16
K =	3.67E+01	ft/day	L_2 =	22.92
K =	1.29E-02	cm/sec	L_1:L_2 Diff <20% ?	YES



Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19B (TEST 1)

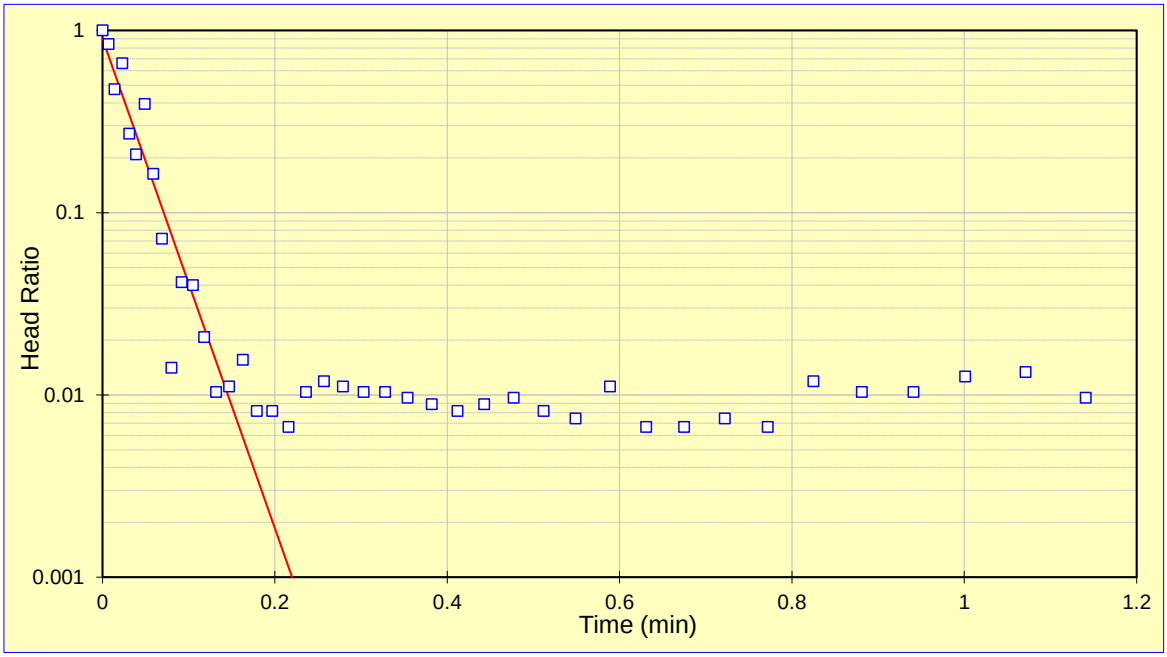
$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	10
t_1 =	0
t_2 =	0.22
h_1/h_0 =	0.90
h_2/h_0 =	0.00

RESULTS

K=	1.84E-02	cm/sec
K=	5.21E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

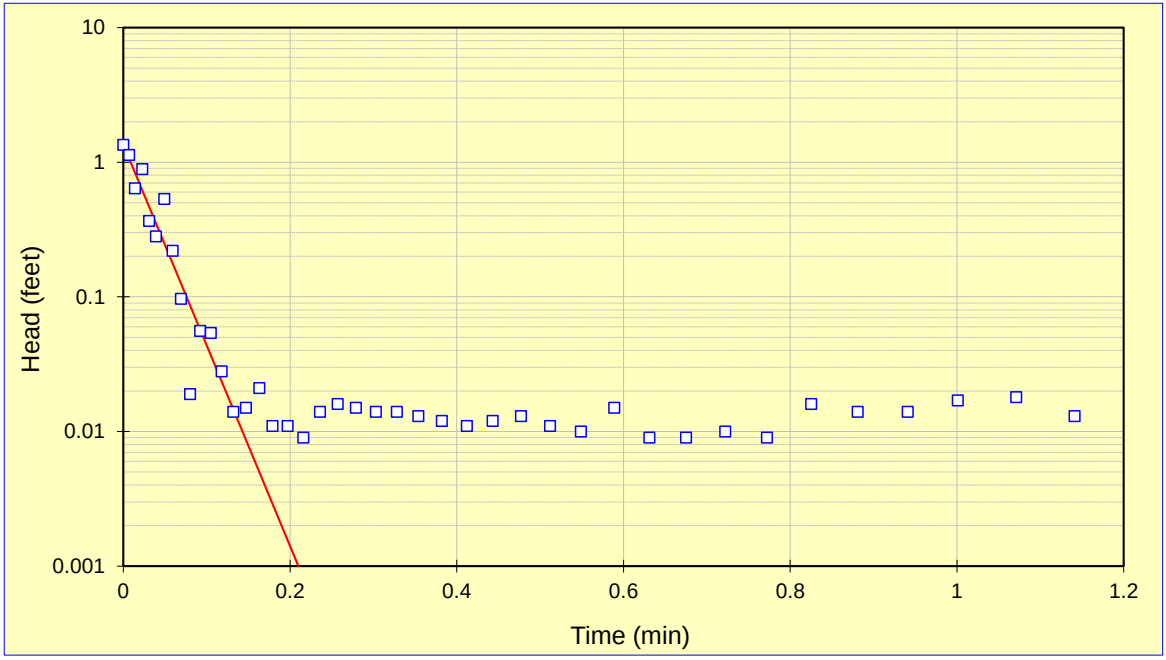
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.02
y_0 =	1.35
y_t =	0.001
t =	0.2

RESULTS

K=	1.83E-02	cm/sec
K=	5.18E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP RISING HEAD SLUG TEST ANALYSIS
UNDERDAMPED SLUG TEST GAMW-19B (TEST 2)

$$T = b + a \ln T$$

where:

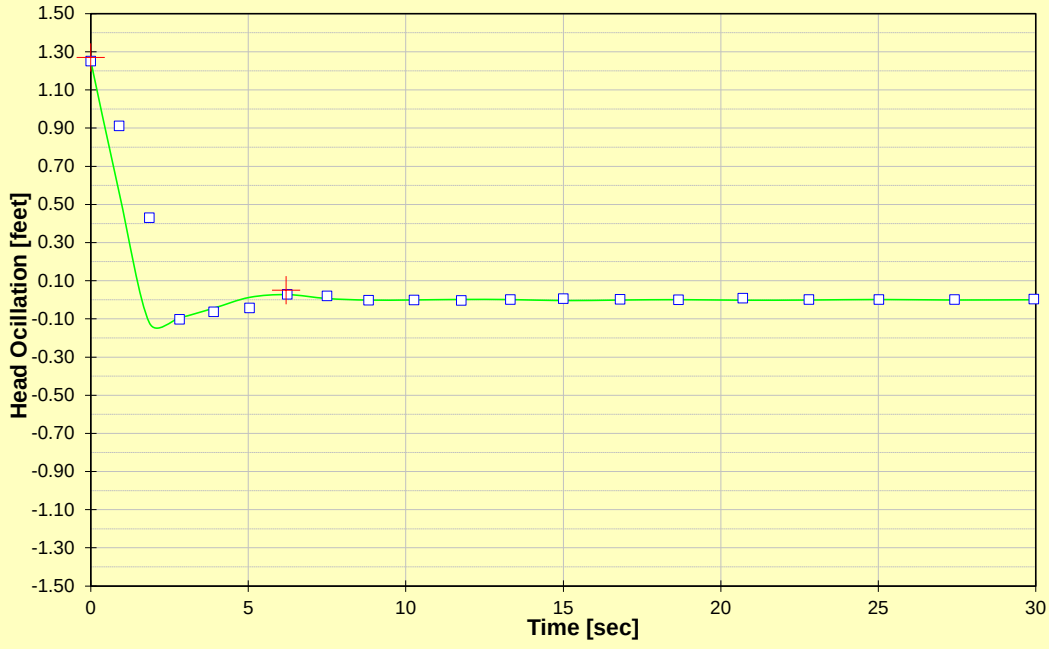
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	1.13983	ft^2
r_s =	0.08	ft	d =	0.4577	ft^{-1}
L_c =	17.95	ft	a =	0.00216	ft^3
L_s =	10.00	ft	t_1 =	0.00	sec
w =	1.0134	ft^{-1}	t_2 =	6.20	sec
g =	0.5217	ft^{-1}	$h(t_1)$ =	1.27	ft
L =	24.78	ft^3/sec^2	$h(t_2)$ =	0.05	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	2.09E-02	ft^2/sec	a < 0.1?	YES
T =	1.12E-02	ft^2/sec	d < 0.7?	YES
T =	9.69E+02	ft^2/day	L_1 =	24.78
K =	3.43E+01	ft/day	L_2 =	22.95
K =	1.21E-02	cm/sec	L_1:L_2 Diff <20% ?	YES



Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/07/16

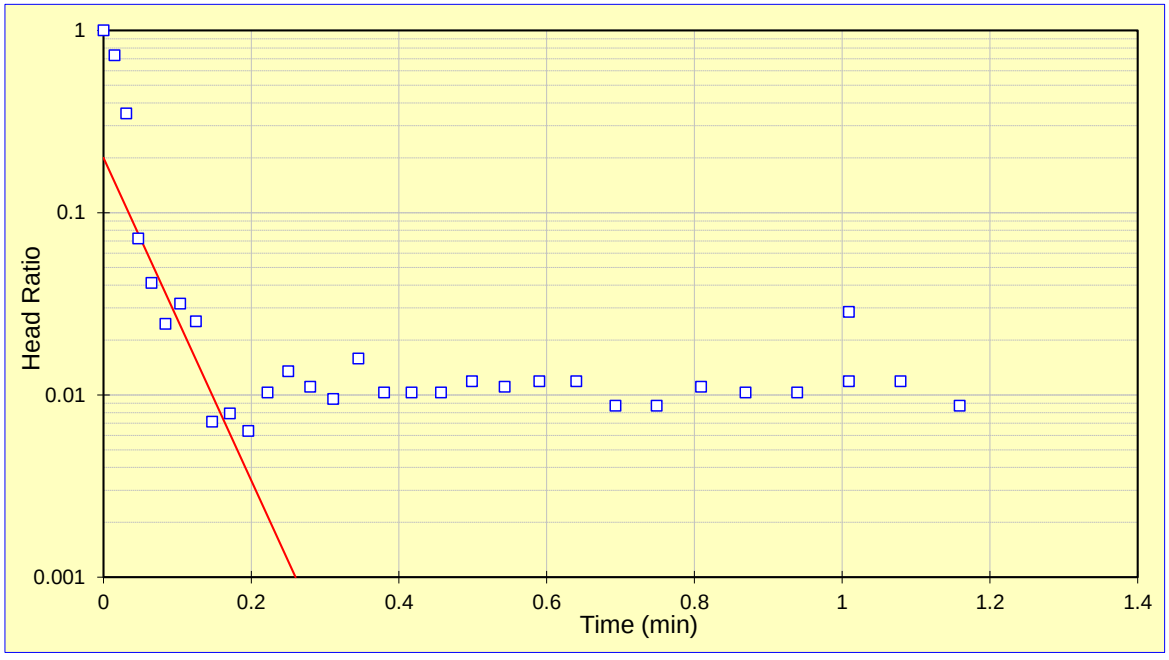
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19B (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	1.21E-02	cm/sec
t_1 =	0	K=	3.43E+01	ft/day
t_2 =	0.26			
h_1/h_0 =	0.20			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

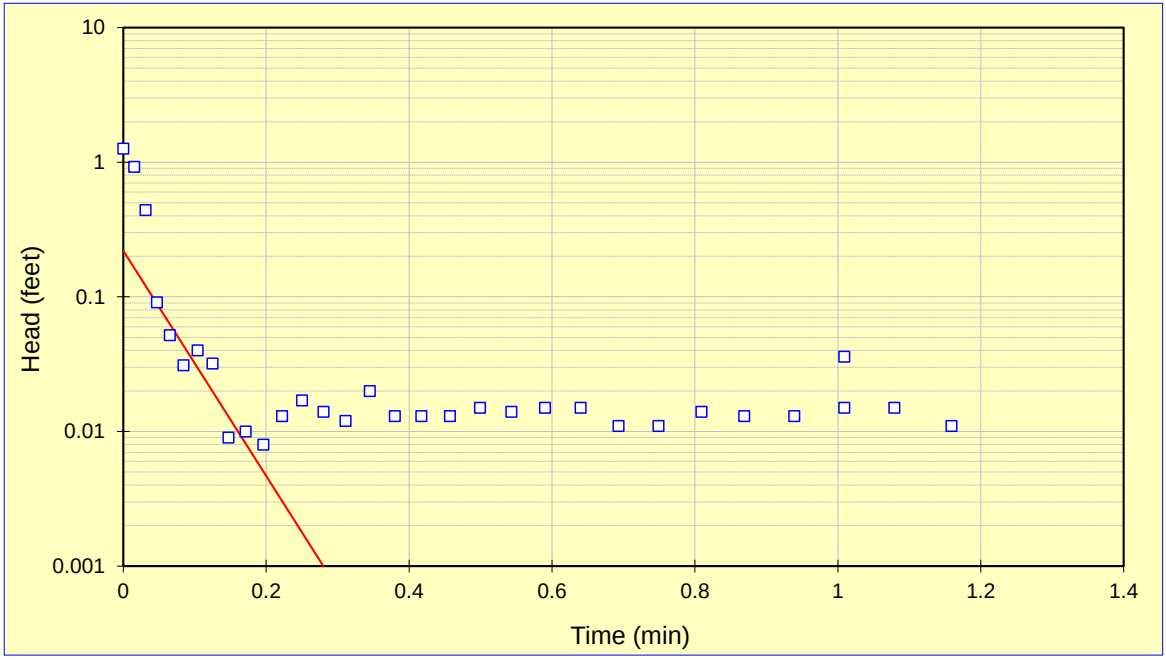
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.02
y_0 =	0.22
y_t =	0.001
t =	0.3

RESULTS

K=	1.03E-02	cm/sec
K=	2.91E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

APPENDIX C

RMSGS AT-01 Pumping Test Report

REPORT

AT-01 Aquifer Test

R. M. Schahfer Generating Station

Submitted to:

Northern Indiana Public Service Company, LLC
R. M. Schahfer Generating Station
Wheatfield, IN

Submitted by:

Golder Associates Inc.
670 North Commercial Street, Suite 103
Manchester, NH 03101
+1 603 668-0880

191-21567

August 2020

Table of Contents

1.0 INTRODUCTION 1

2.0 CONCEPTUAL SITE MODEL 2

3.0 PUMPING WELL DESIGN 2

4.0 FIELD ACTIVITIES AND PROCEDURES 3

4.1 Well and Piezometer Installation 3

4.2 Well and Piezometer Development 3

4.3 Predictive Drawdown Assessment 4

4.4 Pumping Test Set-up and Procedures 4

4.5 Antecedent Groundwater Level Data 5

4.6 Testing Procedures 5

4.6.1 Step-Drawdown Test 5

4.6.2 Constant Rate Discharge Test 6

5.0 DATA ANALYSIS 7

5.1 General Data Evaluation 7

5.2 Drawdown and Recovery Data Evaluation 7

6.0 SUMMARY 8

7.0 REFERENCES 8

TABLES

Table 1 Well and Piezometer Construction Summary
Table 2 Summary of Hydraulic Conductivity Estimates Based on Grain Size Analysis
Table 3 Flow Meter Readings Obtained During the 24-Hour Aquifer Test
Table 4 Manual Groundwater Elevations Measured During the Aquifer Test
Table 5 Summary of Aquifer Test Results

FIGURES

Figure 1 Site Location Map
Figure 2 August 2018 Groundwater Elevation Contour Map
Figure 3 Aquifer Test Well and Piezometer Location Plan
Figure 4 Background Groundwater Hydrograph
Figure 4a Background Groundwater Hydrograph (OW-2B and GAMW-18)
Figure 5 Step Test Drawdown/Recovery Graph
Figure 6 Pumping Well Transducer and Manual Drawdown and Recovery Graph
Figure 7 Aquifer Test Drawdown Hydrograph
Figure 8 Aquifer Test Recovery Hydrograph
Figure 9a Comparison of Transducer Data and Manual Drawdown Graph (OW-7B)
Figure 9b Comparison of Transducer Data and Manual Drawdown Graph (GAMW-18B)
Figure 10 Potentiometric Surface Map Prior to Aquifer Test
Figure 11 Potentiometric Surface Map of Maximum Drawdown Conditions

APPENDICES

APPENDIX A
Pumping Well Design

APPENDIX B
Hydraulic Conductivity Data

APPENDIX C
Well and Piezometer Borehole Logs

APPENDIX D
Photograph Log

APPENDIX E
Aquifer Test Analyses

Acronyms

amsl	above mean sea level
bgs	below ground surface
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
cm/s	centimeters per second
DA	Drying Area
ft	feet
GMPIM	Groundwater Monitoring Program Implementation Manual
Golder	Golder Associates Inc.
gpm	gallons per minute
GWPS	Groundwater Protection Standards
Layne	Layne Christensen Company
MCWB	Metal Cleaning Waste Basin
MSRB	Material Storage Runoff Basin
NIPSCO LLC	Northern Indiana Public Service Company LLC
ORP	oxygen reduction potential
PVC	polyvinyl chloride
RMSGS	Rollin M. Schahfer Generating Station

1.0 INTRODUCTION

Golder Associates Inc. (Golder) prepared this Aquifer Test-01 Report for the Rollin M. Schahfer Generating Station (RMSGS, Site) on behalf of Northern Indiana Public Service Company LLC (NIPSCO LLC). The Site is located at 2723 E 1500 N Road, Wheatfield, Jasper County, Indiana (Latitude 41° 12' 36" and Longitude 87° 01' 48", see Figure 1). NIPSCO LLC manages coal combustion residuals (CCR) in surface impoundments subject to applicable requirements of 40 Code of Federal Regulations (CFR) Part 257 as amended (CCR Rule) including the Multi-Cell Unit (i.e., Material Storage Runoff Basin - MSRB, Metal Cleaning Waste Basin - MCWB, and Drying Area, see Figure 2).

In accordance with provisions of the CCR Rule groundwater monitoring regulations, NIPSCO LLC monitors the MSRB, MWCB, and Drying Area as a single unit due to their proximity to one another and because there is no practical means of monitoring groundwater between the individual impoundments. Following the installation of a groundwater monitoring system in 2016, Golder collected background groundwater samples and performed Detection Monitoring at the Multi-Cell Unit pursuant to the requirements of 40 CFR §257.94 and corresponding State of Indiana requirements. In 2018, Golder performed the first and second Assessment Monitoring sampling events pursuant to the requirements of 40 CFR §257.95 and corresponding State of Indiana requirements.

Following the first Assessment Monitoring groundwater monitoring event, including verification sampling, NIPSCO LLC posted a notification to the publicly accessible website that there were detections of Appendix IV parameters downgradient of the Multi-Cell Unit above the groundwater protection standards (GWPS). In response, NIPSCO LLC completed the requisite Assessment of Corrective Measures (ACM, dated April 2019) and began preparing the Selection of Remedy Report for the Multi-Cell Unit. The Selection of Remedy Report includes an evaluation of groundwater treatment alternatives (e.g., monitored natural attenuation, pump and treat, capping, vertical barriers, in-situ stabilization and solidification, etc.) that may be implemented on Site.

To conform with the applicable requirements of 40 CFR §257.97 and corresponding State of Indiana requirements, the selection of remedy includes the analysis of the effectiveness of potential corrective measures based on their overall performance, reliability, ease of implementation, potential impacts of the remedy, time to complete the remedy, and institutional requirements. In the ACM, Golder first identified potential response actions and then screened potential treatment technologies for further consideration in the Selection of Remedy process.

To obtain data necessary to further evaluate potential groundwater remedy(ies) near the Multi-Cell Unit, NIPSCO LLC requested Golder to perform an aquifer test to supplement existing groundwater data including hydraulic conductivity and storativity, and to assess potential groundwater flow influences (e.g., boundary conditions) of the slurry walls surrounding the Multi-Cell Unit. Golder developed the scope and plans for and implemented an aquifer test of the Site uppermost aquifer in June 2019. The test included:

- Installing and developing one fully penetrating (i.e., screened to the top of the underlying shale bedrock), stainless-steel, six-inch diameter pumping well (AT-01)
- Installing and developing thirteen, two-inch diameter polyvinyl chloride (PVC) piezometers (OW-1, OW-2, OW-2B, OW-3, OW-4, OW-5, OW-5B, OW-6, OW-7, OW-7B, OW-8, OW-9, and OW-10)
- Performing a step-drawdown test at the pumping well (AT-01)
- Performing a 24-hour constant rate drawdown test at pumping well (AT-01) followed by recovery monitoring

Section 2 of this report provides a summary of the conceptual site model (CSM), Section 3 describes the field activities and aquifer test procedures, and Section 4 presents the data analysis and results of the aquifer testing.

2.0 CONCEPTUAL SITE MODEL

Golder's interpretation of the Site geology is based on soil borings, bedrock geology maps, prior reports, and CCR Rule-related well installation activities. The stratigraphy of the Site consists of:

- Brown fine to medium-gained glacial outwash sand from the ground surface to approximately 14 feet below ground surface (ft bgs).
- Grayish-brown fine to medium glacial outwash sand from approximately 14 ft bgs to 36 ft bgs (coarsens with depth).
- Black to dark gray shale with planar cleavage (Ellsworth and Antrim Shales). Depth to bedrock is approximately 33 to 36 ft bgs near the Multi-Cell Unit.

The glacial outwash sands that underlie the Multi-Cell Unit comprise the shallow, unconfined uppermost aquifer based on a review of the information outlined above, an interpretation of the definition of the uppermost aquifer provided in 40 CFR §257.53, and regional hydrogeologic reports (Rosenshein and Hunn, 1964; Arihood and Basch, 1994). According to the Unconsolidated Aquifer Systems of Jasper County, Indiana (Maier, 2010), the uppermost aquifer is part of glacial outwash deposits of the Kankakee Aquifer System. The uppermost aquifer has a saturated thickness of approximately 27.5 ft based on an approximate underlying shale elevation of 632.5 feet above mean sea level (ft amsl) and a water table elevation of approximately 660 ft amsl. The shale bedrock acts as an aquitard compared to the overlying, much more highly permeable, uppermost sand aquifer.

Groundwater in the uppermost aquifer flows to the north and northeast as illustrated by the Site-wide phreatic surface map based on groundwater elevations measured in August 2018 (see Figure 2). The overall direction of groundwater flow is towards the Kankakee River, a regional discharge zone, located approximately 1.75 miles northeast of the Site. In the immediate area of the Multi-Cell Unit (and other non-regulated impoundments) groundwater flow direction is influenced by the slurry walls that surround the various units. Hydraulic heads measured inside the slurry walls are higher than those measured just outside the slurry wall/impoundments. This contrast in potentiometric levels indicates that the slurry walls restrict flow from the CCR impoundments to the uppermost aquifer.

3.0 PUMPING WELL DESIGN

To design the pumping test well depth, diameter, and screen length, Golder used laboratory grain size analyses from Site monitoring wells located near the landfill (see Appendix A-1). Specifically, Golder performed grain size analyses on soil samples collected from monitoring wells GAMW-33B, GAMW-34B, GAMW-35B, GAMW-36B, and GAMW-37B to estimate hydraulic conductivity using methods outlined in Driscoll (1986) (see Appendix A-2 through A-12). Grain size data from GAMW-33B were also used to design the filter pack and screen diameter (see Appendix A-13). Golder used the estimated hydraulic conductivity, aquifer thickness, horizontal hydraulic gradient and annual precipitation to design the screen length, well depth (to top of bedrock), well diameter, flow rate, and pump capacity for the pumping well testing (see Appendix A-14).

In 2016, Golder performed slug testing to estimate hydraulic conductivity in eight monitoring wells in accordance with procedures in the Groundwater Monitoring Program Implementation Manual (GMPIM, Golder 2017). Golder field personnel used a pressure transducer and data logger to obtain the head change test data. Golder analyzed

the head change data using the Hvorslev (1951), Bower and Rice (1976) and van der Kamp (1976) methods to estimate the hydraulic conductivity values. The slug test results, measurement data, and calculations are provided in Appendix B. The average hydraulic conductivity for the wells installed in the upper and lower portions of the alluvial sand is 3.3E-02 centimeters per second (cm/s) and 9.69E-03 cm/s, respectively. The estimated hydraulic conductivity values are consistent with anticipated values for glacial outwash deposits. The hydraulic conductivity of these deposits is at least three orders of magnitude higher than the underlying shale bedrock. The estimated hydraulic conductivity of these shales ranges from 1.9E-04 to 6.0E-11 cm/s (Kay et al., 1996). Based on the glacial outwash estimated hydraulic conductivities and grain size analysis from a nearby boring (GAMW-33B), Golder selected a 0.010-inch slotted Vee-wire stainless-steel screen, with a Number 4 sand filter pack for the pumping well (see Appendix A-14).

4.0 FIELD ACTIVITIES AND PROCEDURES

4.1 Well and Piezometer Installation

Pumping well and piezometer construction details are summarized in Table 1. Golder subcontracted Layne Christensen Company (Layne) to install the pumping well (AT-01) and 13 piezometers (OW-1, OW-2, OW-2B, OW-3, OW-4, OW-5, OW-5B, OW-6, OW-7, OW-7B, OW-8, OW-9, and OW-10) between June 5-7, 2019 at the locations shown in Figure 3. Borehole and well completion logs are provided in Appendix C.

Layne used a track-mounted roto-sonic drilling rig to advance a 10-inch diameter borehole for pumping well AT-01 from the ground surface to the top of bedrock, a depth of approximately 33.5 ft bgs. Layne collected continuous soil samples from runs ranging from five to ten feet. Golder logged lithologic conditions and collected samples for laboratory grain size analysis approximately every five feet. Golder submitted the soil samples to Golder's geotechnical laboratory located in Atlanta, Georgia for grain-size/hydrometer and Atterberg Limit testing using ASTM Methods D6913/D7928 and D4318, respectively (see Appendix A-15).

Layne constructed the pumping well using 20 feet of six-inch diameter, stainless steel, 0.010-inch slotted, Vee-Wire well screen (13.5 to 33.5 ft bgs); a Number 4 filter sand pack; and six-inch diameter stainless-steel riser. An approximately three-foot thick hydrated bentonite seal was placed above the sand pack followed by a bentonite-cement grout to ground surface using a tremie pipe. The well was completed with an above-ground steel protective surface casing with a locking lid.

Layne installed the piezometers by advancing a six-inch diameter borehole using truck- and track-mounted roto-sonic drilling rigs. Layne collected continuous soil samples from the deep boreholes (i.e., OW-2B, OW-5B, and OW-7B) and Golder logged lithologic conditions. The shallow and deep piezometers were screened from approximately 8 to 18 ft bgs and 22 to 32 ft bgs (i.e., just above the shale), respectively. Layne constructed the piezometers using 10 feet of two-inch diameter, schedule 40 polyvinyl chloride (PVC), 0.010-inch machine slotted well screens; and a Number 5 filter pack sand. Layne sealed the piezometers by placing and hydrating bentonite chips in the borehole from the sand pack to ground surface.

4.2 Well and Piezometer Development

Layne developed the pumping well for eight hours and each piezometer for a minimum of 45 minutes using air-lift methods between June 9-10, 2019. Layne developed the pumping well by removing approximately 30 well volumes with a dual pipe air-lift system at approximately 20 gallons per minute (gpm or approximately 9,600 gallons). Golder recorded field water quality parameters including temperature, pH, specific conductivity, oxygen reduction potential (ORP), and dissolved oxygen using a YSI 556 MPS water quality meter, and recorded turbidity

using HACH 2100Q turbidity meter during pumping to confirm that the well was adequately developed. Golder field personnel considered development complete when the field parameters stabilized (i.e., the last three measurements were within +/- 10% of one another and the discharge water was clear). The pumping well development log is provided in Appendix C. Layne developed each piezometer by pumping approximately 400 to 450 gallons and surging the individual piezometers with a submersible pump (field water quality parameters were not collected).

4.3 Predictive Drawdown Assessment

Golder used the pumping well grain size test results to verify the well screen design/filter pack and estimate the potential water drawdown within the pumping well. Golder analyzed grain size data using methods described by Hazen, Kozeny, Fair-Hatch and Breyer, in Freeze and Cherry (1979), Driscoll (1986), and Kresic (1997). These analyses use empirical formulas to estimate hydraulic conductivity as presented in Appendix A (pages A-16 through A-18). The results are summarized in Table 2. These methods have various application limitations based on the grain size distributions, and distributions not meeting these limitations were not used in the estimates as indicated in Table 2. Based on these analyses, glacial outwash hydraulic conductivity ranges from 2.23E-02 cm/s to 4.19E-01 cm/s, with an arithmetic average of 1.37E-01 cm/s. These hydraulic conductivity ranges are similar to previously estimated values.

Golder used the estimated hydraulic conductivity values and CSM to predict a sustainable pumping rate for the aquifer test design using standard methods (Todd and Mays, 2005). Golder estimated that a flow rate of 200 gpm would induce a drawdown of approximately 6.5 feet in the pumping well and a radius of influence of approximately 1,100 ft (see Appendix A-14). Golder used these estimates as an initial design for the pumping test.

4.4 Pumping Test Set-up and Procedures

Golder subcontracted Layne to provide equipment (e.g., pump, hose, generator) and personnel to assist with the aquifer testing. Layne provided a Grundfos SP submersible pump equipped with a 220-volt, single-phase electric motor with a nominal discharge rate of 220 gpm powered by a diesel electric generator. The pump contained a backflow preventer valve to eliminate water flowing back into the well when the pump was shut off. Layne used a digital totalizing flowmeter to record the pumping rate and extracted volume throughout the duration of the tests. Layne personnel connected a three-inch diameter hose to a drop pipe coupler to route flow through a hose (under the haul road in an excavated trench with metal plates to allow traffic flow) to the discharge locations at the southeast corner of the MSRB as shown in the photographs in Appendix D.

Groundwater levels were monitored during testing activities using programmable Level Troll 700 data loggers/transducers at the following locations as depicted on Figure 3:

- Pumping well AT-01
- 13 observation wells (OW-1 through OW-10, including multi-level piezometers)
- Monitoring wells GAMW-18, GAMW-18B, GAMW-04, and GAMW-09B
- Background monitoring well GAMW-03 (assumed to be outside the influence of the aquifer test)

The surface water level in the MCWB was also monitored near OW-9.

In addition, Golder field personnel periodically measured groundwater levels using a Solinst water level meter at all locations during the testing activities. Golder field personnel programmed the transducers to measure water level data logarithmically, starting at 0.25 seconds up to 15 second increments for the constant rate pumping and recovery tests. The Level Troll transducers were equipped with vented data cables to compensate for the effects of changes in barometric pressure on groundwater levels; however, as described in Section 5.1 below, many of the transducers did not appear to compensate for barometric pressure, possibly due to improper venting.

4.5 Antecedent Groundwater Level Data

Golder monitored groundwater levels using transducers and data loggers from June 17 to the start of the step test on June 25, 2019 at 15 locations to evaluate antecedent trends (i.e., variability in water levels over time) in water levels prior to the aquifer testing. Most of the antecedent data shown in Figure 4 indicates unexpected diurnal fluctuations. This type of response is often observed in confined aquifers in response to daily barometric pressure changes or when using unvented transducer cables that are sensitive to barometric pressure changes.

Because the aquifer is not confined, the fluctuations are not attributed to actual changes in the aquifer water levels. This conclusion was confirmed during aquifer testing when similar transducer data fluctuations were observed, but not supported by hand water level measurements.

Although the rented transducer cables were supposedly vented, Golder suspects that the venting was either partially or completely blocked. This is supported by a comparison of air temperature (Gary Airport weather station) to the transducer pressure readings. As illustrated on Figure 4, groundwater levels appear to inversely correlate to air temperature, confirming that the transducer readings are influenced by atmospheric conditions. Golder is unable to discern whether the diurnal fluctuations are due to air pressure changes (due to a lack of reliable barometric pressure data), or simply to the heating and cooling of the cables. But either way, the diurnal fluctuations are not attributed to actual water level changes in the aquifer.

However, two of the monitoring locations do appear to provide useful antecedent water level data (OW-2B and GAMW-18) as illustrated on Figure 4a. Transducer readings for these two locations appear uninfluenced by temperature and indicate that groundwater levels in the pumping test area were generally increasing during antecedent monitoring period, particularly during the rain event on June 23/24. Groundwater elevations peaked shortly after this precipitation event and then began to drop prior to beginning step testing on June 25th.

4.6 Testing Procedures

4.6.1 Step-Drawdown Test

The purpose of the step-drawdown test was to identify an appropriate pumping rate that would be sustainable and sufficiently stress the aquifer for the 24-hour constant rate drawdown test. An evaluation of previously completed slug-tests and the predictive drawdown assessment indicated that the pumping well could sustain a flow rate of over 200 gpm. Golder personnel observed the step-drawdown test (increasing flow rate in each successive step) in pumping well AT-01 on June 25, 2019. The steps and findings are presented below:

Pump Flow Rate (gpm)	Time Duration Per Step (Minutes)	Drawdown in Pumping Well (Feet)
55	30	1.7

Pump Flow Rate (gpm)	Time Duration Per Step (Minutes)	Drawdown in Pumping Well (Feet)
90	45	2.6
150	45	4.6
170	45	5.8

Golder monitored the recovery phase of the step-drawdown test following shutdown of the pump for over 16 hours, which showed that the groundwater elevation recovered to approximately 96% of the original elevation measured before the start of the step-drawdown test. Drawdown and recovery curves for the step-drawdown test are provided in Figure 5.

Based on the results of the step-drawdown test, Golder concluded that pumping well AT-01 was capable of sustaining a flow rate of approximately 170 gpm while generating sufficient drawdown/stress to produce measurable drawdown in the observation wells during the 24-hour constant rate discharge test.

4.6.2 Constant Rate Discharge Test

Golder field personnel began the constant-rate discharge test in AT-01 at 7:30 a.m. on June 26, 2019, using a pumping rate of approximately 163 gpm. Flowmeter readings, including instantaneous flow and totalizer readings are summarized in Table 3. Manual groundwater elevations measured throughout the constant-rate and recovery portions of the aquifer test are presented in Table 4. Due to the number and volume of electronic water level measurements for the constant-rate and recovery tests, they are not provided in the report; however, these measurements are available upon request. Hydrographs of the electronic data from the drawdown and recovery phases are presented in Figures 6 and 7, respectively.

Golder concluded the drawdown phase of the constant-rate aquifer test at 8:05 a.m. on June 27, 2019 (i.e., 24 hours and 35 minutes) from the starting time. Once Layne field personnel turned the pump off, Golder field staff monitored the recovery of the water levels in the pumping well and piezometers for approximately 24 hours.

Golder noted the following field conditions that may have affected the aquifer test data:

- Wet ground surface conditions (i.e., standing water) near the pumping test well array from the rainfall event that occurred on June 23-24th prior to the aquifer test
- A thunderstorm that occurred during the evening of June 26th between 7:30 p.m. and 12:10 a.m. on June 27th. Golder observed approximately 0.6 inch of rain in the on-Site rain gauge during this storm
- Decreasing surface water levels in the MCWB prior to and during the pumping test (potential drawdown by facility personnel).

5.0 DATA ANALYSIS

5.1 General Data Evaluation

Figure 6 illustrates transducer and manual water level measurements collected during the pumping and recovery periods for the pumping well (AT-01). Figures 7 and 8 illustrate observation well transducer data for the drawdown period and recovery periods, respectively. Diurnal fluctuations of pressure transducer readings are apparent during the drawdown and recovery portions of the aquifer test, similar to those observed during the antecedent water level monitoring. The only exceptions were the transducer readings for observation wells GAMW-18B and OW-7B (see Figure 9). Additionally, the June 26 overnight rain event did not affect the water levels measured by the transducers in GAMW-18B and OW-7B. Manual water level measurements illustrated in Figure 6 indicate that later-time transducer data fluctuations (i.e., diurnal fluctuations) are not representative of actual water level conditions in all other wells. This is confirmed by the data collected from GAMW18B and OW-7B, which are apparently not influenced by temperature effects. Given these issues, to perform the data analysis Golder combined early-time transducer data with later-time manual water level measurements.

Discernible drawdown was observed in all of the observation wells located near (i.e., less than 100 feet from) the pumping well (AT-01) during the pumping period. However, no drawdown was identified in the more distal observation wells located 600 to 2,250 feet away from the pumping well (i.e., GAMW-03, GAMW-04, and GAMW-09B). Response to pumping was typically within two minutes of initiation of pumping at most observation wells. At least one foot of drawdown was observed in all the nearby piezometers within approximately 22 minutes of starting the test. The maximum drawdown in each piezometer/monitoring well is summarized in Table 4.

Figure 10 presents pre-pumping potentiometric surface contours for the testing area. The pre-pumping potentiometric surface is relatively flat (i.e., less than a foot of head difference across the testing area), with a general flow direction of west to east, away from the MCWB.

Figure 11 presents maximum drawdown contours based on the drawdown observed at the end of the pumping period. The contours indicate a slightly elongated cone of depression oriented east-west that may be affected by the slurry wall located immediately west of OW-09. The total drawdown measured at observation well OW-09 (3.54 feet) is seemingly anomalous because the drawdown is greater than that observed in wells located closer to the pumping well.

5.2 Drawdown and Recovery Data Evaluation

Golder analyzed the drawdown and recovery aquifer test data using traditional analytical methods for aquifers of unlimited areal extent: Theis (1935), Jacob (Cooper and Jacob 1946), and Theis recovery (Theis 1935). These analyses assume that the aquifer is fully confined; however, in practice these methods are used for semi-confined and unconfined aquifers, such as at the Site. Calculation of transmissivity, hydraulic conductivity and storativity are provided in Appendix E. Results are presented in Table 5 and summarized in the table below.

Well/Piezometer Group	Transmissivity (gpd/ft)	Hydraulic Conductivity (cm/s)	Storativity (dim)
Shallow Wells - Range	4.31E+04 to 8.14E+04	6.78E-02 to 1.28E-01	6.30E-06 to 6.67E+01

Well/Piezometer Group	Transmissivity (gpd/ft)	Hydraulic Conductivity (cm/s)	Storativity (dim)
Shallow Wells – Arithmetic Mean	5.98E+04	9.37E-02	6.15E+00
Deep Wells - Range	5.26E+04 to 7.20E+04	8.27E-02 to 1.13E-01	1.28E-03 to 1.40E-02
Deep Wells – Arithmetic Mean	6.01E+04	9.44E-02	5.68E-03

gpd/ft = gallons per day per foot; cm/s = centimeters per second; dim = dimensionless

The range and mean calculated transmissivity and hydraulic conductivity values for the shallow and deep wells are consistent and similar. There is more variability in the calculated storativity values both between and within shallow and deep portions of the unit.

6.0 SUMMARY

Golder performed step-drawdown and 24-hour aquifer tests to assess the characteristics of the surficial, unconfined aquifer at the R. M. Schafer Generating Station in June 2019. The purpose of the aquifer test was to supplement existing groundwater data including hydraulic conductivity and storativity, and to assess potential influences (e.g., boundary conditions) of the slurry walls surrounding the Multi-Cell Unit, both, in support of on-going Selection of Remedy evaluations.

A comparison of the hydraulic conductivities estimated from grain size analyses, slug tests, and aquifer tests is provided in the table below:

Test Method	Minimum	Maximum	Arithmetic Mean
Grain size analysis	2.23E-02 cm/s	4.19E-01 cm/s	1.18E-01 cm/s
Slug tests	3.45E-03 cm/s	1.01E-01 cm/s	1.72E-02 cm/s
Pumping tests – shallow wells	6.78E-02 cm/s	1.28E-01 cm/s	9.37E-02 cm/s
Pumping tests – deep wells	8.27E-02 cm/s	1.13E-01 cm/s	9.44E-02 cm/s

cm/sec = centimeters per second

The arithmetic mean values for hydraulic conductivity based on the grain size analysis and the pumping test results in the shallow and deep wells are similar (i.e., high E-02, low E-01 cm/sec). The arithmetic mean values for hydraulic conductivity based on the slug test data is about one order of magnitude lower (low E-01 cm/sec).

Future work to identify and evaluate remedial alternatives and/or to evaluate construction dewatering should consider the range of calculated hydraulic parameters presented herein.

7.0 REFERENCES

Arihood, L.D. and Basch, M.E., 1994. Geohydrology and Simulated Ground-water Flow in an Irrigated Area of Northwestern Indiana. U.S. Geological Survey, Water-Resources Investigations Report 92-4046, 38 p.

Bouwer, H. and Rice, R.C., 1976. A Slug Test for Determining Hydraulic Conductivity of Unconfined Aquifers with Completely or Partially Penetrating Wells. Water Resources Research, Vol. 12, pp. 423-428.

Driscoll, F.G., 1986. Groundwater and Wells, 2nd ed., Johnson Filtration Systems, St. Paul, Minnesota, 1,089 p.

Freeze, R.A., and Cherry, J.A., 1979. Groundwater, Prentice Hall Inc., Englewood Cliffs, New Jersey, 604 p.

Golder 2017. "Groundwater Monitoring Program Implementation Manual," October 17, 2017.

Hvorselev, M.J., 1951. Time Lag and Soil Permeability in Groundwater Observations, Bulletin 36, U.S. Army Corps of Engineers, Waterways Experiment Station, Vicksburg, Mississippi.

Kay, R.T., Duwelius, R.F., Brown, T.A., Micke, F.A., and Witt-Smith, C.A., 1996. Geohydrology, Water Levels and Directions of Flow, and Occurrence of Light-Nonaqueous-Phase Liquids on Ground Water in Northwestern Indiana and the Lake Calumet Area of Northeastern Illinois. U.S. Geological Survey, Water-Resources Investigation Report 95-4253, 84 p.

Kresic, N., 1997. Quantitative Solutions in Hydrogeology and Groundwater Modeling. CRC Press, Boca Raton, Florida, 461 p.

Maier, R.D., 2010. Unconsolidated Aquifer Systems of Jasper County, Indiana. Indiana Department of Natural Resources, Division of Water, Resource Assessment Section, Aquifer Systems Map 77-A, 1 plate, scale 1:48,000, 4 p.

Rosenshein, J.S. and Hunn, J.D., 1964. Ground-water Resources of Northwestern Indiana, Preliminary Report: Jasper County. Indiana Department of Conservation, Division of Water Resources, Bulletin No. 25, 83 p., 5 plates.

Theim, G., 1906. Hydrologische Methoden. Gebhardt, Leipzig, 56 p.

Theis, C.V., 1935. The Relation Between the Lowering of the Piezometric Surface and the Rate and Duration of Discharge of a Well Using Groundwater Storage. Transactions of the American Geophysical Union, Vol. 16, pp. 519-524.

Todd, D.K. and Mays, L.W., 2005. Groundwater Hydrology, 3rd ed., John Wiley and Sons, Inc., Hoboken, New Jersey, 636 p.

Van der Kamp, G., 1976. Determining aquifer transmissivity by means of well response tests: The underdamped case. Water Resources Research, vol. 12, p. 71-77.

Golder and the G logo are trademarks of Golder Associates Corporation

APPENDIX A

Pumping Well Design

APPENDIX B

Hydraulic Conductivity Data

APPENDIX C

Well and Piezometer Borehole Logs

APPENDIX D

Photograph Log

APPENDIX E

Aquifer Test Analyses



golder.com

Tables

Table 1: Well and Piezometer Construction Summary
NIPSCO LLC R.M. Schahfer Generating Station

										Pre-Aquifer Test (6/26/2019)			Immediately prior to pump shut-off (6/27/2019)		
Obersvation Well Locations	Northing (ft)	Easting (ft)	Ground Surface Elevation (ft-msl)	Reference Elevation (ft-msl)	Sounded Well Depth (ft)	Screen Interval		Well Diameter (inches)	Distance from AT-01 (ft)	Time of Collection	Depth to Water (ft- btoc)	Groundwater Elevation (ft-msl)	Time of Collection	Depth to Water (ft- btoc)	Groundwater Elevation (ft-msl)
						Top (ft-bgs)	Bottom (ft-bgs)								
OW-1	2,171,874.71	2,971,270.45	666.35	669.33	17.50	8	18	2	21	7:18:00 AM	6.94	662.39	7:42:00 AM	9.92	659.41
OW-2	2,171,859.54	2,971,270.41	666.39	668.43	18.30	8	18	2	36	7:17:00 AM	6.07	662.36	7:39:00 AM	8.82	659.61
OW-2B	2,171,859.73	2,971,276.30	665.96	669.22	32.16	24	34	2	36	7:16:00 AM	6.82	662.40	7:38:00 AM	9.67	659.55
OW-3	2,171,845.39	2,971,269.68	666.34	668.23	18.00	8	18	2	50	7:15:00 AM	5.81	662.42	7:37:00 AM	8.52	659.71
OW-4	2,171,895.05	2,971,285.00	665.30	667.40	18.08	8	18	2	14	7:20:00 AM	5.01	662.39	7:41:00 AM	8.23	659.17
OW-5	2,171,898.18	2,971,295.19	665.18	667.16	18.25	8	18	2	25	7:21:00 AM	4.78	662.38	7:41:00 AM	7.79	659.37
OW-5B	2,171,892.64	2,971,295.17	665.23	668.49	33.00	23	33	2	25	7:20:00 AM	6.10	662.39	7:41:00 AM	9.11	659.38
OW-6	2,171,895.22	2,971,305.30	665.25	667.15	18.25	8	18	2	35	7:21:00 AM	4.77	662.38	7:42:00 AM	7.55	659.60
OW-7	2,171,929.17	2,971,270.63	665.98	667.76	18.41	8	18	2	34	7:25:00 AM	5.36	662.40	7:45:00 AM	8.20	659.56
OW-7B	2,171,930.18	2,971,274.96	665.72	669.06	32.56	22	32	2	35	7:25:00 AM	6.69	662.37	7:45:00 AM	9.56	659.50
OW-8	2,171,939.98	2,971,270.91	665.89	667.85	18.16	8	18	2	45	7:27:00 AM	5.46	662.39	7:46:00 AM	8.17	659.68
OW-9	2,171,894.23	2,971,175.52	668.22	671.25	20.85	10	20	2	95	7:28:00 AM	8.02	663.23	7:49:00 AM	11.56	659.69
OW-10	2,171,893.36	2,971,212.54	665.75	669.69	19.50	8	18	2	58	7:28:00 AM	7.28	662.41	7:47:00 AM	9.98	659.71
AT-01	2,171,895.27	2,971,270.60	666.10	668.60	34.65	13.5	33.5	6	0	7:22:00 AM	6.22	662.38	7:43:00 AM	12.48	656.12
GAMW-03	2,169,821.53	2,971,646.34	665.14	668.77	18.86	5	15	2	2108	7:36:00 AM	4.88	663.89	7:53:00 AM	4.38	664.39
GAMW-04	2,170,947.82	2,971,503.36	665.81	669.21	17.86	5	15	2	614	-	NM	-	7:52:00 AM	6.53	662.68
GAMW-09B	2,172,502.57	2,971,291.67	665.35	668.29	37.42	25	35	2	976	-	NM	-	7:57:00 AM	6.85	661.44
GAMW-18	2,171,919.78	2,971,272.41	666.04	669.07	18.51	5	15	2	25	7:24:00 AM	6.68	662.39	7:43:00 AM	9.58	659.49
GAMW-18B	2,171,910.00	2,971,272.53	665.94	668.47	35.89	25	35	2	15	7:23:00 AM	6.07	662.40	7:43:00 AM	9.34	659.13

Notes:
Locations surveyed in US State Plane Indiana West Zone NAD 1983, NAVD 1988 (ft)
Reference elevation is top of PVC for temporary observation wells and top of casing for permanent wells.
The water level data provided on this table were collected manually with a water level meter.
ft-bgs = feet below ground surface
ft-msl = feet above mean sea level
ft-btoc = feet below top of casing
NM- not measured

Prepared by: DFS
Checked by: AMH
Reviewed by: APTM

Table 2: Summary of Hydraulic Conductivity Estimates Based on Grain Size Analysis
NIPSCO LLC R.M. Schahfer Generating Station

Sample Information			Hydraulic Conductivity Estimate[3,4] (cm/sec)									
Sample location[1]	Depth (feet)	Laboratory USCS Classification[2]	Hazen[5]	Applicable[6] (Y/N)	Kozeny[7]	Applicable[6] (Y/N)	Fair-Hatch	Applicable[6] (Y/N)	Breyer[8]	Applicable[6] (Y/N)	Arithmetic Average of Applicable	Hazen/Breyer Arithmetic Average[5]
AT-01	19.0 to 20.0	SP	1.34E-01	Y	9.92E-02	N	3.30E-01	Y	1.68E-01	Y	2.11E-01	1.51E-01
AT-01	24.0 to 25.0	SP	1.20E-01	Y	8.88E-02	N	2.25E-01	Y	1.52E-01	Y	1.66E-01	1.36E-01
AT-01	29.0 to 30.0	SP	7.69E-02	Y	5.68E-02	N	1.83E-01	Y	9.47E-02	Y	1.18E-01	8.58E-02
GAMW-33B	5.0 to 6.0	SM	2.45E-03	N	1.81E-03	N	2.27E-02	Y	2.46E-03	N	2.27E-02	2.46E-03
GAMW-33B	10.4 to 12.0	SP	4.32E-02	Y	3.20E-02	N	8.83E-02	Y	5.39E-02	Y	6.18E-02	4.86E-02
GAMW-33B	25.9 to 26.8	SP	1.99E-01	Y	1.47E-01	N	3.90E-01	Y	2.24E-01	N	2.94E-01	2.11E-01
GAMW-34B	16.3 to 17.0	SP	9.42E-02	Y	6.96E-02	N	2.67E-01	Y	1.06E-01	N	1.81E-01	1.00E-01
GAMW-35B	10.0 to 11.4	SP	3.18E-02	Y	2.35E-02	N	8.16E-02	Y	3.76E-02	Y	5.03E-02	3.47E-02
GAMW-35B	20.0 to 20.8	SP	8.25E-02	Y	6.09E-02	N	2.07E-01	Y	1.00E-01	Y	1.30E-01	9.14E-02
GAMW-36B	20.8 to 21.4	SW	1.07E-01	N	7.89E-02	N	4.19E-01	Y	1.05E-01	N	4.19E-01	1.06E-01
GAMW-36B	31.5 to 32.0	SP	2.83E-02	Y	7.89E-02	N	5.60E-02	Y	3.58E-02	N	4.21E-02	3.21E-02
GAMW-37B	5.0 to 6.1	SP-SW	2.45E-03	N	1.81E-03	N	2.23E-02	Y	2.48E-03	N	2.23E-02	2.47E-03
GAMW-37B	10.0 to 12.0	SP	2.51E-02	Y	1.85E-02	N	4.90E-02	Y	3.33E-02	Y	3.58E-02	2.92E-02
GAMW-37B	26.5 to 27.0	SW	4.75E-02	N	3.51E-02	N	1.67E-01	Y	4.72E-02	N	1.67E-01	4.73E-02
										Average (cm/sec):	1.37E-01	7.70E-02

Notes:

1. Samples at AT-01 tested by Golder Associates' Soils Laboratory in June 2019 using ASTM D6913. Samples at GAMW-33B, GAMW-34B, GAMW-35B, GAMW-36B and GAMW-37B tested by Golder Associates' Soils Laboratory in November 2016 using ASTM D422.
2. SP = Poorly-graded Sand; SM = Silty Sand; SW = Well-graded Sand.
3. Hydraulic conductivity estimated from grain size analysis data from November 2016 and June 2019. See Apeendix A for analysis.
4. cm/sec = centimeter per second.
5. Hazen Method or arithmetic average of Hazen and Breyer methods ideal for medium sand material.
6. Applicability determined from hydraulic conductivity estimation method's applicability conditions.
7. Kozeny Method ideal for coarse sand material.
8. Breyer Method ideal for silty sand material.

Prepared by: JRS
Checked by: SKB
Reviewed by: APTM

Table 3: Flow Meter Readings Obtained During the 24-Hour Aquifer Test
NIPSCO LLC R.M. Schahfer Generating Station

Date/Time	Elapsed Time (hh:mm)	Instantaneous Flow (gpm)	Totalizer Readings (gallons)	Volume Pumped (gallons)	Calculated Average Flow Rate (gpm)	Elapsed Time (minutes)
6/26/19 7:30	-	-	34,900	0		0
6/26/19 7:31	0:01	164.78	35,140	240	240.00	1
6/26/19 8:05	0:35	163.62	40,798	5,898	168.51	35
6/26/19 8:31	1:01	163.62	44,992	10,092	165.44	61
6/26/19 9:23	1:53	163.62	53,421	18,521	163.90	113
6/26/19 10:27	2:57	163.91	63,966	29,066	164.21	177
6/26/19 11:27	3:57	163.76	73,947	39,047	164.76	237
6/26/19 12:28	4:58	163.33	83,716	48,816	163.81	298
6/26/19 13:41	6:11	163.04	95,688	60,788	163.85	371
6/26/19 15:00	7:30	163.04	108,311	73,411	163.14	450
6/26/19 16:27	8:57	163.04	122,669	87,769	163.44	537
6/26/19 17:57	10:27	162.75	137,388	102,488	163.46	627
6/26/19 19:32	12:02	162.75	152,819	117,919	163.32	722
6/27/19 0:10	16:40	162.17	197,364	162,464	162.46	1,000
6/27/19 7:30	24:00	162.42	269,870	234,970	163.17	1,440
6/27/19 8:05	24:35	0.00	274,802	239,902	162.65	1,475

Notes:
gpm= gallons per minute
hh:mm = hours and minutes

Prepared by: EW
Checked by: ANB
Reviewed by: APTM

Table 4: Manual Groundwater Elevations Measured During the Aquifer Test
NIPSCO LLC R.M. Schahfer Generating Station

OW-1				OW-2				OW-2B				OW-3			
Date/Time	Elapsed Time [hh:mm]	Groundwater Depth [ft btoc]	Drawdown [ft]	Date/Time	Elapsed Time [hh:mm]	Groundwater Depth [ft btoc]	Drawdown [ft]	Date/Time	Elapsed Time [hh:mm]	Groundwater Depth [ft btoc]	Drawdown [ft]	Date/Time	Elapsed Time [hh:mm]	Groundwater Depth [ft btoc]	Drawdown [ft]
6/26/19 7:18		6.94	0	6/26/19 7:17		6.07	0	6/26/19 7:16		6.82	0	6/26/19 7:15		5.81	0
6/26/19 7:52	0:22	8.36	1.42	6/26/19 7:52	0:22	7.19	1.12	6/26/19 7:51	0:21	8.22	1.40	6/26/19 8:06	0:16	7.09	1.28
6/26/19 8:08	0:38	8.51	1.57	6/26/19 8:07	0:37	7.38	1.31	6/26/19 8:07	0:37	8.39	1.57	6/26/19 8:32	0:42	7.28	1.47
6/26/19 8:33	1:03	8.73	1.79	6/26/19 8:33	1:03	7.58	1.51	6/26/19 8:33	1:03	8.56	1.74	6/26/19 9:24	1:34	7.54	1.73
6/26/19 9:25	1:55	8.99	2.05	6/26/19 9:24	1:54	7.85	1.78	6/26/19 9:24	1:54	8.80	1.98	6/26/19 10:28	2:38	7.74	1.93
6/26/19 10:30	3:00	9.15	2.21	6/26/19 10:29	2:59	8.05	1.98	6/26/19 10:29	2:59	8.98	2.16	6/26/19 11:29	3:39	7.83	2.02
6/26/19 11:31	4:01	9.27	2.33	6/26/19 11:30	4:00	8.16	2.09	6/26/19 11:29	3:59	9.06	2.24	6/26/19 12:29	4:39	7.92	2.11
6/26/19 12:31	5:01	9.36	2.42	6/26/19 12:31	5:01	8.36	2.29	6/26/19 12:30	5:00	9.17	2.35	6/26/19 13:42	5:52	7.97	2.16
6/26/19 13:45	6:15	9.44	2.50	6/26/19 13:14	5:44	8.34	2.27	6/26/19 13:43	6:13	9.19	2.37	6/26/19 15:01	7:11	8.07	2.26
6/26/19 15:03	7:33	9.54	2.60	6/26/19 15:03	7:33	8.39	2.32	6/26/19 15:02	7:32	9.31	2.49	6/26/19 16:29	8:39	8.11	2.30
6/26/19 16:32	9:02	9.58	2.64	6/26/19 16:31	9:01	8.46	2.39	6/26/19 16:31	9:01	9.33	2.51	6/26/19 17:59	10:09	8.21	2.40
6/26/19 18:00	10:30	9.60	2.66	6/26/19 18:00	10:30	8.48	2.41	6/26/19 17:59	10:29	9.41	2.59	6/26/19 19:39	11:49	8.22	2.41
6/27/19 0:16	16:46	9.83	2.89	6/27/19 0:14	16:44	8.71	2.64	6/27/19 0:12	16:42	9.41	2.59	6/27/19 0:11	16:21	8.45	2.64
6/27/19 7:42	24:12	9.92	2.98	6/27/19 7:39	24:09	8.82	2.75	6/27/19 7:38	24:08	9.67	2.85	6/27/19 7:37	23:47	8.52	2.71
6/27/19 8:09	0:04	8.93	1.99	6/27/19 8:09	0:04	8.09	2.02	6/27/19 8:08	0:03	8.66	1.84	6/27/19 8:07	0:17	7.84	2.03
6/27/19 8:19	0:14	8.69	1.75	6/27/19 8:18	0:13	7.82	1.75	6/27/19 8:18	0:13	8.41	1.59	6/27/19 8:17	0:27	7.59	1.78
6/27/19 9:07	1:02	8.15	1.21	6/27/19 9:07	1:02	7.29	1.22	6/27/19 9:06	1:01	7.98	1.16	6/27/19 9:06	1:16	7.09	1.28
6/27/19 9:33	1:28	8.02	1.08	6/27/19 9:33	1:28	7.12	1.05	6/27/19 9:33	1:28	7.91	1.09	6/27/19 9:32	1:42	6.93	1.12
6/27/19 10:04	1:59	7.88	0.94	6/27/19 10:03	1:58	7	0.93	6/27/19 10:03	1:58	7.74	0.92	6/27/19 10:02	2:12	6.78	0.97
6/27/19 11:05	3:00	7.77	0.83	6/27/19 11:05	3:00	6.85	0.78	6/27/19 11:03	2:58	7.63	0.81	6/27/19 11:02	3:12	6.63	0.82
6/27/19 12:06	4:01	7.64	0.70	6/27/19 12:05	4:00	6.74	0.67	6/27/19 12:05	4:00	7.51	0.69	6/27/19 12:04	4:14	6.57	0.76
6/28/19 7:54	23:49	7.21	0.27	6/28/19 7:53	23:48	6.32	0.25	6/28/19 7:53	23:48	7.07	0.25	6/28/19 7:52	0:02	6.09	0.28

Notes:
ft btoc= feet below top of casing
Pump started at 07:30 on 6/26/2019. Pump stopped at 08:05 on 6/27/2019.
hh:mm = hours and minutes
NM= not measured

Table 4: Manual Groundwater Elevations Collected During the Aquifer Test
NIPSCO LLC R.M. Schahfer Generating Station

OW-4				OW-5B				OW-5				OW-6			
Date/Time	Elapsed Time [hh:mm]	Groundwater Depth [ft btoc]	Drawdown [ft]	Date/Time	Elapsed Time [hh:mm]	Groundwater Depth [ft btoc]	Drawdown [ft]	Date/Time	Elapsed Time [hh:mm]	Groundwater Depth [ft btoc]	Drawdown [ft]	Date/Time	Elapsed Time [hh:mm]	Groundwater Depth [ft btoc]	Drawdown [ft]
6/26/19 7:20		5.01	0	6/26/19 7:20		6.1	0	6/26/19 7:21		4.78	0	6/26/19 7:21		4.77	0
6/26/19 7:53	0:23	6.76	1.75	6/26/19 7:54	0:24	7.69	1.59	6/26/19 7:54	0:24	6.34	1.56	6/26/19 7:55	0:25	6.03	1.26
6/26/19 8:08	0:38	6.92	1.91	6/26/19 8:09	0:39	7.82	1.72	6/26/19 8:09	0:39	6.49	1.71	6/26/19 8:09	0:39	6.21	1.44
6/26/19 8:34	1:04	7.10	2.09	6/26/19 8:35	1:05	7.98	1.88	6/26/19 8:35	1:05	6.67	1.89	6/26/19 8:35	1:05	6.39	1.62
6/26/19 9:25	1:55	7.32	2.31	6/26/19 9:26	1:56	8.23	2.13	6/26/19 9:26	1:56	6.92	2.14	6/26/19 9:26	1:56	6.62	1.85
6/26/19 10:31	3:01	7.49	2.48	6/26/19 10:32	3:02	8.38	2.28	6/26/19 10:33	3:03	7.06	2.28	6/26/19 10:34	3:04	6.81	2.04
6/26/19 11:32	4:02	7.61	2.60	6/26/19 11:33	4:03	8.47	2.37	6/26/19 11:33	4:03	7.16	2.38	6/26/19 11:34	4:04	6.93	2.16
6/26/19 12:32	5:02	7.69	2.68	6/26/19 12:33	5:03	8.55	2.45	6/26/19 12:33	5:03	7.22	2.44	6/26/19 12:34	5:04	7.01	2.24
6/26/19 13:47	6:17	7.75	2.74	6/26/19 13:47	6:17	8.63	2.53	6/26/19 13:49	6:19	7.31	2.53	6/26/19 13:49	6:19	7.06	2.29
6/26/19 15:04	7:34	7.83	2.82	6/26/19 15:05	7:35	8.66	2.56	6/26/19 15:05	7:35	7.38	2.60	6/26/19 15:06	7:36	7.14	2.37
6/26/19 16:33	9:03	7.90	2.89	6/26/19 16:35	9:05	8.74	2.64	6/26/19 16:36	9:06	7.47	2.69	6/26/19 16:36	9:06	7.22	2.45
6/26/19 18:03	10:33	7.92	2.91	6/26/19 18:02	10:32	8.82	2.72	6/26/19 18:03	10:33	7.48	2.70	6/26/19 18:03	10:33	7.26	2.49
6/27/19 0:18	16:48	8.14	3.13	6/27/19 0:19	16:49	9.06	2.96	6/27/19 0:21	16:51	7.76	2.98	6/27/19 0:22	16:52	7.42	2.65
6/27/19 7:41	24:11	8.23	3.22	6/27/19 7:41	24:11	9.11	3.01	6/27/19 7:41	24:11	7.79	3.01	6/27/19 7:42	24:12	7.55	2.78
6/27/19 8:10	0:05	6.83	1.82	6/27/19 8:11	0:06	7.88	1.78	6/27/19 8:11	0:06	6.56	1.78	6/27/19 8:11	0:06	6.61	1.84
6/27/19 8:20	0:15	6.62	1.61	6/27/19 8:21	0:16	7.67	1.57	6/27/19 8:20	0:15	6.36	1.58	6/27/19 8:21	0:16	6.42	1.65
6/27/19 9:08	1:03	6.19	1.18	6/27/19 9:09	1:04	7.27	1.17	6/27/19 9:09	1:04	5.94	1.16	6/27/19 9:09	1:04	5.96	1.19
6/27/19 9:34	1:29	6.08	1.07	6/27/19 9:35	1:30	7.1	1.00	6/27/19 9:35	1:30	5.81	1.03	6/27/19 9:35	1:30	5.82	1.05
6/27/19 10:05	2:00	5.95	0.94	6/27/19 10:05	2:00	7.03	0.93	6/27/19 10:05	2:00	5.68	0.90	6/27/19 10:06	2:01	5.71	0.94
6/27/19 11:06	3:01	5.81	0.80	6/27/19 11:07	3:02	6.88	0.78	6/27/19 11:07	3:02	5.57	0.79	6/27/19 11:08	3:03	5.55	0.78
6/27/19 12:07	4:02	5.71	0.70	6/27/19 12:08	4:03	6.81	0.71	6/27/19 12:09	4:04	5.48	0.70	6/27/19 12:09	4:04	5.46	0.69
6/28/19 7:55	23:50	5.28	0.27	6/28/19 7:55	23:50	6.39	0.29	6/28/19 7:56	23:51	5.05	0.27	6/28/19 7:56	23:51	5.02	0.25

Notes:
ft btoc= feet below top of casing
Pump started at 07:30 on 6/26/2019. Pump stopped at 08:05 on 6/27/2019.
hh:mm = hours and minutes
NM= not measured

Table 4: Manual Groundwater Elevations Collected During the Aquifer Test
NIPSCO LLC R.M. Schahfer Generating Station

AT-01				GAMW-18B				GAMW-18				OW-7B			
Date/Time	Elapsed Time [hh:mm]	Groundwater Depth [ft btoc]	Drawdown [ft]	Date/Time	Elapsed Time [hh:mm]	Groundwater Depth [ft btoc]	Drawdown [ft]	Date/Time	Elapsed Time [hh:mm]	Groundwater Depth [ft btoc]	Drawdown [ft]	Date/Time	Elapsed Time [hh:mm]	Groundwater Depth [ft btoc]	Drawdown [ft]
6/26/19 7:22		6.22	0	6/26/19 7:23		6.07	0	6/26/19 7:24		6.88	0	6/26/19 7:25		6.69	0
6/26/19 7:55	0:25	10.66	4.44	6/26/19 7:56	0:26	7.96	1.89	6/26/19 7:57	0:27	8.01	1.23	6/26/19 7:57	0:27	8.12	1.43
6/26/19 8:10	0:40	11.08	4.86	6/26/19 8:11	0:41	8.11	2.04	6/26/19 8:11	0:41	8.17	1.49	6/26/19 8:12	0:42	8.25	1.56
6/26/19 8:36	1:06	11.26	5.04	6/26/19 8:37	1:07	8.27	2.20	6/26/19 8:38	1:08	8.36	1.68	6/26/19 8:38	1:08	8.41	1.72
6/26/19 9:27	1:57	11.47	5.25	6/26/19 9:27	1:57	8.45	2.38	6/26/19 9:28	1:58	8.59	1.91	6/26/19 9:28	1:58	8.65	1.96
6/26/19 10:35	3:05	11.65	5.43	6/26/19 10:35	3:05	8.64	2.57	6/26/19 10:36	3:06	8.80	2.12	6/26/19 10:37	3:07	8.84	2.15
6/26/19 11:35	4:05	11.78	5.56	6/26/19 11:36	4:06	8.76	2.69	6/26/19 11:37	4:07	8.91	2.23	6/26/19 11:38	4:08	8.90	2.21
6/26/19 12:35	5:05	11.87	5.65	6/26/19 12:26	4:56	8.81	2.74	6/26/19 12:37	5:07	9.00	2.33	6/26/19 12:37	5:07	8.94	2.25
6/26/19 13:50	6:20	11.94	5.72	6/26/19 13:51	6:21	8.87	2.80	6/26/19 13:52	6:22	9.02	2.34	6/26/19 13:52	6:22	9.04	2.35
6/26/19 15:07	7:37	12.02	5.80	6/26/19 15:07	7:37	8.93	2.86	6/26/19 15:08	7:38	9.15	2.47	6/26/19 15:09	7:39	9.09	2.40
6/26/19 16:38	9:08	12.06	5.84	6/26/19 16:39	9:09	9.01	2.94	6/26/19 16:40	9:10	9.19	2.51	6/26/19 16:42	9:12	9.15	2.46
6/26/19 18:04	10:34	12.12	5.90	6/26/19 18:04	10:34	9.02	2.95	6/26/19 18:05	10:35	9.22	2.54	6/26/19 18:06	10:36	9.18	2.49
6/27/19 0:25	16:55	12.36	6.14	6/27/19 0:26	16:56	9.28	3.21	6/27/19 0:27	16:57	9.41	2.73	6/27/19 0:28	16:58	9.41	2.72
6/27/19 7:43	24:13	12.48	6.26	6/27/19 7:43	24:13	9.34	3.27	6/27/19 7:43	24:13	9.58	2.90	6/27/19 7:45	24:15	9.56	2.87
6/27/19 8:12	0:07	7.92	1.70	6/27/19 8:12	0:07	7.77	1.70	6/27/19 8:13	0:08	8.74	1.86	6/27/19 8:14	0:09	8.39	1.70
6/27/19 8:22	0:17	7.76	1.54	6/27/19 8:22	0:17	7.6	1.53	6/27/19 8:23	0:18	8.54	1.66	6/27/19 8:24	0:19	8.19	1.50
6/27/19 9:10	1:05	7.36	1.14	6/27/19 9:11	1:06	7.19	1.12	6/27/19 9:11	1:06	8.07	1.19	6/27/19 9:12	1:07	7.78	1.09
6/27/19 9:36	1:31	7.25	1.03	6/27/19 9:36	1:31	7.08	1.01	6/27/19 9:37	1:32	7.94	1.06	6/27/19 9:38	1:33	7.68	0.99
6/27/19 10:07	2:02	7.16	0.94	6/27/19 10:07	2:02	6.97	0.90	6/27/19 10:08	2:03	7.89	1.01	6/27/19 10:09	2:04	7.56	0.87
6/27/19 11:09	3:04	6.98	0.76	6/27/19 11:10	3:05	6.84	0.77	6/27/19 11:11	3:06	7.7	0.82	6/27/19 11:11	3:06	7.43	0.74
6/27/19 12:10	4:05	6.93	0.71	6/27/19 12:11	4:06	6.76	0.69	6/27/19 12:12	4:07	7.62	0.74	6/27/19 12:12	4:07	7.41	0.72
6/28/19 6:40	22:35	6.53	0.31												
6/28/19 7:56	23:51	6.45	0.23	6/28/19 7:57	23:52	6.34	0.27	6/28/19 7:57	23:52	7.2	0.32	6/28/19 7:58	23:53	6.99	0.30

Notes:
ft btoc= feet below top of casing
Pump started at 07:30 on 6/26/2019. Pump stopped at 08:05 on 6/27/2019.
hh:mm = hours and minutes
NM= not measured

Table 4: Manual Groundwater Elevations Collected During the Aquifer Test
NIPSCO LLC R.M. Schahfer Generating Station

OW-7				OW-8				OW-9				OW-10				
Date/Time	Elapsed Time [hh:mm]	Groundwater Depth [ft btoc]	Drawdown [ft]	Date/Time	Elapsed Time [hh:mm]	Groundwater Depth [ft btoc]	Drawdown [ft]	Date/Time	Elapsed Time [hh:mm]	Groundwater Depth [ft btoc]	Drawdown [ft]	Date/Time	Elapsed Time [hh:mm]	Groundwater Depth [ft btoc]	Drawdown [ft]	Comments
6/26/19 7:25		5.36	0	6/26/19 7:27		5.46	0	6/26/19 7:28		8.02	0	6/26/19 7:28		7.28	0	pre-24 hour test reading,
6/26/19 7:58	0:28	6.79	1.43	6/26/19 7:58	0:28	NM	NM	6/26/19 7:59	0:29	10.13	2.11	6/26/19 7:58	0:28	8.59	1.31	
6/26/19 8:12	0:42	6.91	1.55	6/26/19 8:13	0:43	6.88	1.42	6/26/19 8:15	0:45	10.28	2.26	6/26/19 8:14	0:44	8.71	1.43	
6/26/19 8:38	1:08	7.09	1.73	6/26/19 8:39	1:09	7.05	1.59	6/26/19 8:40	1:10	10.42	2.40	6/26/19 8:40	1:10	8.87	1.59	
6/26/19 9:30	2:00	7.31	1.95	6/26/19 9:30	2:00	7.27	1.81	6/26/19 9:31	2:01	10.59	2.57	6/26/19 9:31	2:01	9.08	1.80	
6/26/19 10:40	3:10	7.47	2.11	6/26/19 10:40	3:10	7.43	1.97	6/26/19 10:43	3:13	10.79	2.77	6/26/19 10:42	3:12	9.28	2.00	
6/26/19 11:38	4:08	7.53	2.17	6/26/19 11:39	4:09	7.51	2.05	6/26/19 11:42	4:12	10.91	2.89	6/26/19 11:41	4:11	9.35	2.07	
6/26/19 12:38	5:08	7.63	2.27	6/26/19 12:39	5:09	7.58	2.12	6/26/19 12:41	5:11	10.95	2.93	6/26/19 12:40	5:10	9.44	2.16	
6/26/19 13:54	6:24	7.69	2.33	6/26/19 13:54	6:24	7.65	2.19	6/26/19 13:57	6:27	11.00	2.98	6/26/19 13:56	6:26	9.51	2.23	
6/26/19 15:09	7:39	7.78	2.42	6/26/19 15:10	7:40	7.75	2.29	6/26/19 15:12	7:42	11.07	3.05	6/26/19 15:11	7:41	9.56	2.28	
6/26/19 16:44	9:14	7.82	2.46	6/26/19 16:45	9:15	7.80	2.34	6/26/19 16:49	9:19	11.14	3.12	6/26/19 16:48	9:18	9.63	2.35	
6/26/19 18:06	10:36	7.85	2.49	6/26/19 18:07	10:37	7.81	2.35	6/26/19 18:09	10:39	11.16	3.14	6/26/19 18:08	10:38	9.67	2.39	
6/27/19 0:29	16:59	8.10	2.74	6/27/19 0:30	17:00	8.05	2.59	6/27/19 0:35	17:05	11.41	3.39	6/27/19 0:33	17:03	9.89	2.61	
6/27/19 7:45	24:15	8.20	2.84	6/27/19 7:46	24:16	8.17	2.71	6/27/19 7:49	24:19	11.56	3.54	6/27/19 7:47	24:17	9.98	2.70	
6/27/19 8:14	0:09	7.12	1.76	6/27/19 8:15	0:10	7.19	1.73	6/27/19 8:16	0:11	10.47	2.45	6/27/19 8:15	0:10	8.94	1.66	
6/27/19 8:24	0:19	6.92	1.56	6/27/19 8:24	0:19	7.02	1.56	6/27/19 8:26	0:21	10.28	2.26	6/27/19 8:25	0:20	8.77	1.49	
6/27/19 9:13	1:08	6.56	1.20	6/27/19 9:13	1:08	6.61	1.15	6/27/19 9:15	1:10	9.95	1.93	6/27/19 9:14	1:09	8.43	1.15	
6/27/19 9:38	1:33	6.4	1.04	6/27/19 9:39	1:34	6.48	1.02	6/27/19 9:40	1:35	9.89	1.87	6/27/19 9:40	1:35	8.29	1.01	
6/27/19 10:09	2:04	6.27	0.91	6/27/19 10:10	2:05	6.38	0.92	6/27/19 10:12	2:07	9.72	1.70	6/27/19 10:11	2:06	8.17	0.89	
6/27/19 11:12	3:07	6.17	0.81	6/27/19 11:12	3:07	6.21	0.75	6/27/19 11:14	3:09	9.59	1.57	6/27/19 11:13	3:08	8.04	0.76	
6/27/19 12:14	4:09	6.1	0.74	6/27/19 12:15	4:10	6.19	0.73	6/27/19 12:17	4:12	9.52	1.50	6/27/19 12:16	4:11	7.99	0.71	
6/28/19 7:58	23:53	5.65	0.29	6/28/19 7:59	23:54	5.77	0.31	6/28/19 8:00	23:55	8.14	0.12	6/28/19 7:59	23:54	7.54	0.26	collected after pump and transducer removed

Notes:
ft btoc= feet below top of casing
Pump started at 07:30 on 6/26/2019. Pump stopped at 08:05 on 6/27/2019.
hh:mm = hours and minutes
NM= not measured

Prepared by: EW
Checked by: ANB
Reviewed by: APTM

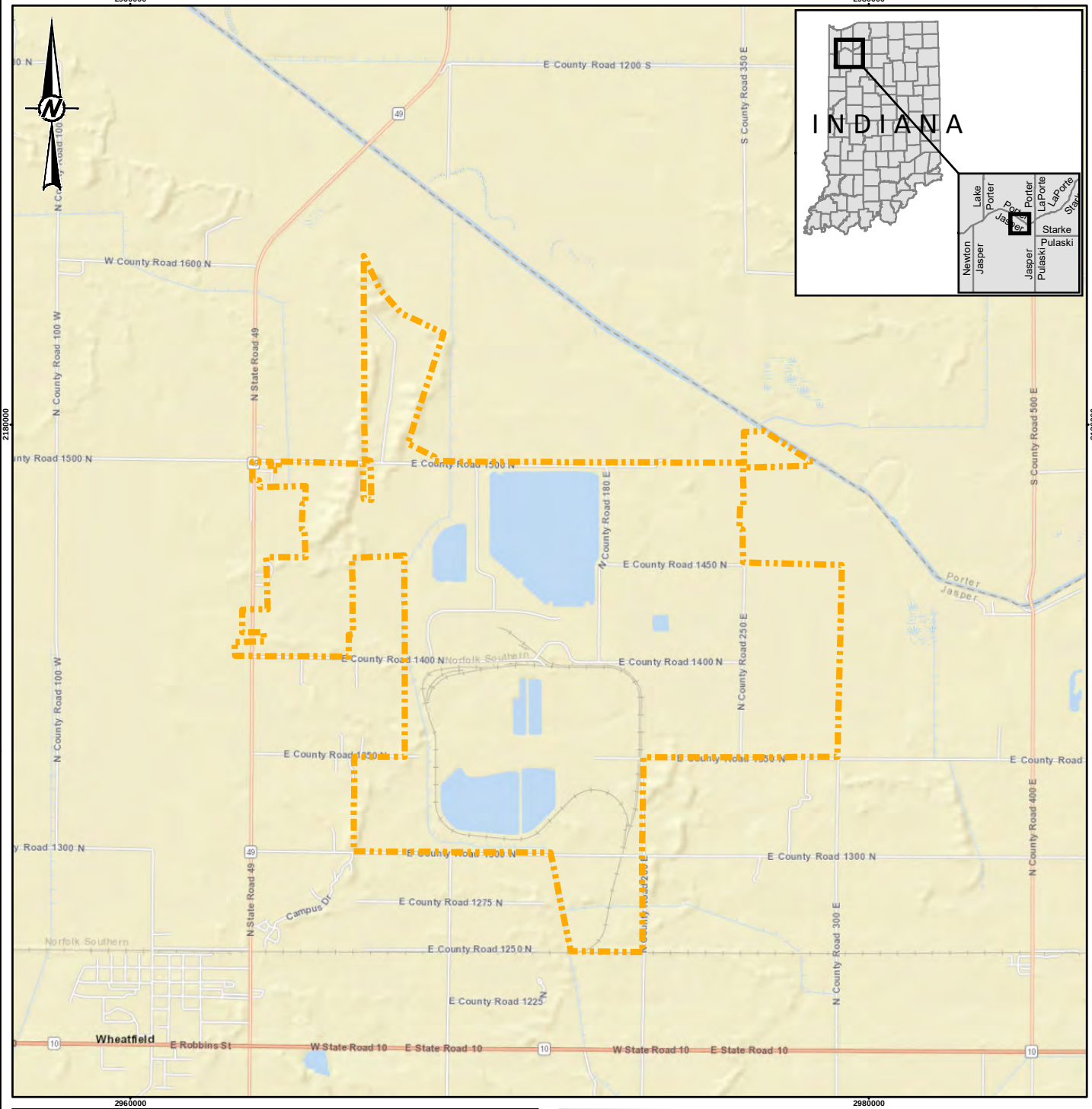
Table 5: Summary of Aquifer Test Results
NIPSCO LLC R.M. Schahfer Generating Station

Well/Piezometer ID	Analysis Method	Pumping Test Results - Transmissivity			Estimated Hydraulic Conductivity		Storage Coefficient
		[m^2/s]	[gpd/ft]	[ft^2/day]	[cm/s]	[ft/day]	[dim]
SHALLOW WELLS							
AT-01	Theis	1.10E-02	7.64E+04	1.02E+04	1.20E-01	340	2.39E-05
	Jacob	1.08E-02	7.53E+04	1.01E+04	1.18E-01	335	6.30E-06
	Theis Recovery	1.13E-02	7.84E+04	1.05E+04	1.23E-01	349	n/a
OW-1	Theis	8.68E-03	6.04E+04	8.07E+03	9.49E-02	269	6.67E+01
	Jacob	7.14E-03	4.97E+04	6.64E+03	7.82E-02	222	1.96E+01
	Theis Recovery	7.29E-03	5.07E+04	6.78E+03	7.57E-02	215	n/a
OW-2	Theis	1.08E-02	7.48E+04	1.00E+04	1.18E-01	335	1.14E-02
	Jacob	6.40E-03	4.45E+04	5.95E+03	7.00E-02	198	1.09E-02
	Theis Recovery	6.20E-03	4.31E+04	5.76E+03	6.78E-02	192	n/a
OW-3	Theis	8.15E-03	5.67E+04	7.58E+03	8.91E-02	253	1.33E-02
	Jacob	7.10E-03	4.94E+04	6.60E+03	7.76E-02	220	4.55E-03
	Theis Recovery	7.06E-03	4.91E+04	6.56E+03	7.71E-02	219	n/a
OW-4	Theis	1.03E-02	7.20E+04	9.63E+03	1.13E-01	320	8.68E-03
	Jacob	7.62E-03	5.30E+04	7.09E+03	8.33E-02	236	7.98E-03
	Theis Recovery	6.93E-03	4.82E+04	6.44E+03	7.57E-02	215	n/a
OW-5	Theis	9.44E-03	6.57E+04	8.78E+03	1.03E-01	292	1.25E-02
	Jacob	7.60E-03	5.29E+04	7.07E+03	8.32E-02	236	5.04E-03
	Theis Recovery	7.42E-03	5.16E+04	6.90E+03	8.12E-02	230	n/a
OW-6	Theis	9.27E-03	6.45E+04	8.62E+03	1.01E-01	286	1.19E-02
	Jacob	7.66E-03	5.33E+04	7.13E+03	8.37E-02	237	3.69E-03
	Theis Recovery	7.13E-03	4.96E+04	6.63E+03	7.80E-02	221	n/a
OW-7	Theis	9.96E-03	6.93E+04	9.26E+03	1.09E-01	309	3.87E+01
	Jacob	7.63E-03	5.31E+04	7.10E+03	8.35E-02	237	2.22E+01
	Theis Recovery	7.98E-03	5.55E+04	7.42E+03	8.73E-02	247	n/a
OW-8	Theis	8.68E-03	6.04E+04	8.07E+03	9.49E-02	269	1.47E-02
	Jacob	7.62E-03	5.30E+04	7.09E+03	8.34E-02	236	4.15E-03
	Theis Recovery	7.65E-03	5.32E+04	7.11E+03	8.37E-02	237	n/a
OW-9	Theis	7.69E-03	5.35E+04	7.15E+03	8.40E-02	238	6.57E-04
	Jacob	7.56E-03	5.26E+04	7.03E+03	8.26E-02	234	9.69E-05
	Theis Recovery	8.28E-03	5.76E+04	7.70E+03	9.06E-02	257	n/a
OW-10	Theis	1.13E-02	7.84E+04	1.05E+04	1.18E-01	335	3.02E-03
	Jacob	1.17E-02	8.14E+04	1.09E+04	1.28E-01	363	4.02E-04
	Theis Recovery	1.07E-02	7.43E+04	9.93E+03	1.17E-01	332	n/a
GAMW-18	Theis	1.03E-02	7.20E+04	9.63E+03	1.13E-01	320	4.30E-01
	Jacob	7.09E-03	4.93E+04	6.59E+03	7.74E-02	219	2.21E-02
	Theis Recovery	1.01E-02	7.04E+04	9.41E+03	1.11E-01	315	n/a
SHALLOW WELLS	*Minimum:*	*6.20E-03*	*4.31E+04*	*5.76E+03*	*6.78E-02*	*192*	*6.30E-06*
	Maximum:	*1.17E-02*	*8.14E+04*	*1.09E+04*	*1.28E-01*	*363*	*6.67E+01*
	Arithmetic Mean:	*8.60E-03*	*5.98E+04*	*8.00E+03*	*9.37E-02*	*266*	*6.15E+00*
DEEP WELLS							
OW-2B	Theis	9.60E-03	6.68E+04	8.93E+03	1.05E-01	298	4.59E-03
	Jacob	8.01E-03	5.57E+04	7.45E+03	8.76E-02	248	2.69E-03
	Theis Recovery	8.21E-03	5.71E+04	7.63E+03	8.97E-02	254	n/a
OW-5B	Theis	1.03E-02	7.20E+04	9.63E+03	1.13E-01	320	4.89E-03
	Jacob	9.04E-03	6.29E+04	8.41E+03	9.89E-02	280	1.28E-03
	Theis Recovery	8.15E-03	5.67E+04	7.58E+03	8.92E-02	253	n/a
OW-7B	Theis	8.97E-03	6.24E+04	8.34E+03	9.80E-02	278	1.40E-02
	Jacob	7.75E-03	5.39E+04	7.21E+03	8.47E-02	240	4.08E-03
	Theis Recovery	7.96E-03	5.54E+04	7.41E+03	8.70E-02	247	n/a
GAMW-18B	Theis	9.96E-03	6.93E+04	9.26E+03	1.09E-01	309	6.97E-03
	Jacob	7.56E-03	5.26E+04	7.03E+03	8.27E-02	234	6.95E-03
	Theis Recovery	8.03E-03	5.59E+04	7.47E+03	8.79E-02	249	n/a
DEEP WELLS	*Minimum:*	*7.56E-03*	*5.26E+04*	*7.03E+03*	*8.27E-02*	*234*	*1.28E-03*
	Maximum:	*1.03E-02*	*7.20E+04*	*9.63E+03*	*1.13E-01*	*320*	*1.40E-02*
	Arithmetic Mean:	*8.63E-03*	*6.01E+04*	*8.03E+03*	*9.44E-02*	*268*	*5.68E-03*

Notes:
ft = feet
m^2/s = square meters per second
gpd/ft = gallons per day per foot
ft^2/day = square feet per day
cm/s = centimeters per second
ft/day = feet per day
dim = dimensionless
n/a = not applicable

Prepared by: JRS
Checked by: AMH
Reviewed by: APTM

Figures



LEGEND

Approximate Property Line

0 0.75 1.5

1 " = 0.75 miles Miles

REFERENCE(S)

SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

SITE LOCATION MAP

CONSULTANT

GOLDER

YYYY-MM-DD	9/20/2019
DESIGNED	DFS
PREPARED	SHL
REVIEWED	JSP
APPROVED	MAH

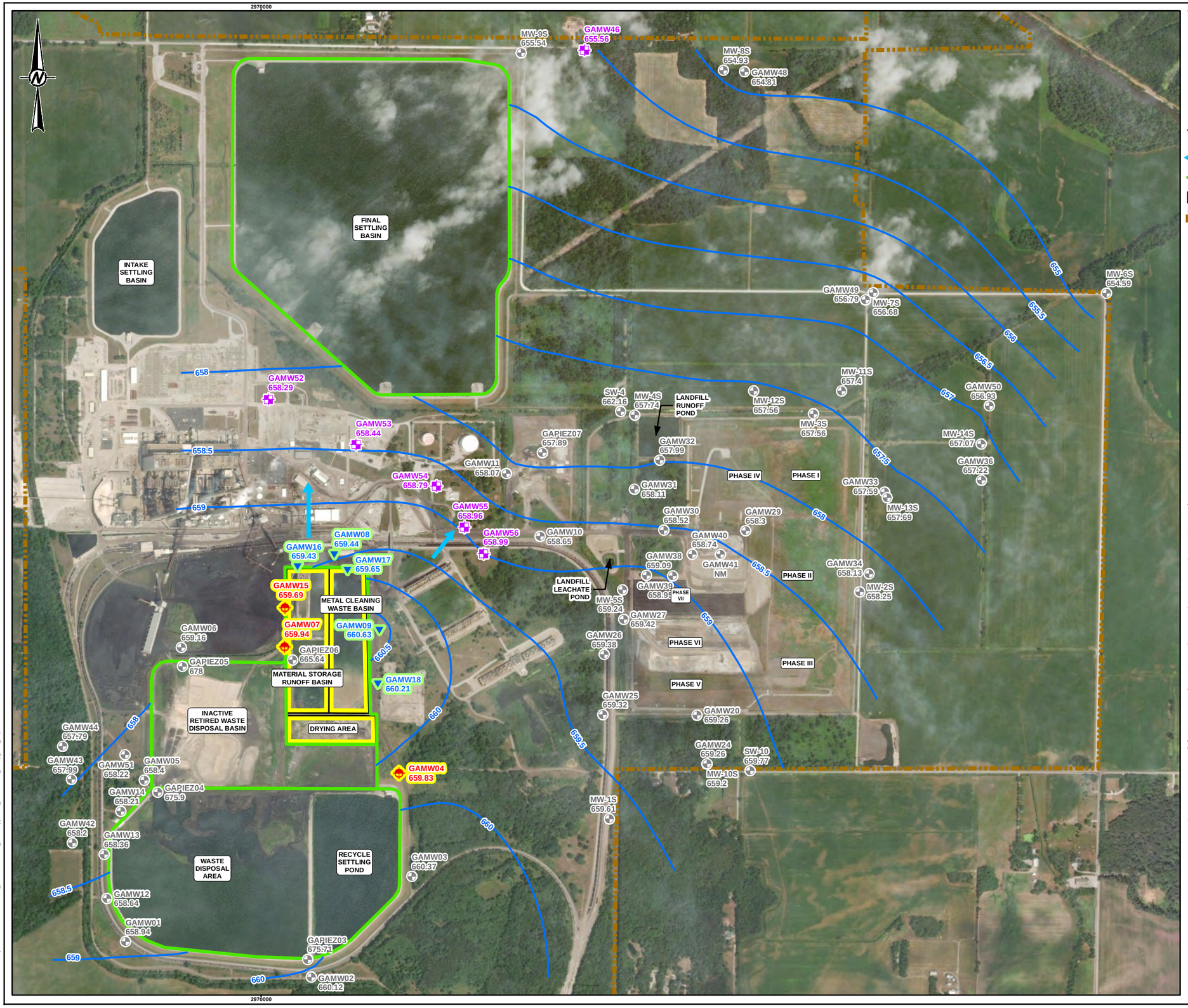
PROJECT NO.	CONTROL	REV.	FIGURE
19121567	A	0	1

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

1 in

0

PATH: V:\001 GIS Projects\NIPSCO\Schahfer\99_PROJ\19121567_2019Support\40_PROD\001_Pump_Test_Report\19121567-001-HS-0001.mxd PRINTED ON: 2019-09-20 AT 11:16:22 AM



LEGEND

- Assessment Monitoring Well
- Background Monitoring Well
- Downgradient Monitoring Well
- Non-CCR Well
- August 2018 Groundwater Elevation Contour (0.5 ft interval)
- Generalized Groundwater Flow Direction
- Slurry Wall
- CCR Units
- Approximate Property Line

0 1,000 2,000

1 " = 1,050 feet Feet

FIGURE NARRATIVE

THIS FIGURE DEPICTS THE GROUNDWATER SURFACE WITHIN THE UPPER PORTION OF THE SURFICIAL AQUIFER, AND IS INTENDED TO REPRESENT THE APPROXIMATE ELEVATION OF THE GROUNDWATER POTENTIOMETRIC SURFACE. THE POSTED DATA WERE CALCULATED FROM DEPTH TO WATER MEASUREMENTS CONDUCTED BY GOLDER ON AUGUST 27-28, 2018.

THE DIRECTION OF HORIZONTAL GROUNDWATER FLOW AT AND NEAR THE POTENTIOMETRIC SURFACE CAN BE GENERALLY INTERPRETED AS BEING PERPENDICULAR TO THE GROUNDWATER ELEVATION CONTOURS.

GOLDER INFERRED THE ELEVATION CONTOURS BASED ON THE DATA ILLUSTRATED. THE ACTUAL ELEVATION OF THE POTENTIOMETRIC SURFACE LIKELY VARIES FROM ACTUAL CONDITIONS. OTHER INTERPRETATIONS ARE POSSIBLE. THE DEPTH TO GROUNDWATER IS KNOWN TO VARY WITH TIME.

NOTE(S)

1. WATER LEVEL MEASUREMENTS COLLECTED BETWEEN AUGUST 27-28, 2018.
2. NM INDICATES WATER LEVEL WAS NOT MEASURED IN AUGUST 2018.

REFERENCE(S)

1. SERVICE LAYER CREDITS: SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY
2. GROUNDWATER ELEVATION DATA FROM 'MULTI-MNA REPORT' IN 2018.

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

AUGUST 2018 GROUNDWATER ELEVATION CONTOUR MAP

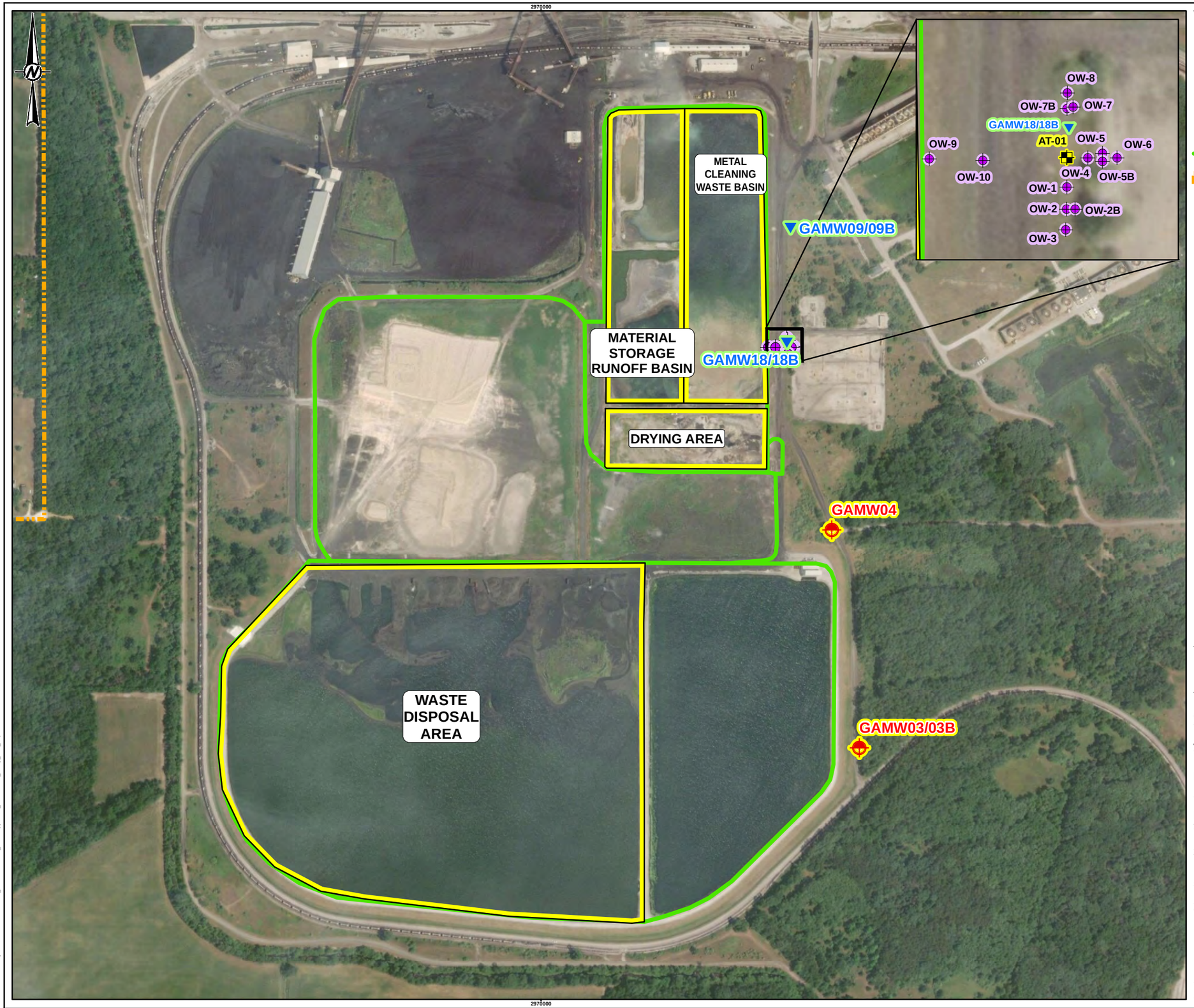
CONSULTANT

GOLDER

YYYY-MM-DD	9/20/2019
DESIGNED	JSP
PREPARED	SHL
REVIEWED	DFS
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
19121567	A	0	2

PATH: V:\001 GIS Projects\NIPSCO\Schahfer\mxd_PROJ\19121567_2019\support\40_PROD\0001_Pump_Test_Report\19121567-0001-HS-0006.mxd PRINTED ON: 2019-09-20 AT: 10:48:55 AM
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
1 in
0



LEGEND

- Aquifer Test Well
- Observation Well
- Background Monitoring Well
- Downgradient Monitoring Well
- Slurry Wall
- Approximate Property Line

DO NOT RELY THIS DOCUMENT

DRAFT

0 500 1,000

1 " = 500 feet Feet

NOTE(S)

REFERENCE(S)

1. SERVICE LAYER CREDITS: SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEROGRID, IGN, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

AQUIFER TEST WELL AND PIEZOMETER LOCATION PLAN

CONSULTANT

GOLDER

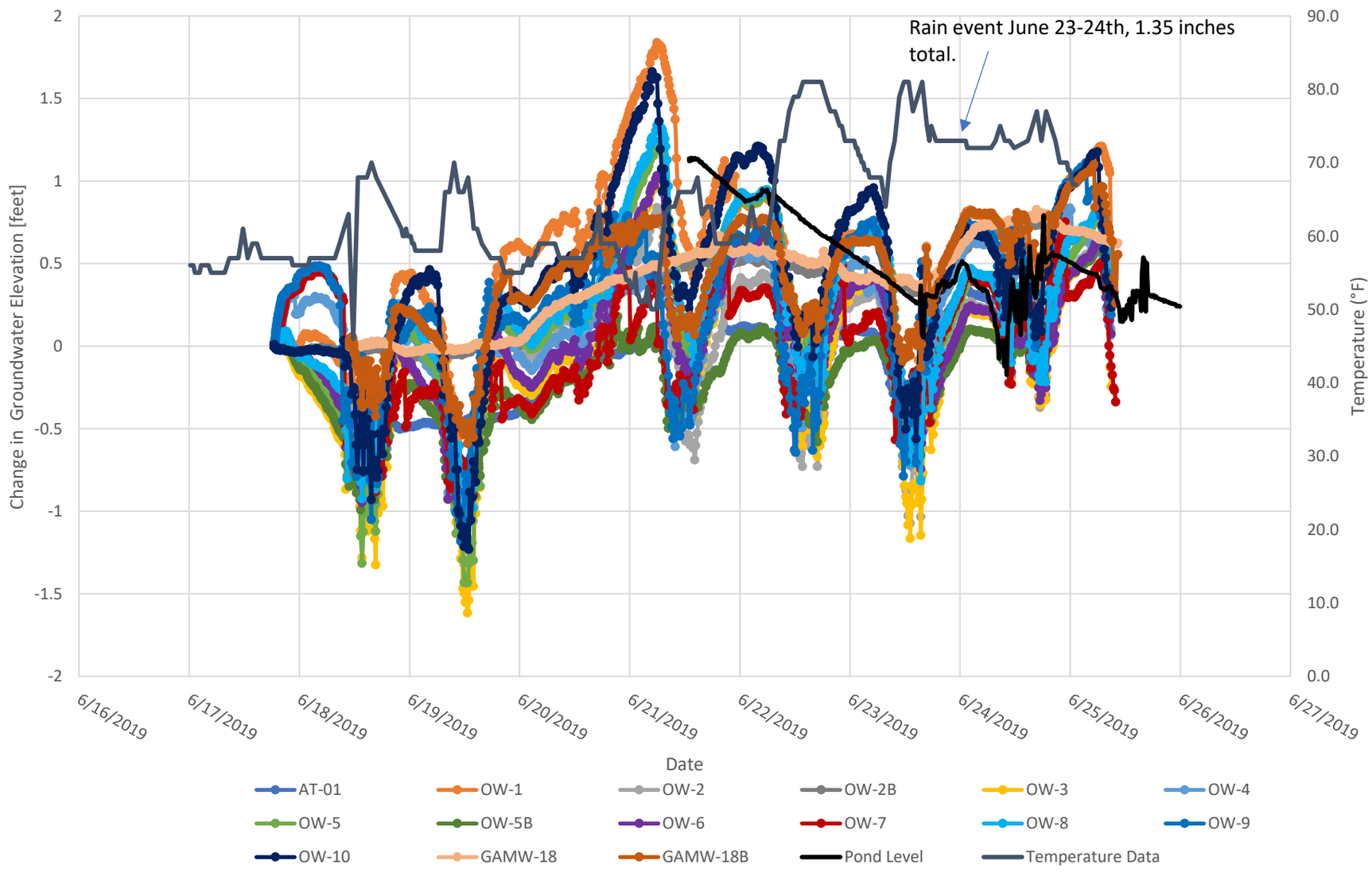
YYYY-MM-DD	4/23/2020
DESIGNED	JSP
PREPARED	SHL
REVIEWED	JSP
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
19121567	A	0	3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI B

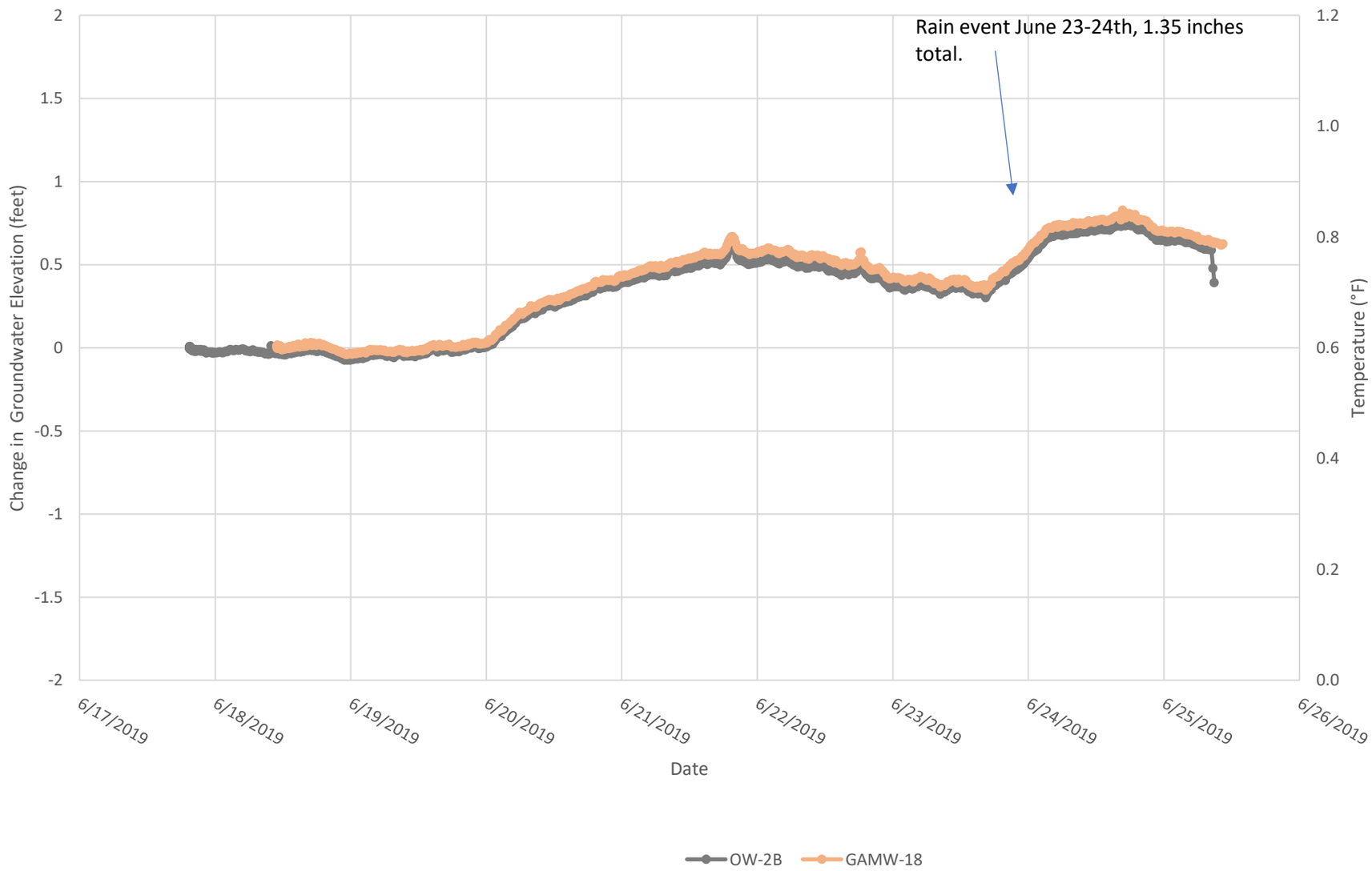
PATH: V:\001 GIS Projects\NIPSCO\Schahfer\99_PROJ\19121567_2019\support\40_PROD\0001_Pump_Test_Report\1912567-0001-HS-0002.mxd PRINTED ON: 2020-04-23 AT: 2:36:52 PM

Figure 4: Background Groundwater Data



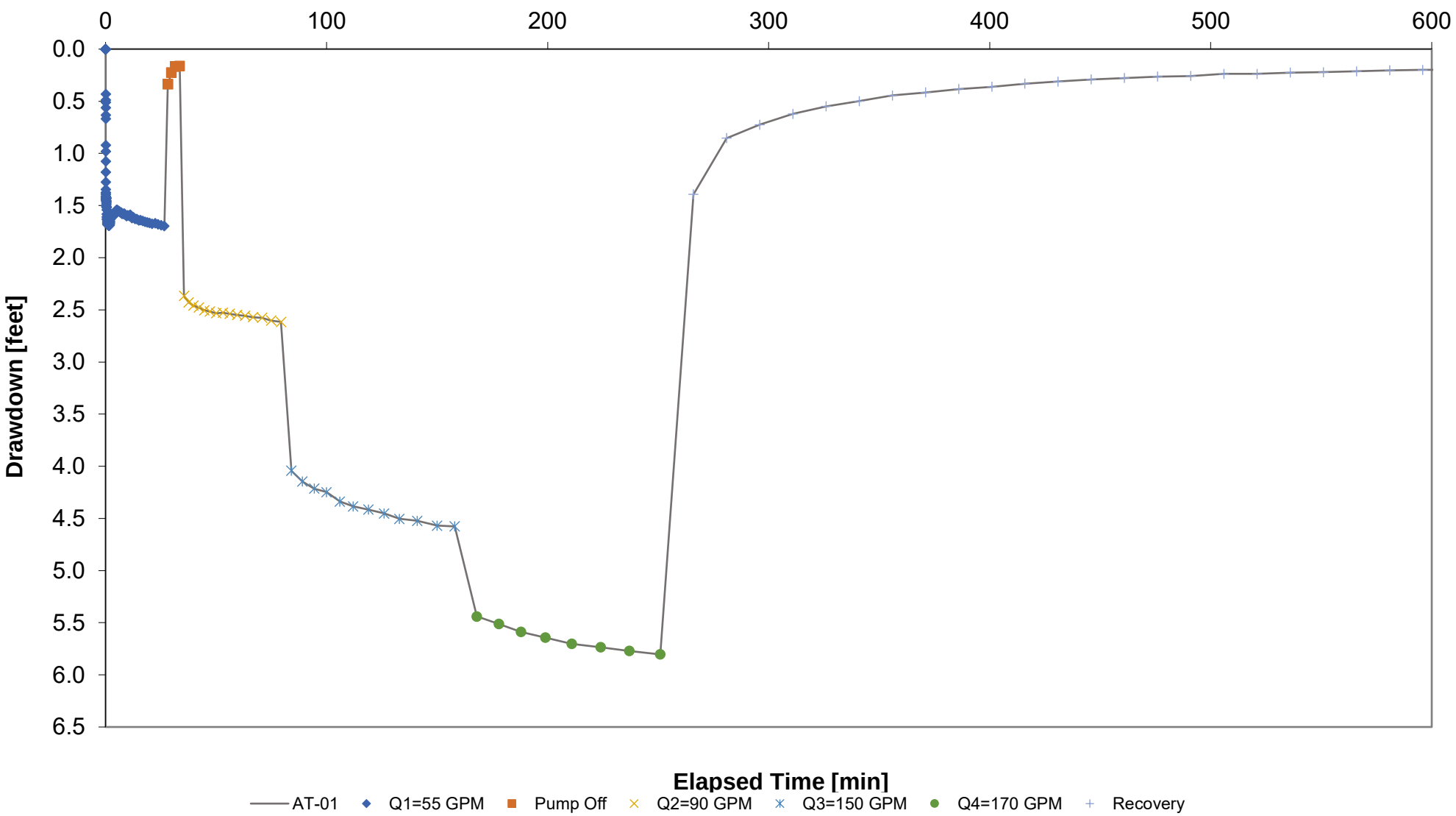
Note: Graph is diplaying changes in groundwater elevation. Positive values indicate higher groundwater elevation than when transducer was installed and negative values indicate lower groundwater elevation than when tranducer was installed.

Figure 4a: Background Groundwater Data



Note: Graph is diplaying changes in groundwater elevation. Positive values indicate higher groundwater elevation than when transducer was installed and negative values indicate lower groundwater elevation than when tranducer was installed.

Figure 5: Step Test Drawdown/ Recovery Graph



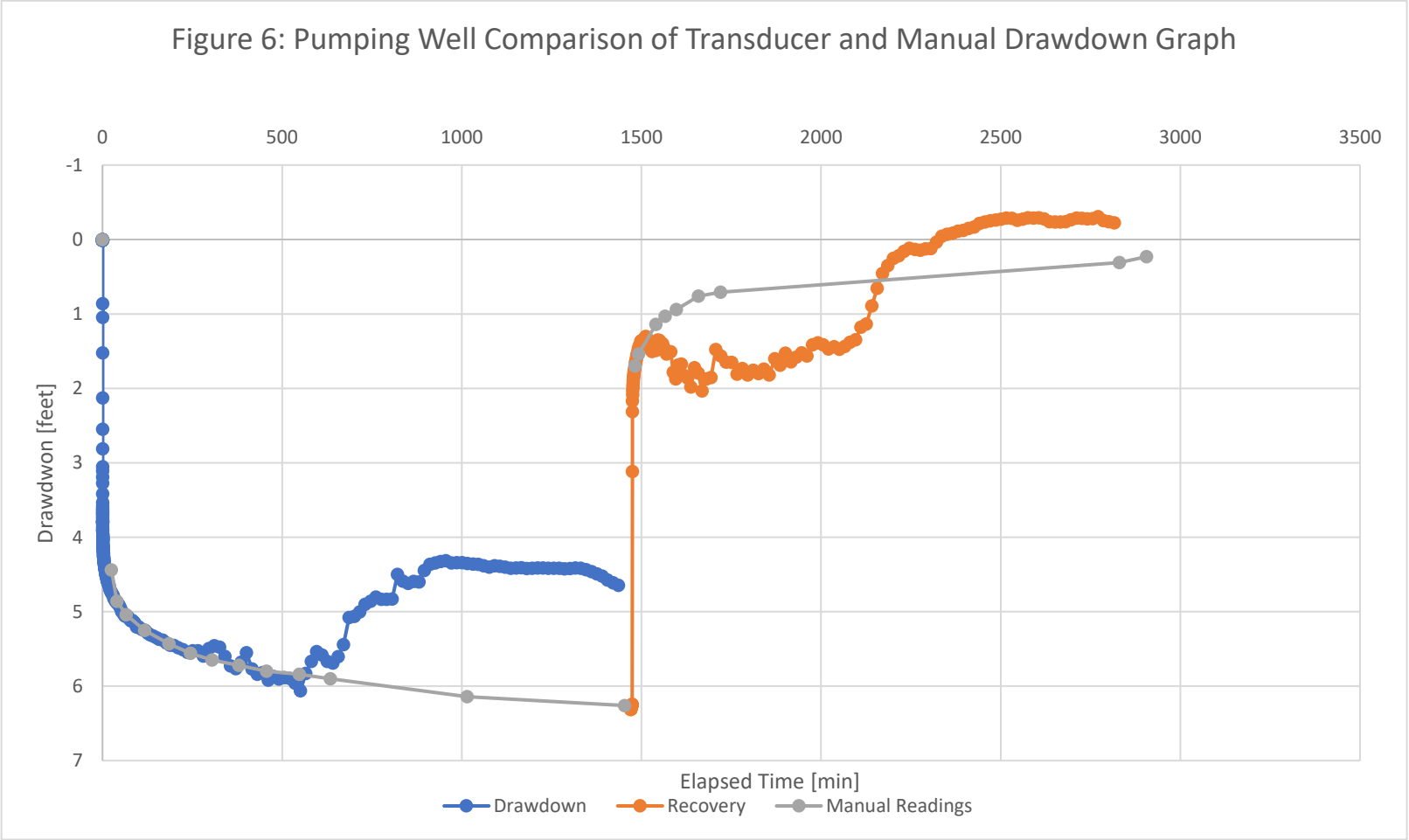


Figure 6: Pumping Well Comparison of Transducer and Manual Drawdown Graph
0
500
1000
1500
2000
2500
3000
3500
-1
0
1
2
3
4
5
6
7
Drawdwon [feet]
Elapsed Time [min]
Drawdown
Recovery
Manual Readings

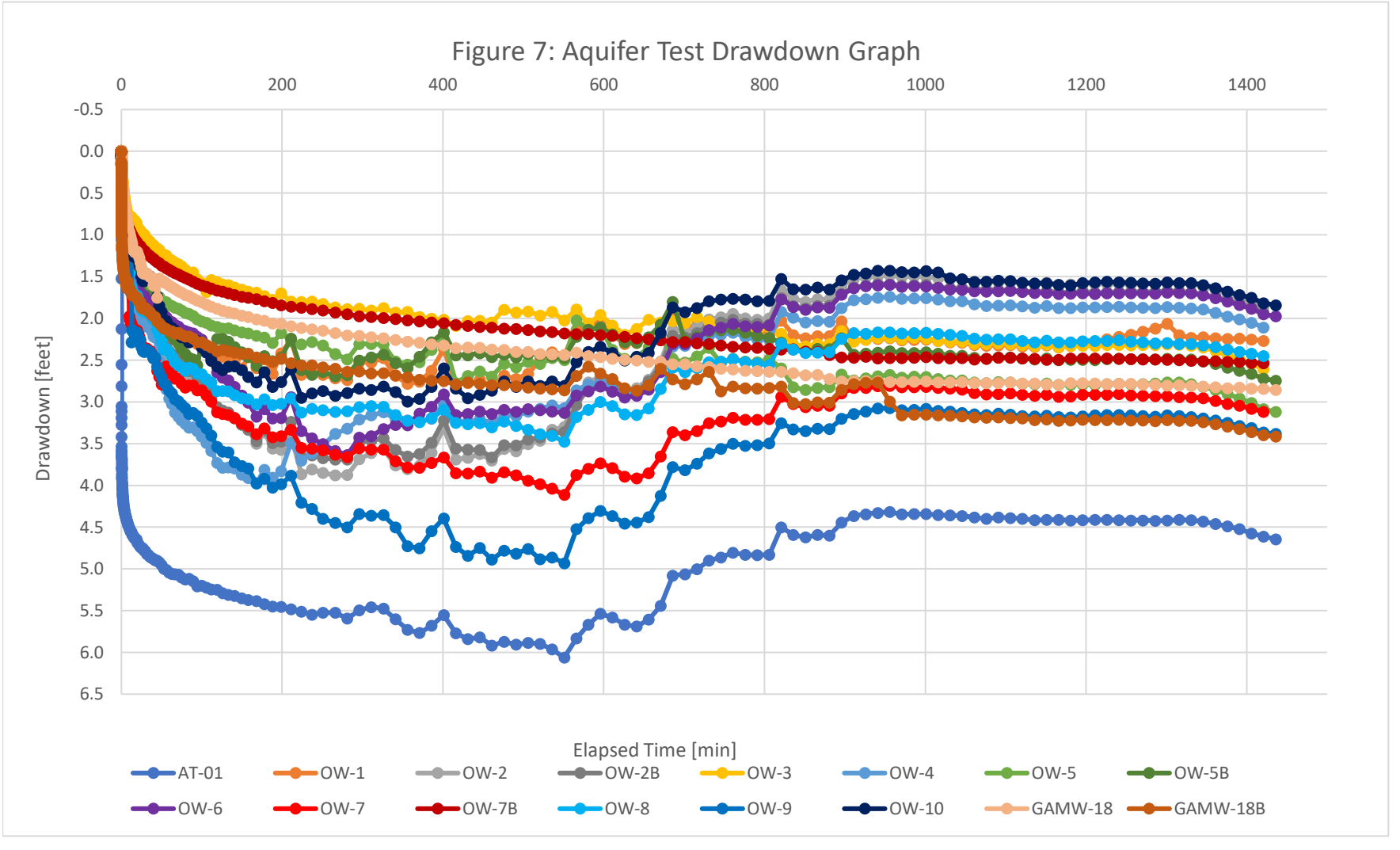


Figure 7: Aquifer Test Drawdown Graph
0
200
400
600
800
1000
1200
1400
-0.5
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
Drawdown [feet]
Elapsed Time [min]
AT-01
OW-1
OW-2
OW-2B
OW-3
OW-4
OW-5
OW-5B
OW-6
OW-7
OW-7B
OW-8
OW-9
OW-10
GAMW-18
GAMW-18B

Figure 8: Aquifer Test Recovery Graph

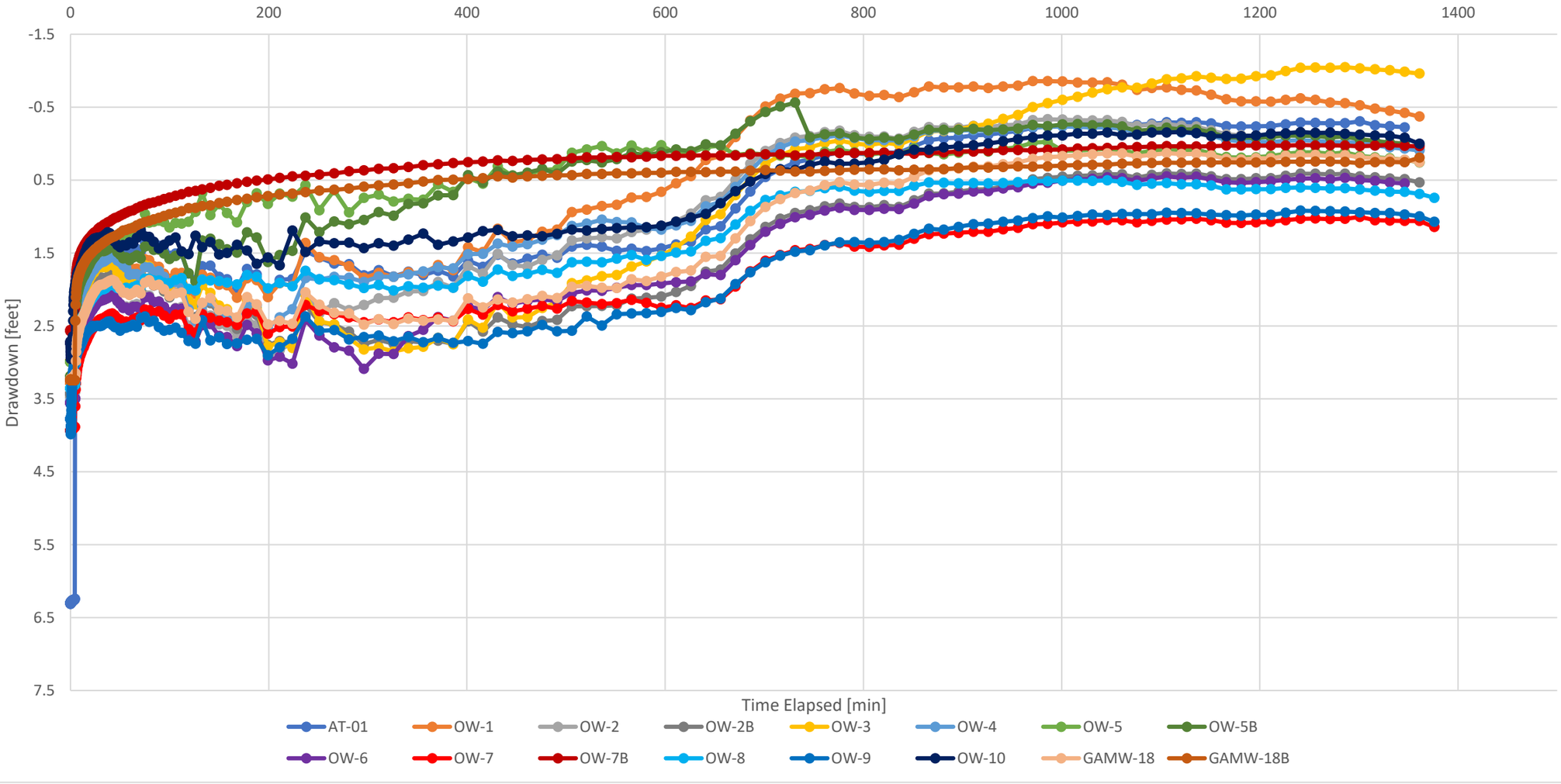


Figure 9a: Comparison of Transducer Data and Manual Drawdown Graph

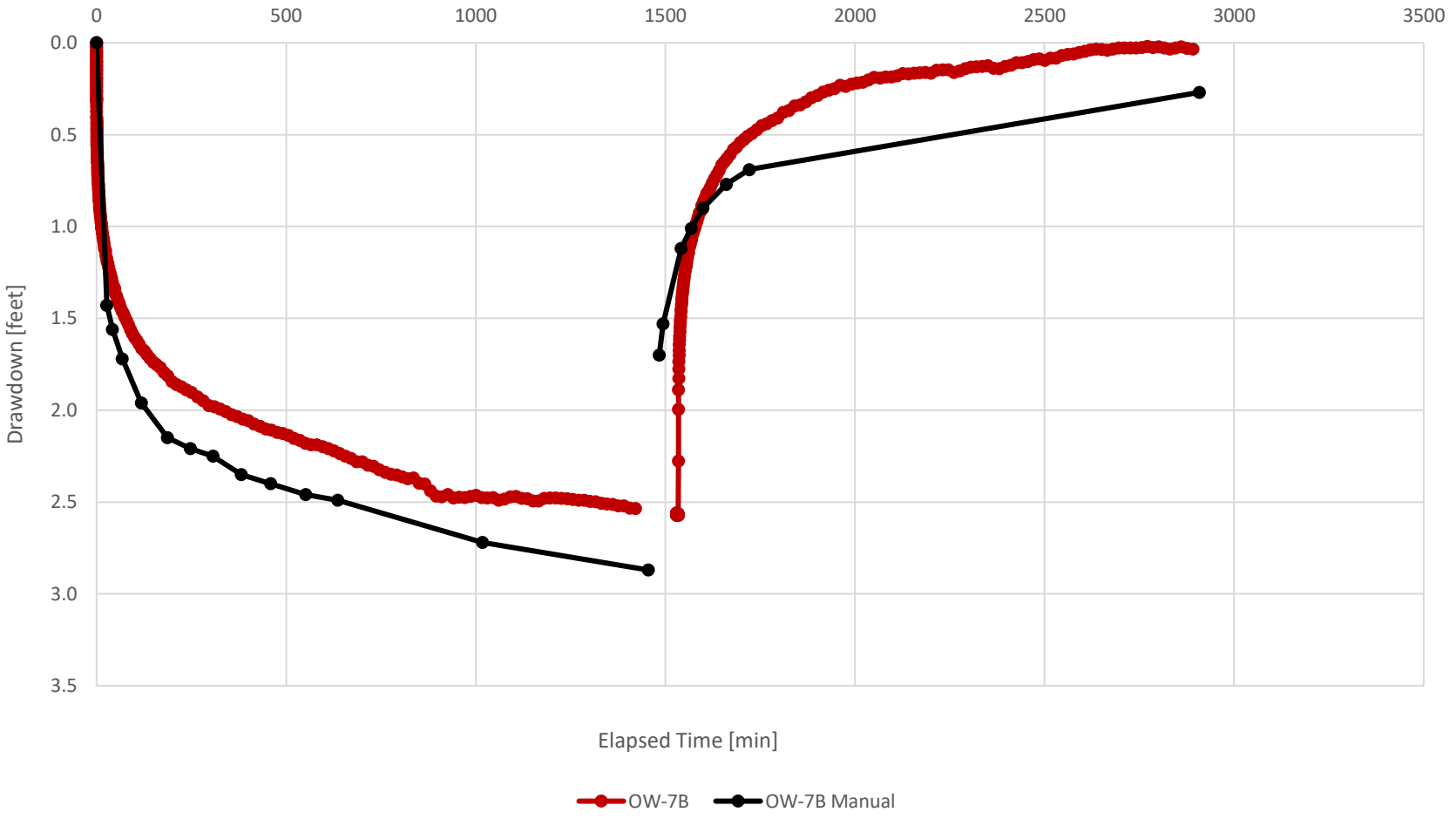
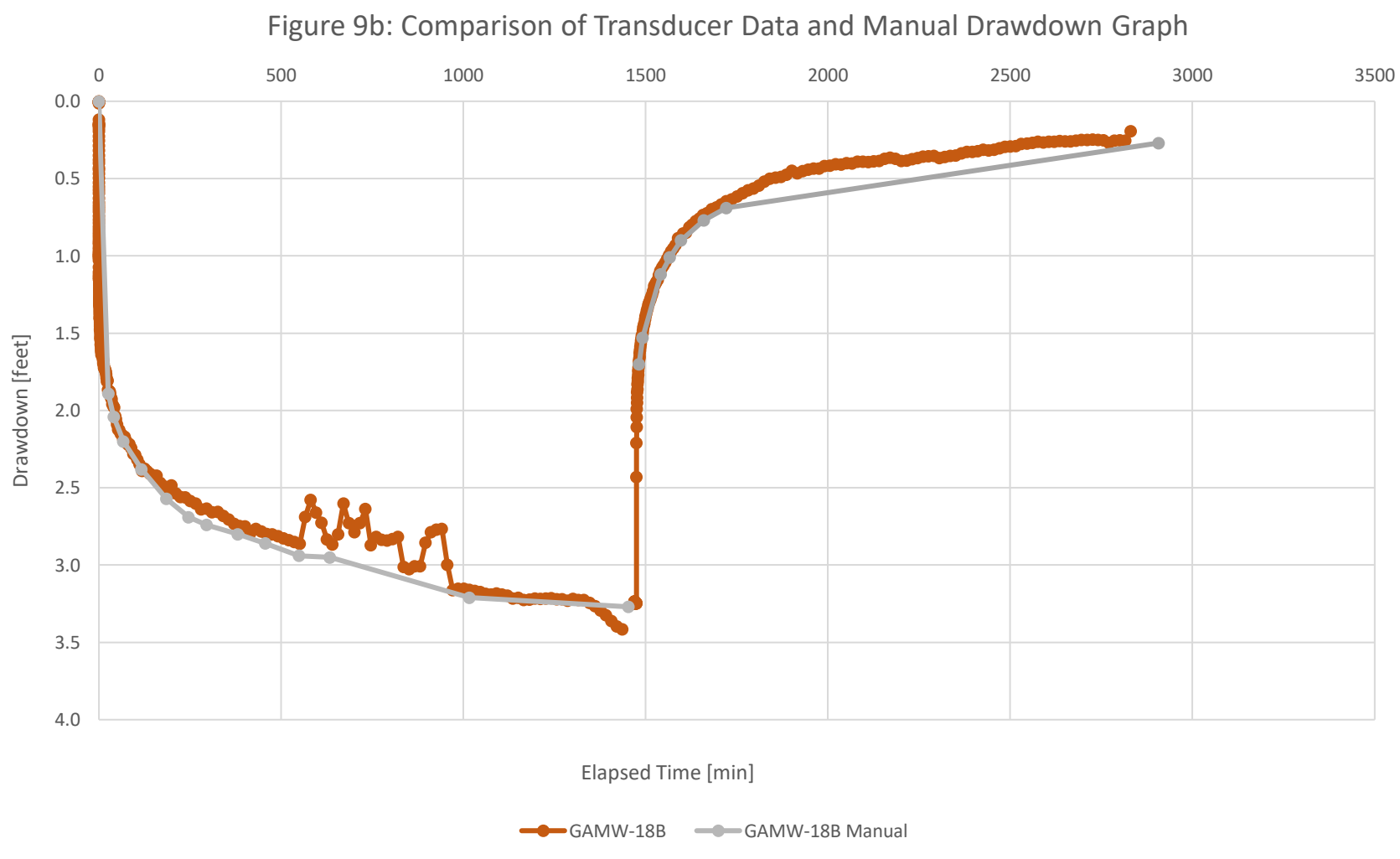
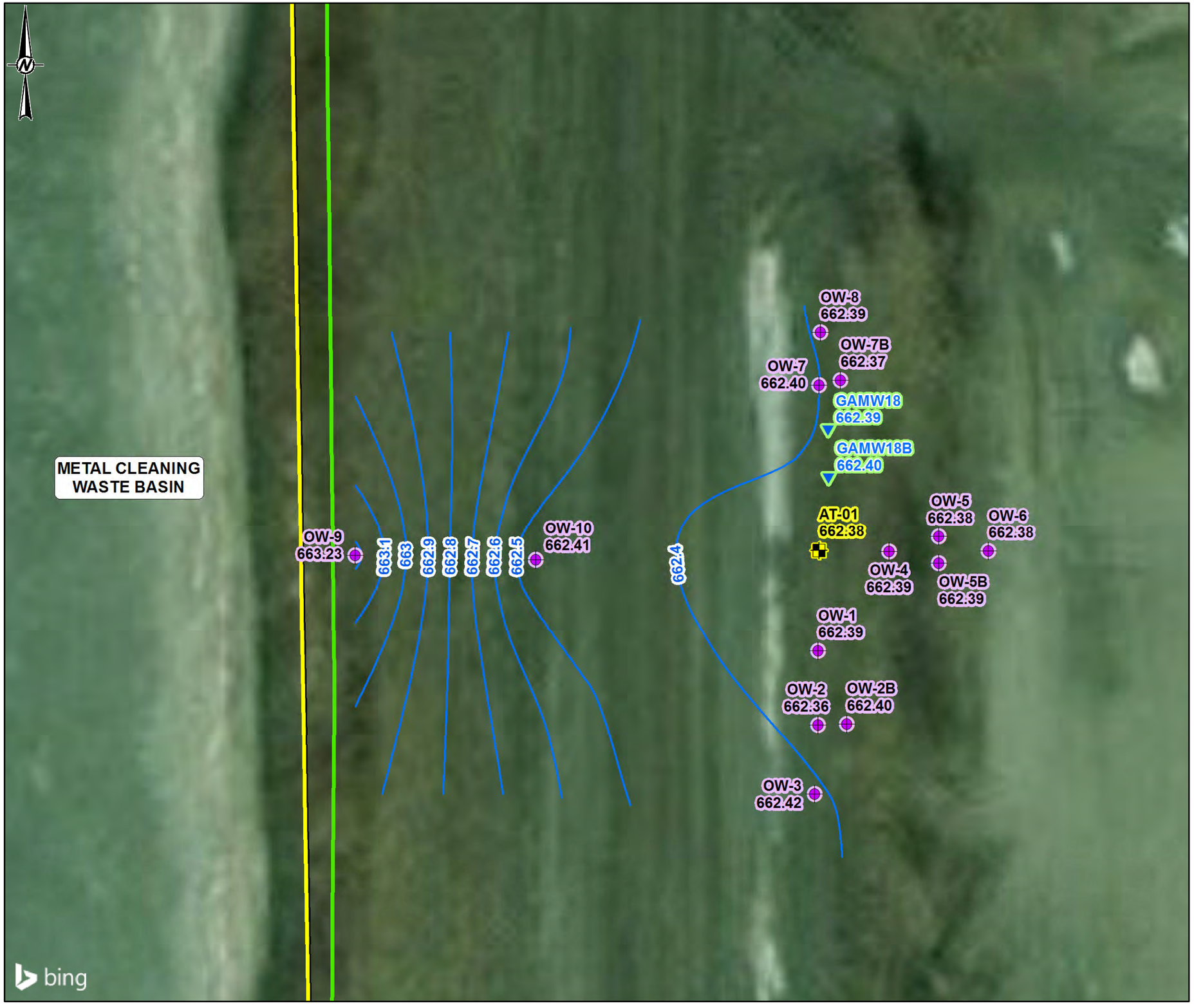


Figure 9b: Comparison of Transducer Data and Manual Drawdown Graph





LEGEND

- Aquifer Test Well
- Downgradient Monitoring Well
- Observation Well; Abandoned
- Pre-pumping Test Groundwater Elevation Contour (0.1 ft interval)
- Slurry Wall
- Limits of Metal Cleaning Waste Basin

FIGURE NARRATIVE

THIS FIGURE DEPICTS THE GROUNDWATER ELEVATION SCREENED WITHIN THE UPPER PORTION OF THE SURFICIAL AQUIFER, AND IS INTENDED TO REPRESENT THE APPROXIMATE ELEVATION OF THE GROUNDWATER POTENTIOMETRIC SURFACE. GOLDER CALCULATED THE POSTED DATA FROM DEPTH TO WATER MEASUREMENTS MADE ON JUNE 26, 2019 JUST PRIOR TO THE INITIATION OF THE AQUIFER TEST.

THE DIRECTION OF HORIZONTAL GROUNDWATER FLOW AT AND NEAR THE POTENTIOMETRIC SURFACE CAN BE GENERALLY INTERPRETED AS BEING PERPENDICULAR TO THE GROUNDWATER ELEVATION CONTOURS.

GOLDER INFERRED THE ELEVATION CONTOURS BASED ON THE DATA ILLUSTRATED. THE ACTUAL ELEVATION OF THE POTENTIOMETRIC SURFACE IS LIKELY MORE HETEROGENEOUS THAN SHOWN AND ACTUAL CONDITIONS WILL VARY. OTHER INTERPRETATIONS ARE POSSIBLE. THE DEPTH TO GROUNDWATER IS KNOWN TO VARY WITH TIME.

DO NOT RELY THIS DOCUMENT

DRAFT

0 20 40

1 " = 20 feet Feet

REFERENCE(S)

1. SERVICE LAYER CREDITS: © 2020 MICROSOFT CORPORATION © 2020 MAXAR ©CNES (2020) DISTRIBUTION AIRBUS DS

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

POTENTIOMETRIC SURFACE MAP PRIOR TO PUMPING TEST

CONSULTANT

GOLDER

YYYY-MM-DD	7/14/2020
DESIGNED	JSP
PREPARED	SHL
REVIEWED	-
APPROVED	-

PROJECT NO.	CONTROL	REV.	FIGURE
19121567	A	0	10

PATH: V:\001 GIS Projects\NIPSCO\Schahfer\99_PROJ\19121567_2019Support\40_PROD\0001_Pump_Test_Report\19121567-0001-HS-0007.mxd PRINTED ON: 2020-07-14 AT: 4:25:18 PM

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



LEGEND

- Aquifer Test Well
- Downgradient Monitoring Well
- Observation Well
- Maximum Drawdown Contour (0.5 ft interval)
- Slurry Wall
- Limits of Metal Cleaning Waste Basin

FIGURE NARRATIVE

THIS FIGURE DEPICTS THE MAXIMUM DRAWDOWN OBSERVED DURING THE AQUIFER TEST WITHIN THE UPPER PORTION OF THE SURFICIAL AQUIFER, AND IS INTENDED TO REPRESENT THE APPROXIMATE ELEVATION OF THE GROUNDWATER POTENTIOMETRIC SURFACE UNDER PUMPING CONDITIONS. GOLDER CALCULATED THE POSTED DATA FROM DEPTH TO WATER MEASUREMENTS MADE ON JUNE 27, 2019 JUST PRIOR TO SHUTTING OFF THE PUMP.

GOLDER INFERRED THE ELEVATION CONTOURS BASED ON THE DATA ILLUSTRATED. OTHER INTERPRETATIONS ARE POSSIBLE.

DO NOT RELY THIS DOCUMENT

DRAFT

0 20 40

1 " = 20 feet Feet

REFERENCE(S)

1. SERVICE LAYER CREDITS: © 2020 MICROSOFT CORPORATION © 2020 DIGITALGLOBE ©CNES (2020) DISTRIBUTION AIRBUS DS

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

MAXIMUM DRAWDOWN CONTOURS

CONSULTANT

GOLDER

YYYY-MM-DD	5/4/2020
DESIGNED	DFS
PREPARED	SHL
REVIEWED	JSP
APPROVED	APTM

PROJECT NO.	CONTROL	REV.	FIGURE
19121567	A	0	11

PATH: V:\001 GIS Projects\NIPSCO\Schahfer\99_PROJ\19121567_2019\Support\40_PROD\0001_Pump_Test_Report\19121567-0001-HS-0008.mxd PRINTED ON: 2020-05-04 AT: 5:03:57 PM

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
1 in
0

APPENDIX A

Pumping Well Design

TABLE 1
NIPSCO/CCR GW MON/IN
SUMMARY OF SOIL DATA

Sample Type	Boring/Pit Number	Sample Number	Sample Depth (ft)	USCS Soil Classification	Delivered Moisture (%)	Atterberg Limits			Grain Size Distribution			Specific Gravity	Moisture/Density Relationship Standard Proctor		Additional Tests Comments (See Notes)
						LL	PL	PI	% Finer 3/4"	% Finer #4	% Finer #200		Dry Density (pcf)	Moisture (%)	
Bag	GAMW-33B, 34B,35B, 36B, 37B	S2 (bot) Comp	5'8"-7'	SP	--	--	--	--	100	100	5	--	107.8	14.7	DS
Bag	GAMW-33B	S3	10.5"-12'	SP	--	--	--	--	100	98	3	--	--	--	
Bag	GAMW-37B	S3	10'-12'	SP	--	--	--	--	100	100	4	--	--	--	
Bag	GAMW-35B	S3 (top)	10'-11'5"	SP	--	--	--	--	100	95	4	--	--	--	
Bag	GAMW-33B	S6 (top)	25'11"-26'9"	SP	--	--	--	--	100	93	3	--	--	--	
Bag	GAMW-36B	S5 (top)	20'10"-21'5"	SW	--	--	--	--	100	87	2	--	--	--	
Bag	GAMW-34B	S4	16'3"-17'	SP	--	--	--	--	99	85	2	--	--	--	
Bag	GAMW-35B	S5 (top)	20'-20'10"	SP	--	--	--	--	100	99	1	--	--	--	
Bag	GAMW-37B	S2 (top)	5'-6'1"	--	--	--	--	--	100	100	16	--	--	--	
Bag	GAMW-33B	S2 (top)	5'-6'	--	--	--	--	--	100	99	16	--	--	--	
Bag	GAMW-36B	S7 (bot)	31'5.5"-32'	SP	--	--	--	--	100	99	2	--	--	--	
Bag	GAMW-37B	S6 (bot)	26'6"-27'	SP	--	--	--	--	100	82	5	--	--	--	

NOTES:

LL= LIQUID LIMIT
PL= PLASTIC LIMIT
PI= PLASTIC INDEX
SL= SHRINKAGE LIMIT
UW= UNIT WEIGHT
P or Red Indicates Pending test result(s)
***** Over size corrected value per ASTM D4718

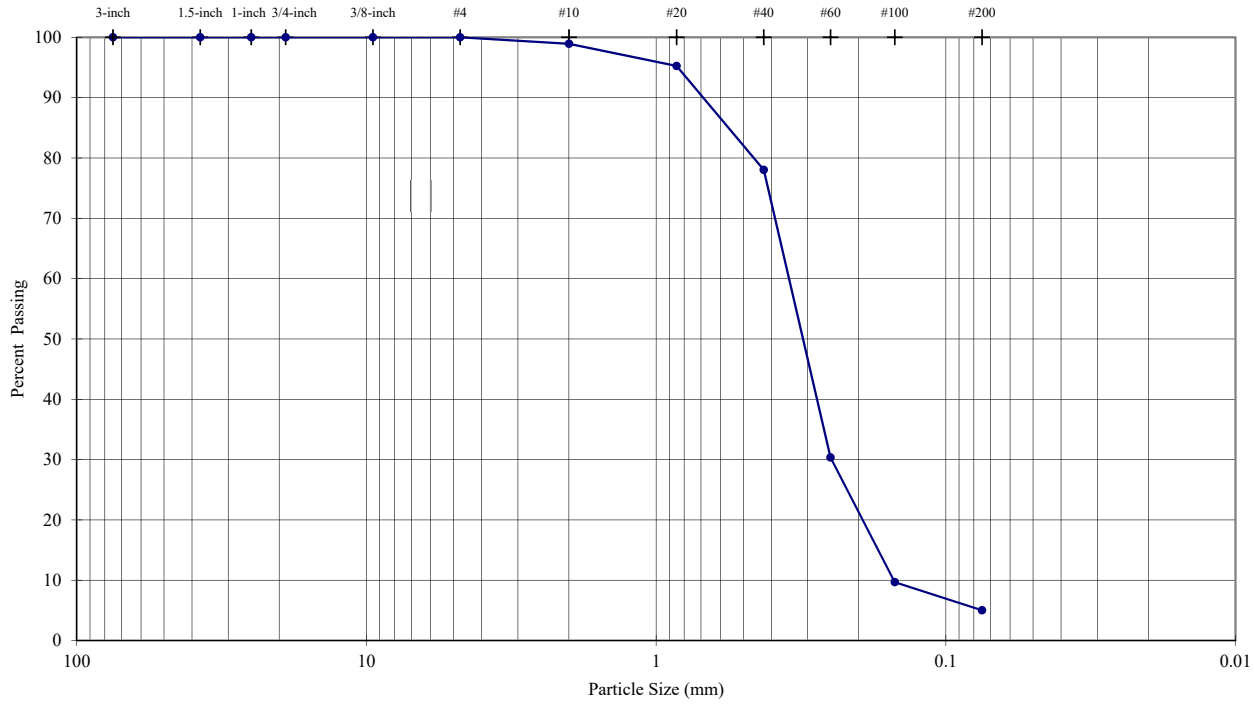
T = TRIAXIAL TEST
U = UNCONFINED COMPRESSION TEST
C = CONSOLIDATION TEST
DS = DIRECT SHEAR TEST
PERM = PERMEABILITY

November-16 **1648171.03**

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

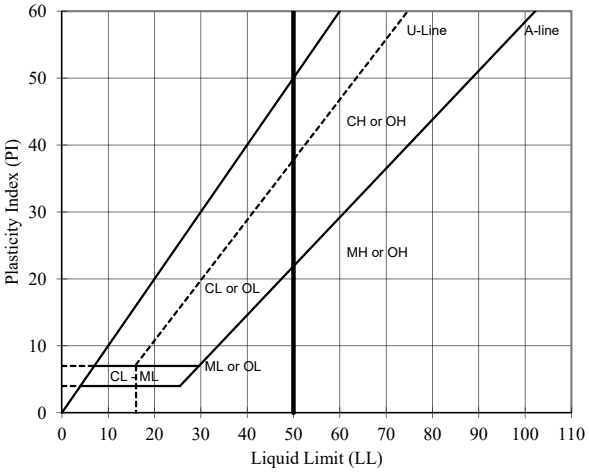
PROJECT NAME: **NIPSCO/CCR GW Mon/IN**
SAMPLE ID: **S2 (bot) Comp** DEPTH (ft): **5'8"-7'**
TYPE: **Bags**



Sieve	Particle Size (mm)	% Passing
3-inch	75.0	**100.0**
1.5-inch	37.5	**100.0**
1-inch	25.0	**100.0**
3/4-inch	19.0	**100.0**
3/8-inch	9.5	**100.0**
#4	4.8	**100.0**
#10	2.00	**98.9**
#20	0.85	**95.3**
#40	0.43	**78.0**
#60	0.25	**30.3**
#100	0.15	**9.7**
#200	0.075	**5.0**

Sieve Analysis

Description	Percentage
Coarse Gravel	**0.00**
Fine Gravel	**0.00**
Coarse Sand	**1.07**
Medium Sand	**20.91**
Fine Sand	**73.01**
Silt or Clay Fines	**5.01**



USCS Description (ASTM D 2487):

Poorly graded sand, olive brown, moist

LL	PL	PI
--	--	--

As-Received Moisture Content (%): --

USCS Group Symbol: SP

Notes: 0g of particles up to 4.75 mm maximum size were removed from particle size analysis sample prior to testing
Particle size analysis sample was not mechanically dispersed; hydrometer test was not performed
Sample prepared for Atterberg Limits testing by the dry method
Material retained on No. 40 sieve removed from Atterberg Limits sample by sieving
Plastic Limit test performed by hand rolling. Method A Liquid Limit test performed using mechanical device

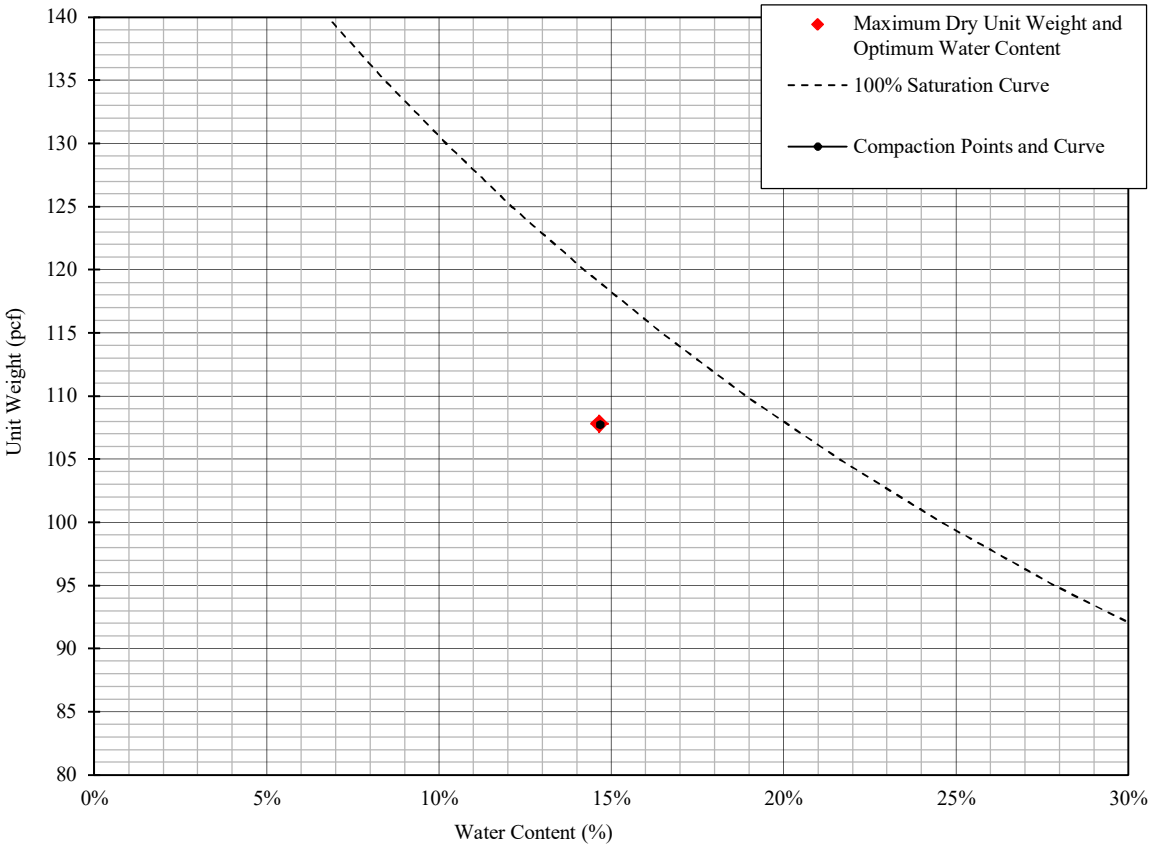
TECH	BQ
DATE	11/22/2016
REVIEW	MB

November-16 1648171.03

LABORATORY COMPACTION CHARACTERISTICS OF SOIL
ASTM D698 - Method A (One-Point Proctor)

Manual Rammer	Moist Preparation

PROJECT NAME: **NIPSCO/CCR GW Mon/IN**
SAMPLE ID: **S2 (bot) Comp** DEPTH (ft): **5'8"-7'**
TYPE: **Bags**



% Test Fraction Passing #4 Sieve	**100%**
As-Received Moisture Content	**NA**
Specific Gravity (estimated)	**2.65**

Maximum Dry Unit Weight (pcf)	**107.8**
Optimum Water Content (%)	**14.7**

USCS Description (ASTM D 2487): Poorly graded sand, olive brown, moist

USCS SP

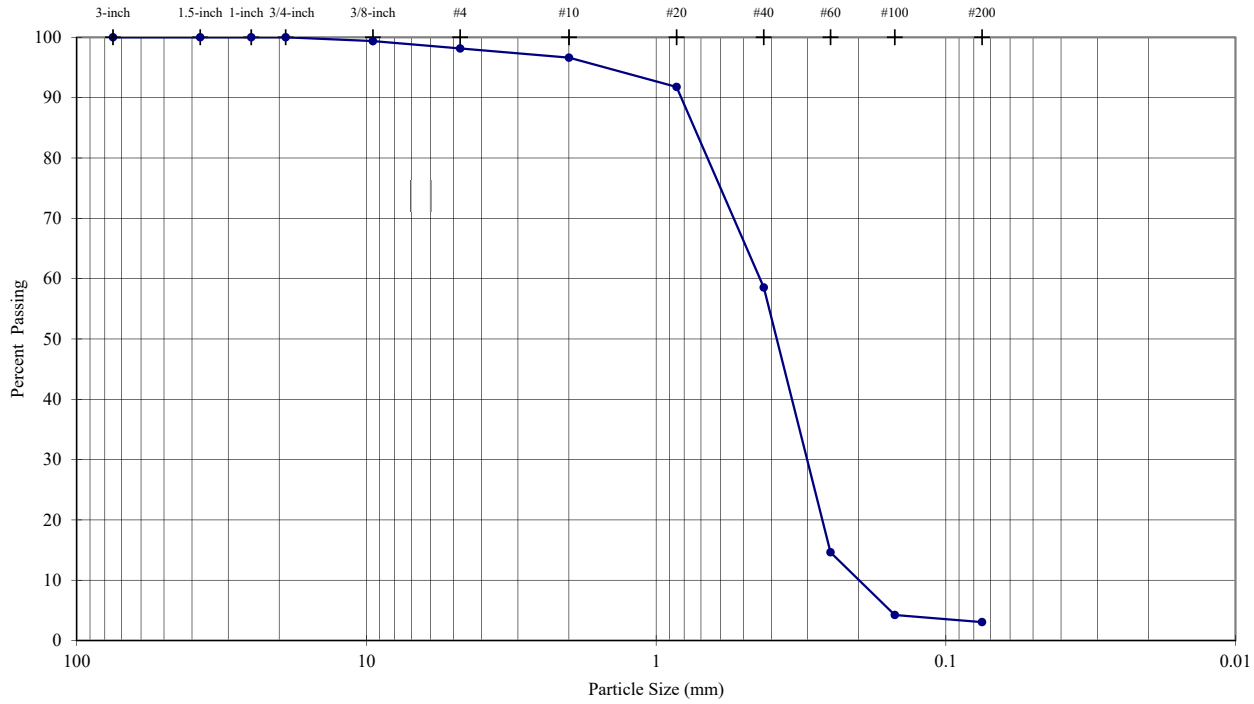
TECH	BQ
DATE	11/17/2016
REVIEW	MB

November-16 **1648171.0300**

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

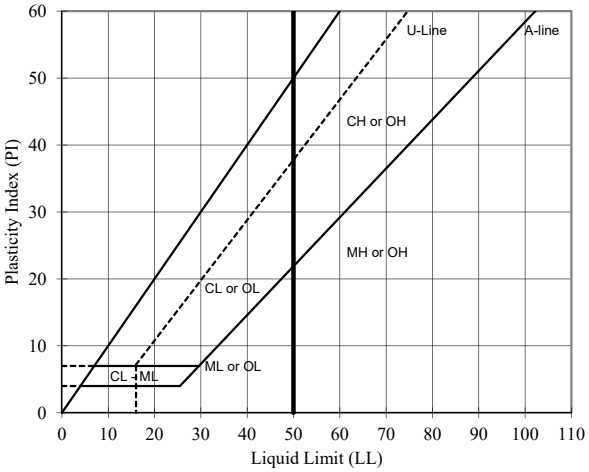
PROJECT NAME: **NIPSCO/CCR GW Mon/IN**
SAMPLE ID: **GAMW-33B / S3** DEPTH (ft): **10.5"-12'**
TYPE: **Bag**



Sieve	Particle Size (mm)	% Passing
3-inch	75.0	**100.0**
1.5-inch	37.5	**100.0**
1-inch	25.0	**100.0**
3/4-inch	19.0	**100.0**
3/8-inch	9.5	**99.4**
#4	4.8	**98.2**
#10	2.00	**96.6**
#20	0.85	**91.8**
#40	0.43	**58.5**
#60	0.25	**14.6**
#100	0.15	**4.2**
#200	0.075	**3.1**

Sieve Analysis

Description	Percentage
Coarse Gravel	**0.00**
Fine Gravel	**1.84**
Coarse Sand	**1.53**
Medium Sand	**38.10**
Fine Sand	**55.47**
Silt or Clay Fines	**3.06**



USCS Description (ASTM D 2487):

Poorly graded sand, olive brown, moist

LL	PL	PI
--	--	--

As-Received Moisture Content (%): --

USCS Group Symbol: SP

Notes: 0 g of particles up to 19.0 mm maximum size were removed from particle size analysis sample prior to testing
Particle size analysis sample was not mechanically dispersed; hydrometer test was not performed
Atterberg Limits test was not performed

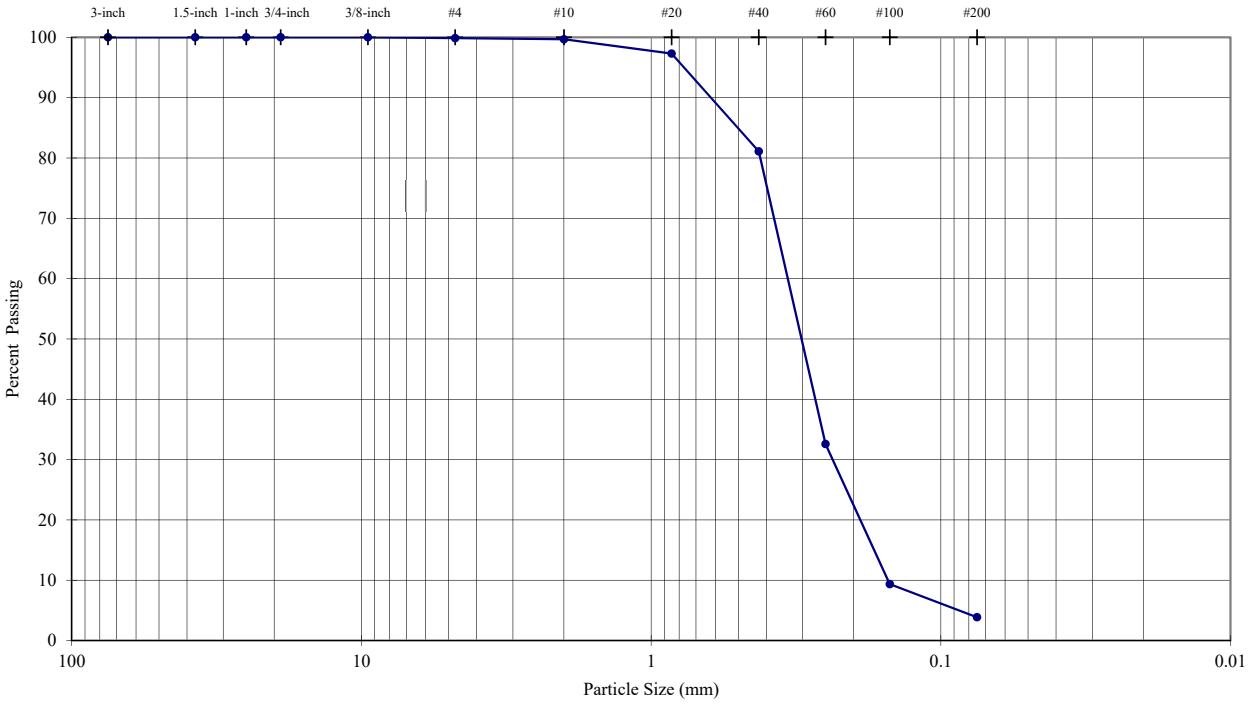
TECH	BQ
DATE	11/16/2016
REVIEW	MB

November-16 **1648171.0300**

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

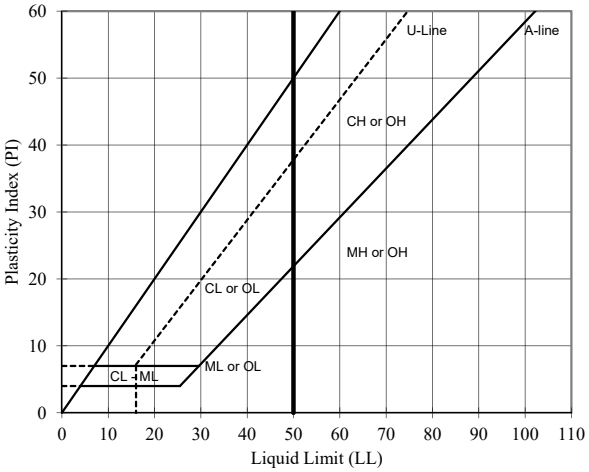
PROJECT NAME: **NIPSCO/CCR GW Mon/IN**
SAMPLE ID: **GAMW-37B / S3** DEPTH (ft): **10-12**
TYPE: **Bag**



Sieve	Particle Size (mm)	% Passing
3-inch	75.0	**100.0**
1.5-inch	37.5	**100.0**
1-inch	25.0	**100.0**
3/4-inch	19.0	**100.0**
3/8-inch	9.5	**100.0**
#4	4.8	**99.9**
#10	2.00	**99.7**
#20	0.85	**97.3**
#40	0.43	**81.1**
#60	0.25	**32.6**
#100	0.15	**9.4**
#200	0.075	**3.9**

Sieve Analysis

Description	Percentage
Coarse Gravel	**0.00**
Fine Gravel	**0.14**
Coarse Sand	**0.18**
Medium Sand	**18.59**
Fine Sand	**77.23**
Silt or Clay Fines	**3.86**



USCS Description (ASTM D 2487):

SILTY SAND, olive brown, moist

LL	PL	PI
--	--	--

As-Received Moisture Content (%): --

USCS Group Symbol: SP

Notes: 0 g of particles up to 9.5 mm maximum size were removed from particle size analysis sample prior to testing
Particle size analysis sample was not mechanically dispersed; hydrometer test was not performed
Atterberg Limits test was not performed.

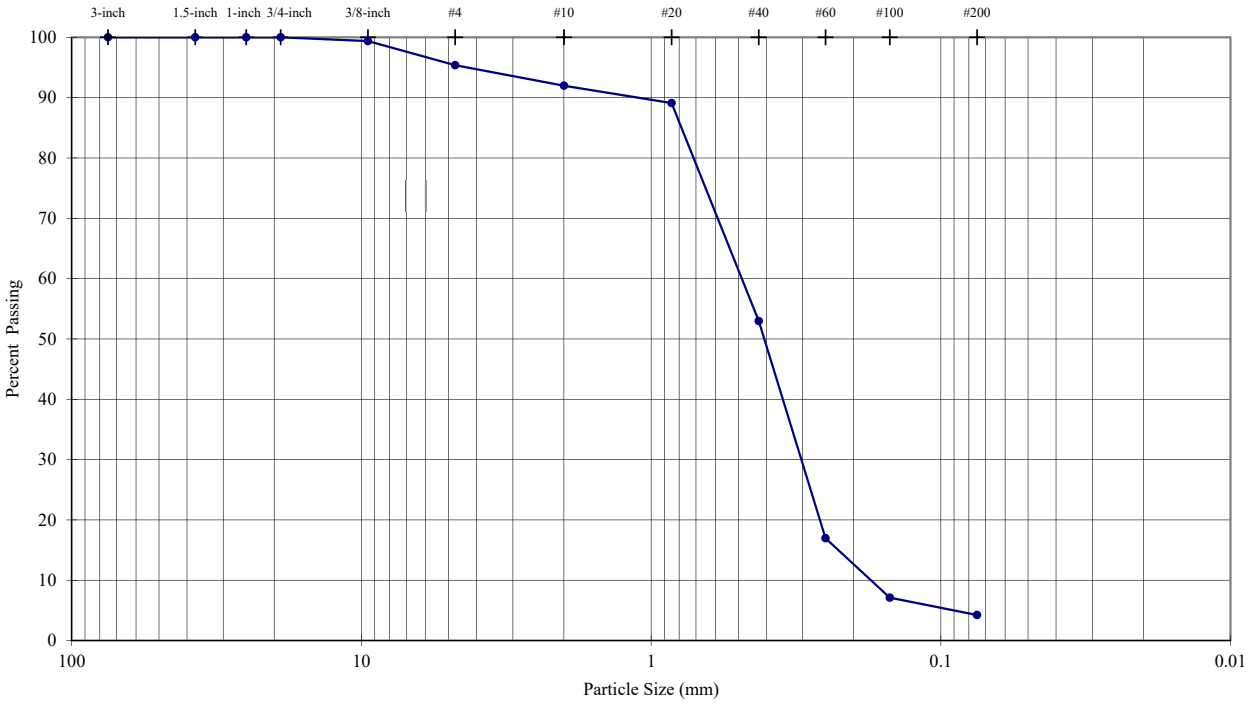
TECH	BQ
DATE	11/16/2016
REVIEW	MB

November-16 **1648171.03**

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

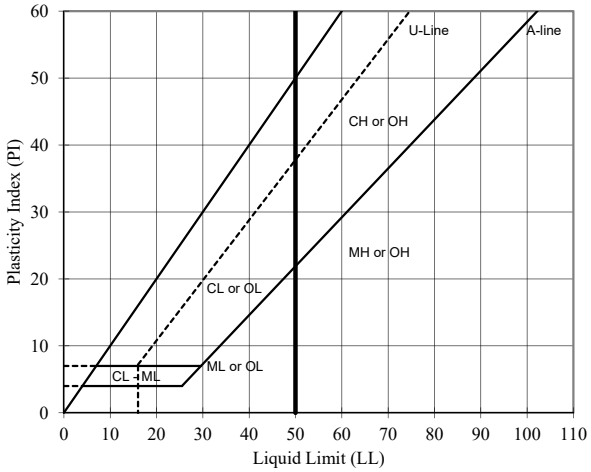
PROJECT NAME: **NIPSCO/CCR GW Mon/IN**
SAMPLE ID: **GAMW-35B / S3 (top)** DEPTH (ft.): **10'-11'5"**
TYPE: **Bag**



Sieve Analysis (Initial Separation on No. 4 Sieve)

Sieve	Particle Size (mm)	% Passing
3-inch	75.0	**100.0**
1.5-inch	37.5	**100.0**
1-inch	25.0	**100.0**
3/4-inch	19.0	**100.0**
3/8-inch	9.5	**99.4**
#4	4.8	**95.4**
#10	2.00	**92.0**
#20	0.85	**89.1**
#40	0.43	**53.0**
#60	0.25	**17.0**
#100	0.15	**7.1**
#200	0.075	**4.2**

Description	Percentage
Coarse Gravel	**0.00**
Fine Gravel	**4.62**
Coarse Sand	**3.40**
Medium Sand	**39.02**
Fine Sand	**48.72**
Silt or Clay Fines	**4.24**



USCS Description (ASTM D 2487):

Poorly graded sand, light brownish gray, dry

LL	PL	PI
--	--	--

As-Received Moisture Content (%): --

USCS Group Symbol: SP

Notes: 0 g of particles up to 19.0 mm maximum size were removed from particle size analysis sample prior to testing
Particle size analysis sample was not mechanically dispersed; hydrometer test was not performed
Atterberg Limits test was not performed.

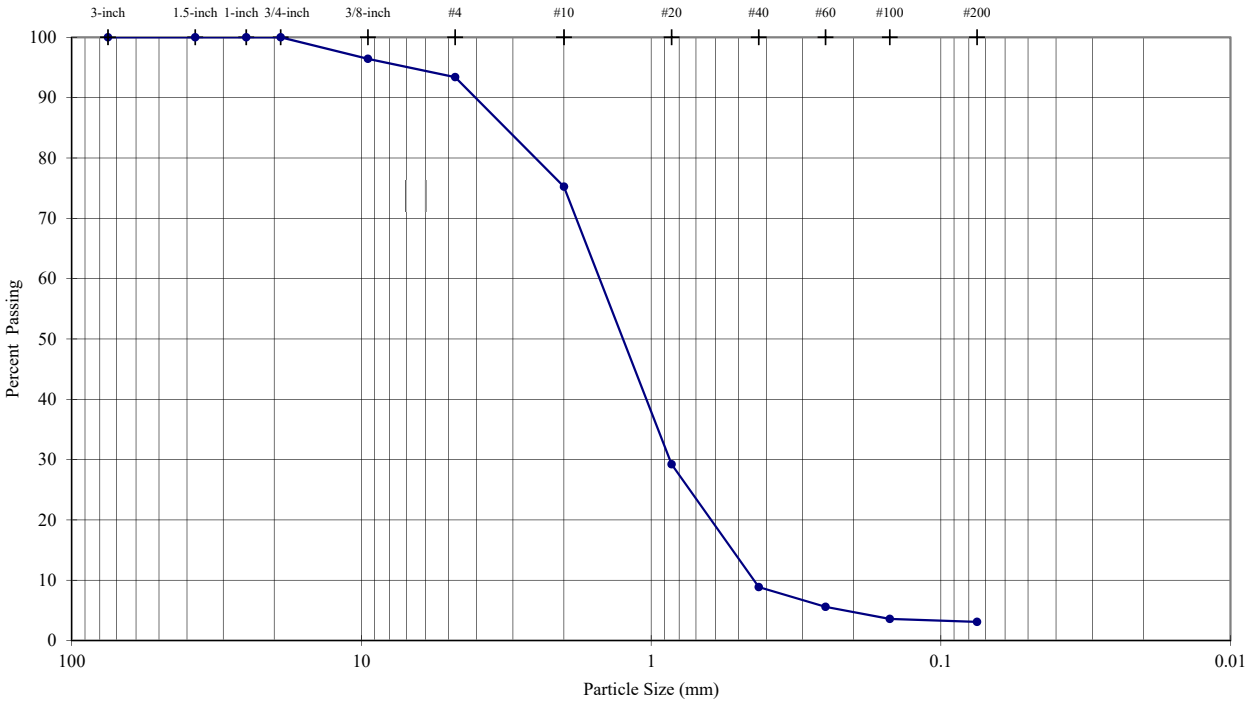
TECH	BQ
DATE	11/17/2016
REVIEW	MB

November-16 **1648171.0300**

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

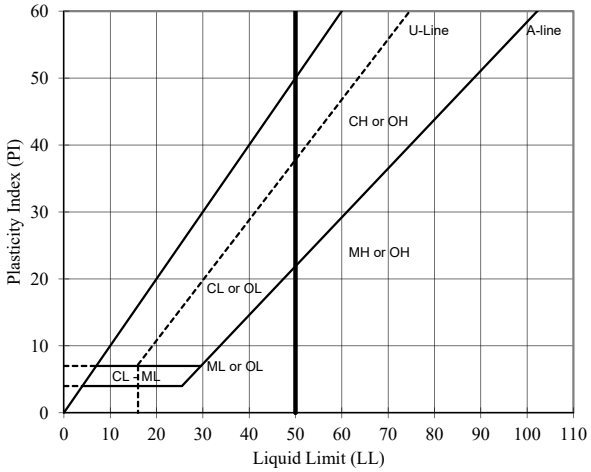
PROJECT NAME: **NIPSCO/CCR GW Mon/IN**
SAMPLE ID: **GAMW-33B / S6 (top)** DEPTH (ft): **25'11"-26'9"**
TYPE: **Bag**



Sieve Analysis

Sieve	Particle Size (mm)	% Passing
3-inch	75.0	**100.0**
1.5-inch	37.5	**100.0**
1-inch	25.0	**100.0**
3/4-inch	19.0	**100.0**
3/8-inch	9.5	**96.4**
#4	4.8	**93.4**
#10	2.00	**75.2**
#20	0.85	**29.2**
#40	0.43	**8.9**
#60	0.25	**5.6**
#100	0.15	**3.6**
#200	0.075	**3.1**

Description	Percentage
Coarse Gravel	**0.00**
Fine Gravel	**6.60**
Coarse Sand	**18.16**
Medium Sand	**66.38**
Fine Sand	**5.77**
Silt or Clay Fines	**3.09**



USCS Description (ASTM D 2487):

Poorly graded sand, dark olive gray, moist

LL	PL	PI
--	--	--

As-Received Moisture Content (%): --

USCS Group Symbol: SP

Notes: 0 g of particles up to 19.0 mm maximum size were removed from particle size analysis sample prior to testing
Particle size analysis sample was not mechanically dispersed; hydrometer test was not performed
Atterberg Limits test was not performed.

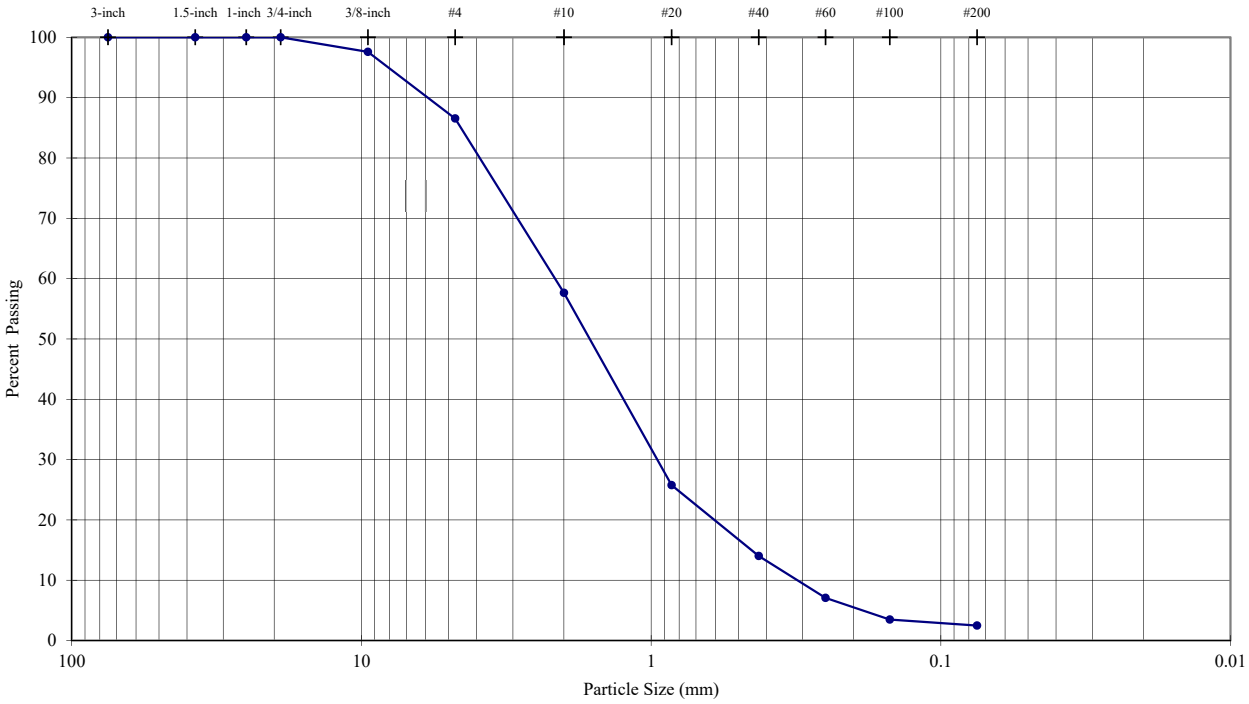
TECH	BQ
DATE	11/16/2016
REVIEW	MB

November-16 **1648171.03**

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

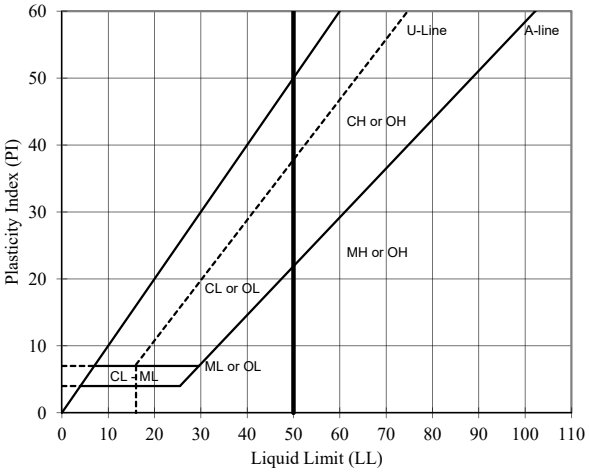
PROJECT NAME: **NIPSCO/CCR GW Mon/IN**
SAMPLE ID: **GAMW-36B / S5** DEPTH (ft.): **20'10"-21'5"**
TYPE: **Bag**



Sieve Analysis (Initial Separation on No. 4 Sieve)

Sieve	Particle Size (mm)	% Passing
3-inch	75.0	**100.0**
1.5-inch	37.5	**100.0**
1-inch	25.0	**100.0**
3/4-inch	19.0	**100.0**
3/8-inch	9.5	**97.6**
#4	4.8	**86.5**
#10	2.00	**57.6**
#20	0.85	**25.8**
#40	0.43	**14.0**
#60	0.25	**7.1**
#100	0.15	**3.5**
#200	0.075	**2.5**

Description	Percentage
Coarse Gravel	**0.00**
Fine Gravel	**13.45**
Coarse Sand	**28.91**
Medium Sand	**43.62**
Fine Sand	**11.53**
Silt or Clay Fines	**2.48**



USCS Description (ASTM D 2487):

Well-graded sand, olive brown, dry

LL	PL	PI
--	--	--

As-Received Moisture Content (%): --

USCS Group Symbol: SW

Notes: 0 g of particles up to 19.0 mm maximum size were removed from particle size analysis sample prior to testing
Particle size analysis sample was not mechanically dispersed; hydrometer test was not performed
Atterberg Limits test was not performed

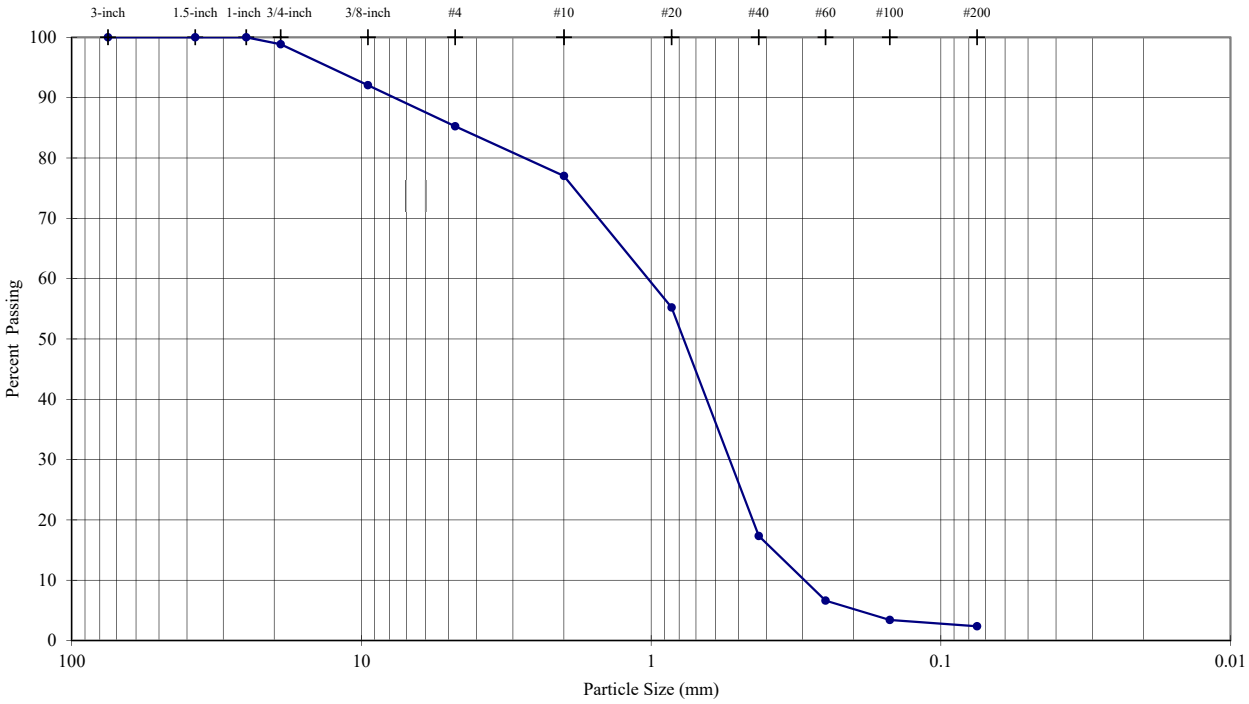
TECH	BQ
DATE	11/17/2016
REVIEW	MB

November-16 **1648171.03**

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

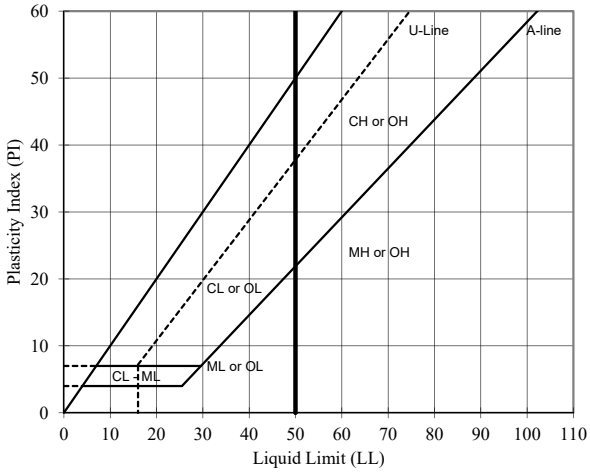
PROJECT NAME: **NIPSCO/CCR GW Mon/IN**
SAMPLE ID: **GAMW-34B** DEPTH (ft.): **16'3"-17'**
TYPE: **Bag**



Sieve	Particle Size (mm)	% Passing
3-inch	75.0	**100.0**
1.5-inch	37.5	**100.0**
1-inch	25.0	**100.0**
3/4-inch	19.0	**98.9**
3/8-inch	9.5	**92.1**
#4	4.8	**85.3**
#10	2.00	**77.0**
#20	0.85	**55.2**
#40	0.43	**17.3**
#60	0.25	**6.6**
#100	0.15	**3.4**
#200	0.075	**2.4**

Sieve Analysis (Initial Separation on No. 4 Sieve)

Description	Percentage
Coarse Gravel	**1.15**
Fine Gravel	**13.60**
Coarse Sand	**8.23**
Medium Sand	**59.68**
Fine Sand	**14.97**
Silt or Clay Fines	**2.37**



USCS Description (ASTM D 2487):

Poorly graded sand, light olive brown, dry

LL	PL	PI
--	--	--

As-Received Moisture Content (%): --

USCS Group Symbol: SP

Notes: 0 g of particles up to 25.0 mm maximum size were removed from particle size analysis sample prior to testing
Particle size analysis sample was not mechanically dispersed; hydrometer test was not performed
Atterberg Limits test was not performed

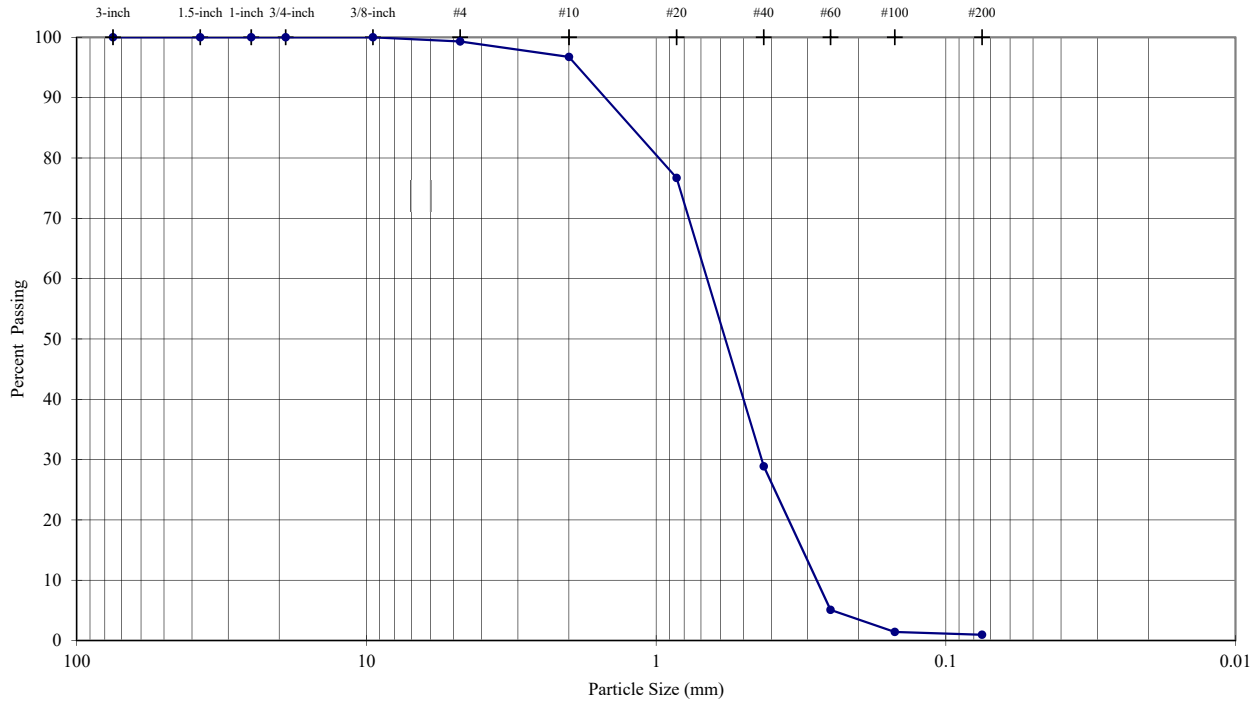
TECH	BQ
DATE	11/17/2016
REVIEW	MB

November-16 **1648171.0300**

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

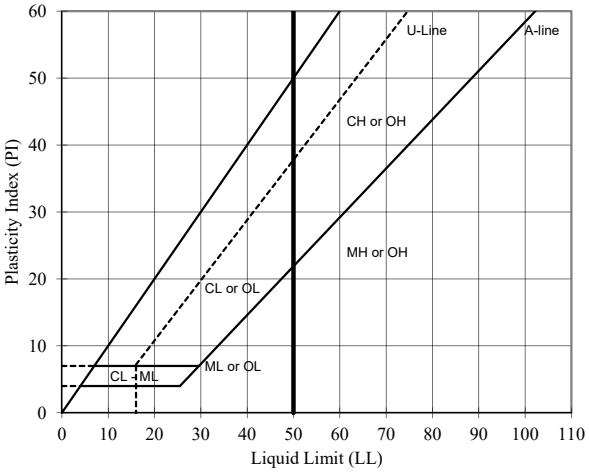
PROJECT NAME: **NIPSCO/CCR GW Mon/IN**
SAMPLE ID: **GAMW-35B / S5 (top)** DEPTH (ft): **20'-20'10"**
TYPE: **Bag**



Sieve Analysis

Sieve	Particle Size (mm)	% Passing
3-inch	75.0	**100.0**
1.5-inch	37.5	**100.0**
1-inch	25.0	**100.0**
3/4-inch	19.0	**100.0**
3/8-inch	9.5	**100.0**
#4	4.8	**99.3**
#10	2.00	**96.7**
#20	0.85	**76.7**
#40	0.43	**28.9**
#60	0.25	**5.1**
#100	0.15	**1.4**
#200	0.075	**1.0**

Description	Percentage
Coarse Gravel	**0.00**
Fine Gravel	**0.68**
Coarse Sand	**2.57**
Medium Sand	**67.88**
Fine Sand	**27.91**
Silt or Clay Fines	**0.96**



USCS Description (ASTM D 2487):

Poorly graded sand, dark olive brown, moist

LL	PL	PI
--	--	--

As-Received Moisture Content (%): --

USCS Group Symbol: SP

Notes: 0 g of particles up to 9.5 mm maximum size were removed from particle size analysis sample prior to testing
Particle size analysis sample was not mechanically dispersed; hydrometer test was not performed
Atterberg Limits test was not performed.

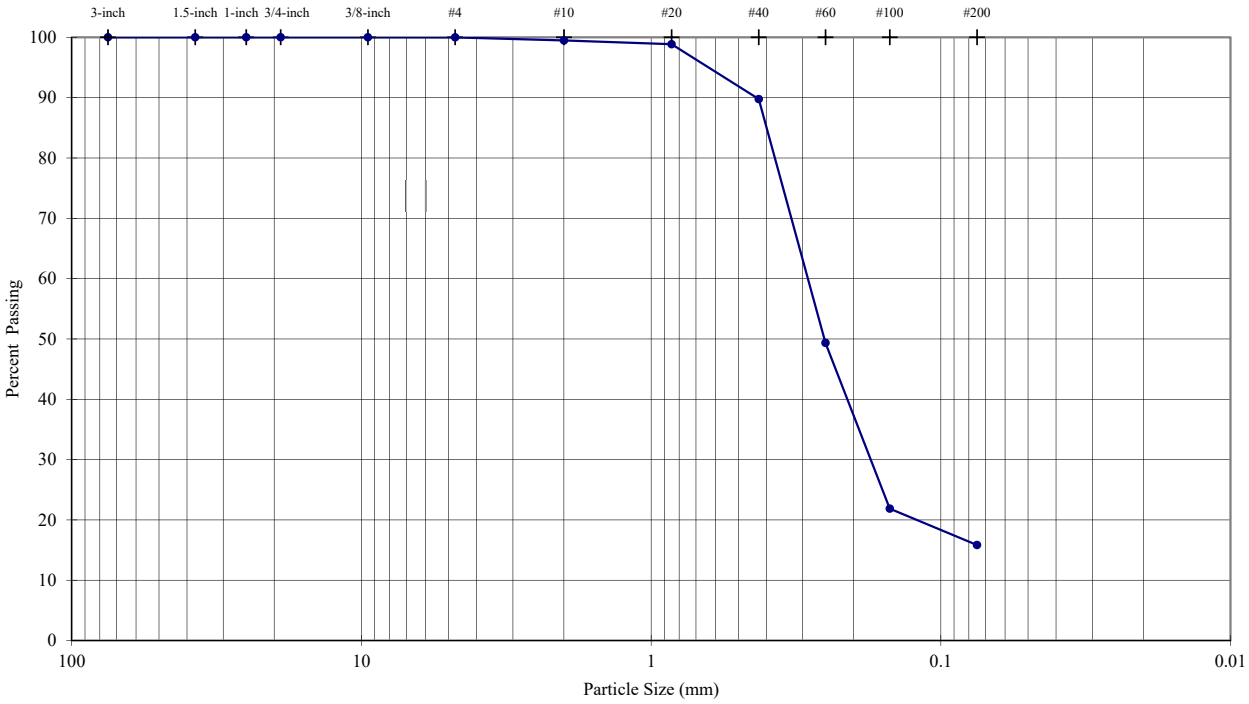
TECH	BQ
DATE	11/16/2016
REVIEW	MB

November-16 **1648171.0300**

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

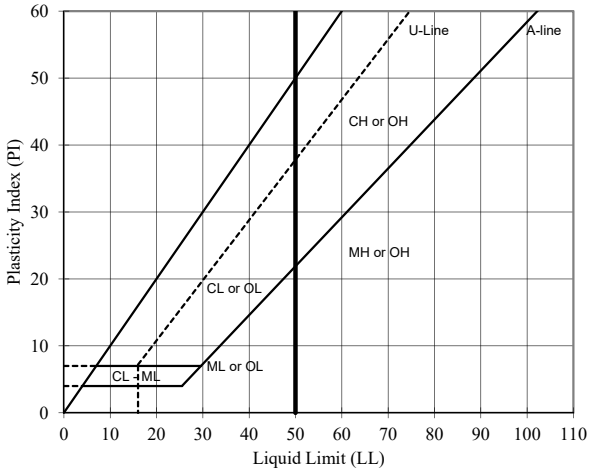
PROJECT NAME: **NIPSCO/CCR GW Mon/IN**
SAMPLE ID: **GAMW-37B / S2 (top)** DEPTH (ft): **5'-6'1"**
TYPE: **Bag**



Sieve	Particle Size (mm)	% Passing
3-inch	75.0	**100.0**
1.5-inch	37.5	**100.0**
1-inch	25.0	**100.0**
3/4-inch	19.0	**100.0**
3/8-inch	9.5	**100.0**
#4	4.8	**100.0**
#10	2.00	**99.5**
#20	0.85	**98.9**
#40	0.43	**89.8**
#60	0.25	**49.3**
#100	0.15	**21.9**
#200	0.075	**15.8**

Sieve Analysis

Description	Percentage
Coarse Gravel	**0.00**
Fine Gravel	**0.01**
Coarse Sand	**0.51**
Medium Sand	**9.72**
Fine Sand	**73.92**
Silt or Clay Fines	**15.84**



Visual Description (Golder Procedure):

SILTY SAND, black, moist

LL	PL	PI
--	--	--

As-Received Moisture Content (%): --

USCS Group Symbol: --

Notes: 0 g of particles up to 4.8 mm maximum size were removed from particle size analysis sample prior to testing
Particle size analysis sample was not mechanically dispersed; hydrometer test was not performed
Atterberg Limits test was not performed.

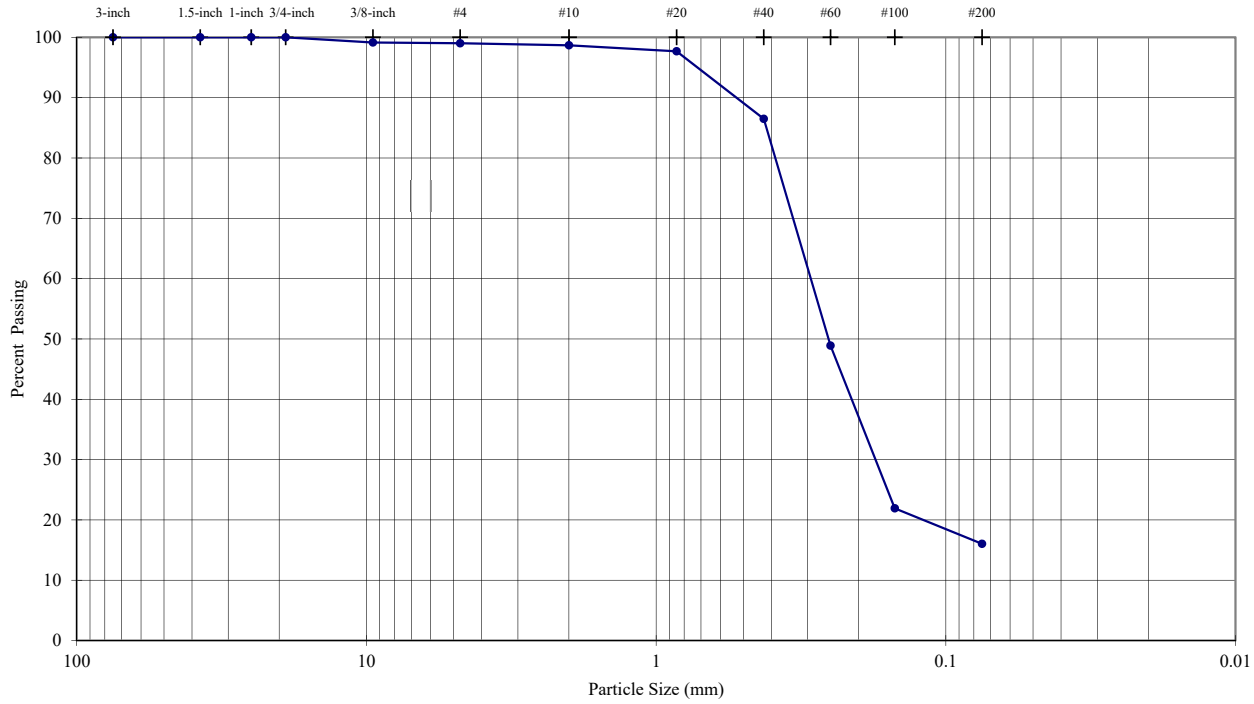
TECH	BQ
DATE	11/16/2016
REVIEW	MB

November-16 **1648171.0300**

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

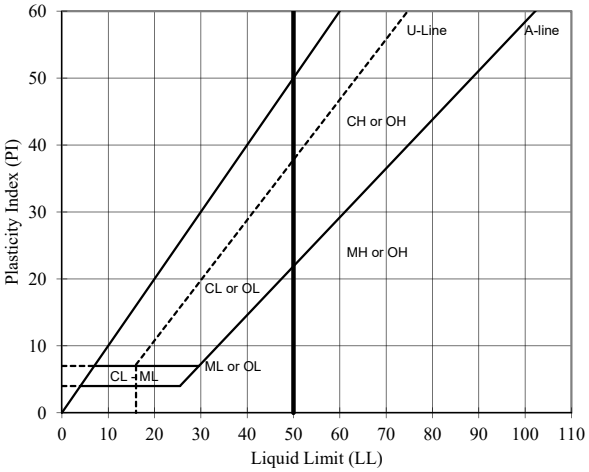
PROJECT NAME: **NIPSCO/CCR GW Mon/IN**
SAMPLE ID: **GAMW-33B / S2 (top)** DEPTH (ft): **5-6**
TYPE: **Bag**



Sieve	Particle Size (mm)	% Passing
3-inch	75.0	**100.0**
1.5-inch	37.5	**100.0**
1-inch	25.0	**100.0**
3/4-inch	19.0	**100.0**
3/8-inch	9.5	**99.1**
#4	4.8	**99.0**
#10	2.00	**98.7**
#20	0.85	**97.7**
#40	0.43	**86.5**
#60	0.25	**48.9**
#100	0.15	**21.9**
#200	0.075	**16.0**

Sieve Analysis

Description	Percentage
Coarse Gravel	**0.00**
Fine Gravel	**0.98**
Coarse Sand	**0.33**
Medium Sand	**12.19**
Fine Sand	**70.45**
Silt or Clay Fines	**16.04**



Visual Description (Golder Procedure):

SILTY SAND, black, moist

LL	PL	PI
--	--	--

As-Received Moisture Content (%): --

USCS Group Symbol: --

Notes: 0 g of particles up to 19.0 mm maximum size were removed from particle size analysis sample prior to testing
Particle size analysis sample was not mechanically dispersed; hydrometer test was not performed
Atterberg Limits test was not performed.

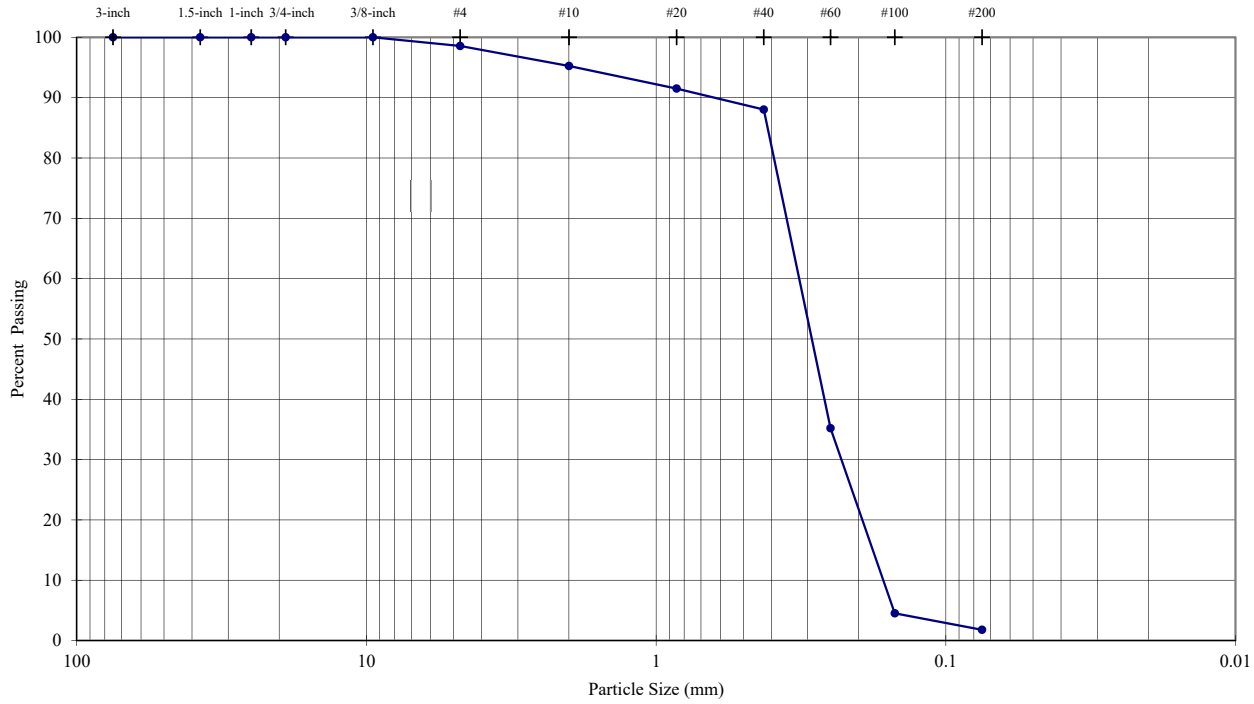
TECH	BQ
DATE	11/16/2016
REVIEW	MB

November-16 **1648171.0300**

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

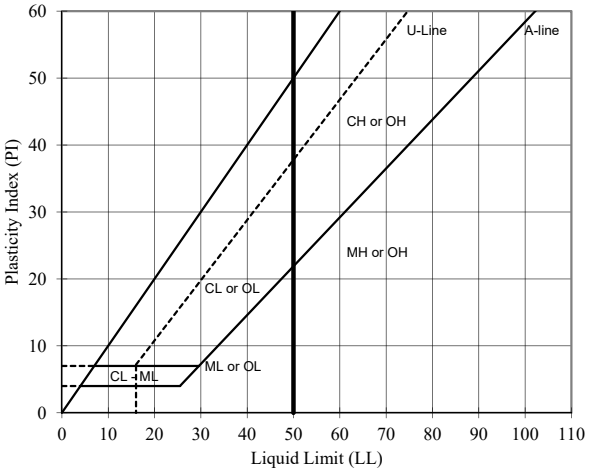
PROJECT NAME: **NIPSCO/CCR GW Mon/IN**
SAMPLE ID: **GAMW-36B / S7 (bot)** DEPTH (ft): **31'5.5"-32'**
TYPE: **Bag**



Sieve Analysis

Sieve	Particle Size (mm)	% Passing
3-inch	75.0	**100.0**
1.5-inch	37.5	**100.0**
1-inch	25.0	**100.0**
3/4-inch	19.0	**100.0**
3/8-inch	9.5	**100.0**
#4	4.8	**98.6**
#10	2.00	**95.2**
#20	0.85	**91.5**
#40	0.43	**88.0**
#60	0.25	**35.2**
#100	0.15	**4.5**
#200	0.075	**1.8**

Description	Percentage
Coarse Gravel	**0.00**
Fine Gravel	**1.44**
Coarse Sand	**3.31**
Medium Sand	**7.22**
Fine Sand	**86.25**
Silt or Clay Fines	**1.78**



USCS Description (ASTM D 2487):

Poorly graded sand, dark grayish brown, moist

LL	PL	PI
--	--	--

As-Received Moisture Content (%): --

USCS Group Symbol: SP

Notes: 0 g of particles up to 9.5 mm maximum size were removed from particle size analysis sample prior to testing
Particle size analysis sample was not mechanically dispersed; hydrometer test was not performed
Atterberg Limits test was not performed.

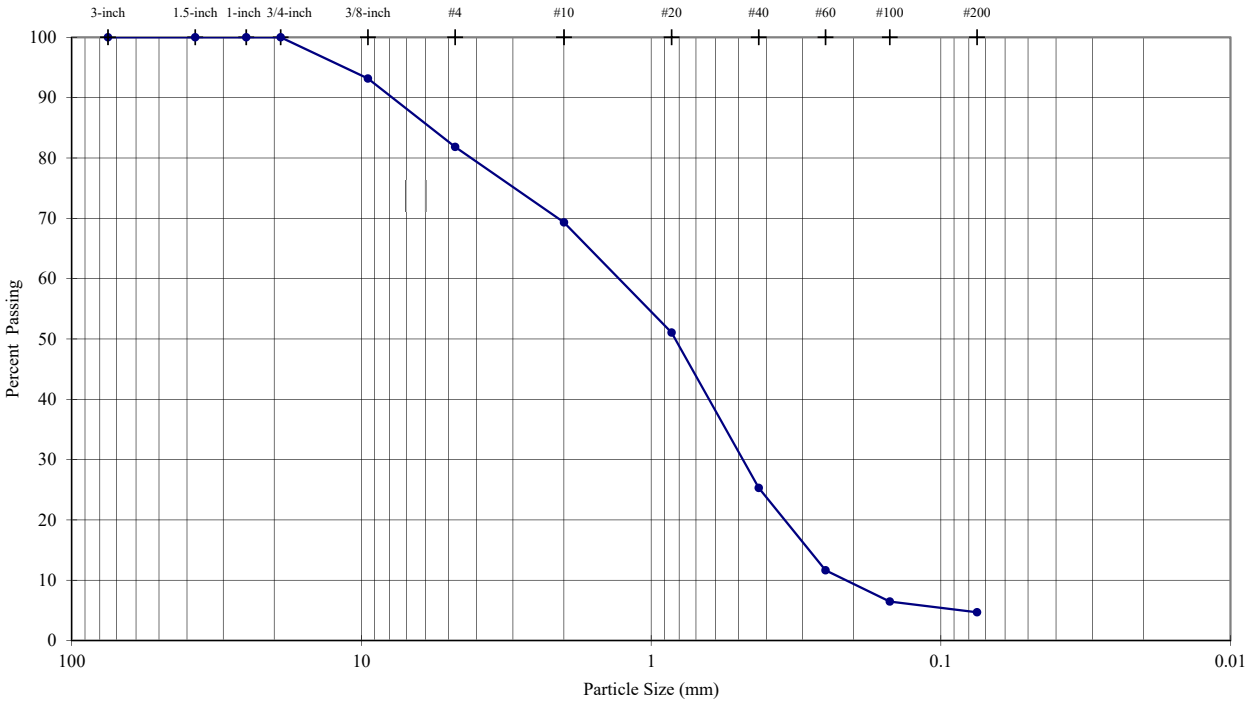
TECH	BQ
DATE	11/16/2016
REVIEW	MB

November-16 **1648171.03**

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D421, D422, D4318

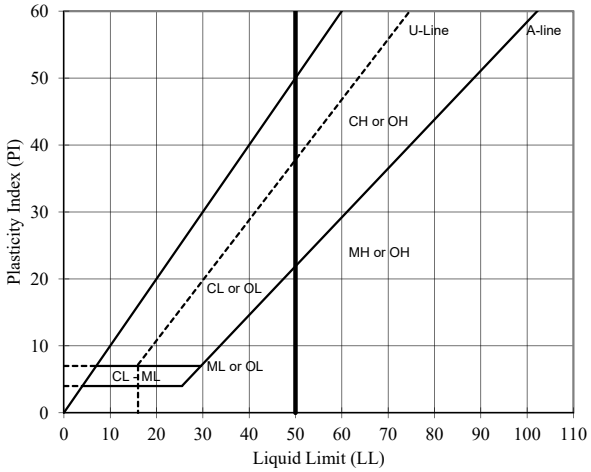
PROJECT NAME: **NIPSCO/CCR GW Mon/IN**
SAMPLE ID: **GAMW-37B / S6 (bot)** DEPTH (ft.): **26'6"-27'**
TYPE: **Bag**



Sieve Analysis (Initial Separation on No. 4 Sieve)

Sieve	Particle Size (mm)	% Passing
3-inch	75.0	**100.0**
1.5-inch	37.5	**100.0**
1-inch	25.0	**100.0**
3/4-inch	19.0	**100.0**
3/8-inch	9.5	**93.2**
#4	4.8	**81.8**
#10	2.00	**69.3**
#20	0.85	**51.0**
#40	0.43	**25.3**
#60	0.25	**11.7**
#100	0.15	**6.5**
#200	0.075	**4.7**

Description	Percentage
Coarse Gravel	**0.00**
Fine Gravel	**18.17**
Coarse Sand	**12.50**
Medium Sand	**44.03**
Fine Sand	**20.61**
Silt or Clay Fines	**4.69**



USCS Description (ASTM D 2487):

Poorly graded sand with gravel, olive brown, dry

LL	PL	PI
--	--	--

As-Received Moisture Content (%): --

USCS Group Symbol: SP

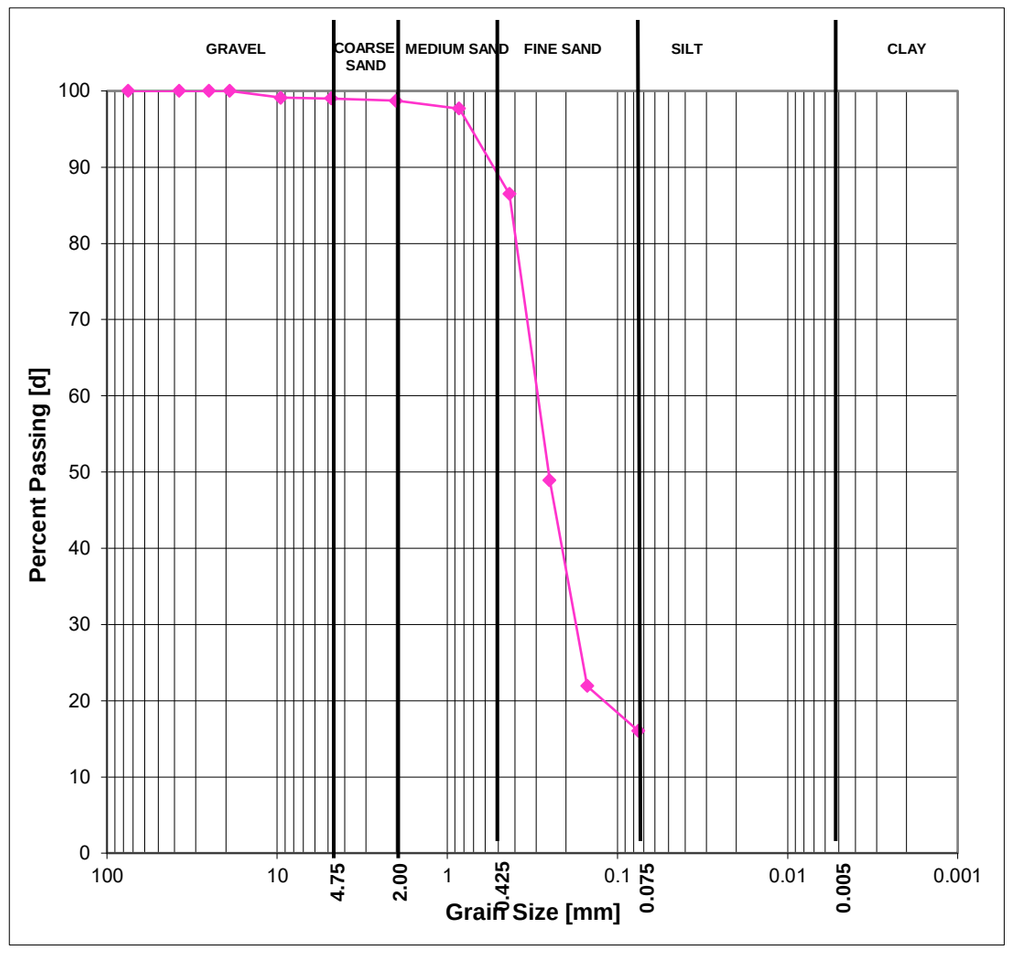
Notes: 0 g of particles up to 19.0 mm maximum size were removed from particle size analysis sample prior to testing
Particle size analysis sample was not mechanically dispersed; hydrometer test was not performed
Atterberg Limits test was not performed.

TECH	BQ
DATE	11/17/2016
REVIEW	MB

APPENDIX A-2
HYDRAULIC CONDUCTIVITY CALCULATED FROM GRAIN SIZE ANALYSIS
SAMPLE NO. GAMW-33B S2 (TOP) 5' - 6'

GRAIN SIZE ANALYSIS

Sieve Size	Percentage Passed Through Sieve	Fraction Percent P	Geometric Mean d_m	P/d_m
3"	100.00	0.00	75.000	0.000
1.5"	100.00	0.00	37.500	0.000
1"	100.00	0.00	25.000	0.000
0.75"	100.00	0.90	19.000	0.047
0.375"	99.10	0.10	9.500	0.011
4	99.00	0.30	4.800	0.062
10	98.70	1.00	2.000	0.500
20	97.70	11.20	0.850	13.176
40	86.50	37.60	0.430	87.442
60	48.90	27.00	0.250	108.000
100	21.90	5.90	0.150	39.333
200	16.00	16.00	0.075	213.333
Sum:	**100.00**			**461.905**
Coarse Sand Sum:	**0.30**			



INPUT PARAMETERS

Inputs	Description	Value	Units		Inputs	Description	Value	Units
d_{10}	10% pass	0.050	[mm]	[select from graph]	C_h	Hazen constant	6.0E-04	[dim]
d_{60}	60% pass	0.310	[mm]	[select from graph]	C_k	Kozeny constant	8.3E-03	[dim]
n	porosity	0.35	[dim]					
Θ	sand shape factor	6.0	[dim]	[select from 4 choices]	C_b	$C_b = 6.0 \times 10^{-4} \log \frac{500}{cu}$	1.14E-03	[dim]
	rounded	*6.0*			f(n) Kozeny/Fair-Hatch	$f(n) = \frac{n^3}{(1-n)^2}$	1.01E-01	[dim]
	subrounded	*6.6*						
	subangular	*7.1*			f(P) Fair-Hatch	$f(P) = \frac{1}{m\left(\frac{\Theta}{100}\sum\frac{P}{d_m}\right)^2}$	2.60E-10	[dim]
	angular	*7.7*						
c_u	uniformity coefficient [d_{60}/d_{10}]	6.20	[dim]		f(n) Hazen	**f(n) = [1+10(n-0.26)]**	1.9	[dim]
g	gravitational acceleration	9.807	[m/s^2]					
v	kinematic viscosity [25°C]	1.14E-06	[m^2/s]					
m	packing factor	5	[dim]					

ANALYSIS AND RESULTS

Method	Equation	Hydraulic Conductivity m/s	Hydraulic Conductivity cm/s	Applicability Conditions		Applicable/Comments
Hazen	$K = \frac{g}{v} C_h f(n) d_{10}^2$	2.45E-05	2.45E-03	c_u < 5?	NO	**NOT APPLICABLE**
				d_{10} > 0.1?	NO	
				d_{10} < 3.0?	YES	
Kozeny	$K = \frac{g}{v} C_k f(n) d_{10}^2$	1.81E-05	1.81E-03	85%>coarse sand?	NO	**NOT APPLICABLE**
Fair-Hatch	$K = \frac{g}{v} f(n) f(P)$	2.27E-04	2.27E-02	No Test		No Applicability Test
Breyer	$K = \frac{g}{v} C_b d_{10}^2$	2.46E-05	2.46E-03	c_u < 3?	NO	**NOT APPLICABLE**
				c_u > 0.1?	YES	
				d_{10} < 0.6 mm?	YES	
				d_{10} > 0.06 mm?	NO	

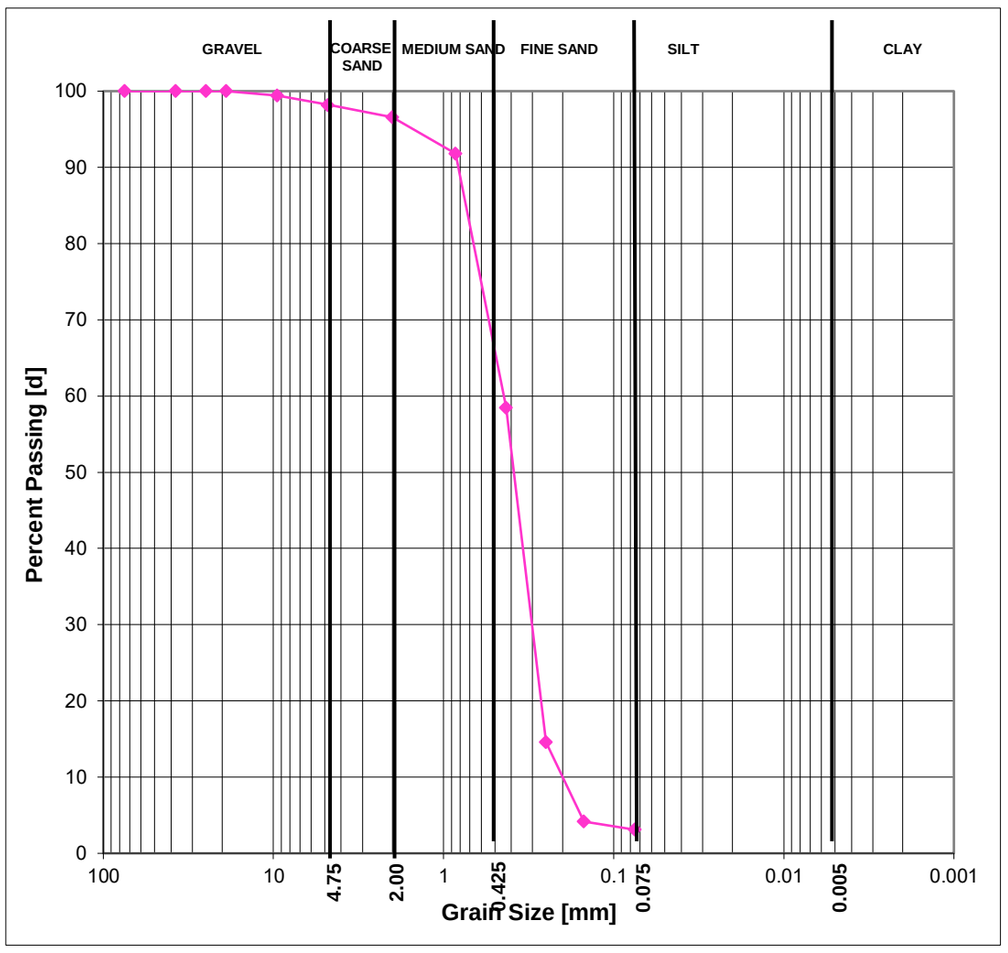
Project Name: NIPSCO
Project Number: 19121567

Analysis by: JRS
Checked by: SKB
Analysis date: 3/29/2020

APPENDIX A-3
HYDRAULIC CONDUCTIVITY CALCULATED FROM GRAIN SIZE ANALYSIS
SAMPLE NO. GAMW-33B S3 10.5'-12'

GRAIN SIZE ANALYSIS

Sieve Size	Percentage Passed Through Sieve	Fraction Percent P	Geometric Mean d_m	P/d_m
3"	100.00	0.00	75.000	0.000
1.5"	100.00	0.00	37.500	0.000
1"	100.00	0.00	25.000	0.000
0.75"	100.00	0.60	19.000	0.032
0.375"	99.40	1.20	9.500	0.126
4	98.20	1.60	4.800	0.333
10	96.60	4.80	2.000	2.400
20	91.80	33.30	0.850	39.176
40	58.50	43.90	0.430	102.093
60	14.60	10.40	0.250	41.600
100	4.20	1.10	0.150	7.333
200	3.10	3.10	0.075	41.333
Sum:		**100.00**		**234.427**
Coarse Sand Sum:		**1.60**		



INPUT PARAMETERS

Inputs	Description	Value	Units		Inputs	Description	Value	Units
d_{10}	10% pass	0.210	[mm]	[select from graph]	C_h	Hazen constant	6.0E-04	[dim]
d_{60}	60% pass	0.450	[mm]	[select from graph]	C_k	Kozeny constant	8.3E-03	[dim]
n	porosity	0.35	[dim]					
Θ	sand shape factor	6.0	[dim]	[select from 4 choices]	C_b	$C_b = 6.0 \times 10^{-4} \log \frac{500}{cu}$	1.42E-03	[dim]
	rounded	*6.0*			f(n) Kozeny/Fair-Hatch	$f(n) = \frac{n^3}{(1-n)^2}$	1.01E-01	[dim]
	subrounded	*6.6*						
	subangular	*7.1*			f(P) Fair-Hatch	$f(P) = \frac{1}{m\left(\frac{\Theta}{100}\sum\frac{P}{d_m}\right)^2}$	1.01E-09	[dim]
	angular	*7.7*						
c_u	uniformity coefficient [d_{60}/d_{10}]	2.14	[dim]		f(n) Hazen	**f(n) = [1+10(n-0.26)]**	1.9	[dim]
g	gravitational acceleration	9.807	[m/s^2]					
v	kinematic viscosity [25°C]	1.14E-06	[m^2/s]					
m	packing factor	5	[dim]					

ANALYSIS AND RESULTS

Method	Equation	Hydraulic Conductivity m/s	Hydraulic Conductivity cm/s	Applicability Conditions		Applicable/Comments
Hazen	$K = \frac{g}{v} C_h f(n) d_{10}^2$	**4.32E-04**	4.32E-02	c_u < 5?	YES	**POTENTIALLY APPLICABLE**
				d_{10} > 0.1?	YES	
				d_{10} < 3.0?	YES	
Kozeny	$K = \frac{g}{v} C_k f(n) d_{10}^2$	**3.20E-04**	3.20E-02	85%>coarse sand?	NO	**NOT APPLICABLE**
Fair-Hatch	$K = \frac{g}{v} f(n) f(P)$	**8.83E-04**	8.83E-02	No Test		No Applicability Test
Breyer	$K = \frac{g}{v} C_b d_{10}^2$	**5.39E-04**	5.39E-02	c_u < 3?	YES	**POTENTIALLY APPLICABLE**
				c_u > 0.1?	YES	
				d_{10} < 0.6 mm?	YES	
				d_{10} > 0.06 mm?	YES	

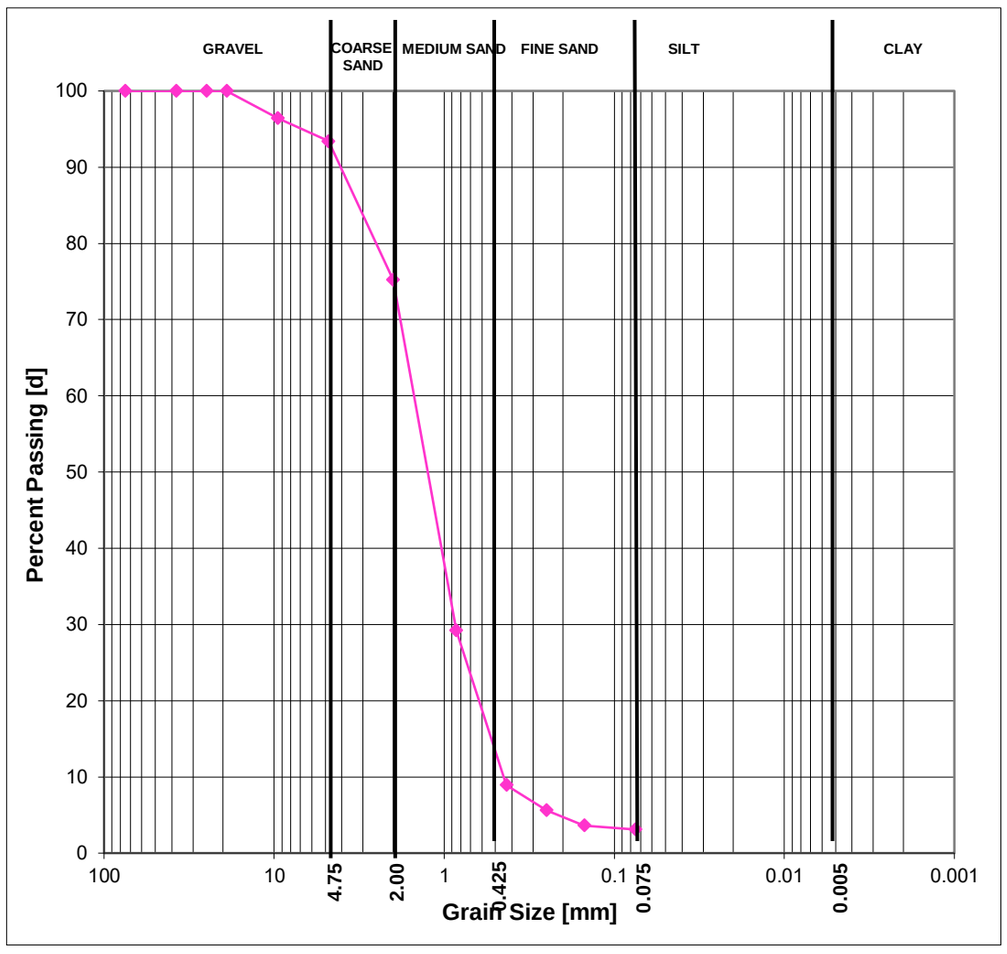
Project Name: NIPSCO
Project Number: 19121567

Analysis by: JRS
Checked by: SKB
Analysis date: 3/29/2020

APPENDIX A-4
HYDRAULIC CONDUCTIVITY CALCULATED FROM GRAIN SIZE ANALYSIS
SAMPLE NO. GAMW-33B S6 (TOP) 25'11" - 26'9"

GRAIN SIZE ANALYSIS

Sieve Size	Percentage Passed Through Sieve	Fraction Percent P	Geometric Mean d_m	P/d_m
3"	100.00	0.00	75.000	0.000
1.5"	100.00	0.00	37.500	0.000
1"	100.00	0.00	25.000	0.000
0.75"	100.00	3.60	19.000	0.189
0.375"	96.40	3.00	9.500	0.316
4	93.40	18.20	4.800	3.792
10	75.20	46.00	2.000	23.000
20	29.20	20.30	0.850	23.882
40	8.90	3.30	0.430	7.674
60	5.60	2.00	0.250	8.000
100	3.60	0.50	0.150	3.333
200	3.10	3.10	0.075	41.333
Sum:		**100.00**		**111.520**
Coarse Sand Sum:		**18.20**		



INPUT PARAMETERS

Inputs	Description	Value	Units		Inputs	Description	Value	Units
d_{10}	10% pass	0.450	[mm]	[select from graph]	C_h	Hazen constant	6.0E-04	[dim]
d_{60}	60% pass	1.620	[mm]	[select from graph]	C_k	Kozeny constant	8.3E-03	[dim]
n	porosity	0.35	[dim]					
Θ	sand shape factor	6.0	[dim]	[select from 4 choices]	C_b	$C_b = 6.0 \times 10^{-4} \log \frac{500}{cu}$	1.29E-03	[dim]
	rounded	*6.0*			f(n) Kozeny/Fair-Hatch	$f(n) = \frac{n^3}{(1-n)^2}$	1.01E-01	[dim]
	subrounded	*6.6*						
	subangular	*7.1*						
	angular	*7.7*						
c_u	uniformity coefficient [d_{60}/d_{10}]	3.60	[dim]		f(P) Fair-Hatch	$f(P) = \frac{1}{m\left(\frac{\Theta}{100}\sum\frac{P}{d_m}\right)^{\frac{1}{2}}}$	4.47E-09	[dim]
g	gravitational acceleration	9.807	[m/s^2]					
v	kinematic viscosity [25°C]	1.14E-06	[m^2/s]					
m	packing factor	5	[dim]		f(n) Hazen	**f(n) = [1+10(n-0.26)]**	1.9	[dim]

ANALYSIS AND RESULTS

Method	Equation	Hydraulic Conductivity m/s	Hydraulic Conductivity cm/s	Applicability Conditions		Applicable/Comments
Hazen	$K = \frac{g}{v} C_h f(n) d_{10}^2$	**1.99E-03**	**1.99E-01**	c_u < 5?	YES	**POTENTIALLY APPLICABLE**
				d_{10} > 0.1?	YES	
				d_{10} < 3.0?	YES	
Kozeny	$K = \frac{g}{v} C_k f(n) d_{10}^2$	**1.47E-03**	**1.47E-01**	85%>coarse sand?	NO	**NOT APPLICABLE**
Fair-Hatch	$K = \frac{g}{v} f(n) f(P)$	**3.90E-03**	**3.90E-01**	No Test		No Applicability Test
Breyer	$K = \frac{g}{v} C_b d_{10}^2$	**2.24E-03**	**2.24E-01**	c_u < 3?	NO	**NOT APPLICABLE**
				c_u > 0.1?	YES	
				d_{10} < 0.6 mm?	YES	
				d_{10} > 0.06 mm?	YES	

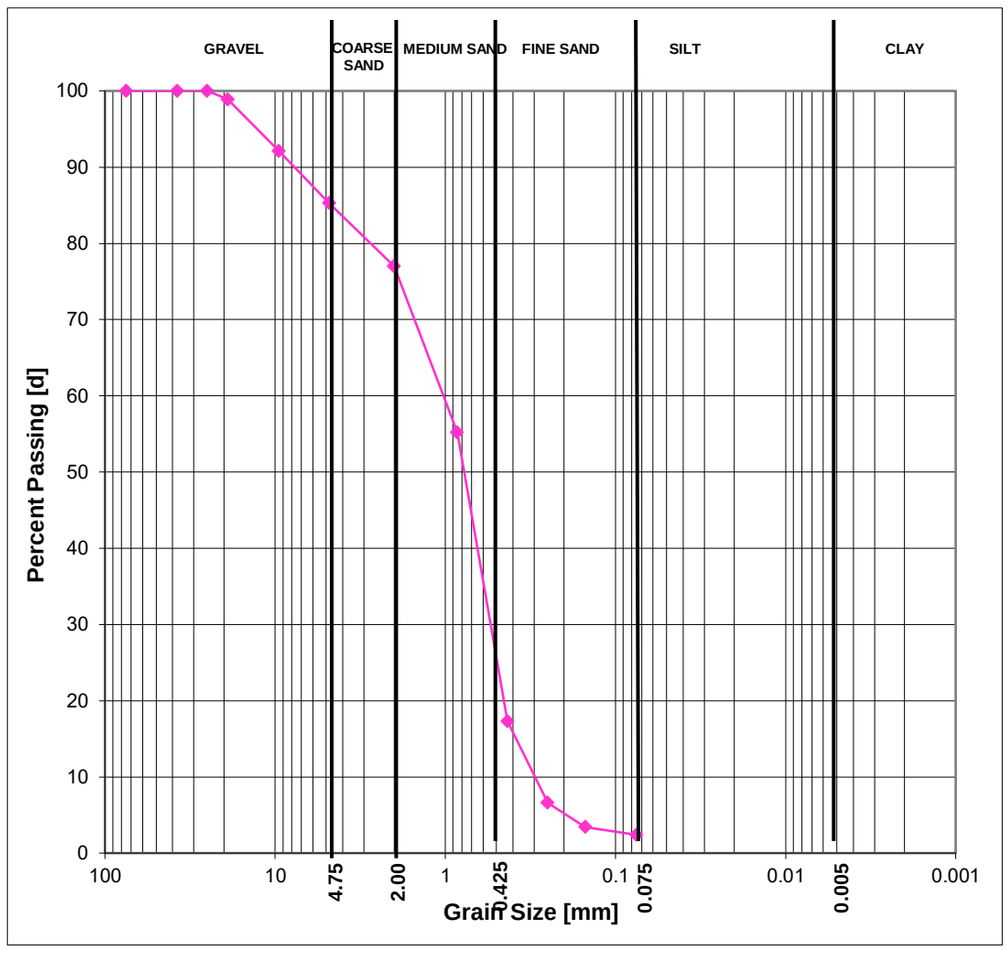
Project Name: NIPSCO
Project Number: 19121567

Analysis by: JRS
Checked by: SKB
Analysis date: 3/29/2020

APPENDIX A-5
HYDRAULIC CONDUCTIVITY CALCULATED FROM GRAIN SIZE ANALYSIS
SAMPLE NO. GAMW-34B BAG 16'3" - 17'

GRAIN SIZE ANALYSIS

Sieve Size	Percentage Passed Through Sieve	Fraction Percent P	Geometric Mean d_m	P/d_m
3"	100.00	0.00	75.000	0.000
1.5"	100.00	0.00	37.500	0.000
1"	100.00	1.10	25.000	0.044
0.75"	98.90	6.80	19.000	0.358
0.375"	92.10	6.80	9.500	0.716
4	85.30	8.30	4.800	1.729
10	77.00	21.80	2.000	10.900
20	55.20	37.90	0.850	44.588
40	17.30	10.70	0.430	24.884
60	6.60	3.20	0.250	12.800
100	3.40	1.00	0.150	6.667
200	2.40	2.40	0.075	32.000
	Sum:	**100.00**		**134.685**
	Coarse Sand Sum:	**8.30**		



INPUT PARAMETERS

Inputs	Description	Value	Units		Inputs	Description	Value	Units
d_{10}	10% pass	0.310	[mm]	[select from graph]	C_h	Hazen constant	6.0E-04	[dim]
d_{60}	60% pass	1.110	[mm]	[select from graph]	C_k	Kozeny constant	8.3E-03	[dim]
n	porosity	0.35	[dim]					
Θ	sand shape factor	6.0	[dim]	[select from 4 choices]	C_b	$C_b = 6.0 \times 10^{-4} \log \frac{500}{cu}$	1.29E-03	[dim]
	rounded	*6.0*			f(n) Kozeny/Fair-Hatch	$f(n) = \frac{n^3}{(1-n)^2}$	1.01E-01	[dim]
	subrounded	*6.6*						
	subangular	*7.1*						
	angular	*7.7*						
c_u	uniformity coefficient [d_{60}/d_{10}]	3.58	[dim]		f(P) Fair-Hatch	$f(P) = \frac{1}{m\left(\frac{\Theta}{100}\sum\frac{P}{d_m}\right)^2}$	3.06E-09	[dim]
g	gravitational acceleration	9.807	[m/s^2]					
v	kinematic viscosity [25°C]	1.14E-06	[m^2/s]					
m	packing factor	5	[dim]		f(n) Hazen	**f(n) = [1+10(n-0.26)]**	1.9	[dim]

ANALYSIS AND RESULTS

Method	Equation	Hydraulic Conductivity m/s	Hydraulic Conductivity cm/s	Applicability Conditions		Applicable/Comments
Hazen	$K = \frac{g}{v} C_h f(n) d_{10}^2$	**9.42E-04**	9.42E-02	c_u < 5?	YES	**POTENTIALLY APPLICABLE**
				d_{10} > 0.1?	YES	
				d_{10} < 3.0?	YES	
Kozeny	$K = \frac{g}{v} C_k f(n) d_{10}^2$	**6.96E-04**	6.96E-02	85%>coarse sand?	NO	**NOT APPLICABLE**
Fair-Hatch	$K = \frac{g}{v} f(n) f(P)$	**2.67E-03**	2.67E-01	No Test		No Applicability Test
Breyer	$K = \frac{g}{v} C_b d_{10}^2$	**1.06E-03**	1.06E-01	c_u < 3?	NO	**NOT APPLICABLE**
				c_u > 0.1?	YES	
				d_{10} < 0.6 mm?	YES	
				d_{10} > 0.06 mm?	YES	

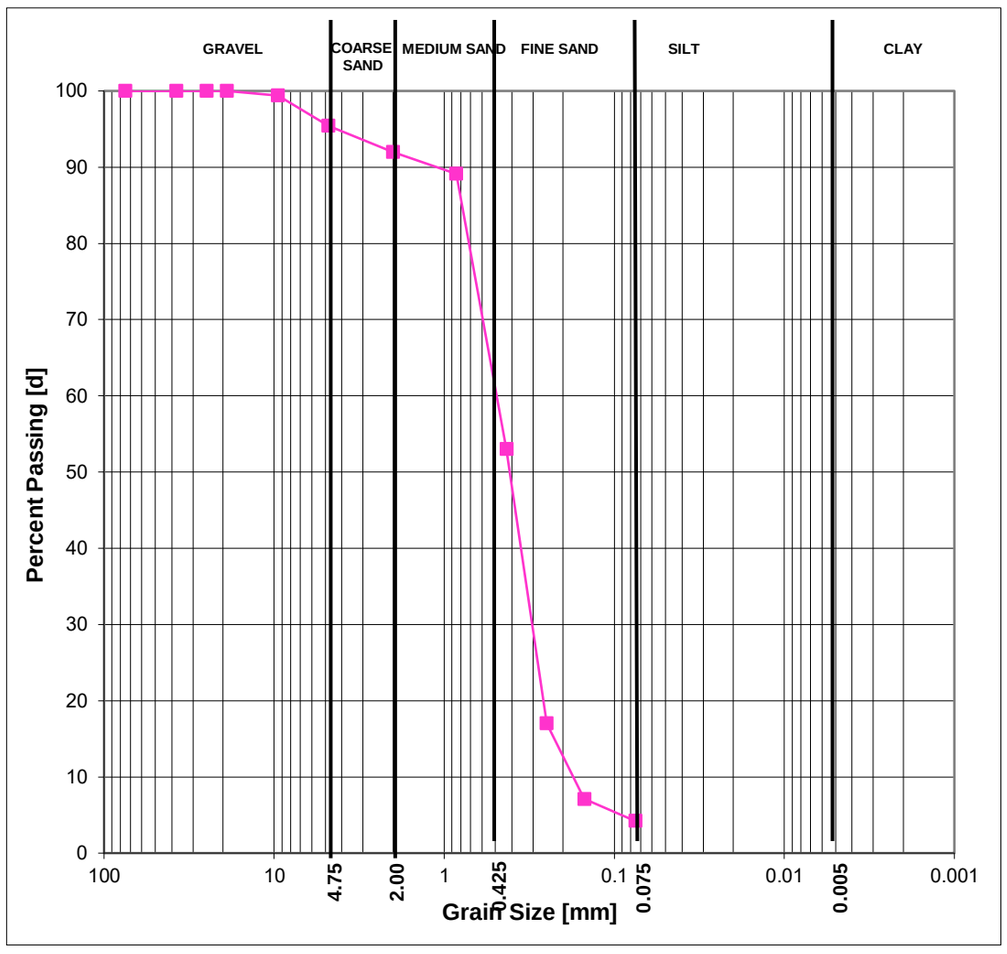
Project Name: NIPSCO
Project Number: 19121567

Analysis by: JRS
Checked by: SKB
Analysis date: 3/29/2020

APPENDIX A-6
HYDRAULIC CONDUCTIVITY CALCULATED FROM GRAIN SIZE ANALYSIS
SAMPLE NO. GAMW-35B S3 (TOP) 10'-11' 5"

GRAIN SIZE ANALYSIS

Sieve Size	Percentage Passed Through Sieve	Fraction Percent P	Geometric Mean d_m	P/d_m
3"	100.00	0.00	75.000	0.000
1.5"	100.00	0.00	37.500	0.000
1"	100.00	0.00	25.000	0.000
0.75"	100.00	0.60	19.000	0.032
0.375"	99.40	4.00	9.500	0.421
4	95.40	3.40	4.800	0.708
10	92.00	2.90	2.000	1.450
20	89.10	36.10	0.850	42.471
40	53.00	36.00	0.430	83.721
60	17.00	9.90	0.250	39.600
100	7.10	2.90	0.150	19.333
200	4.20	4.20	0.075	56.000
Sum:	**100.00**			**243.736**
Coarse Sand Sum:	**3.40**			



INPUT PARAMETERS

Inputs	Description	Value	Units		Inputs	Description	Value	Units
d_{10}	10% pass	0.180	[mm]	[select from graph]	C_h	Hazen constant	6.0E-04	[dim]
d_{60}	60% pass	0.510	[mm]	[select from graph]	C_k	Kozeny constant	8.3E-03	[dim]
n	porosity	0.35	[dim]					
Θ	sand shape factor	6.0	[dim]	[select from 4 choices]	C_b	$C_b = 6.0 \times 10^{-4} \log \frac{500}{cu}$	1.35E-03	[dim]
	rounded	*6.0*			f(n) Kozeny/Fair-Hatch	$f(n) = \frac{n^3}{(1-n)^2}$	1.01E-01	[dim]
	subrounded	*6.6*						
	subangular	*7.1*						
	angular	*7.7*						
c_u	uniformity coefficient [d_{60}/d_{10}]	2.83	[dim]		f(P) Fair-Hatch	$f(P) = \frac{1}{m\left(\frac{\Theta}{100}\sum\frac{P}{d_m}\right)^2}$	9.35E-10	[dim]
g	gravitational acceleration	9.807	[m/s^2]					
v	kinematic viscosity [25°C]	1.14E-06	[m^2/s]					
m	packing factor	5	[dim]		f(n) Hazen	**f(n) = [1+10(n-0.26)]**	1.9	[dim]

ANALYSIS AND RESULTS

Method	Equation	Hydraulic Conductivity m/s	Hydraulic Conductivity cm/s	Applicability Conditions		Applicable/Comments
Hazen	$K = \frac{g}{v} C_h f(n) d_{10}^2$	3.18E-04	3.18E-02	c_u < 5?	YES	**POTENTIALLY APPLICABLE**
				d_{10} > 0.1?	YES	
				d_{10} < 3.0?	YES	
Kozeny	$K = \frac{g}{v} C_k f(n) d_{10}^2$	2.35E-04	2.35E-02	85%>coarse sand?	NO	**NOT APPLICABLE**
Fair-Hatch	$K = \frac{g}{v} f(n) f(P)$	8.16E-04	8.16E-02	No Test		No Applicability Test
Breyer	$K = \frac{g}{v} C_b d_{10}^2$	3.76E-04	3.76E-02	c_u < 3?	YES	**POTENTIALLY APPLICABLE**
				c_u > 0.1?	YES	
				d_{10} < 0.6 mm?	YES	
				d_{10} > 0.06 mm?	YES	

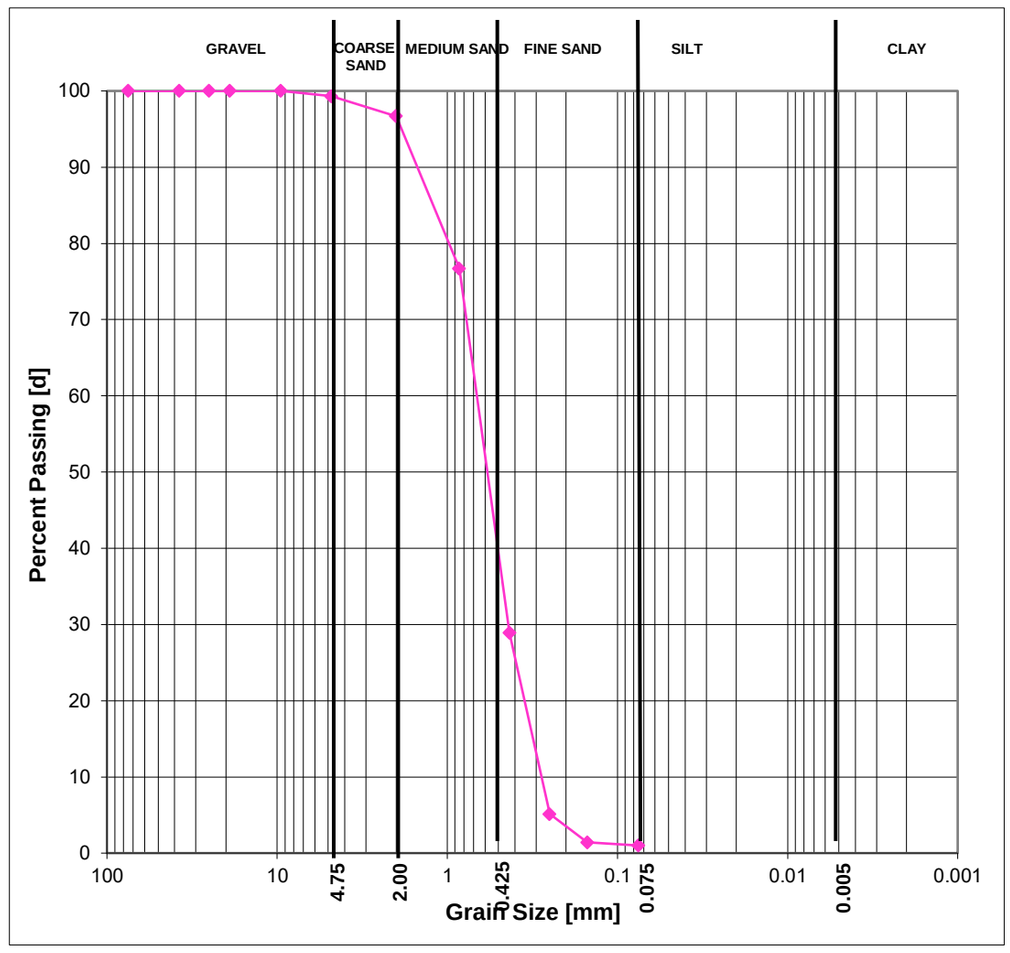
Project Name: NIPSCO
Project Number: 19121567

Analysis by: JRS
Checked by: SKB
Analysis date: 3/29/2020

APPENDIX A-7
HYDRAULIC CONDUCTIVITY CALCULATED FROM GRAIN SIZE ANALYSIS
SAMPLE NO. GAMW-35B S5 20' - 20'10"

GRAIN SIZE ANALYSIS

Sieve Size	Percentage Passed Through Sieve	Fraction Percent P	Geometric Mean d_m	P/d_m
3"	100.00	0.00	75.000	0.000
1.5"	100.00	0.00	37.500	0.000
1"	100.00	0.00	25.000	0.000
0.75"	100.00	0.00	19.000	0.000
0.375"	100.00	0.70	9.500	0.074
4	99.30	2.60	4.800	0.542
10	96.70	20.00	2.000	10.000
20	76.70	47.80	0.850	56.235
40	28.90	23.80	0.430	55.349
60	5.10	3.70	0.250	14.800
100	1.40	0.40	0.150	2.667
200	1.00	1.00	0.075	13.333
	Sum:	**100.00**		**152.999**
	Coarse Sand Sum:	**2.60**		



INPUT PARAMETERS

Inputs	Description	Value	Units		Inputs	Description	Value	Units
d_{10}	10% pass	0.290	[mm]	[select from graph]	C_h	Hazen constant	6.0E-04	[dim]
d_{60}	60% pass	0.710	[mm]	[select from graph]	C_k	Kozeny constant	8.3E-03	[dim]
n	porosity	0.35	[dim]					
Θ	sand shape factor	6.0	[dim]	[select from 4 choices]	C_b	$C_b = 6.0 \times 10^{-4} \log \frac{500}{cu}$	1.39E-03	[dim]
	rounded	*6.0*			f(n) Kozeny/Fair-Hatch	$f(n) = \frac{n^3}{(1-n)^2}$	1.01E-01	[dim]
	subrounded	*6.6*						
	subangular	*7.1*						
	angular	*7.7*						
c_u	uniformity coefficient [d_{60}/d_{10}]	2.45	[dim]		f(P) Fair-Hatch	$f(P) = \frac{1}{m\left(\frac{\Theta}{100}\sum\frac{P}{d_m}\right)^2}$	2.37E-09	[dim]
g	gravitational acceleration	9.807	[m/s^2]					
v	kinematic viscosity [25°C]	1.14E-06	[m^2/s]					
m	packing factor	5	[dim]		f(n) Hazen	**f(n) = [1+10(n-0.26)]**	1.9	[dim]

ANALYSIS AND RESULTS

Method	Equation	Hydraulic Conductivity m/s	Hydraulic Conductivity cm/s	Applicability Conditions		Applicable/Comments
Hazen	$K = \frac{g}{v} C_h f(n) d_{10}^2$	**8.25E-04**	8.25E-02	c_u < 5?	YES	**POTENTIALLY APPLICABLE**
				d_{10} > 0.1?	YES	
				d_{10} < 3.0?	YES	
Kozeny	$K = \frac{g}{v} C_k f(n) d_{10}^2$	**6.09E-04**	6.09E-02	85%>coarse sand?	NO	**NOT APPLICABLE**
Fair-Hatch	$K = \frac{g}{v} f(n) f(P)$	**2.07E-03**	2.07E-01	No Test		No Applicability Test
Breyer	$K = \frac{g}{v} C_b d_{10}^2$	**1.00E-03**	1.00E-01	c_u < 3?	YES	**POTENTIALLY APPLICABLE**
				c_u > 0.1?	YES	
				d_{10} < 0.6 mm?	YES	
				d_{10} > 0.06 mm?	YES	

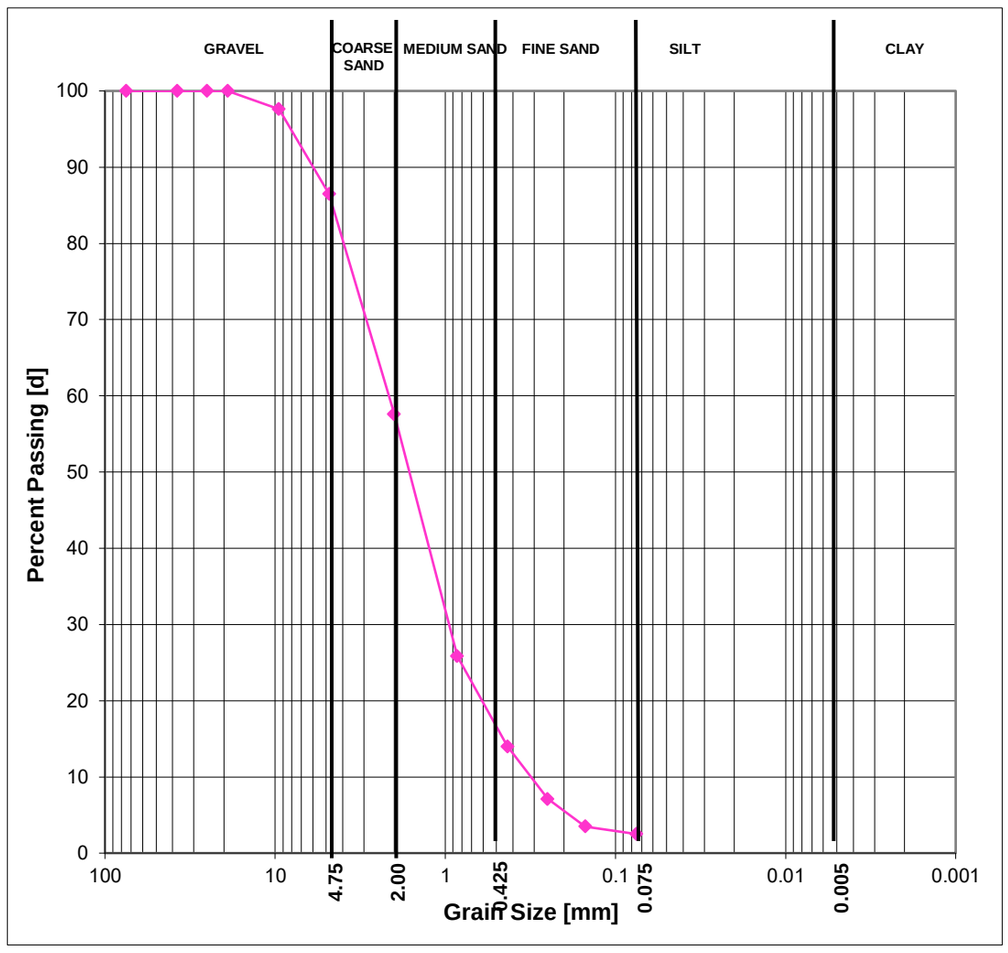
Project Name: NIPSCO
Project Number: 19121567

Analysis by: JRS
Checked by: SKB
Analysis date: 3/29/2020

APPENDIX A-8
HYDRAULIC CONDUCTIVITY CALCULATED FROM GRAIN SIZE ANALYSIS
SAMPLE NO. GAMW-36B S5 20'10" - 21'5"

GRAIN SIZE ANALYSIS

Sieve Size	Percentage Passed Through Sieve	Fraction Percent P	Geometric Mean d_m	P/d_m
3"	100.00	0.00	75.000	0.000
1.5"	100.00	0.00	37.500	0.000
1"	100.00	0.00	25.000	0.000
0.75"	100.00	2.40	19.000	0.126
0.375"	97.60	11.10	9.500	1.168
4	86.50	28.90	4.800	6.021
10	57.60	31.80	2.000	15.900
20	25.80	11.80	0.850	13.882
40	14.00	6.90	0.430	16.047
60	7.10	3.60	0.250	14.400
100	3.50	1.00	0.150	6.667
200	2.50	2.50	0.075	33.333
	Sum:	**100.00**		**107.544**
	Coarse Sand Sum:	**28.90**		



INPUT PARAMETERS

Inputs	Description	Value	Units		Inputs	Description	Value	Units
d_{10}	10% pass	0.330	[mm]	[select from graph]	C_h	Hazen constant	6.0E-04	[dim]
d_{60}	60% pass	2.230	[mm]	[select from graph]	C_k	Kozeny constant	8.3E-03	[dim]
n	porosity	0.35	[dim]					
Θ	sand shape factor	6.0	[dim]	[select from 4 choices]	C_b	$C_b = 6.0 \times 10^{-4} \log \frac{500}{cu}$	1.12E-03	[dim]
	rounded	*6.0*			f(n) Kozeny/Fair-Hatch	$f(n) = \frac{n^3}{(1-n)^2}$	1.01E-01	[dim]
	subrounded	*6.6*						
	subangular	*7.1*						
	angular	*7.7*						
c_u	uniformity coefficient [d_{60}/d_{10}]	6.76	[dim]		f(P) Fair-Hatch	$f(P) = \frac{1}{m\left(\frac{\Theta}{100}\sum \frac{P}{d_m}\right)^2}$	4.80E-09	[dim]
g	gravitational acceleration	9.807	[m/s^2]					
v	kinematic viscosity [25°C]	1.14E-06	[m^2/s]					
m	packing factor	5	[dim]		f(n) Hazen	**f(n) = [1+10(n-0.26)]**	1.9	[dim]

ANALYSIS AND RESULTS

Method	Equation	Hydraulic Conductivity m/s	Hydraulic Conductivity cm/s	Applicability Conditions		Applicable/Comments
Hazen	$K = \frac{g}{v} C_h f(n) d_{10}^2$	**1.07E-03**	**1.07E-01**	c_u < 5?	NO	**NOT APPLICABLE**
				d_{10} > 0.1?	YES	
				d_{10} < 3.0?	YES	
Kozeny	$K = \frac{g}{v} C_k f(n) d_{10}^2$	**7.89E-04**	**7.89E-02**	85%>coarse sand?	NO	**NOT APPLICABLE**
Fair-Hatch	$K = \frac{g}{v} f(n) f(P)$	**4.19E-03**	**4.19E-01**	No Test		No Applicability Test
Breyer	$K = \frac{g}{v} C_b d_{10}^2$	**1.05E-03**	**1.05E-01**	c_u < 3?	NO	**NOT APPLICABLE**
				c_u > 0.1?	YES	
				d_{10} < 0.6 mm?	YES	
				d_{10} > 0.06 mm?	YES	

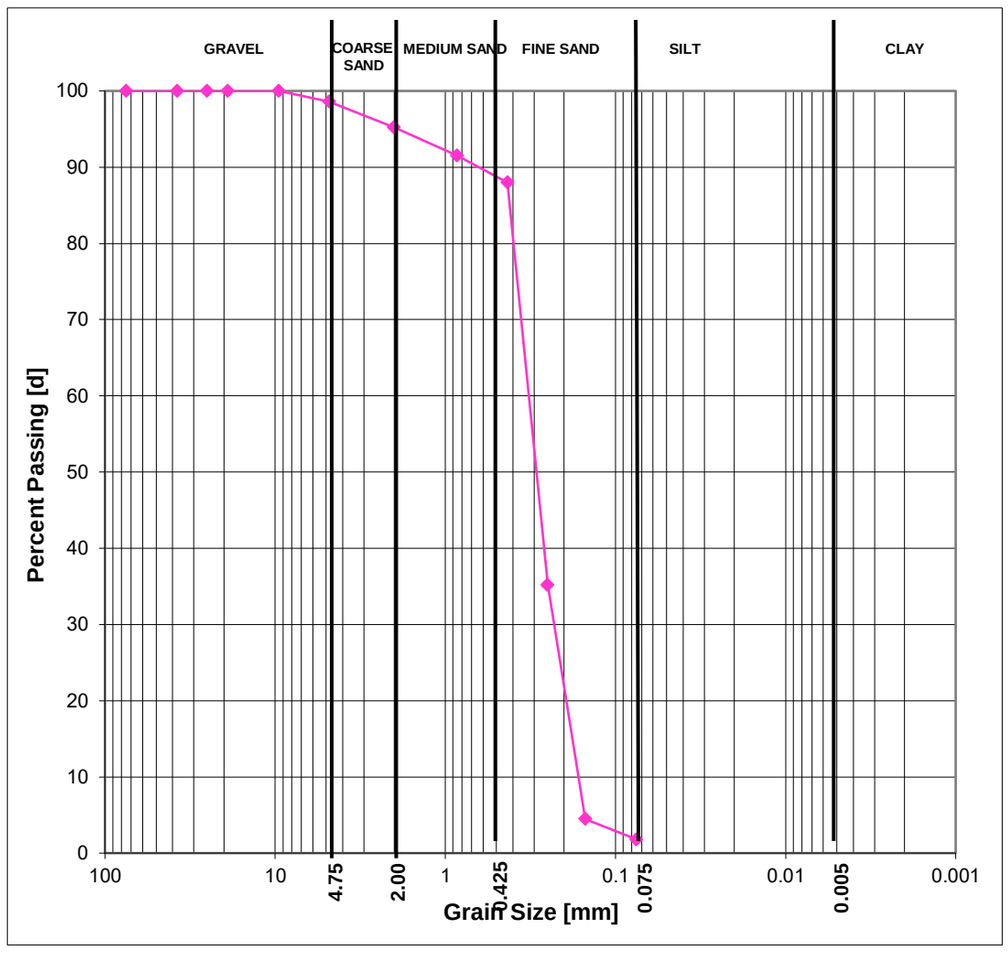
Project Name: NIPSCO
Project Number: 19121567

Analysis by: JRS
Checked by: SKB
Analysis date: 3/29/2020

APPENDIX A-9
HYDRAULIC CONDUCTIVITY CALCULATED FROM GRAIN SIZE ANALYSIS
SAMPLE NO. GAMW-37B S7 (BOT) 31'5" - 32'

GRAIN SIZE ANALYSIS

Sieve Size	Percentage Passed Through Sieve	Fraction Percent P	Geometric Mean d_m	P/d_m
3"	100.00	0.00	75.000	0.000
1.5"	100.00	0.00	37.500	0.000
1"	100.00	0.00	25.000	0.000
0.75"	100.00	0.00	19.000	0.000
0.375"	100.00	1.40	9.500	0.147
4	98.60	3.40	4.800	0.708
10	95.20	3.70	2.000	1.850
20	91.50	3.50	0.850	4.118
40	88.00	52.80	0.430	122.791
60	35.20	30.70	0.250	122.800
100	4.50	2.70	0.150	18.000
200	1.80	1.80	0.075	24.000
Sum:		**100.00**		**294.414**
Coarse Sand Sum:		**3.40**		



INPUT PARAMETERS

Inputs	Description	Value	Units		Inputs	Description	Value	Units
d_{10}	10% pass	0.170	[mm]	[select from graph]	C_h	Hazen constant	6.0E-04	[dim]
d_{60}	60% pass	0.340	[mm]	[select from graph]	C_k	Kozeny constant	8.3E-03	[dim]
n	porosity	0.35	[dim]					
Θ	sand shape factor	6.0	[dim]	[select from 4 choices]	C_b	$C_b = 6.0 \times 10^{-4} \log \frac{500}{cu}$	1.44E-03	[dim]
	rounded	*6.0*			f(n) Kozeny/Fair-Hatch	$f(n) = \frac{n^3}{(1-n)^2}$	1.01E-01	[dim]
	subrounded	*6.6*						
	subangular	*7.1*						
	angular	*7.7*						
c_u	uniformity coefficient [d_{60}/d_{10}]	2.00	[dim]		f(P) Fair-Hatch	$f(P) = \frac{1}{m\left(\frac{\Theta}{100}\sum\frac{P}{d_m}\right)^2}$	6.41E-10	[dim]
g	gravitational acceleration	9.807	[m/s^2]					
v	kinematic viscosity [25°C]	1.14E-06	[m^2/s]					
m	packing factor	5	[dim]		f(n) Hazen	**f(n) = [1+10(n-0.26)]**	1.9	[dim]

ANALYSIS AND RESULTS

Method	Equation	Hydraulic Conductivity m/s	Hydraulic Conductivity cm/s	Applicability Conditions		Applicable/Comments
Hazen	$K = \frac{g}{v} C_h f(n) d_{10}^2$	**2.83E-04**	**2.83E-02**	c_u < 5?	YES	**POTENTIALLY APPLICABLE**
				d_{10} > 0.1?	YES	
				d_{10} < 3.0?	YES	
Kozeny	$K = \frac{g}{v} C_k f(n) d_{10}^2$	**2.09E-04**	**2.09E-02**	85%>coarse sand?	NO	**NOT APPLICABLE**
Fair-Hatch	$K = \frac{g}{v} f(n) f(P)$	**5.60E-04**	**5.60E-02**	No Test		No Applicability Test
Breyer	$K = \frac{g}{v} C_b d_{10}^2$	**3.58E-04**	**3.58E-02**	c_u < 3?	YES	**POTENTIALLY APPLICABLE**
				c_u > 0.1?	YES	
				d_{10} < 0.6 mm?	YES	
				d_{10} > 0.06 mm?	YES	

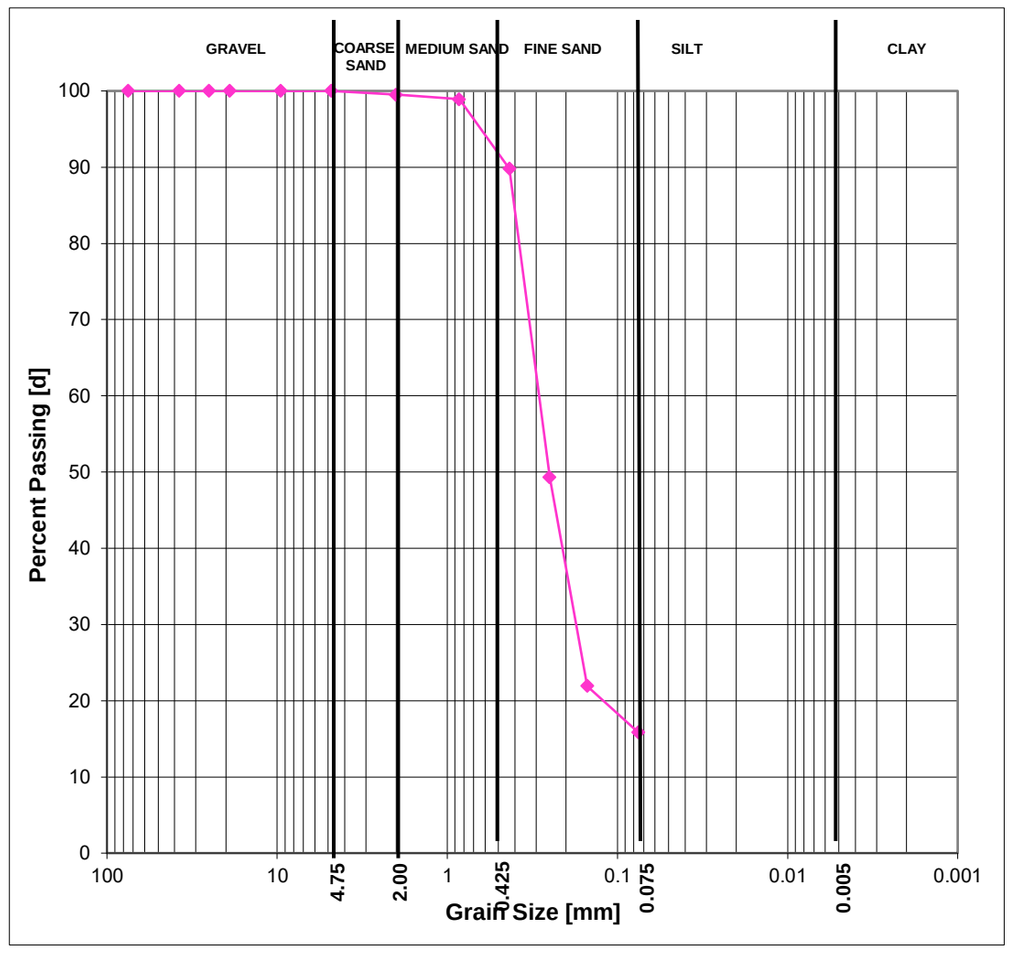
Project Name: NIPSCO
Project Number: 19121567

Analysis by: JRS
Checked by: SKB
Analysis date: 3/29/2020

APPENDIX A-10
HYDRAULIC CONDUCTIVITY CALCULATED FROM GRAIN SIZE ANALYSIS
SAMPLE NO. GAMW-37B S2 (TOP) 5' - 6'1"

GRAIN SIZE ANALYSIS

Sieve Size	Percentage Passed Through Sieve	Fraction Percent P	Geometric Mean d_m	P/d_m
3"	100.00	0.00	75.000	0.000
1.5"	100.00	0.00	37.500	0.000
1"	100.00	0.00	25.000	0.000
0.75"	100.00	0.00	19.000	0.000
0.375"	100.00	0.00	9.500	0.000
4	100.00	0.50	4.800	0.104
10	99.50	0.60	2.000	0.300
20	98.90	9.10	0.850	10.706
40	89.80	40.50	0.430	94.186
60	49.30	27.40	0.250	109.600
100	21.90	6.10	0.150	40.667
200	15.80	15.80	0.075	210.667
Sum:	**100.00**			**466.229**
Coarse Sand Sum:	**0.50**			



INPUT PARAMETERS

Inputs	Description	Value	Units		Inputs	Description	Value	Units
d_{10}	10% pass	0.050	[mm]	[select from graph]	C_h	Hazen constant	6.0E-04	[dim]
d_{60}	60% pass	0.300	[mm]	[select from graph]	C_k	Kozeny constant	8.3E-03	[dim]
n	porosity	0.35	[dim]					
Θ	sand shape factor	6.0	[dim]	[select from 4 choices]	C_b	$C_b = 6.0 \times 10^{-4} \log \frac{500}{cu}$	1.15E-03	[dim]
	rounded	*6.0*			f(n) Kozeny/Fair-Hatch	$f(n) = \frac{n^3}{(1-n)^2}$	1.01E-01	[dim]
	subrounded	*6.6*						
	subangular	*7.1*						
	angular	*7.7*						
c_u	uniformity coefficient [d_{60}/d_{10}]	6.00	[dim]		f(P) Fair-Hatch	$f(P) = \frac{1}{m\left(\frac{\Theta}{100}\sum\frac{P}{d_m}\right)^2}$	2.56E-10	[dim]
g	gravitational acceleration	9.807	[m/s^2]					
v	kinematic viscosity [25°C]	1.14E-06	[m^2/s]					
m	packing factor	5	[dim]		f(n) Hazen	**f(n) = [1+10(n-0.26)]**	1.9	[dim]

ANALYSIS AND RESULTS

Method	Equation	Hydraulic Conductivity m/s	Hydraulic Conductivity cm/s	Applicability Conditions		Applicable/Comments
Hazen	$K = \frac{g}{v} C_h f(n) d_{10}^2$	2.45E-05	2.45E-03	c_u < 5?	NO	**NOT APPLICABLE**
				d_{10} > 0.1?	NO	
				d_{10} < 3.0?	YES	
Kozeny	$K = \frac{g}{v} C_k f(n) d_{10}^2$	1.81E-05	1.81E-03	85%>coarse sand?	NO	**NOT APPLICABLE**
Fair-Hatch	$K = \frac{g}{v} f(n) f(P)$	2.23E-04	2.23E-02	No Test		No Applicability Test
Breyer	$K = \frac{g}{v} C_b d_{10}^2$	2.48E-05	2.48E-03	c_u < 3?	NO	**NOT APPLICABLE**
				c_u > 0.1?	YES	
				d_{10} < 0.6 mm?	YES	
				d_{10} > 0.06 mm?	NO	

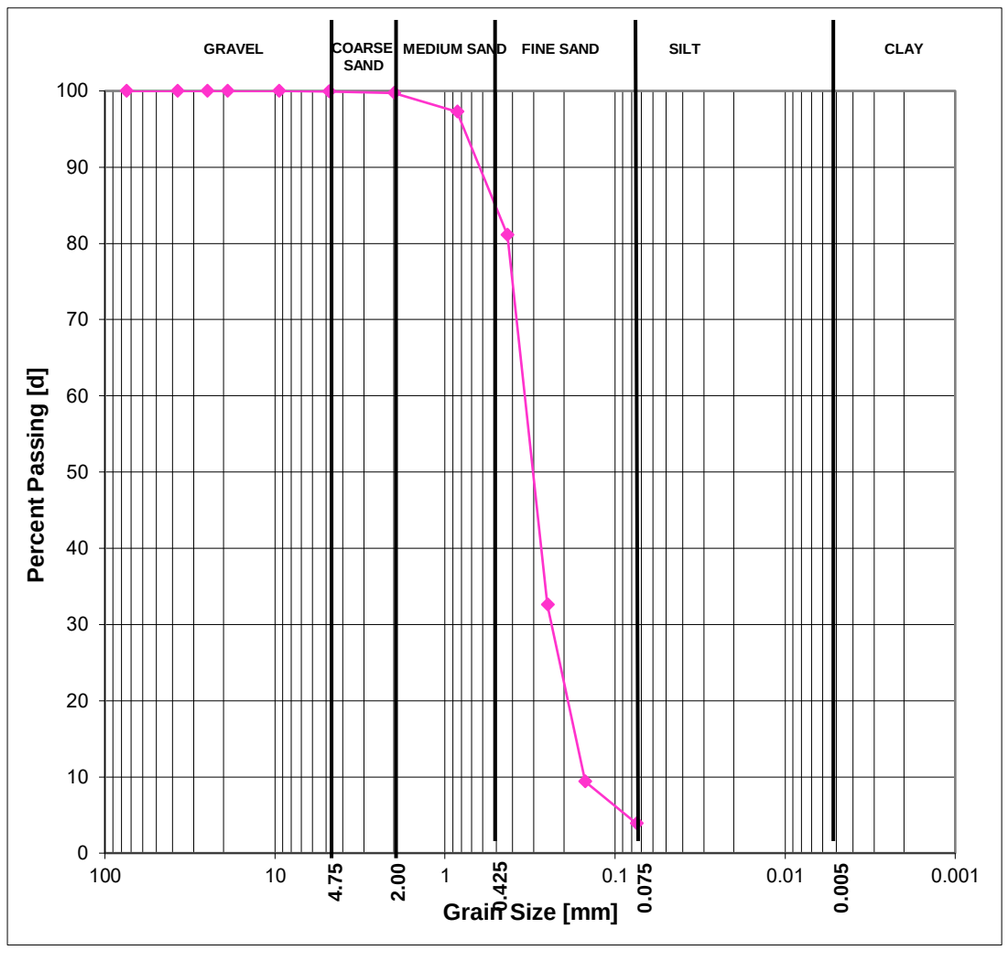
Project Name: NIPSCO
Project Number: 19121567

Analysis by: JRS
Checked by: SKB
Analysis date: 3/29/2020

APPENDIX A-11
HYDRAULIC CONDUCTIVITY CALCULATED FROM GRAIN SIZE ANALYSIS
SAMPLE NO. GAMW-37B S3 10'-12'

GRAIN SIZE ANALYSIS

Sieve Size	Percentage Passed Through Sieve	Fraction Percent P	Geometric Mean d_m	P/d_m
3"	100.00	0.00	75.000	0.000
1.5"	100.00	0.00	37.500	0.000
1"	100.00	0.00	25.000	0.000
0.75"	100.00	0.00	19.000	0.000
0.375"	100.00	0.10	9.500	0.011
4	99.90	0.20	4.800	0.042
10	99.70	2.40	2.000	1.200
20	97.30	16.20	0.850	19.059
40	81.10	48.50	0.430	112.791
60	32.60	23.20	0.250	92.800
100	9.40	5.50	0.150	36.667
200	3.90	3.90	0.075	52.000
Sum:		**100.00**		**314.568**
Coarse Sand Sum:		**0.20**		



INPUT PARAMETERS

Inputs	Description	Value	Units		Inputs	Description	Value	Units
d_{10}	10% pass	0.160	[mm]	[select from graph]	C_h	Hazen constant	6.0E-04	[dim]
d_{60}	60% pass	0.240	[mm]	[select from graph]	C_k	Kozeny constant	8.3E-03	[dim]
n	porosity	0.35	[dim]					
Θ	sand shape factor	6.0	[dim]	[select from 4 choices]	C_b	$C_b = 6.0 \times 10^{-4} \log \frac{500}{cu}$	1.51E-03	[dim]
	rounded	*6.0*			f(n) Kozeny/Fair-Hatch	$f(n) = \frac{n^3}{(1-n)^2}$	1.01E-01	[dim]
	subrounded	*6.6*						
	subangular	*7.1*						
	angular	*7.7*						
c_u	uniformity coefficient [d_{60}/d_{10}]	1.50	[dim]		f(P) Fair-Hatch	$f(P) = \frac{1}{m\left(\frac{\Theta}{100}\sum\frac{P}{d_m}\right)^{\frac{1}{3}}}$	5.61E-10	[dim]
g	gravitational acceleration	9.807	[m/s^2]					
v	kinematic viscosity [25°C]	1.14E-06	[m^2/s]					
m	packing factor	5	[dim]		f(n) Hazen	**f(n) = [1+10(n-0.26)]**	1.9	[dim]

ANALYSIS AND RESULTS

Method	Equation	Hydraulic Conductivity m/s	Hydraulic Conductivity cm/s	Applicability Conditions		Applicable/Comments
Hazen	$K = \frac{g}{v} C_h f(n) d_{10}^2$	**2.51E-04**	**2.51E-02**	c_u < 5?	YES	**POTENTIALLY APPLICABLE**
				d_{10} > 0.1?	YES	
				d_{10} < 3.0?	YES	
Kozeny	$K = \frac{g}{v} C_k f(n) d_{10}^2$	**1.85E-04**	**1.85E-02**	85%>coarse sand?	NO	**NOT APPLICABLE**
Fair-Hatch	$K = \frac{g}{v} f(n) f(P)$	**4.90E-04**	**4.90E-02**	No Test		No Applicability Test
Breyer	$K = \frac{g}{v} C_b d_{10}^2$	**3.33E-04**	**3.33E-02**	c_u < 3?	YES	**POTENTIALLY APPLICABLE**
				c_u > 0.1?	YES	
				d_{10} < 0.6 mm?	YES	
				d_{10} > 0.06 mm?	YES	

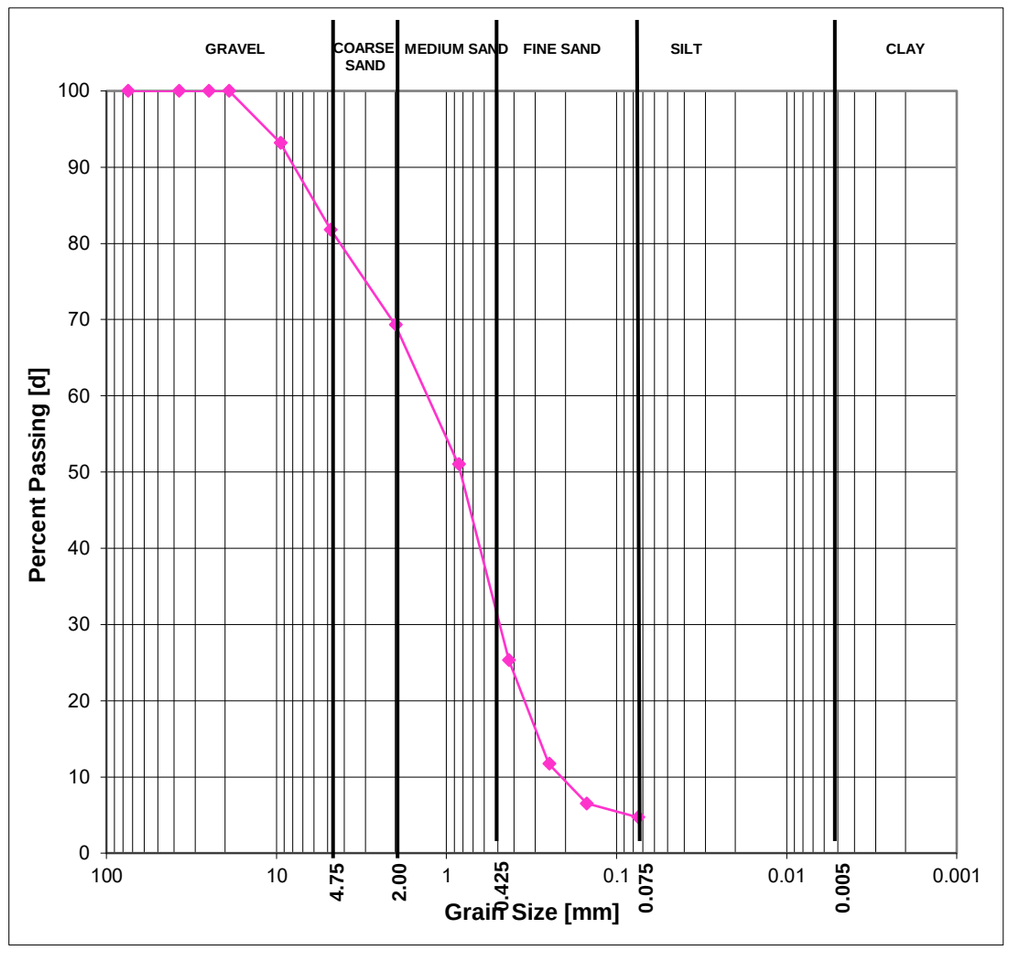
Project Name: NIPSCO
Project Number: 19121567

Analysis by: JRS
Checked by: SKB
Analysis date: 3/29/2020

APPENDIX A-12
HYDRAULIC CONDUCTIVITY CALCULATED FROM GRAIN SIZE ANALYSIS
SAMPLE NO. GAMW-37B S3 26.5'-27'

GRAIN SIZE ANALYSIS

Sieve Size	Percentage Passed Through Sieve	Fraction Percent P	Geometric Mean d_m	P/d_m
3"	100.00	0.00	75.000	0.000
1.5"	100.00	0.00	37.500	0.000
1"	100.00	0.00	25.000	0.000
0.75"	100.00	6.80	19.000	0.358
0.375"	93.20	11.40	9.500	1.200
4	81.80	12.50	4.800	2.604
10	69.30	18.30	2.000	9.150
20	51.00	25.70	0.850	30.235
40	25.30	13.60	0.430	31.628
60	11.70	5.20	0.250	20.800
100	6.50	1.80	0.150	12.000
200	4.70	4.70	0.075	62.667
Sum:		**100.00**		**170.642**
Coarse Sand Sum:		**12.50**		



INPUT PARAMETERS

Inputs	Description	Value	Units		Inputs	Description	Value	Units
d_{10}	10% pass	0.220	[mm]	[select from graph]	C_h	Hazen constant	6.0E-04	[dim]
d_{60}	60% pass	1.420	[mm]	[select from graph]	C_k	Kozeny constant	8.3E-03	[dim]
n	porosity	0.35	[dim]					
Θ	sand shape factor	6.0	[dim]	[select from 4 choices]	C_b	$C_b = 6.0 \times 10^{-4} \log \frac{500}{cu}$	1.13E-03	[dim]
	rounded	*6.0*			f(n) Kozeny/Fair-Hatch	$f(n) = \frac{n^3}{(1-n)^2}$	1.01E-01	[dim]
	subrounded	*6.6*						
	subangular	*7.1*						
	angular	*7.7*						
c_u	uniformity coefficient [d_{60}/d_{10}]	6.45	[dim]		f(P) Fair-Hatch	$f(P) = \frac{1}{m\left(\frac{\Theta}{100}\sum\frac{P}{d_m}\right)^2}$	1.91E-09	[dim]
g	gravitational acceleration	9.807	[m/s^2]					
v	kinematic viscosity [25°C]	1.14E-06	[m^2/s]					
m	packing factor	5	[dim]		f(n) Hazen	**f(n) = [1+10(n-0.26)]**	1.9	[dim]

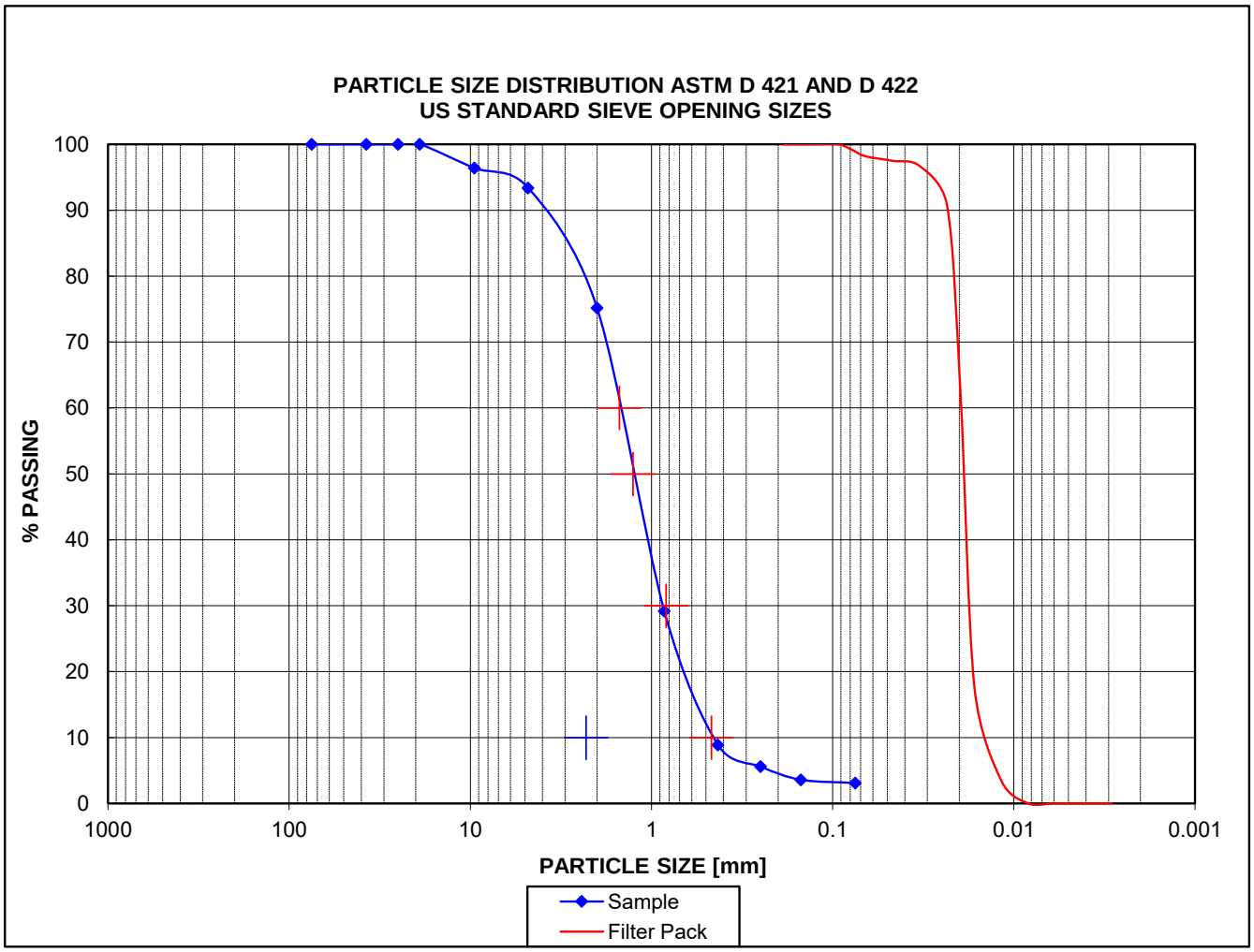
ANALYSIS AND RESULTS

Method	Equation	Hydraulic Conductivity m/s	Hydraulic Conductivity cm/s	Applicability Conditions		Applicable/Comments
Hazen	$K = \frac{g}{v} C_h f(n) d_{10}^2$	**4.75E-04**	**4.75E-02**	c_u < 5?	NO	**NOT APPLICABLE**
				d_{10} > 0.1?	YES	
				d_{10} < 3.0?	YES	
Kozeny	$K = \frac{g}{v} C_k f(n) d_{10}^2$	**3.51E-04**	**3.51E-02**	85%>coarse sand?	NO	**NOT APPLICABLE**
Fair-Hatch	$K = \frac{g}{v} f(n) f(P)$	**1.67E-03**	**1.67E-01**	No Test		No Applicability Test
Breyer	$K = \frac{g}{v} C_b d_{10}^2$	**4.72E-04**	**4.72E-02**	c_u < 3?	NO	**NOT APPLICABLE**
				c_u > 0.1?	YES	
				d_{10} < 0.6 mm?	YES	
				d_{10} > 0.06 mm?	YES	

Project Name: NIPSCO
Project Number: 19121567

Analysis by: JRS
Checked by: SKB
Analysis date: 3/29/2020

APPENDIX A-13
GRAVEL PACK WELL DESIGN CALCULATIONS
WELL GAMW-33B
SAMPLE DEPTH 25'11' - 26'9"



SCREEN AND FILTER PACK CALCULATION

	% Passing	Particle Size [mm]	Particle Size [in]			
				Uniformity Coefficient	3.22	[dim]
$D_{60\ passing}$	60	1.50	0.059	Gravel Pack Ratio	4	[dim]
$D_{50\ passing}$	50	1.26	0.050	Design Screen Slot Size	0.010	inches
$D_{30\ passing}$	30	0.83	0.033	Design Gravel Pack Size	Global #5	[dim]
$D_{10\ passing}$	10	0.47	0.018	Hydraulic Conductivty (Sieve)	615.6	ft/day
$D_{30\ filter\ pack}$	30	3.32	0.131	Hydraulic Conductivty (slug)	646	ft/day
$D_{10\ filter\ pack}$	10	2.30	0.090	Extraction Well	**TEST**	

WELL DESIGN CRITERIA

Max. Pumping Rate	200	gpm	Total Open Area	16.0%	Percent
Screen Length	20	feet	Screen Transmitting Capacity	124.55	gpm
Screen Diameter	6	inches	Entrance Velocity	0.005	ft/sec (<0.1)
Screen Interval	5-35	ft bgs	Approach Velocity	0.0003	ft/sec (<0.02)
Total Open Area	39.96	in^2/foot	Uphole Velocity	0.07	ft/sec (<5)

Analysis described in Groundwater and Wells, Driscoll, F.G., 1986, pages 441-443 and 451-452 and Williams, E.B., 1981, Fundamental Concepts of Well Design. Ground Water Vol 19, #5, p 527-542.

Project Name:	NIPSCO Pumping Test	Analysis By:	JRS
Project No.:	1648171.03	Checked By:	
Test Date:	11/16/2016	Analysis Date:	7/1/2019

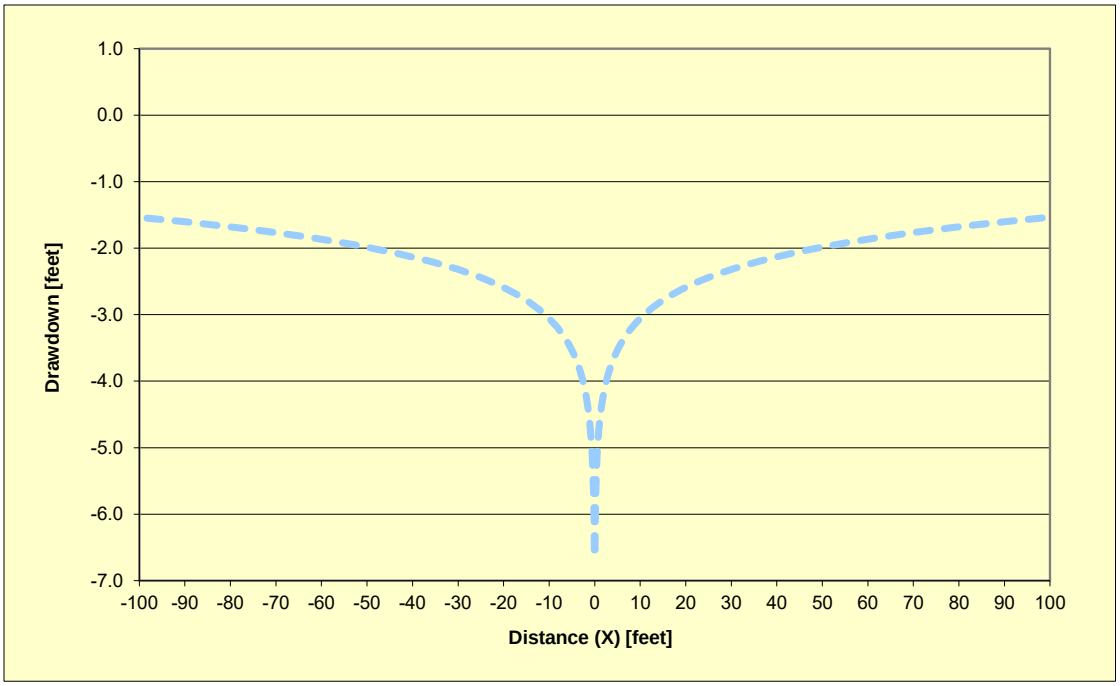
Appendix A-14
Steady State Radial Flow to a Well in Unconfined Aquifer with Uniform Recharge and Pumping From One Well

Hydraulic head as a function of radial distance for
1) unconfined aquifer and radius of influence (R) from Todd & Mays, 1980, eq. 4.2.10 (rearranged), pp. 157.

$$h = \left(H^2 - \frac{Q}{\pi K} \ln \frac{R}{r} \right)^{1/2} \qquad R = \left(\frac{Q}{\pi W} \right)^{1/2}$$

where:
K = Horizontal hydraulic conductivity [L/T]
b = Aquifer thickness [L]
T = Transmissivity [L^2/T]
I = Hydraulic gradient [L/L]
H = Initial hydraulic head above reference [L]
Z = Reference elevation [L]
W = Infiltration [L/T]
R = Calculated radius of influence [L]
r_w = Well radius [L]
s_w = Drawdown at the well [L]
Q = Pumping rate [L^3/T]
h = Calculated hydraulic head [L]
r = Radial distance from the pumping well [L]

Aquifer Data				Well Data			
K =	1.18E-01	[cm/s]	<-- K value	Q =	200.0	[gpm]	<-- Pumping rate
K =	334.53	[ft/day]		Q =	38500	[ft^3/day]	
b =	30.0	[ft]	<-- Aquifer thickness	r_w =	0.08	[ft]	<-- Pumping well diameter
T=	10035.9	[ft^2/day]		R =	1158	[ft]	
I =	0.00E+00	ft/day	<-- Horizontal gradient				
H =	30.0	[ft]	<-- Height of GWL above impermeable layer				
W =	40.0	[in/year]	<-- Annual precipitation				
W =	9.1E-03	[ft/day]					



NIPSCO/CCR GW MON/IN
SUMMARY OF SOIL DATA

Sample Identification	Sample Type	Sample Depth	Soil Classification	Natural Moisture %	Atterberg Limits				Grain Size Distribution			Compaction		Gs	Unit Weight		Permeability (cm/sec)	Additional Tests Conducted (See Notes)
					L.L.	P.L.	P.I.	L.I.	% Finer No. 4 Sieve	% Finer No. 200 Sieve	% Finer .005 mm	Maximum Dry Density (lb/cuft)	Optimum Moisture %		Moisture %	Dry (lb/cuft)		
AT-01-3-5	Bag	3.0-5.0'	(SP-SM)	16.1	-	-	-	-	100.0	7.8	-	-	-	-	-	-	-	-
AT-01-11-12	Bag	11.0-12.0'	(ML)	16.2	-	-	-	-	100.0	79.9	-	-	-	-	-	-	-	-
AT-01-12.5-13.5	Bag	12.5-13.5'	(SM)	16.7	-	-	-	-	100.0	48.7	-	-	-	-	-	-	-	-
AT-01-19-20	Bag	19.0-20.0'	SP	14.6	-	-	-	-	96.7	0.8	-	-	-	-	-	-	-	-
AT-01-24-25	Bag	24.0-25.0'	SP	17.3	-	-	-	-	98.3	1.5	-	-	-	-	-	-	-	-
AT-01-29-30	Bag	29.0-30.0'	SP	16.8	-	-	-	-	99.8	0.6	-	-	-	-	-	-	-	-

ABBREVIATIONS:
LIQUID LIMIT (LL)
PLASTIC LIMIT (PL)
PLASTICITY INDEX (PI)
LIQUIDITY INDEX (LI)
SPECIFIC GRAVITY (Gs)
MOISTURE (Mc)

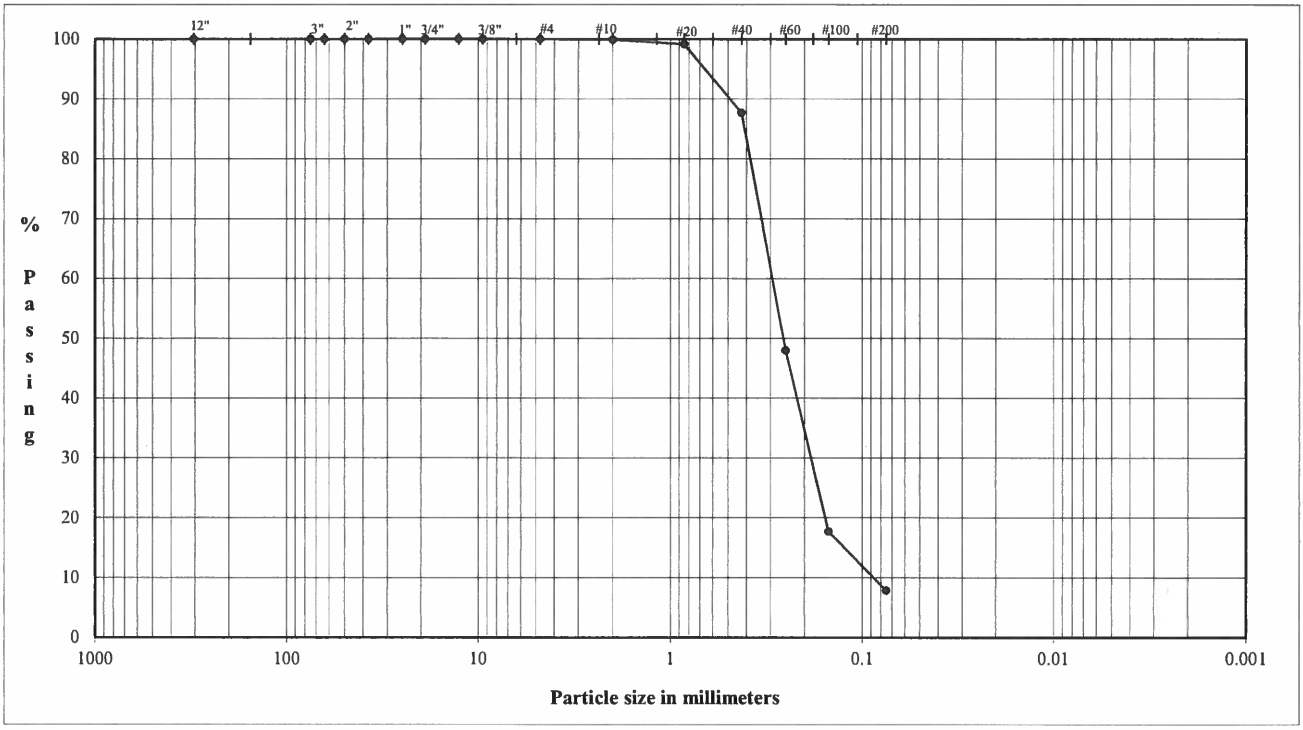
NOTES:
T = TRIAXIAL TEST
U = UNCONFINED COMPRESSION TEST
C = CONSOLIDATION TEST
DS = DIRECT SHEAR TEST
O = ORGANIC CONTENT
P = pH

JUNE 2019 1648171-01

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D6913, D4318

PROJECT NAME: **NIPSCO/CCR GW MON/IN**
SAMPLE ID: **AT-01-3-5** Depth: **3.0-5.0'**
TYPE: **Bag**

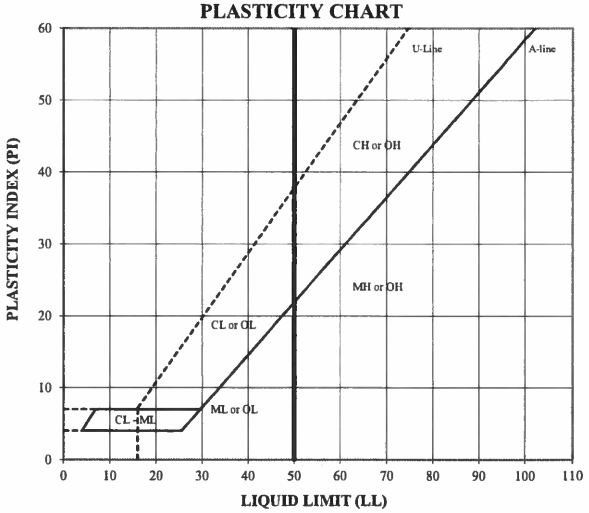


	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay
COBBLES	GRAVEL		SAND			FINES

U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**100.0**		
0.75"	19.0	**100.0**	Coarse Gravel	**0.0**
0.50"	12.7	**100.0**		
0.375"	9.5	**100.0**		
#4	4.8	**100.0**	Fine Gravel	**0.0**
#10	2.00	**99.9**	Coarse Sand	**0.1**
#20	0.85	**99.2**		
#40	0.43	**87.7**	Medium Sand	**12.2**
#60	0.25	**47.9**		
#100	0.15	**17.7**		
#200	0.075	**7.8**	Fine Sand	**79.8**
			Fines	**7.8**

PLASTICITY CHART



ATTERBERG LIMITS
Method -B (Dry preparation)

M_c	LL	PL	PI	LI
16.1				

LL (oven-dried) / < 0.75 = ORGANIC (OL/OH)

DESCRIPTION: SAND, fine to coarse, some fines; brown.

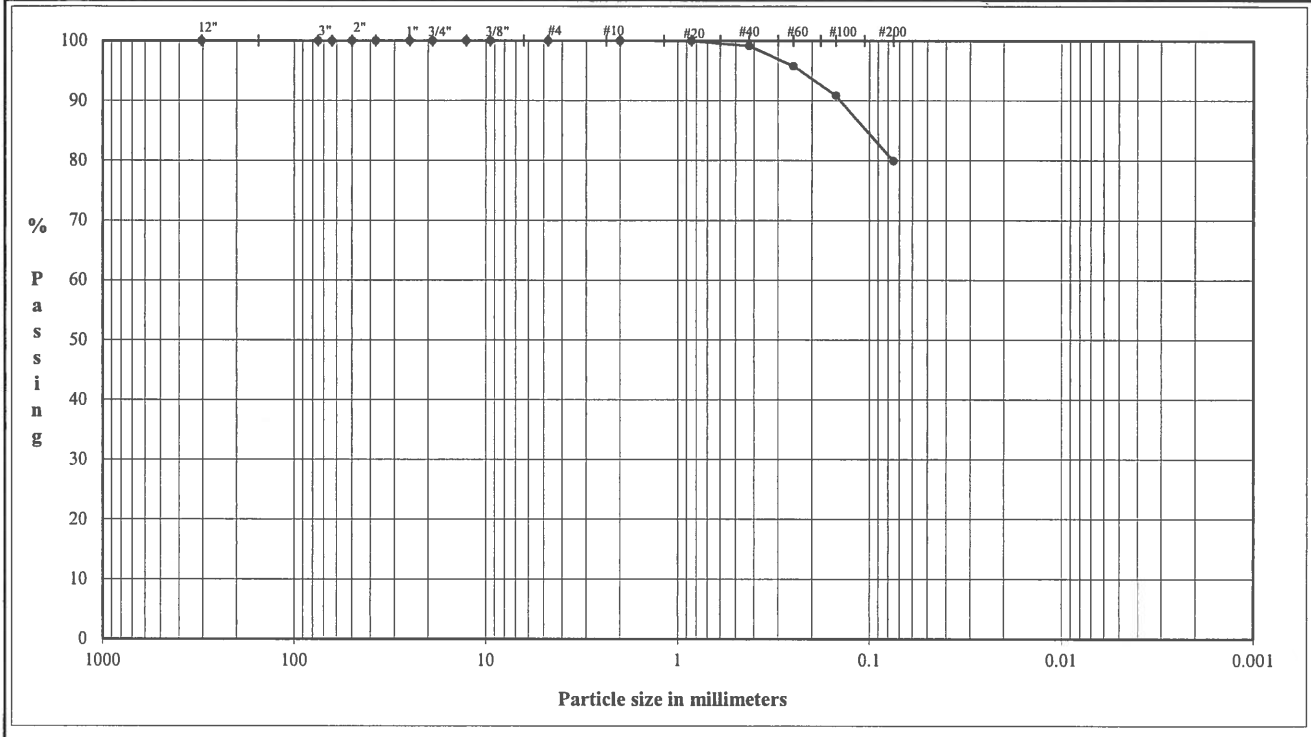
USCS: (SP-SM)

TECH	TB/LJ
DATE	6/12/19
CHECK	
REVIEW	
APPROVE	

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D6913, D4318

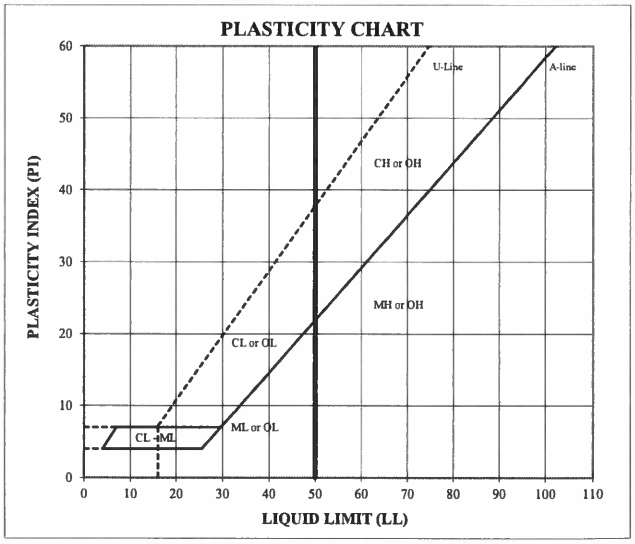
PROJECT NAME: **NIPSCO/CCR GW MON/IN**
SAMPLE ID: **AT-01-11-12** Depth: **11.0-12.0'**
TYPE: **Bag**



COBBLES	GRAVEL		SAND			FINES
	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay

U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**100.0**		
0.75"	19.0	**100.0**	Coarse Gravel	**0.0**
0.50"	12.7	**100.0**		
0.375"	9.5	**100.0**		
#4	4.8	**100.0**	Fine Gravel	**0.0**
#10	2.00	**100.0**	Coarse Sand	**0.0**
#20	0.85	**99.9**		
#40	0.43	**99.1**	Medium Sand	**0.9**
#60	0.25	**95.8**		
#100	0.15	**90.8**		
#200	0.075	**79.9**	Fine Sand	**19.3**
			Fines	**79.9**



ATTERBERG LIMITS
Method -B (Dry preparation)

M_c	LL	PL	PI	LI
16.2				

LL (oven-dried) / < 0.75 = ORGANIC (OL/OH)

DESCRIPTION: sandy SILT, fine to medium; tan.

USCS: (ML)

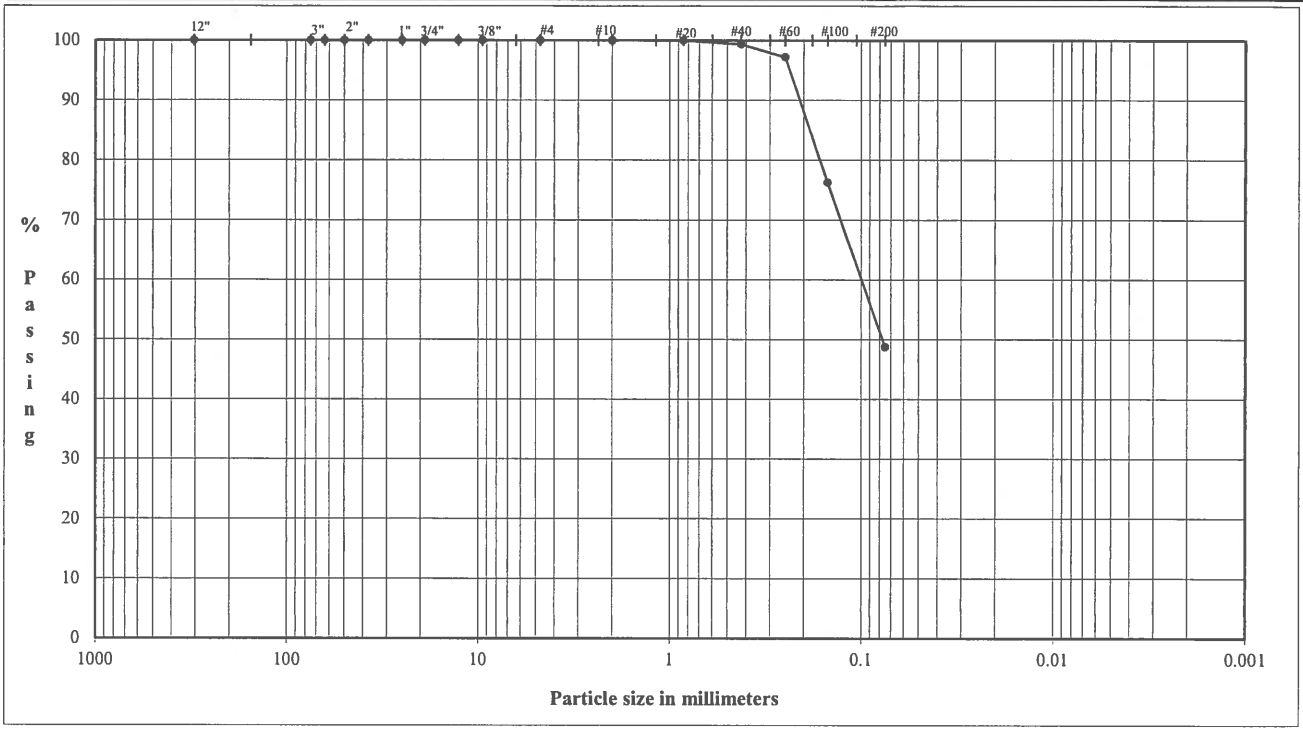
TECH	TB/LJ
DATE	6/12/19
CHECK	
REVIEW	
APPROVE	

JUNE 2019 1648171-01

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D6913, D4318

PROJECT NAME: **NIPSCO/CCR GW MON/IN**
SAMPLE ID: **AT-01-12.5-13.5** Depth: **12.5-13.5'**
TYPE: **Bag**

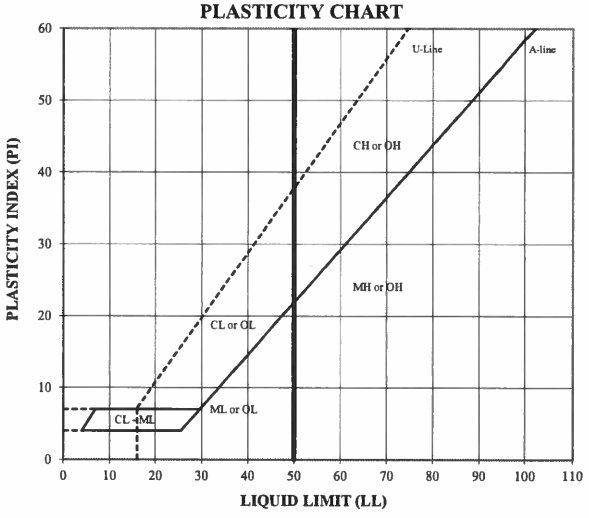


	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay
COBBLES	GRAVEL		SAND			FINES

U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	100.0		
3.0"	75.0	100.0	Cobbles	0.0
2.5"	63.5	100.0		
2.0"	50.0	100.0		
1.5"	37.5	100.0		
1.0"	25.0	100.0		
0.75"	19.0	100.0	Coarse Gravel	0.0
0.50"	12.7	100.0		
0.375"	9.5	100.0		
#4	4.8	100.0	Fine Gravel	0.0
#10	2.00	100.0	Coarse Sand	0.0
#20	0.85	100.0		
#40	0.43	99.4	Medium Sand	0.6
#60	0.25	97.2		
#100	0.15	76.2		
#200	0.075	48.7	Fine Sand	50.6
			Fines	48.7

PLASTICITY CHART



ATTERBERG LIMITS
Method -B (Dry preparation)

M_c	LL	PL	PI	LI
16.7				

LL (oven-dried) / < 0.75 = ORGANIC (OL/OH)

DESCRIPTION: SAND and SILT, fine to medium; tan.

USCS: (SM)

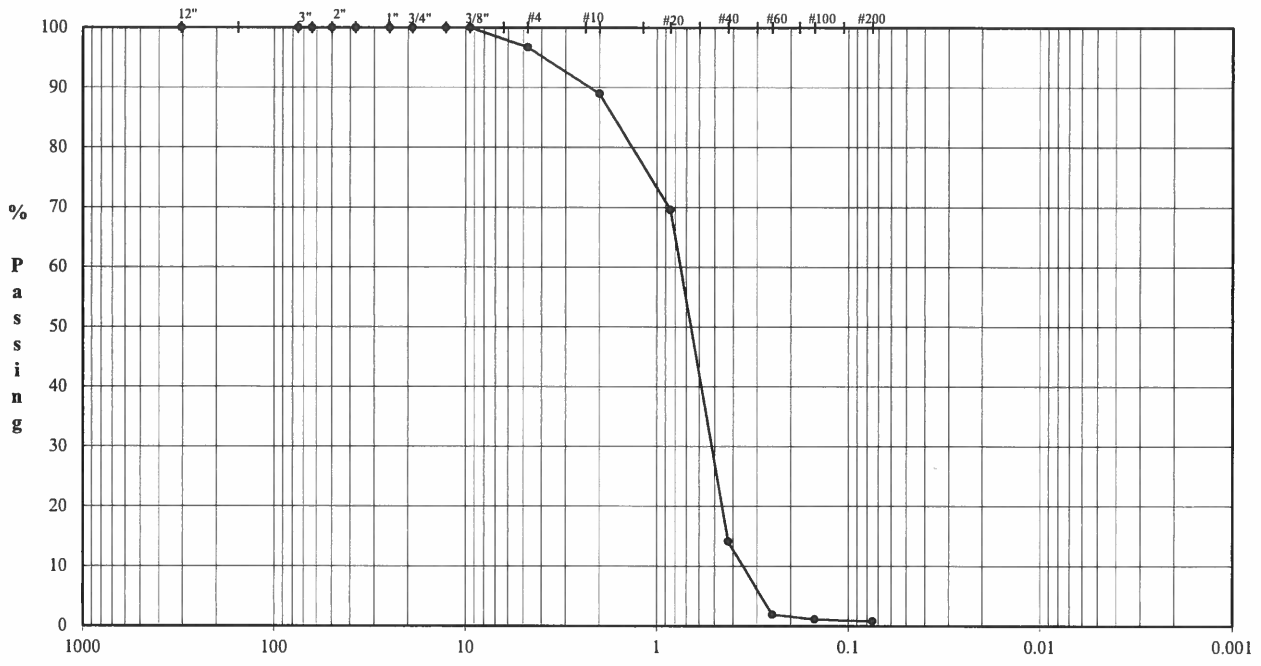
TECH	TB/LJ
DATE	6/12/19
CHECK	
REVIEW	
APPROVE	

JUNE 2019 1648171-01

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D6913, D4318

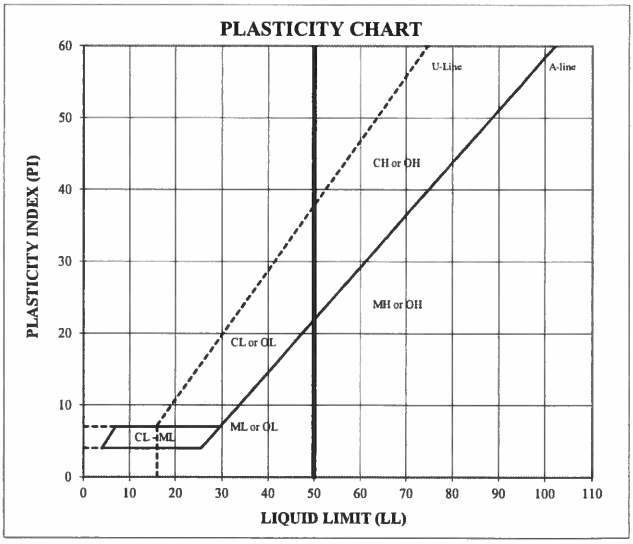
PROJECT NAME: **NIPSCO/CCR GW MON/IN**
SAMPLE ID: **AT-01-19-20** Depth: **19.0-20.0'**
TYPE: **Bag**



	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay
COBBLES	GRAVEL		SAND			FINES

U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**100.0**		
0.75"	19.0	**100.0**	Coarse Gravel	**0.0**
0.50"	12.7	**100.0**		
0.375"	9.5	**100.0**		
#4	4.8	**96.7**	Fine Gravel	**3.3**
#10	2.00	**89.0**	Coarse Sand	**7.7**
#20	0.85	**69.6**		
#40	0.43	**14.1**	Medium Sand	**74.8**
#60	0.25	**1.9**		
#100	0.15	**1.1**		
#200	0.075	**0.8**	Fine Sand	**13.3**
			Fines	**0.8**



ATTERBERG LIMITS
Method -B (Dry preparation)

M_c	LL	PL	PI	LI
14.6				

LL (oven-dried) / < 0.75 = ORGANIC (OL/OH)

DESCRIPTION: SAND, fine to coarse, trace gravel, trace fines; brown.

USCS: SP

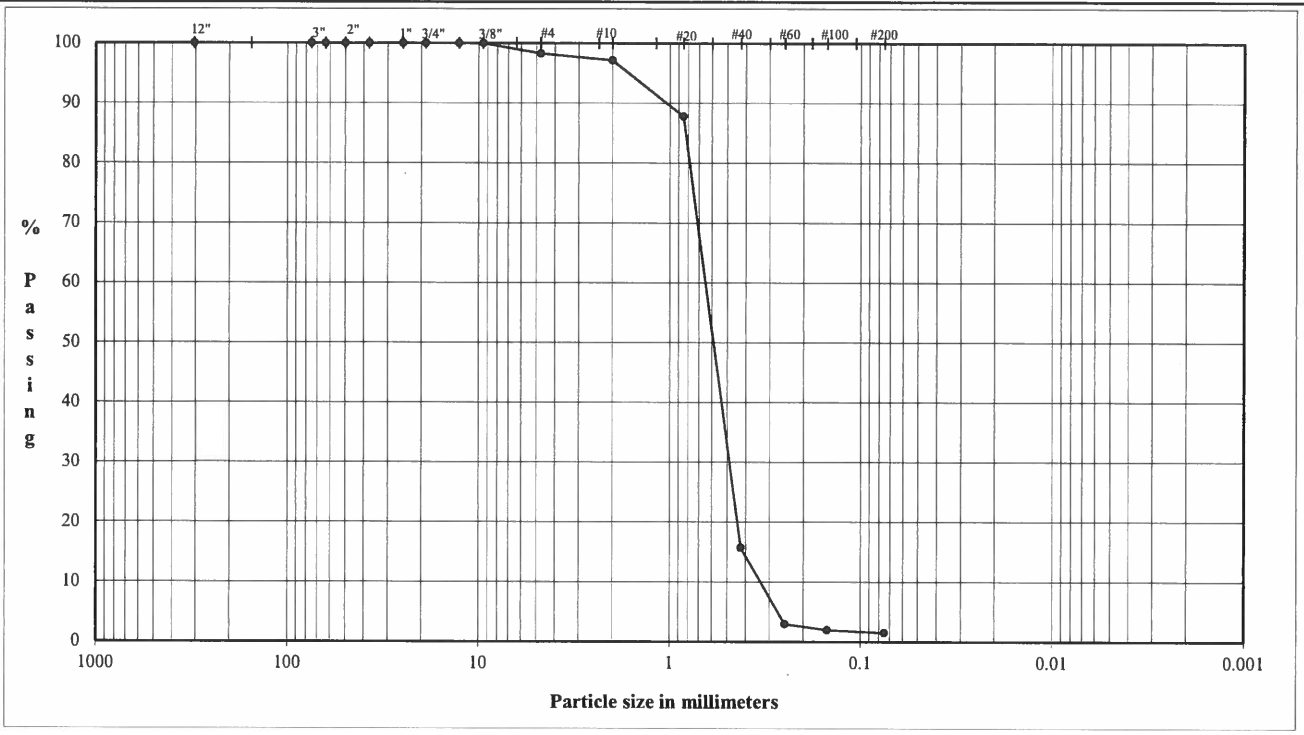
TECH	TB/LJ
DATE	6/12/19
CHECK	
REVIEW	
APPROVE	

JUNE 2019 1648171-01

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D6913, D4318

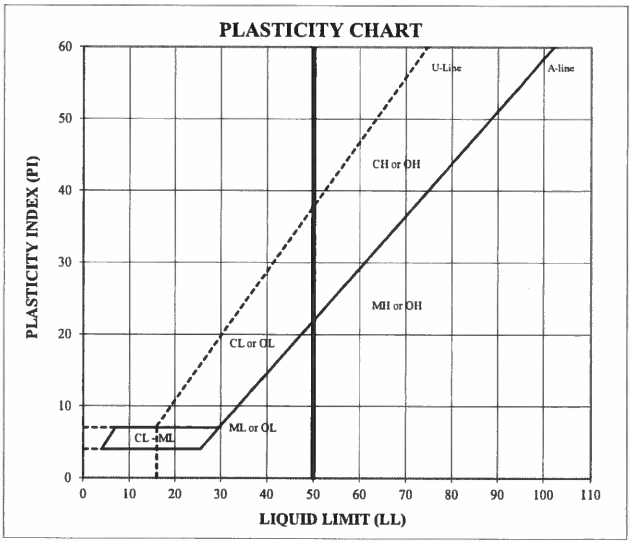
PROJECT NAME: **NIPSCO/CCR GW MON/IN**
SAMPLE ID: **AT-01-24-25** Depth: **24.0-25.0'**
TYPE: **Bag**



	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay
COBBLES	GRAVEL		SAND			FINES

U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**100.0**		
0.75"	19.0	**100.0**	Coarse Gravel	**0.0**
0.50"	12.7	**100.0**		
0.375"	9.5	**100.0**		
#4	4.8	**98.3**	Fine Gravel	**1.7**
#10	2.00	**97.1**	Coarse Sand	**1.1**
#20	0.85	**87.8**		
#40	0.43	**15.8**	Medium Sand	**81.4**
#60	0.25	**2.9**		
#100	0.15	**2.0**		
#200	0.075	**1.5**	Fine Sand	**14.3**
			Fines	**1.5**



ATTERBERG LIMITS
Method -B (Dry preparation)

M_c	LL	PL	PI	LI
17.3				

LL (oven-dried) / < 0.75 = ORGANIC (OL/OH)

DESCRIPTION: SAND, fine to coarse, trace gravel, trace fines; gray and brown.

USCS: SP

TECH	TB/LJ
DATE	6/12/19
CHECK	
REVIEW	
APPROVE	

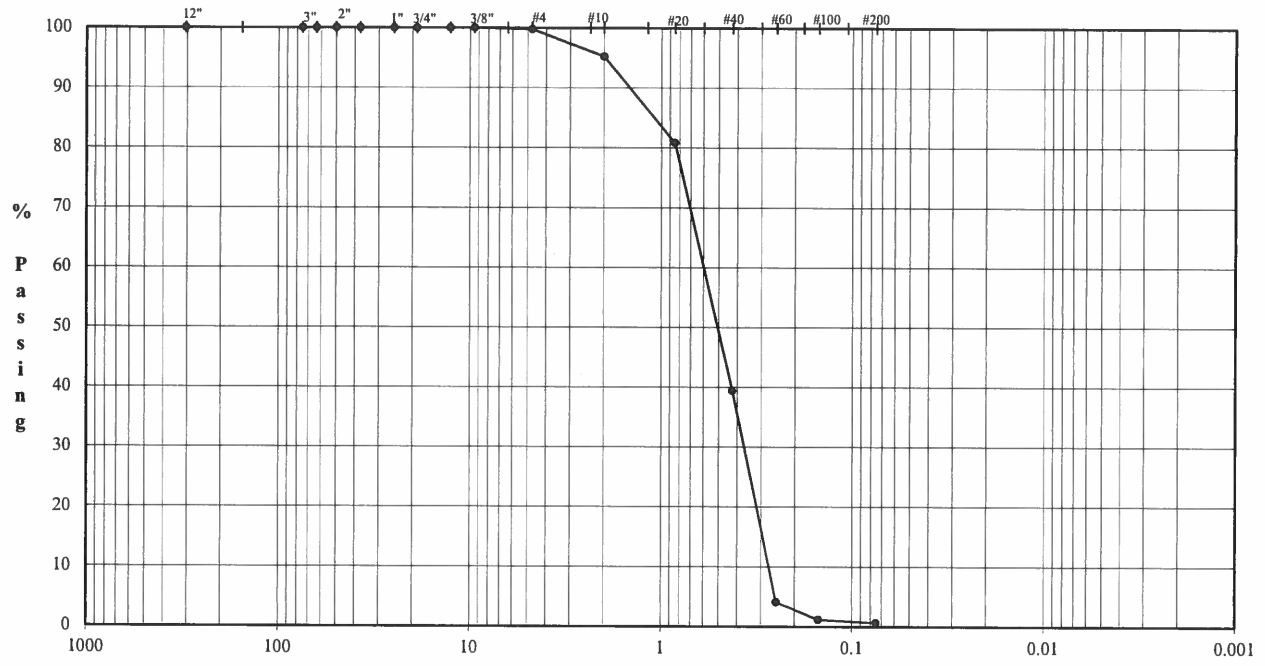
JUNE 2019

1648171-01

PARTICLE SIZE DISTRIBUTION & ATTERBERG LIMITS

ASTM D6913, D4318

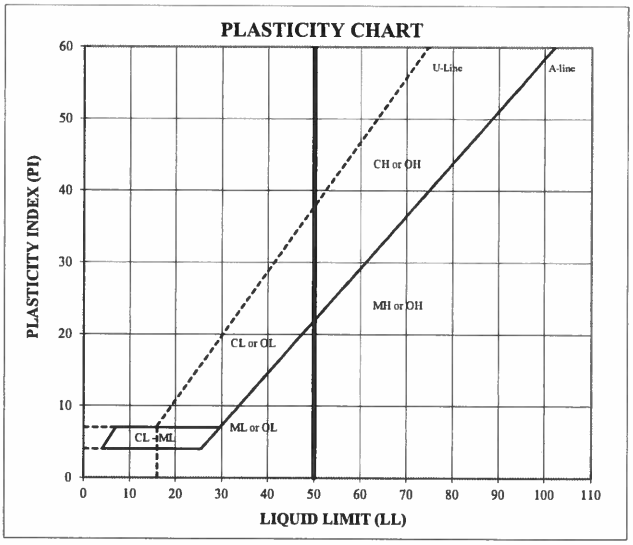
PROJECT NAME: **NIPSCO/CCR GW MON/IN**
SAMPLE ID: **AT-01-29-30** Depth: **29.0-30.0'**
TYPE: **Bag**



	Coarse	Fine	Coarse	Medium	Fine	Silt or Clay
COBBLES	GRAVEL		SAND			FINES

U.S. Standard Sieves Sizes and Numbers

	Particle Size (mm)	% Passing	Particle Size Classification	Percentage
12.0"	304.8	**100.0**		
3.0"	75.0	**100.0**	Cobbles	**0.0**
2.5"	63.5	**100.0**		
2.0"	50.0	**100.0**		
1.5"	37.5	**100.0**		
1.0"	25.0	**100.0**		
0.75"	19.0	**100.0**	Coarse Gravel	**0.0**
0.50"	12.7	**100.0**		
0.375"	9.5	**100.0**		
#4	4.8	**99.8**	Fine Gravel	**0.2**
#10	2.00	**95.2**	Coarse Sand	**4.5**
#20	0.85	**80.8**		
#40	0.43	**39.4**	Medium Sand	**55.8**
#60	0.25	**4.1**		
#100	0.15	**1.2**		
#200	0.075	**0.6**	Fine Sand	**38.8**
			Fines	**0.6**



DESCRIPTION: SAND, fine to coarse, trace gravel, trace fines; gray and brown.

USCS: SP

ATTERBERG LIMITS

Method -B (Dry preparation)

M_c	LL	PL	PI	LI
16.8				

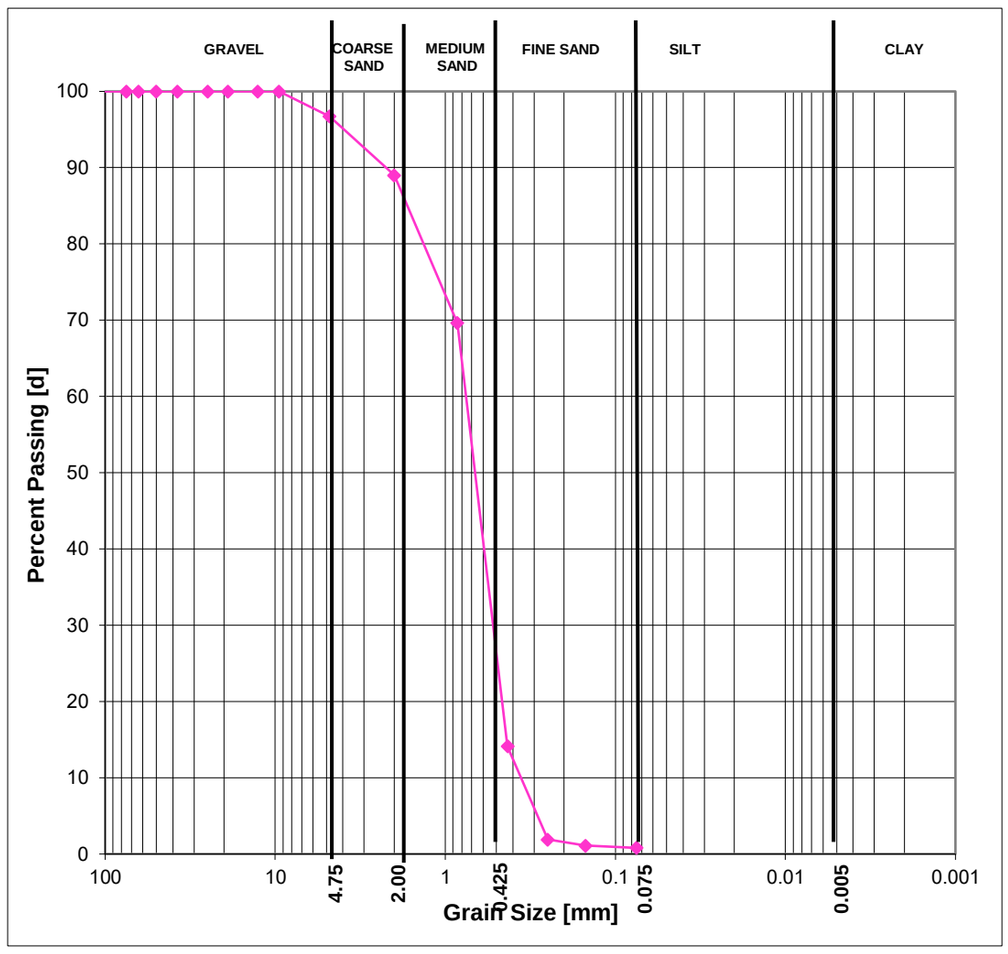
LL (oven-dried) / < 0.75 = ORGANIC (OL/OH)

TECH	TB/LJ
DATE	6/12/19
CHECK	
REVIEW	
APPROVE	

APPENDIX A-16
HYDRAULIC CONDUCTIVITY CALCULATED FROM GRAIN SIZE ANALYSIS
SAMPLE NO. AT-01 19 - 20'

GRAIN SIZE ANALYSIS

Sieve Size	Percentage Passed Through Sieve	Fraction Percent P	Geometric Mean d_m	P/d_m
12"	100.00	0.00	304.8	0.000
3"	100.00	0.00	75.000	0.000
2.5"	100.00	0.00	63.500	0.000
2.0"	100.00	0.00	50.000	0.000
1.5"	100.00	0.00	37.500	0.000
1.0"	100.00	0.00	25.000	0.000
0.75"	100.00	0.00	19.000	0.000
0.50"	100.00	0.00	12.700	0.000
0.375"	100.00	3.30	9.500	0.347
4	96.70	7.70	4.800	1.604
10	89.00	19.40	2.000	9.700
20	69.60	55.50	0.850	65.294
40	14.10	12.20	0.430	28.372
60	1.90	0.80	0.250	3.200
100	1.10	0.30	0.150	2.000
200	0.80	0.80	0.075	10.667
	Sum:	**100.00**		**121.184**
	Coarse Sand Sum:	**7.70**		



INPUT PARAMETERS

Inputs	Description	Value	Units		Inputs	Description	Value	Units
d_{10}	10% pass	0.370	[mm]	[select from graph]	C_h	Hazen constant	6.0E-04	[dim]
d_{60}	60% pass	0.780	[mm]	[select from graph]	C_k	Kozeny constant	8.3E-03	[dim]
n	porosity	0.35	[dim]					
Θ	sand shape factor	6.0	[dim]	[select from 4 choices]	C_b	$C_b = 6.0 \times 10^{-4} \log \frac{500}{cu}$	1.43E-03	[dim]
	rounded	*6.0*			f(n) Kozeny/Fair-Hatch	$f(n) = \frac{n^3}{(1-n)^2}$	1.01E-01	[dim]
	subrounded	*6.6*						
	subangular	*7.1*						
	angular	*7.7*						
c_u	uniformity coefficient [d_{60}/d_{10}]	2.11	[dim]		f(P) Fair-Hatch	$f(P) = \frac{1}{m\left(\frac{\Theta}{100}\sum\frac{P}{d_m}\right)^2}$	3.78E-09	[dim]
g	gravitational acceleration	9.807	[m/s^2]					
v	kinematic viscosity [25°C]	1.14E-06	[m^2/s]					
m	packing factor	5	[dim]		f(n) Hazen	**f(n) = [1+10(n-0.26)]**	1.9	[dim]

ANALYSIS AND RESULTS

Method	Equation	Hydraulic Conductivity m/s	Hydraulic Conductivity cm/s	Applicability Conditions		Applicable/Comments
Hazen	$K = \frac{g}{v} C_h f(n) d_{10}^2$	1.34E-03	1.34E-01	c_u < 5?	YES	**POTENTIALLY APPLICABLE**
				d_{10} > 0.1?	YES	
				d_{10} < 3.0?	YES	
Kozeny	$K = \frac{g}{v} C_k f(n) d_{10}^2$	9.92E-04	9.92E-02	85%>coarse sand?	NO	**NOT APPLICABLE**
Fair-Hatch	$K = \frac{g}{v} f(n) f(P)$	3.30E-03	3.30E-01	No Test		No Applicability Test
Breyer	$K = \frac{g}{v} C_b d_{10}^2$	1.68E-03	1.68E-01	c_u < 3?	YES	**POTENTIALLY APPLICABLE**
				c_u > 0.1?	YES	
				d_{10} < 0.6 mm?	YES	
				d_{10} > 0.06 mm?	YES	

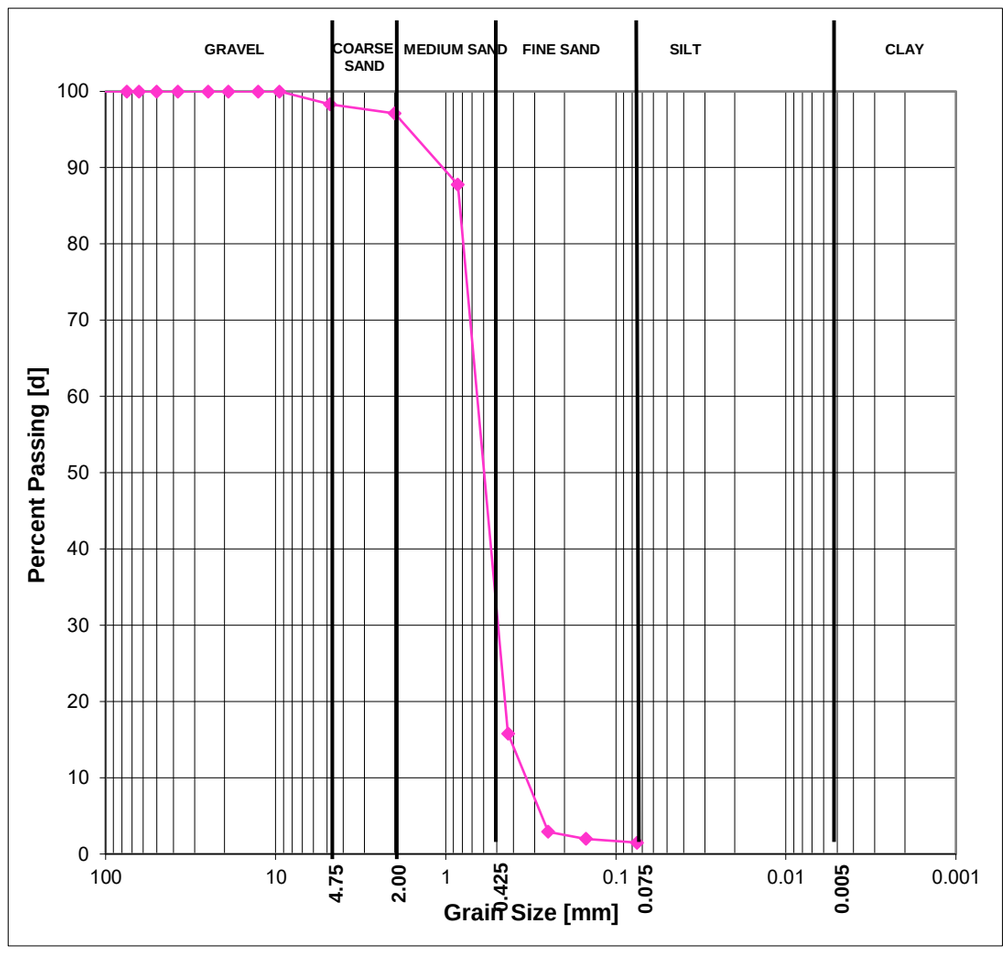
Project Name: NIPSCO LLC
Project Number: 19121567

Analysis by: JRS
Checked by: SKB
Analysis date: 3/29/2020

APPENDIX A-17
HYDRAULIC CONDUCTIVITY CALCULATED FROM GRAIN SIZE ANALYSIS
SAMPLE NO. AT-01 24 - 25'

GRAIN SIZE ANALYSIS

Sieve Size	Percentage Passed Through Sieve	Fraction Percent P	Geometric Mean d_m	P/d_m
12"	100.00	0.00	304.8	0.000
3"	100.00	0.00	75.000	0.000
2.5"	100.00	0.00	63.500	0.000
2.0"	100.00	0.00	50.000	0.000
1.5"	100.00	0.00	37.500	0.000
1.0"	100.00	0.00	25.000	0.000
0.75"	100.00	0.00	19.000	0.000
0.50"	100.00	0.00	12.700	0.000
0.375"	100.00	1.70	9.500	0.179
4	98.30	1.20	4.800	0.250
10	97.10	9.30	2.000	4.650
20	87.80	72.00	0.850	84.706
40	15.80	12.90	0.430	30.000
60	2.90	0.90	0.250	3.600
100	2.00	0.50	0.150	3.333
200	1.50	1.50	0.075	20.000
Sum:		**100.00**		**146.718**
Coarse Sand Sum:		**1.20**		



INPUT PARAMETERS

Inputs	Description	Value	Units		Inputs	Description	Value	Units
d_{10}	10% pass	0.350	[mm]	[select from graph]	C_h	Hazen constant	6.0E-04	[dim]
d_{60}	60% pass	0.690	[mm]	[select from graph]	C_k	Kozeny constant	8.3E-03	[dim]
n	porosity	0.35	[dim]					
Θ	sand shape factor	6.0	[dim]	[select from 4 choices]	C_b	$C_b = 6.0 \times 10^{-4} \log \frac{500}{cu}$	1.44E-03	[dim]
	rounded	*6.0*			f(n) Kozeny/Fair-Hatch	$f(n) = \frac{n^3}{(1-n)^2}$	1.01E-01	[dim]
	subrounded	*6.6*						
	subangular	*7.1*						
	angular	*7.7*						
c_u	uniformity coefficient [d_{60}/d_{10}]	1.97	[dim]		f(P) Fair-Hatch	$f(P) = \frac{1}{m\left(\frac{\Theta}{100}\sum\frac{P}{d_m}\right)^{\frac{1}{2}}}$	2.58E-09	[dim]
g	gravitational acceleration	9.807	[m/s^2]					
v	kinematic viscosity [25°C]	1.14E-06	[m^2/s]					
m	packing factor	5	[dim]		f(n) Hazen	**f(n) = [1+10(n-0.26)]**	1.9	[dim]

ANALYSIS AND RESULTS

Method	Equation	Hydraulic Conductivity m/s	Hydraulic Conductivity cm/s	Applicability Conditions		Applicable/Comments
Hazen	$K = \frac{g}{v} C_h f(n) d_{10}^2$	**1.20E-03**	1.20E-01	c_u < 5?	YES	**POTENTIALLY APPLICABLE**
				d_{10} > 0.1?	YES	
				d_{10} < 3.0?	YES	
Kozeny	$K = \frac{g}{v} C_k f(n) d_{10}^2$	**8.88E-04**	8.88E-02	85%>coarse sand?	NO	**NOT APPLICABLE**
Fair-Hatch	$K = \frac{g}{v} f(n) f(P)$	**2.25E-03**	2.25E-01	No Test		No Applicability Test
Breyer	$K = \frac{g}{v} C_b d_{10}^2$	**1.52E-03**	1.52E-01	c_u < 3?	YES	**POTENTIALLY APPLICABLE**
				c_u > 0.1?	YES	
				d_{10} < 0.6 mm?	YES	
				d_{10} > 0.06 mm?	YES	

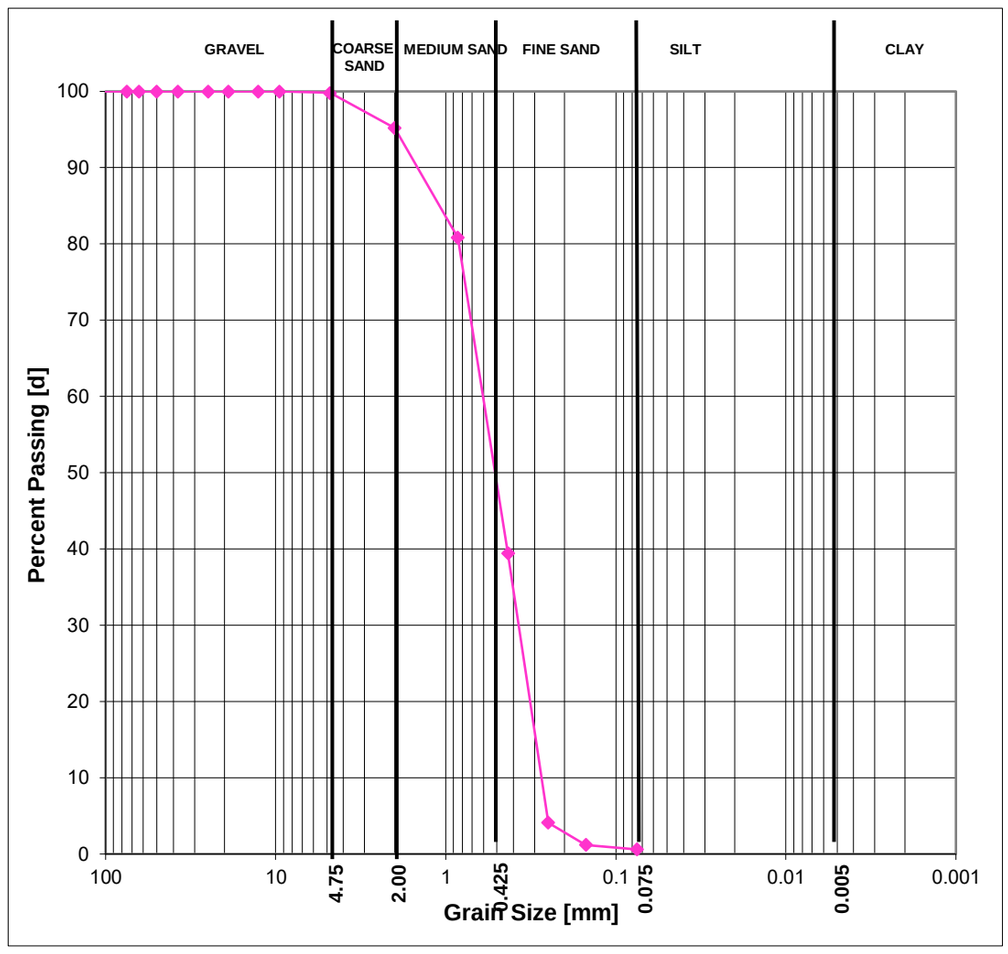
Project Name: NIPSCO
Project Number: 19121567

Analysis by: JRS
Checked by: SKB
Analysis date: 3/29/2020

APPENDIX A-18
HYDRAULIC CONDUCTIVITY CALCULATED FROM GRAIN SIZE ANALYSIS
SAMPLE NO. AT-01 29 - 30'

GRAIN SIZE ANALYSIS

Sieve Size	Percentage Passed Through Sieve	Fraction Percent P	Geometric Mean d_m	P/d_m
12"	100.00	0.00	304.8	0.000
3"	100.00	0.00	75.000	0.000
2.5"	100.00	0.00	63.500	0.000
2.0"	100.00	0.00	50.000	0.000
1.5"	100.00	0.00	37.500	0.000
1.0"	100.00	0.00	25.000	0.000
0.75"	100.00	0.00	19.000	0.000
0.50"	100.00	0.00	12.700	0.000
0.375"	100.00	0.20	9.500	0.021
4	99.80	4.60	4.800	0.958
10	95.20	14.40	2.000	7.200
20	80.80	41.40	0.850	48.706
40	39.40	35.30	0.430	82.093
60	4.10	2.90	0.250	11.600
100	1.20	0.60	0.150	4.000
200	0.60	0.60	0.075	8.000
	Sum:	**100.00**		**162.578**
	Coarse Sand Sum:	**4.60**		



INPUT PARAMETERS

Inputs	Description	Value	Units		Inputs	Description	Value	Units
d_{10}	10% pass	0.280	[mm]	[select from graph]	C_h	Hazen constant	6.0E-04	[dim]
d_{60}	60% pass	0.640	[mm]	[select from graph]	C_k	Kozeny constant	8.3E-03	[dim]
n	porosity	0.35	[dim]					
Θ	sand shape factor	6.0	[dim]	[select from 4 choices]	C_b	$C_b = 6.0 \times 10^{-4} \log \frac{500}{cu}$	1.40E-03	[dim]
	rounded	*6.0*			f(n) Kozeny/Fair-Hatch	$f(n) = \frac{n^3}{(1-n)^2}$	1.01E-01	[dim]
	subrounded	*6.6*						
	subangular	*7.1*						
	angular	*7.7*						
c_u	uniformity coefficient [d_{60}/d_{10}]	2.29	[dim]		f(P) Fair-Hatch	$f(P) = \frac{1}{m\left(\frac{\Theta}{100}\sum\frac{P}{d_m}\right)^{\frac{1}{3}}}$	2.10E-09	[dim]
g	gravitational acceleration	9.807	[m/s^2]					
v	kinematic viscosity [25°C]	1.14E-06	[m^2/s]					
m	packing factor	5	[dim]		f(n) Hazen	**f(n) = [1+10(n-0.26)]**	1.9	[dim]

ANALYSIS AND RESULTS

Method	Equation	Hydraulic Conductivity m/s	Hydraulic Conductivity cm/s	Applicability Conditions		Applicable/Comments
Hazen	$K = \frac{g}{v} C_h f(n) d_{10}^2$	7.69E-04	7.69E-02	c_u < 5?	YES	**POTENTIALLY APPLICABLE**
				d_{10} > 0.1?	YES	
				d_{10} < 3.0?	YES	
Kozeny	$K = \frac{g}{v} C_k f(n) d_{10}^2$	5.68E-04	5.68E-02	85%>coarse sand?	NO	**NOT APPLICABLE**
Fair-Hatch	$K = \frac{g}{v} f(n) f(P)$	1.83E-03	1.83E-01	No Test		No Applicability Test
Breyer	$K = \frac{g}{v} C_b d_{10}^2$	9.47E-04	9.47E-02	c_u < 3?	YES	**POTENTIALLY APPLICABLE**
				c_u > 0.1?	YES	
				d_{10} < 0.6 mm?	YES	
				d_{10} > 0.06 mm?	YES	

Project Name: NIPSCO
Project Number: 19121567

Analysis by: JRS
Checked by: SKB
Analysis date: 3/29/2020

APPENDIX B

Hydraulic Conductivity Data

Appendix B
HYDRAULIC CONDUCTIVITY TESTING RESULTS

Well	Date	Screened Interval	Type	Test Duration	Test Number	Hvorslev Method		Bouwer and Rice Method		van der Kamp Method		Hvorslev/Bouwer and Rice Arithmetic Mean	
						cm/sec	ft/day	cm/sec	ft/day	cm/sec	ft/day	cm/sec	ft/day
GAMW03	7/7/2016	5-15	Transducer (Rising)	<2 min	1	7.44E-03	2.11E+01	4.99E-03	1.42E+01	n/a	n/a	6.22E-03	1.77E+01
					2	7.45E-03	2.11E+01	5.22E-03	1.48E+01	n/a	n/a	6.34E-03	1.80E+01
GAMW13	7/7/2016	5-15	Transducer (Rising)	<2 min	1	5.75E-02	1.63E+02	3.91E-02	1.11E+02	n/a	n/a	4.83E-02	1.37E+02
					2	6.50E-02	1.84E+02	4.81E-02	1.36E+02	n/a	n/a	5.66E-02	1.60E+02
GAMW15	7/7/2016	5-15	Transducer (Rising)	<2 min	1	2.59E-02	7.34E+01	1.63E-02	4.63E+01	n/a	n/a	2.11E-02	5.99E+01
					2	1.11E-02	3.15E+01	1.08E-02	3.05E+01	n/a	n/a	1.10E-02	3.10E+01
GAMW19	7/7/2016	6-16	Transducer (Rising)	<2 min	1	3.70E-02	1.05E+02	2.25E-02	6.38E+01	n/a	n/a	2.98E-02	8.44E+01
					2	1.01E-01	2.87E+02	6.85E-02	1.94E+02	n/a	n/a	8.48E-02	2.41E+02
Average Shallow (515 ftbgs)						**3.90E-02**	**1.11E+02**	**2.69E-02**	**7.63E+01**	**n/a**	**n/a**	**3.30E-02**	**9.35E+01**
GAMW03B	7/8/2016	27-37	Transducer (Falling)	<2 min	1	6.78E-03	1.92E+01	5.81E-03	1.65E+01	n/a	n/a	6.30E-03	1.79E+01
					2	4.30E-03	1.22E+01	4.79E-03	1.36E+01	n/a	n/a	4.55E-03	1.29E+01
			Transducer (Rising)	<2 min	1	5.65E-03	1.60E+01	6.42E-03	1.82E+01	n/a	n/a	6.04E-03	1.71E+01
					2	1.47E-02	4.16E+01	1.25E-02	3.55E+01	1.49E-02	4.22E+01	1.36E-02	3.86E+01
GAMW13B	7/7/2016	25-35	Transducer (Falling)	<2 min	1	8.48E-03	2.40E+01	9.27E-03	2.63E+01	n/a	n/a	8.88E-03	2.52E+01
					2	8.09E-03	2.29E+01	9.27E-03	2.63E+01	n/a	n/a	8.68E-03	2.46E+01
			Transducer (Rising)	<2 min	1	1.11E-02	3.15E+01	1.16E-02	3.30E+01	2.73E-02	7.74E+01	1.14E-02	3.23E+01
					2	1.06E-02	3.00E+01	1.08E-02	3.06E+01	1.06E-02	3.01E+01	1.07E-02	3.03E+01
GAMW15B	7/7/2016	27.7-37.7	Transducer (Falling)	<2 min	1	4.50E-03	1.28E+01	3.45E-03	9.79E+00	n/a	n/a	3.98E-03	1.13E+01
					2	1.03E-02	2.91E+01	8.75E-03	2.48E+01	9.53E-03	2.70E+01	9.53E-03	2.70E+01
			Transducer (Rising)	<2 min	1	1.17E-02	3.32E+01	1.06E-02	3.02E+01	1.24E-02	3.50E+01	1.12E-02	3.17E+01
					2	1.06E-02	3.02E+01	9.79E-03	2.77E+01	1.69E-02	4.80E+01	1.02E-02	2.90E+01
GAMW19B	7/7/2016	23-33	Transducer (Falling)	<2 min	1	1.37E-02	3.88E+01	1.44E-02	4.09E+01	n/a	n/a	1.41E-02	3.99E+01
					2	6.82E-03	1.93E+01	6.31E-03	1.79E+01	n/a	n/a	6.57E-03	1.86E+01
			Transducer (Rising)	<2 min	1	1.84E-02	5.21E+01	1.83E-02	5.18E+01	1.29E-02	3.67E+01	1.84E-02	5.20E+01
					2	1.21E-02	3.43E+01	1.03E-02	2.91E+01	1.21E-02	3.43E+01	1.12E-02	3.17E+01
Average Deep (2535 ftbgs)						**9.86E-03**	**2.80E+01**	**9.52E-03**	**2.70E+01**	**1.46E-02**	**4.13E+01**	**9.69E-03**	**2.75E+01**

Notes:
ft/day = feet per day
cm/sec = centimeters per second
n/a = not analyzed

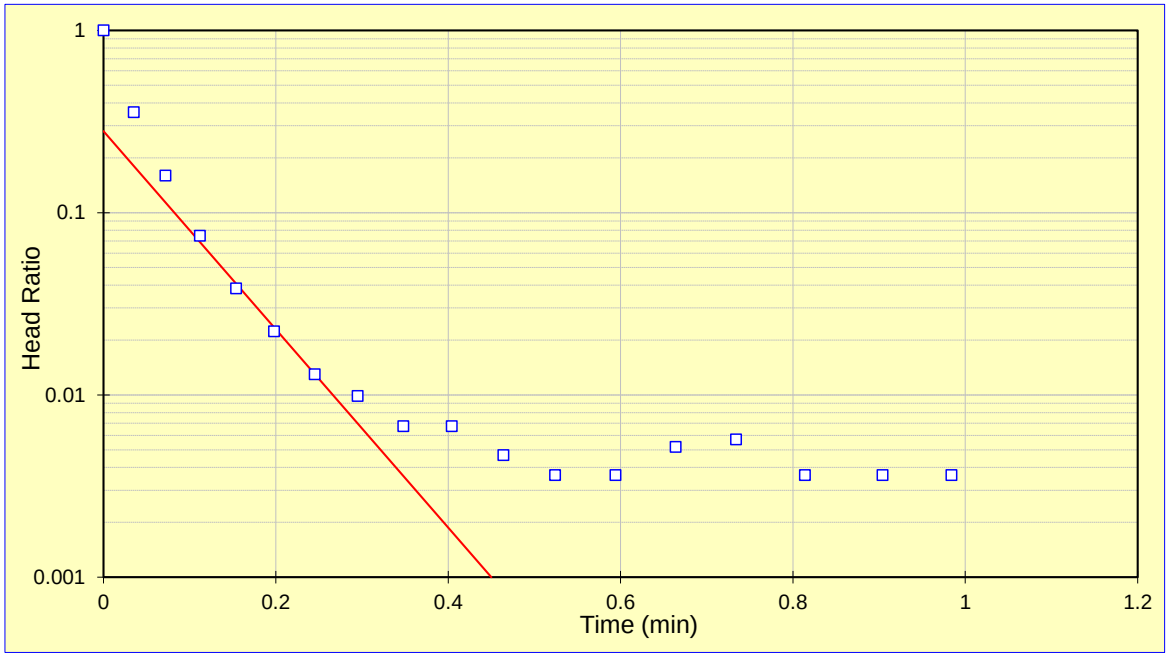
Prepared by: DFS
Checked by: KMC
Reviewed by: MAH

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03 (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left|\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right| 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	7.44E-03	cm/sec
t_1 =	0	K=	2.11E+01	ft/day
t_2 =	0.45			
h_1/h_0 =	0.28			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/25/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03 (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

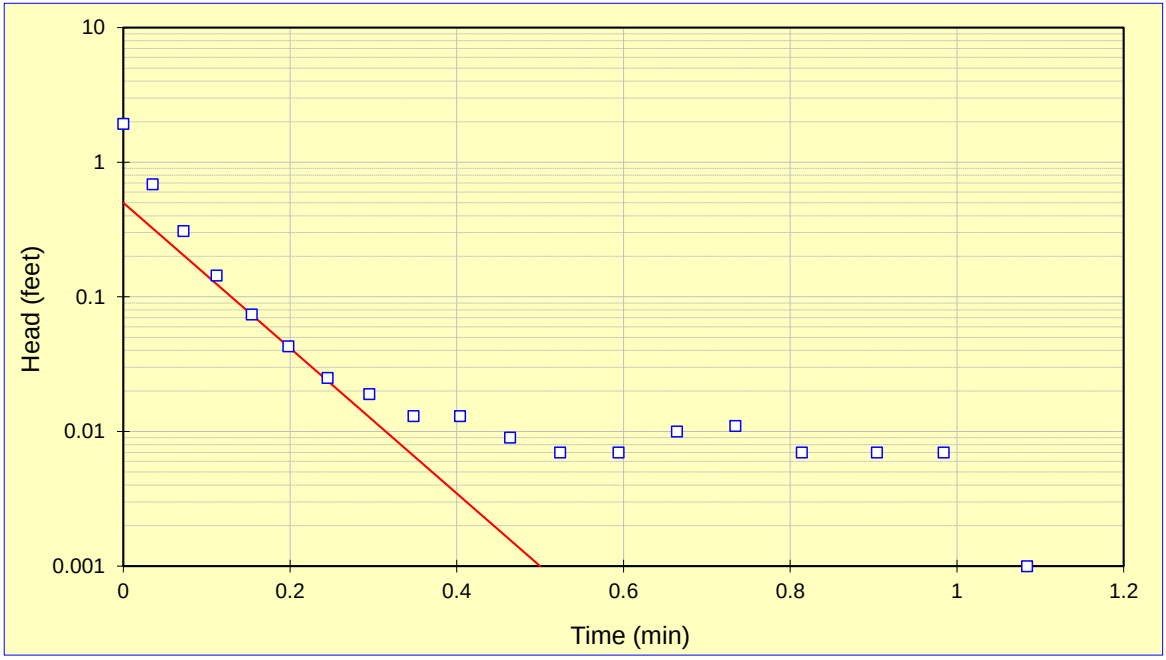
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.28
y_0 =	0.50
y_t =	0.001
t =	0.5

RESULTS

K=	4.99E-03	cm/sec
K=	1.42E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

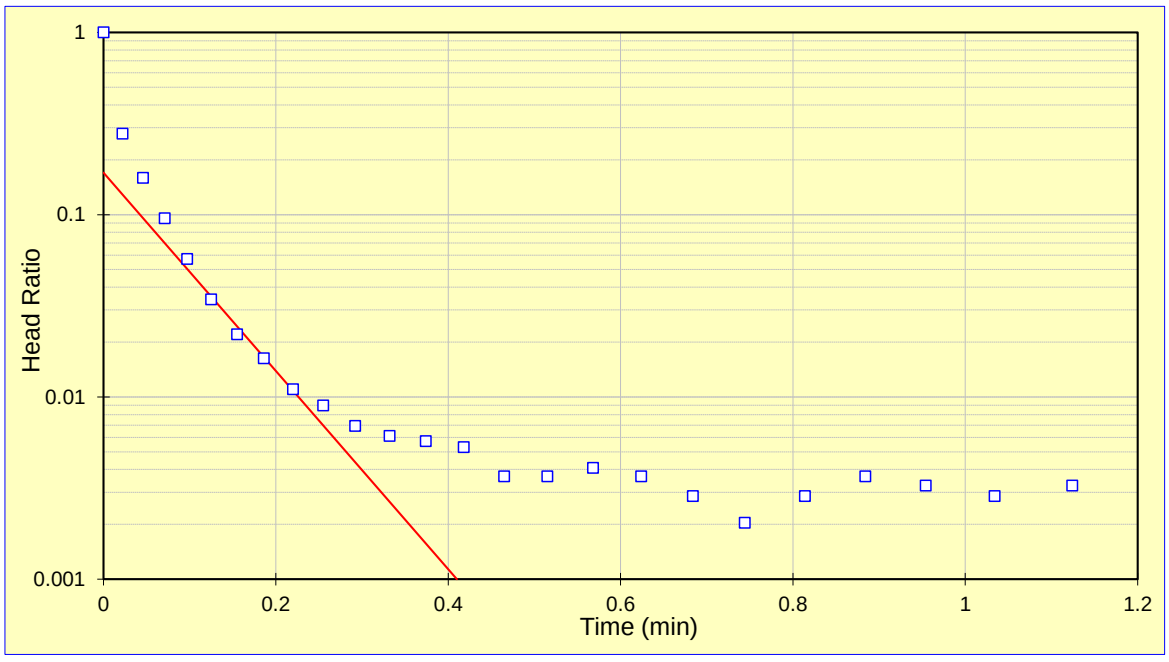
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03 (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	7.45E-03	cm/sec
t_1 =	0	K=	2.11E+01	ft/day
t_2 =	0.41			
h_1/h_0 =	0.17			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

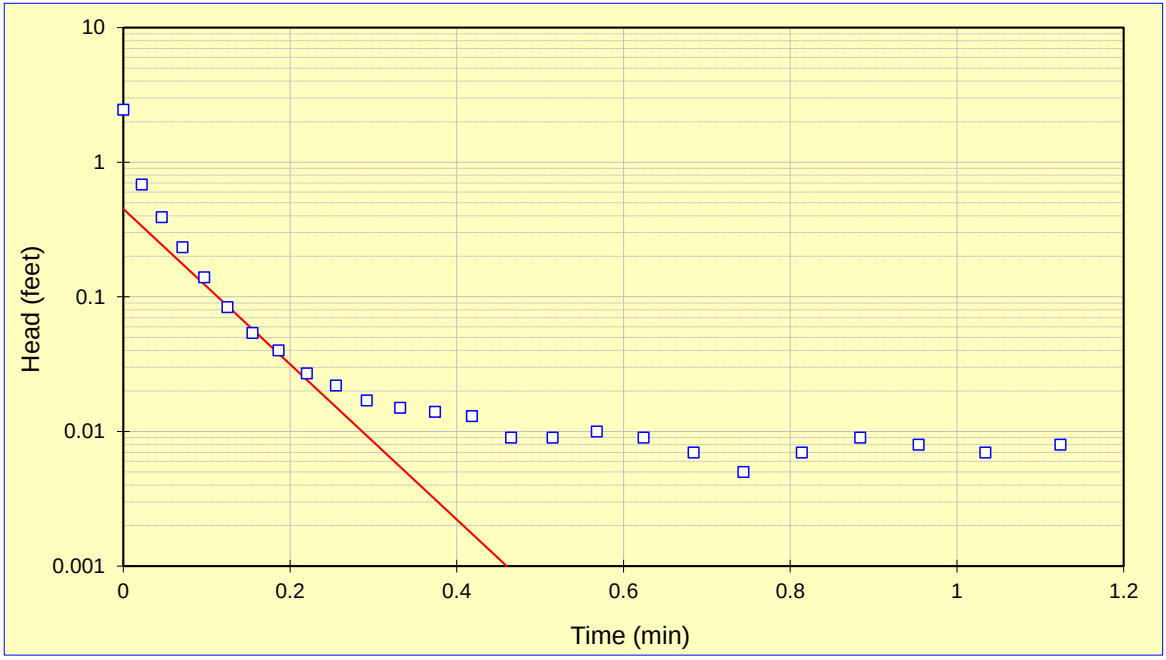
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.23
y_0 =	0.45
y_t =	0.001
t =	0.5

RESULTS

K=	5.22E-03	cm/sec
K=	1.48E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

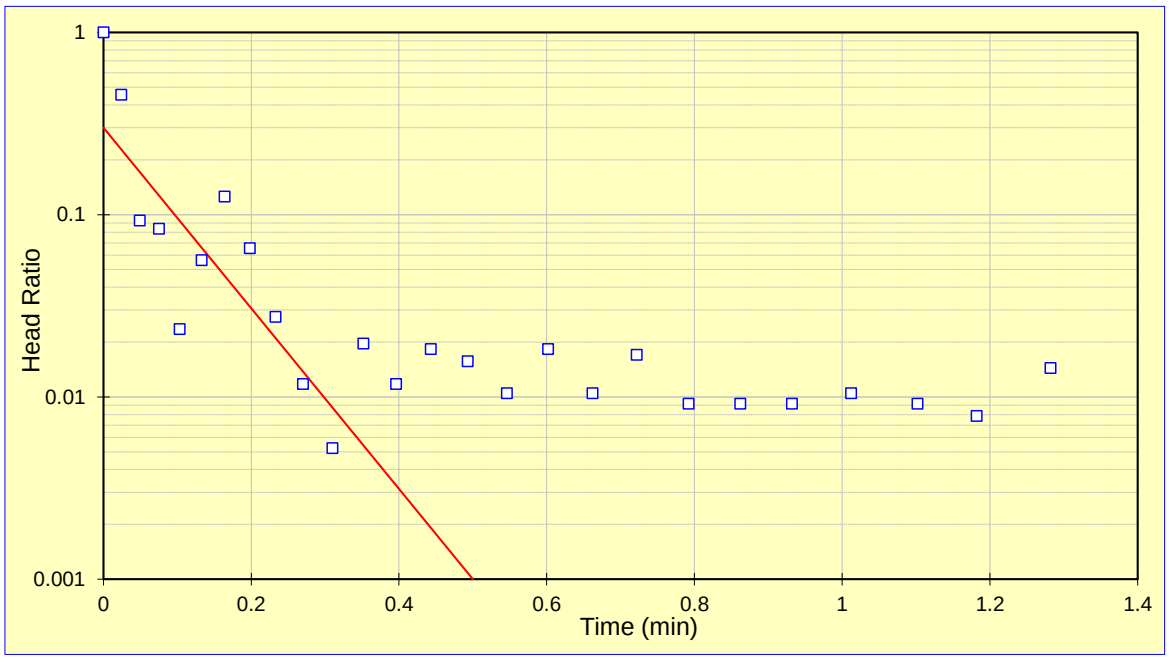
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-03B (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln \frac{L_e}{R_e} \left| \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right| 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	6.78E-03	cm/sec
t_1 =	0	K=	1.92E+01	ft/day
t_2 =	0.5			
h_1/h_0 =	0.30			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-03B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

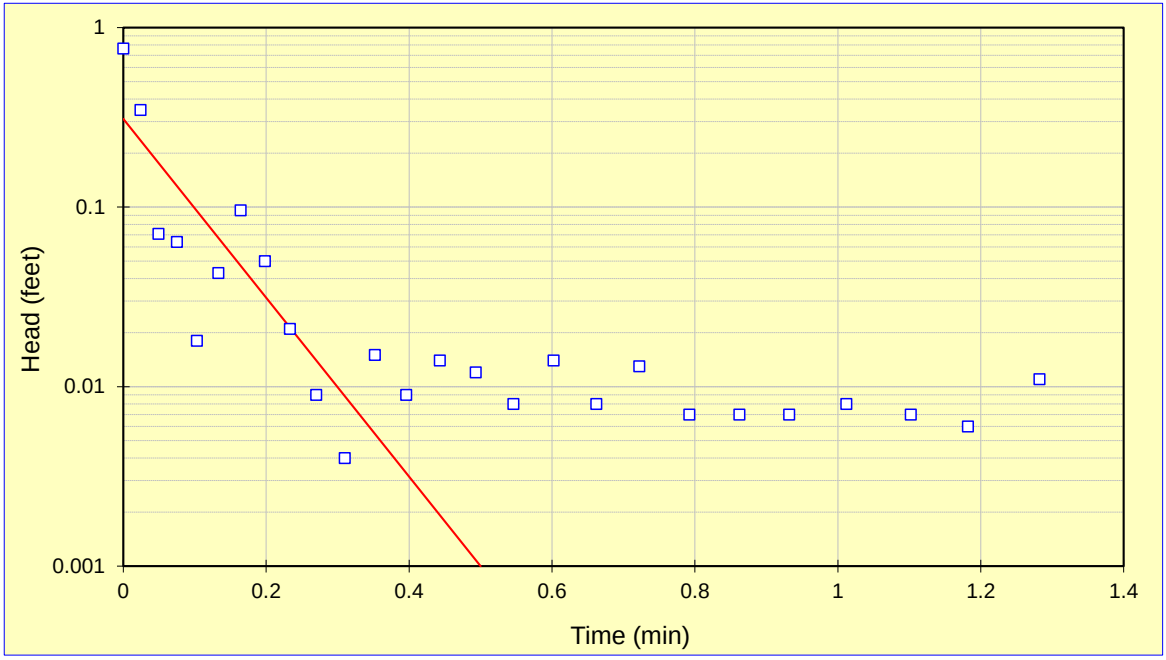
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.87
y_0 =	0.31
y_t =	0.001
t =	0.5

RESULTS

K=	5.81E-03	cm/sec
K=	1.65E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

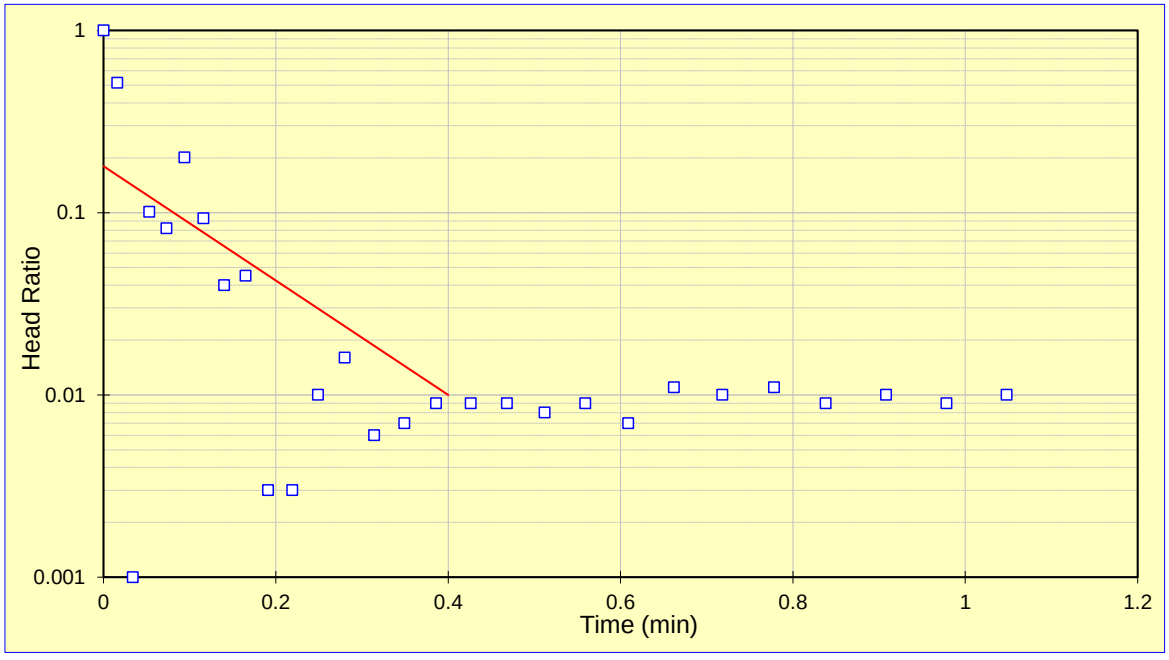
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-03B (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	4.30E-03	cm/sec
t_1 =	0	K=	1.22E+01	ft/day
t_2 =	0.4			
h_1/h_0 =	0.18			
h_2/h_0 =	0.01			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-03B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

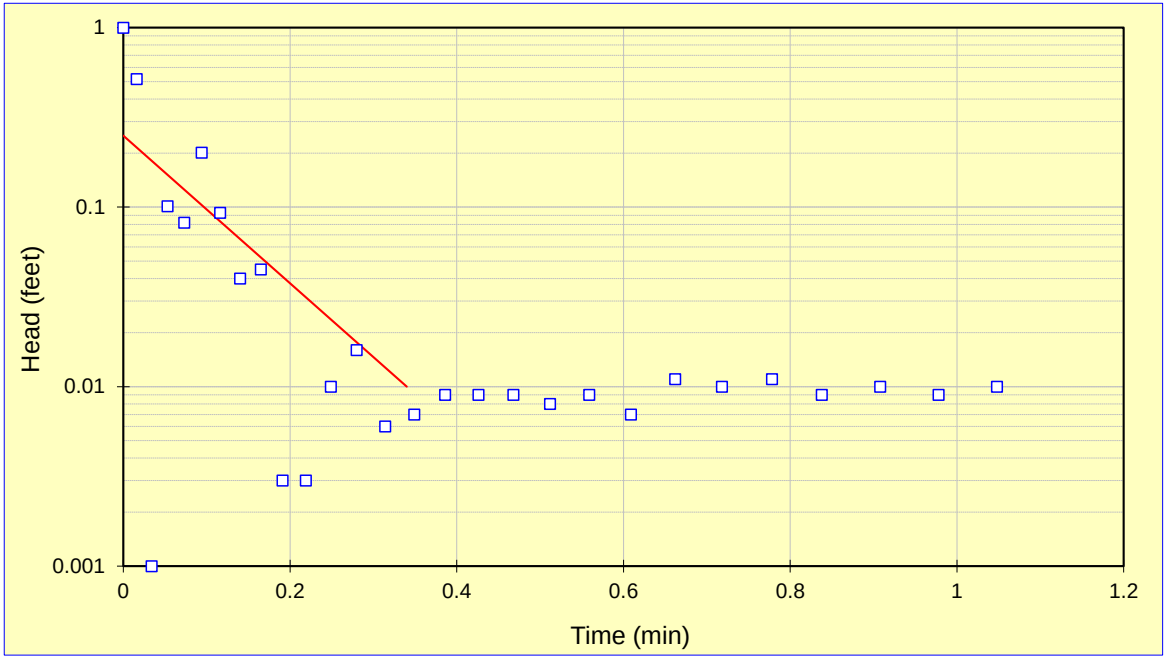
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.87
y_0 =	0.25
y_t =	0.010
t =	0.3

RESULTS

K=	4.79E-03	cm/sec
K=	1.36E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

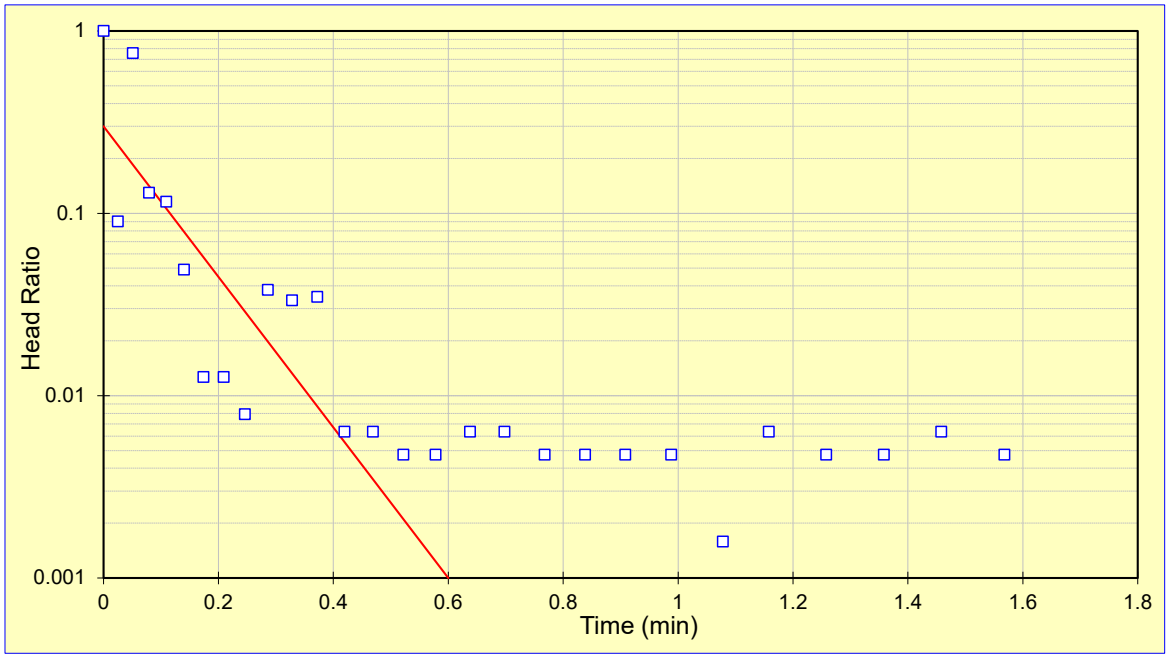
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03B (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	5.65E-03	cm/sec
t_1 =	0	K=	1.60E+01	ft/day
t_2 =	0.6			
h_1/h_0 =	0.30			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

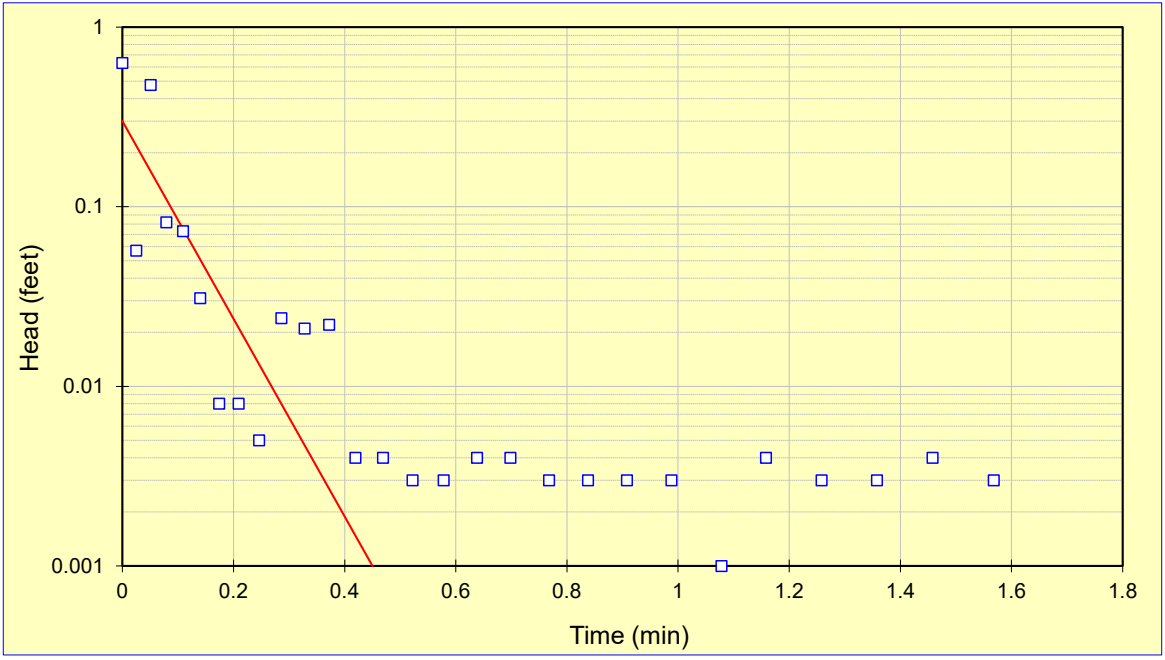
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.87
y_0 =	0.30
y_t =	0.001
t =	0.5

RESULTS

K=	6.42E-03	cm/sec
K=	1.82E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP RISING HEAD SLUG TEST ANALYSIS
UNDERDAMPED SLUG TEST GAMW-03B (TEST 2)

$$T = b + a\ln T$$

where:

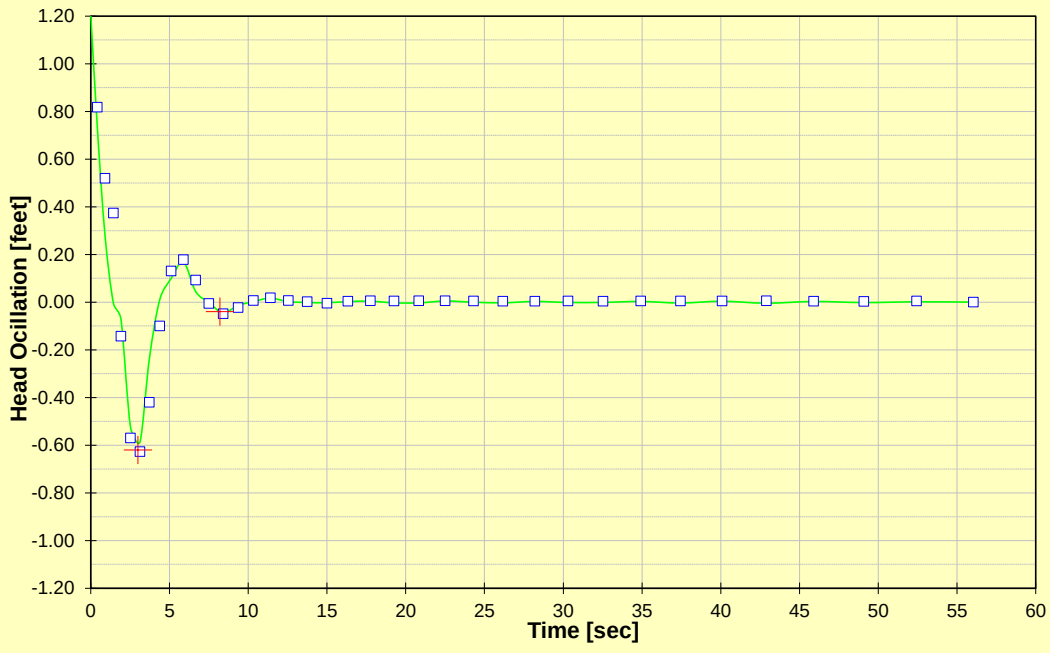
$$b = -a\ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g / L^{1/2}\right) / 8d$$
$$d = \gamma / \left(g / L\right)^{1/2}$$
$$L = g / \left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	1.31826	ft^2
r_s =	0.08	ft	d =	0.3998	ft^{-1}
L_c =	19.62	ft	a =	0.00286	ft^3
L_s =	10.00	ft	t_1 =	3.00	sec
ω =	1.2083	ft^{-1}	t_2 =	8.20	sec
γ =	0.5271	ft^{-1}	$h(t_1)$ =	0.62	ft
L =	18.52	ft^3/sec^2	$h(t_2)$ =	0.04	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	2.73E-02	ft^2/sec	α < 0.1?	YES
T =	1.53E-02	ft^2/sec	d < 0.7?	YES
T =	1.32E+03	ft^2/day	L_1 =	18.52
K =	4.22E+01	ft/day	L_2 =	24.62
K =	1.49E-02	cm/sec	L_1:L_2 Diff <20% ?	NO



Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/08/16

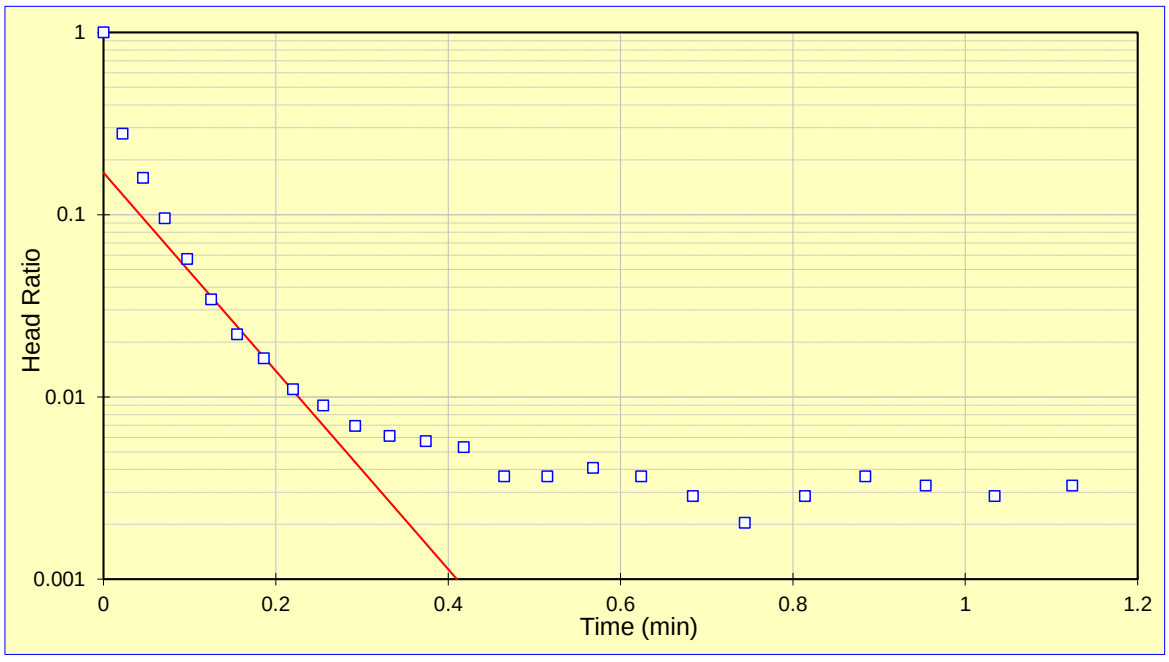
Analysis By: DFS
Checked By: JRS
Analysis Date: 8/8/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03 (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	7.45E-03	cm/sec
t_1 =	0	K=	2.11E+01	ft/day
t_2 =	0.41			
h_1/h_0 =	0.17			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-03 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

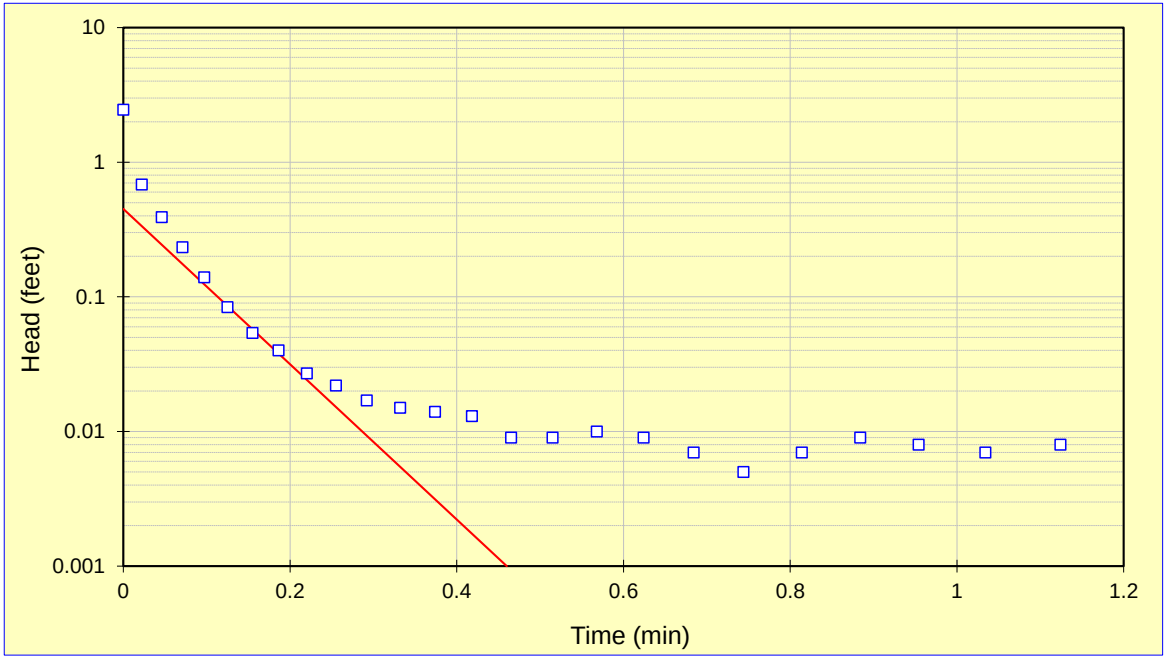
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.23
y_0 =	0.45
y_t =	0.001
t =	0.5

RESULTS

K=	5.22E-03	cm/sec
K=	1.48E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13B (TEST 1)

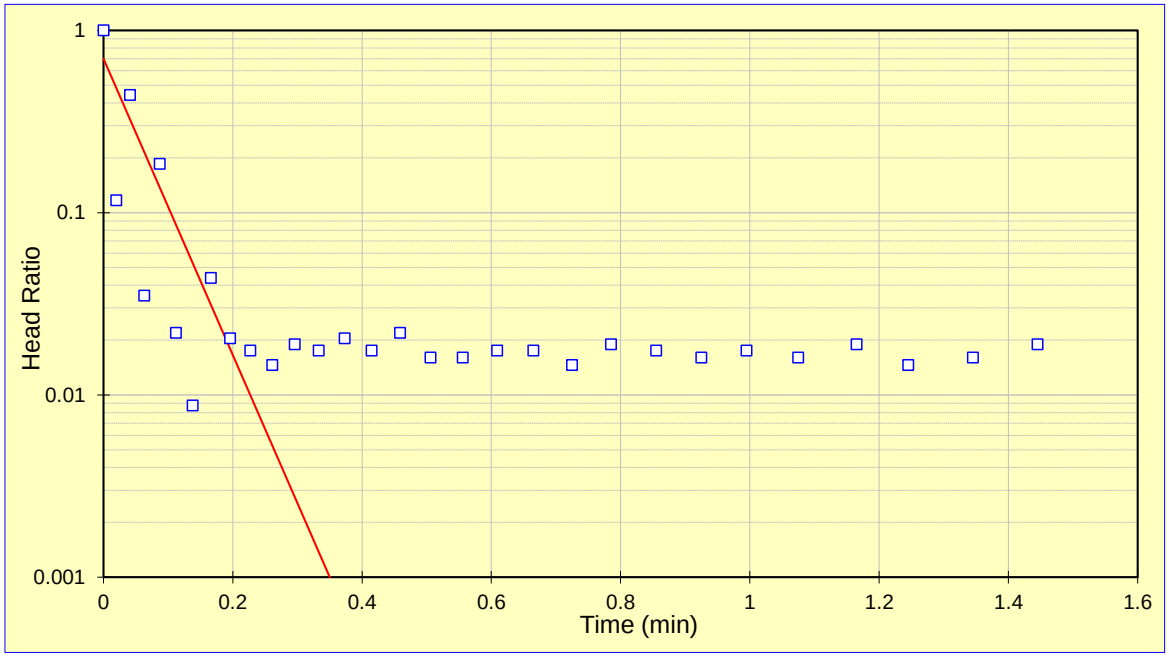
$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	10
t_1 =	0
t_2 =	0.35
h_1/h_0 =	0.70
h_2/h_0 =	0.00

RESULTS

K=	1.11E-02	cm/sec
K=	3.15E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

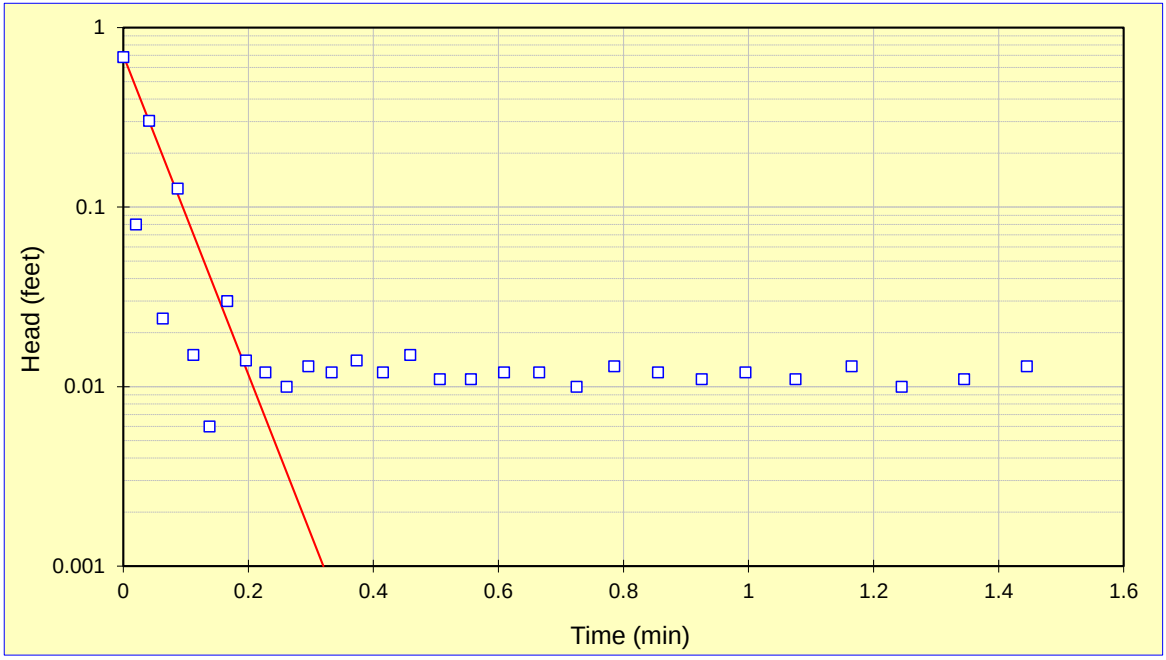
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.22
y_0 =	0.70
y_t =	0.001
t =	0.3

RESULTS

K=	1.16E-02	cm/sec
K=	3.30E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

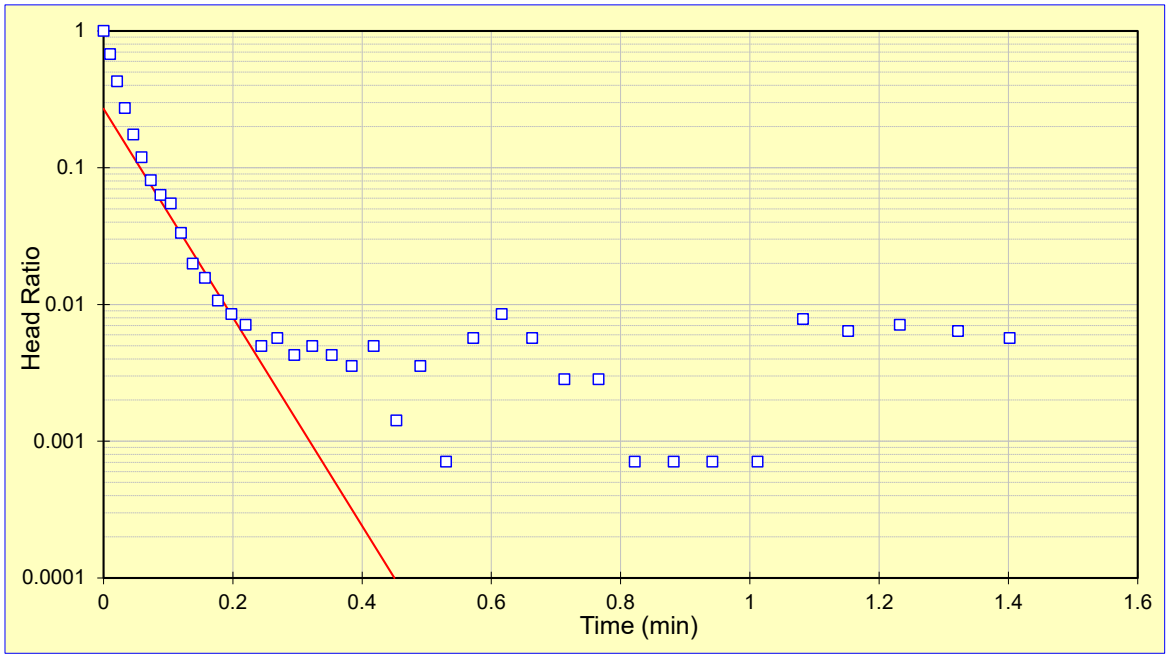
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13 (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.20			
R_e =	0.34			
L_e =	9.037	K=	6.50E-02	cm/sec
t_1 =	0	K=	1.84E+02	ft/day
t_2 =	0.45			
h_1/h_0 =	0.27			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

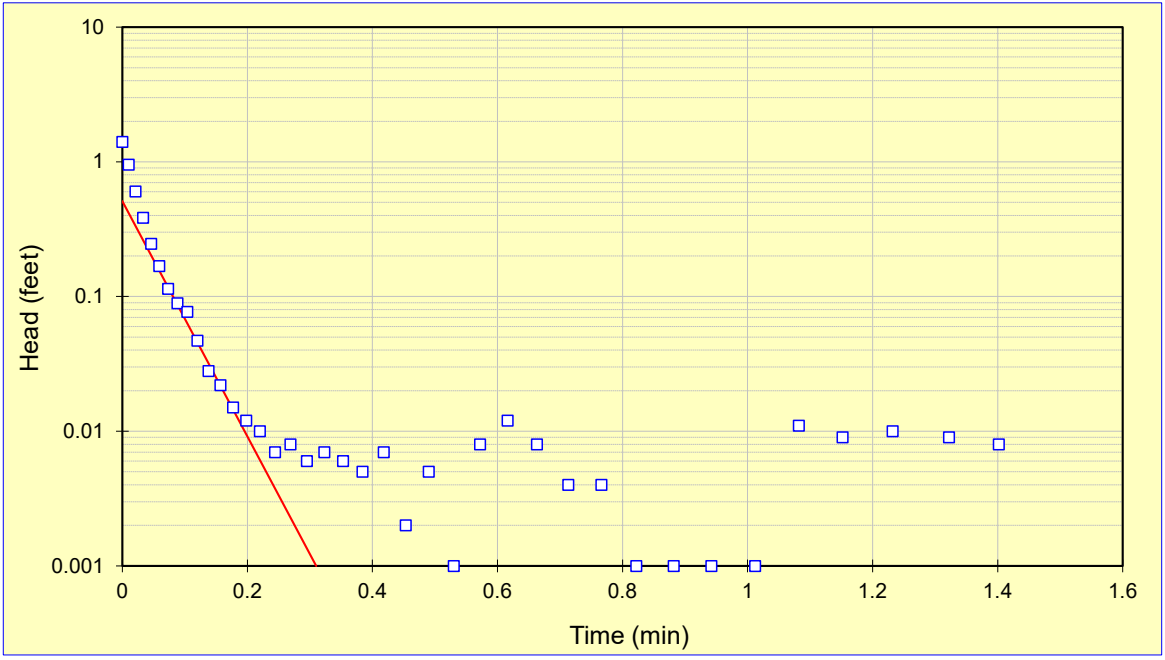
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.20
r_w =	0.34
L_e =	9.037
$\ln(R_e/r_w)$=	2.11
y_0 =	0.51
y_t =	0.001
t =	0.3

RESULTS

K=	4.81E-02	cm/sec
K=	1.36E+02	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

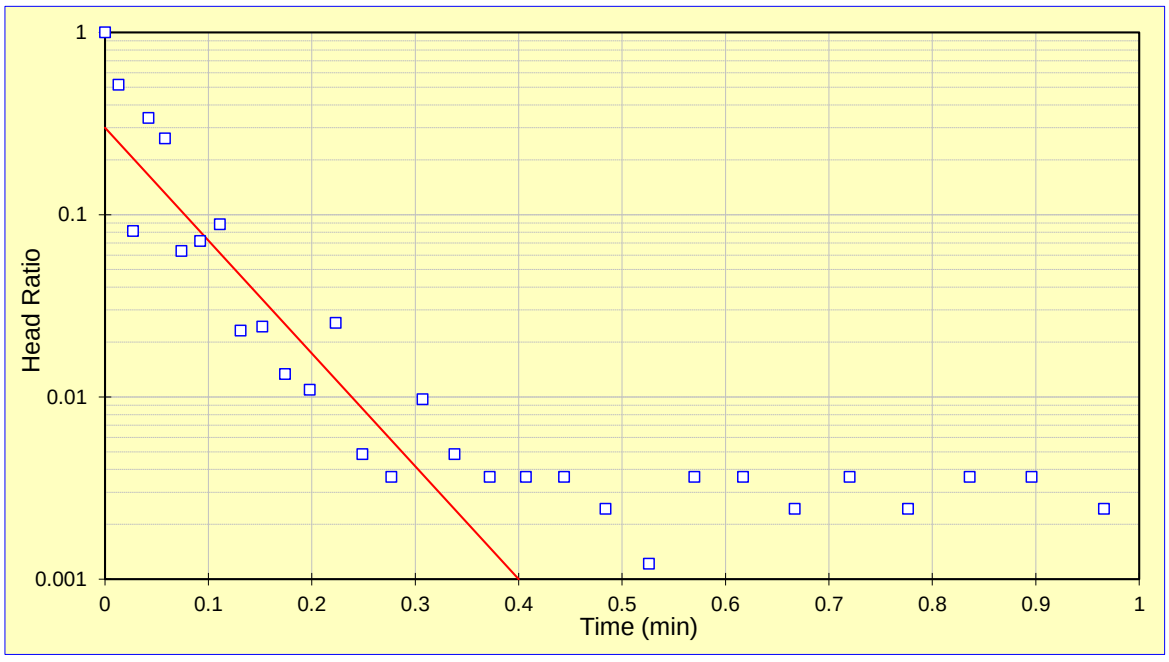
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-13B (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left|\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right| 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	8.48E-03	cm/sec
t_1 =	0	K=	2.40E+01	ft/day
t_2 =	0.4			
h_1/h_0 =	0.30			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-13B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

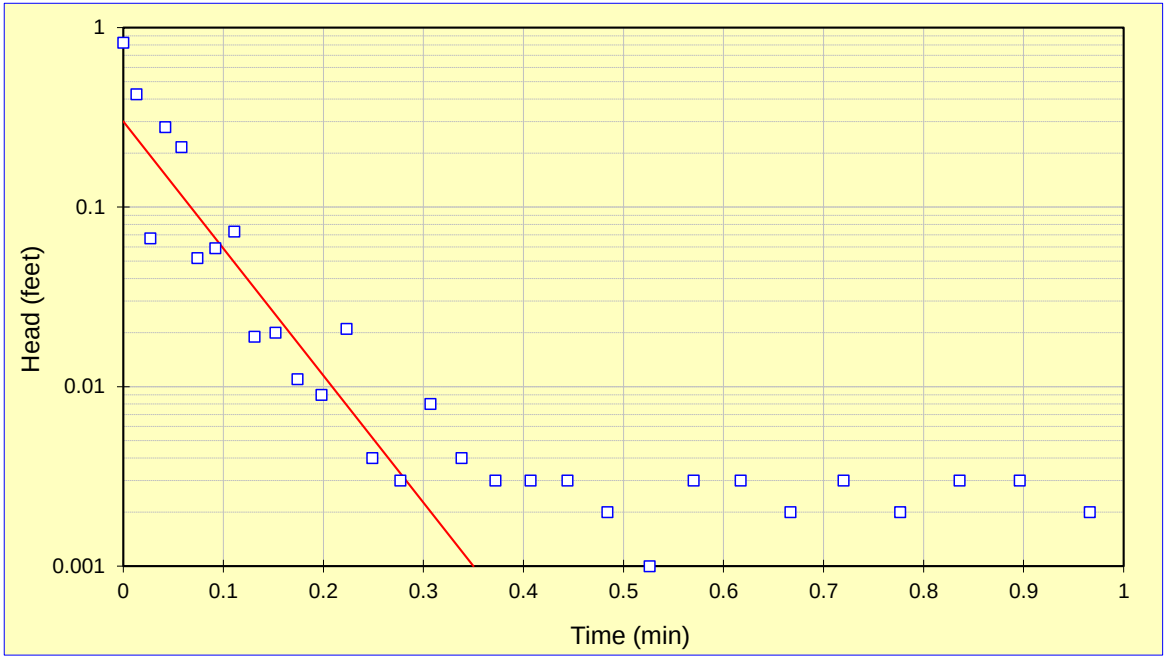
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.22
y_0 =	0.30
y_t =	0.001
t =	0.4

RESULTS

K=	9.27E-03	cm/sec
K=	2.63E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-13B (TEST 2)

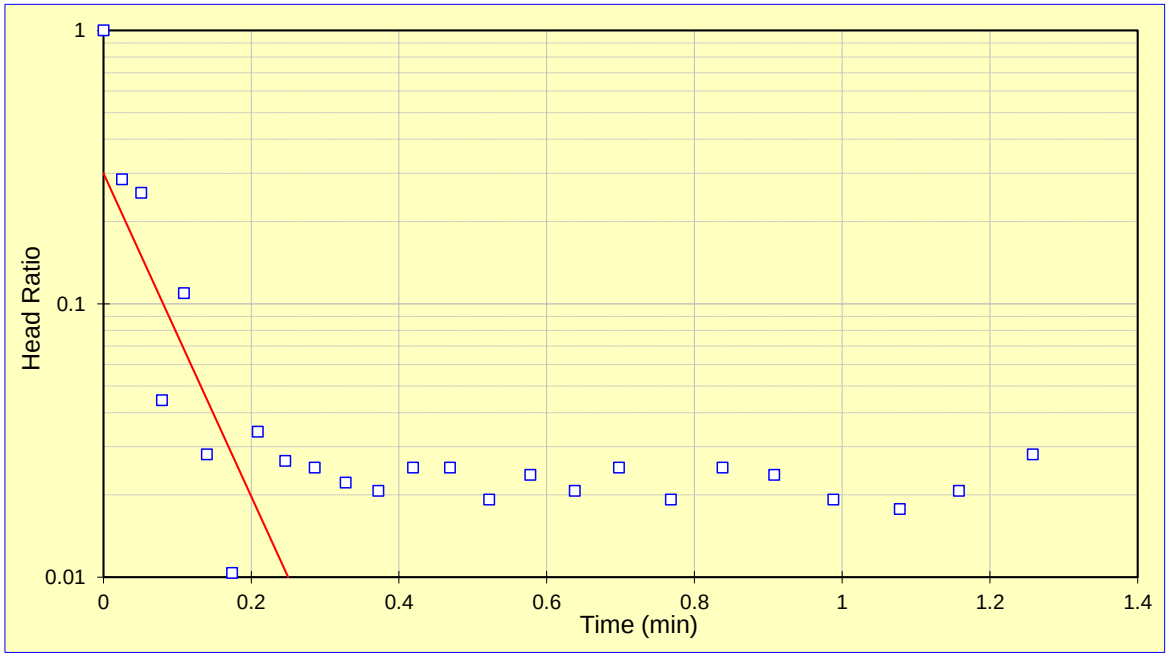
$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	10
t_1 =	0
t_2 =	0.25
h_1/h_0 =	0.30
h_2/h_0 =	0.01

RESULTS

K=	8.09E-03	cm/sec
K=	2.29E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-13B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

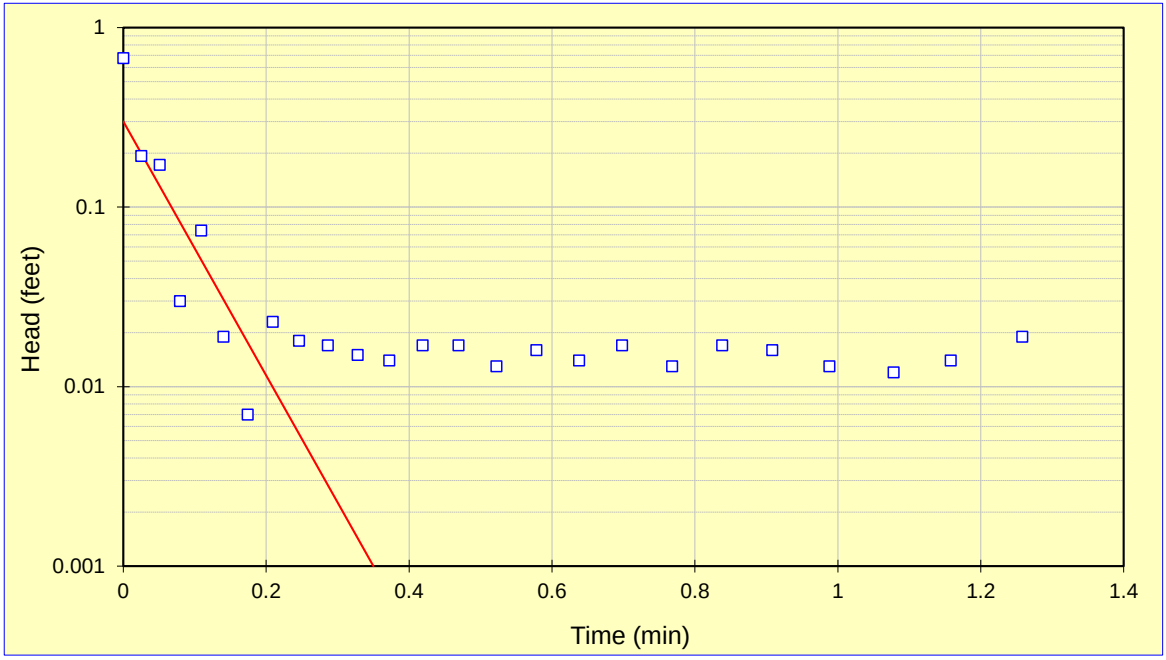
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.22
y_0 =	0.30
y_t =	0.001
t =	0.4

RESULTS

K=	9.27E-03	cm/sec
K=	2.63E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP RISING HEAD SLUG TEST ANALYSIS
UNDERDAMPED SLUG TEST GAMW-13B (TEST 1)

$$T = b + a \ln T$$

where:

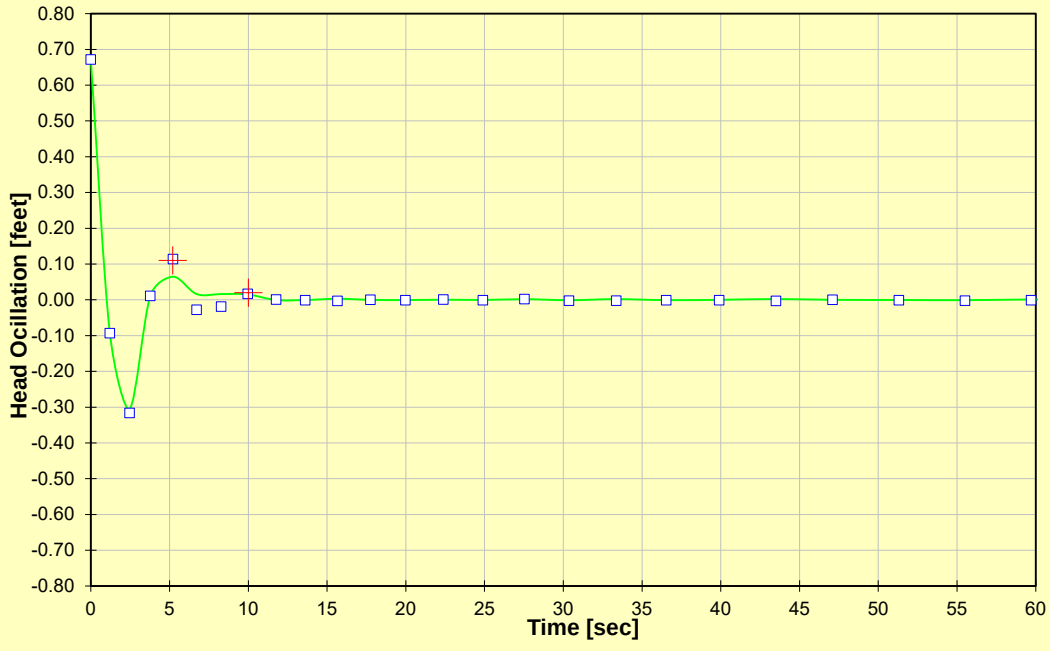
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	1.35632	ft^2
r_s =	0.08	ft	d =	0.2619	ft^{-1}
L_c =	19.45	ft	a =	0.00450	ft^3
L_s =	9.98	ft	t_1 =	5.20	sec
w =	1.3090	ft^{-1}	t_2 =	10.00	sec
g =	0.3552	ft^{-1}	$h(t_1)$ =	0.11	ft
L =	17.50	ft^3/sec^2	$h(t_2)$ =	0.02	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	4.27E-02	ft^2/sec	$a < 0.1$?	YES
T =	2.64E-02	ft^2/sec	$d < 0.7$?	YES
T =	2.28E+03	ft^2/day	L_1 =	17.50
K =	7.74E+01	ft/day	L_2 =	24.44
K =	2.73E-02	cm/sec	L_1:L_2 Diff <20% ?	NO



Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13B (TEST 1)

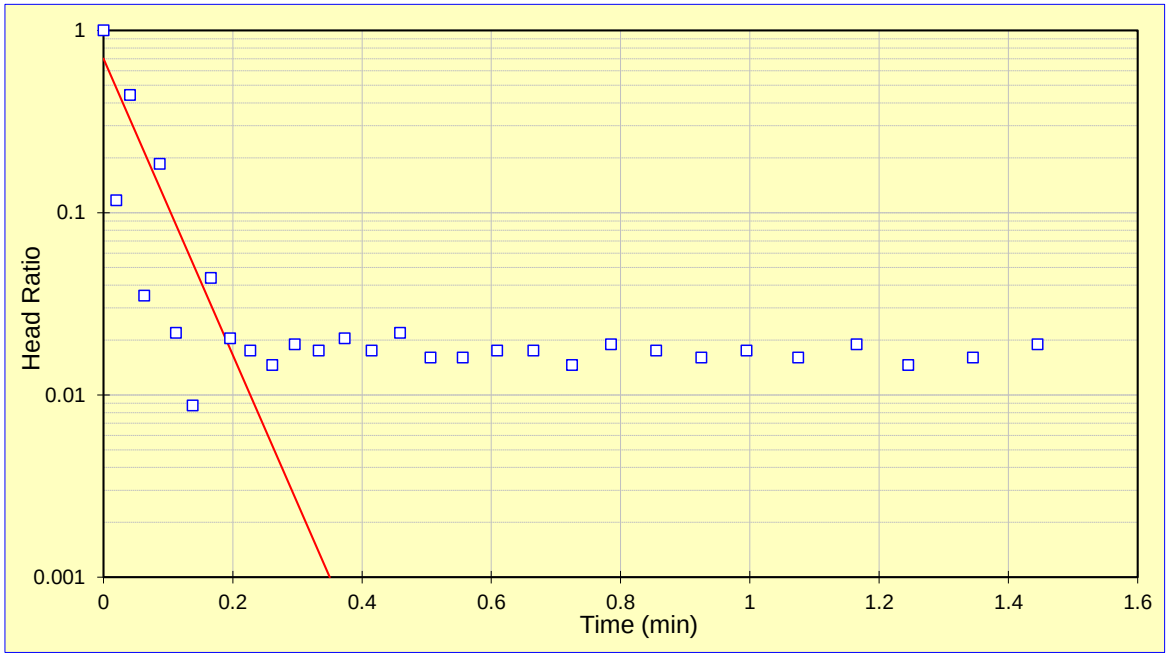
$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	10
t_1 =	0
t_2 =	0.35
h_1/h_0 =	0.70
h_2/h_0 =	0.00

RESULTS

K=	1.11E-02	cm/sec
K=	3.15E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

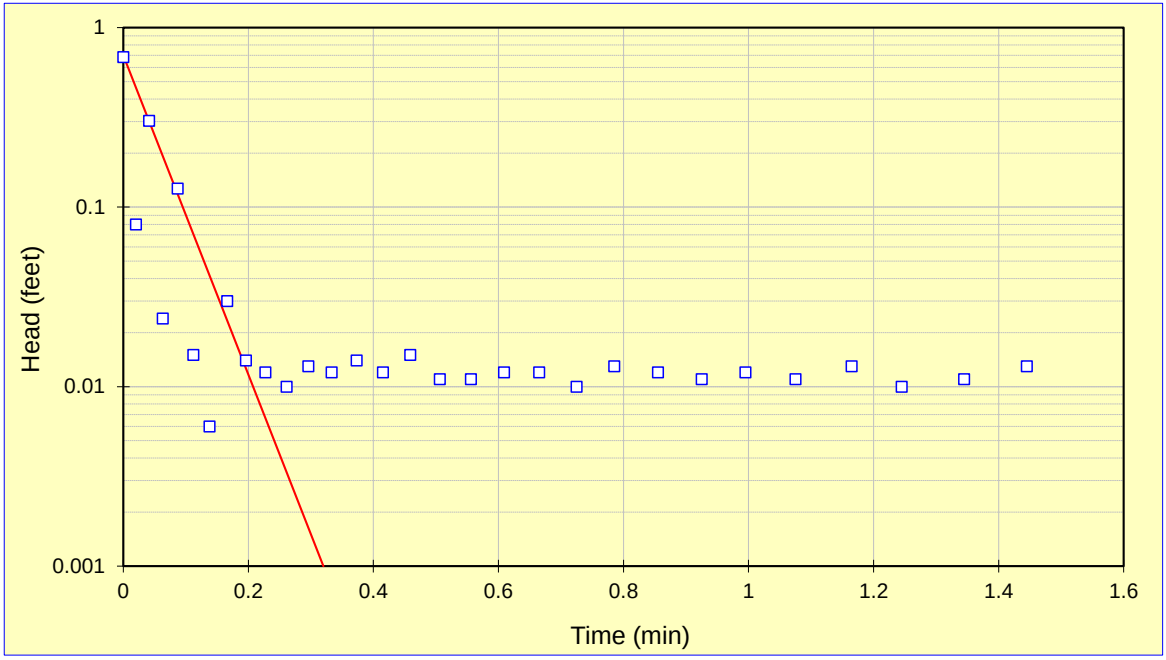
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.22
y_0 =	0.70
y_t =	0.001
t =	0.3

RESULTS

K=	1.16E-02	cm/sec
K=	3.30E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP RISING HEAD SLUG TEST ANALYSIS
UNDERDAMPED SLUG TEST GAMW-13B (TEST 2)

$$T = b + a \ln T$$

where:

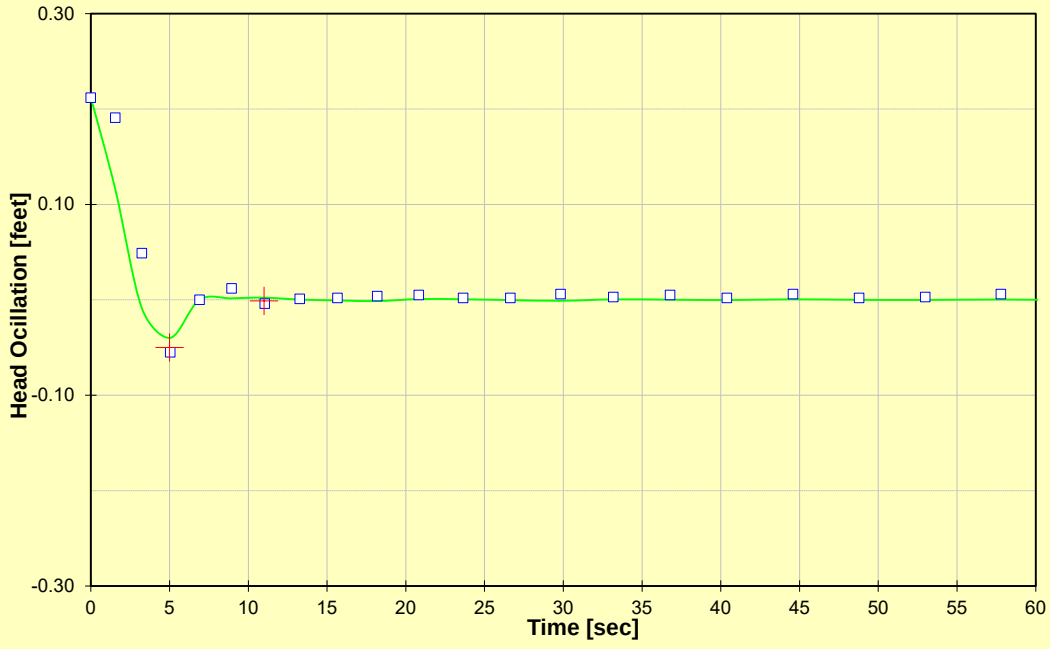
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	1.23358	ft^2
r_s =	0.08	ft	d =	0.5285	ft^{-1}
L_c =	19.14	ft	a =	0.00203	ft^3
L_s =	9.98	ft	t_1 =	5.00	sec
w =	1.0472	ft^{-1}	t_2 =	11.00	sec
g =	0.6520	ft^{-1}	$h(t_1)$ =	0.05	ft
L =	21.15	ft^3/sec^2	$h(t_2)$ =	0.00	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	1.95E-02	ft^2/sec	a < 0.1?	YES
T =	1.02E-02	ft^2/sec	d < 0.7?	YES
T =	8.77E+02	ft^2/day	L_1 =	21.15
K =	3.01E+01	ft/day	L_2 =	24.13
K =	1.06E-02	cm/sec	L_1:L_2 Diff <20% ?	YES



Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13B (TEST 2)

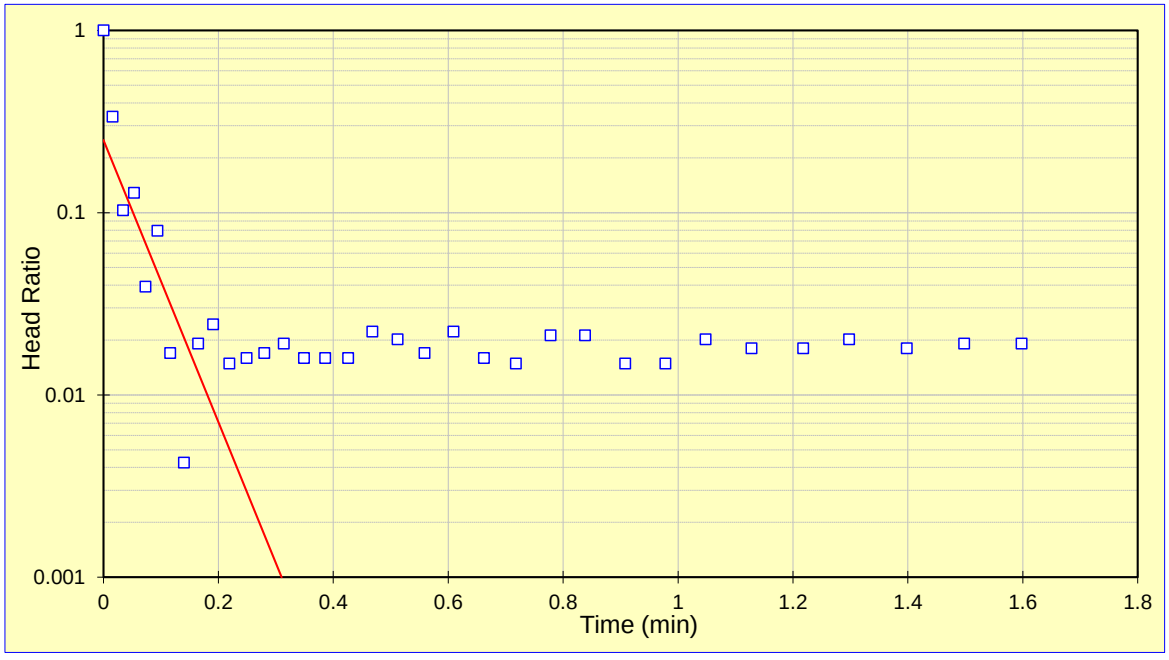
$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	10
t_1 =	0
t_2 =	0.31
h_1/h_0 =	0.25
h_2/h_0 =	0.00

RESULTS

K=	1.06E-02	cm/sec
K=	3.00E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-13B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

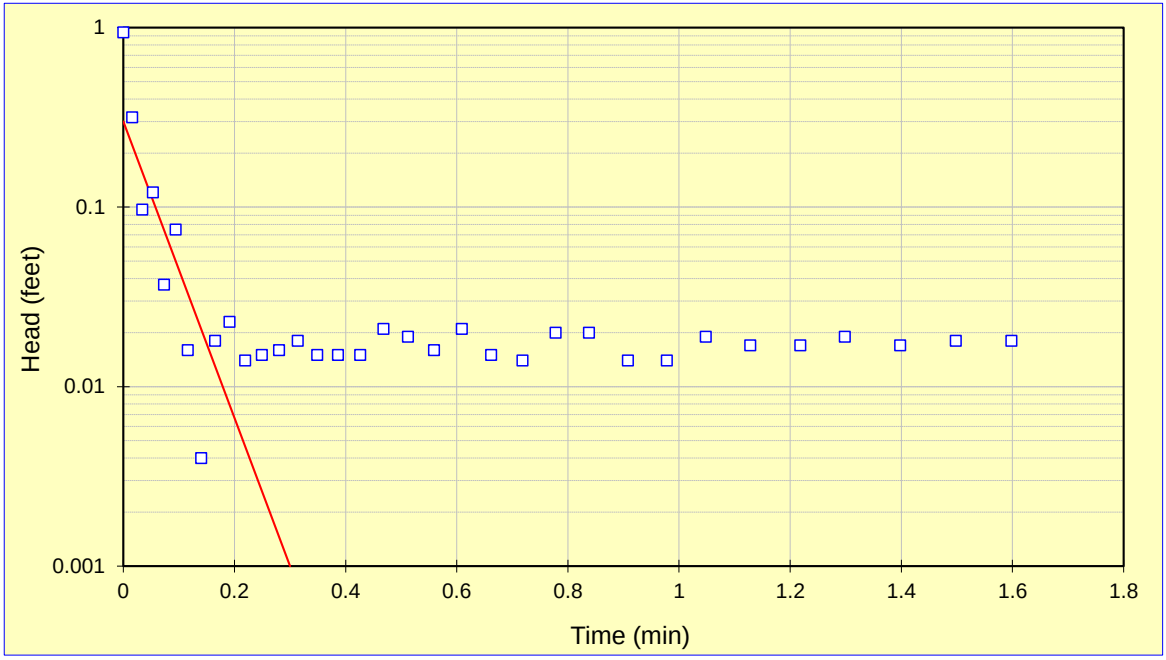
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.22
y_0 =	0.30
y_t =	0.001
t =	0.3

RESULTS

K=	1.08E-02	cm/sec
K=	3.06E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

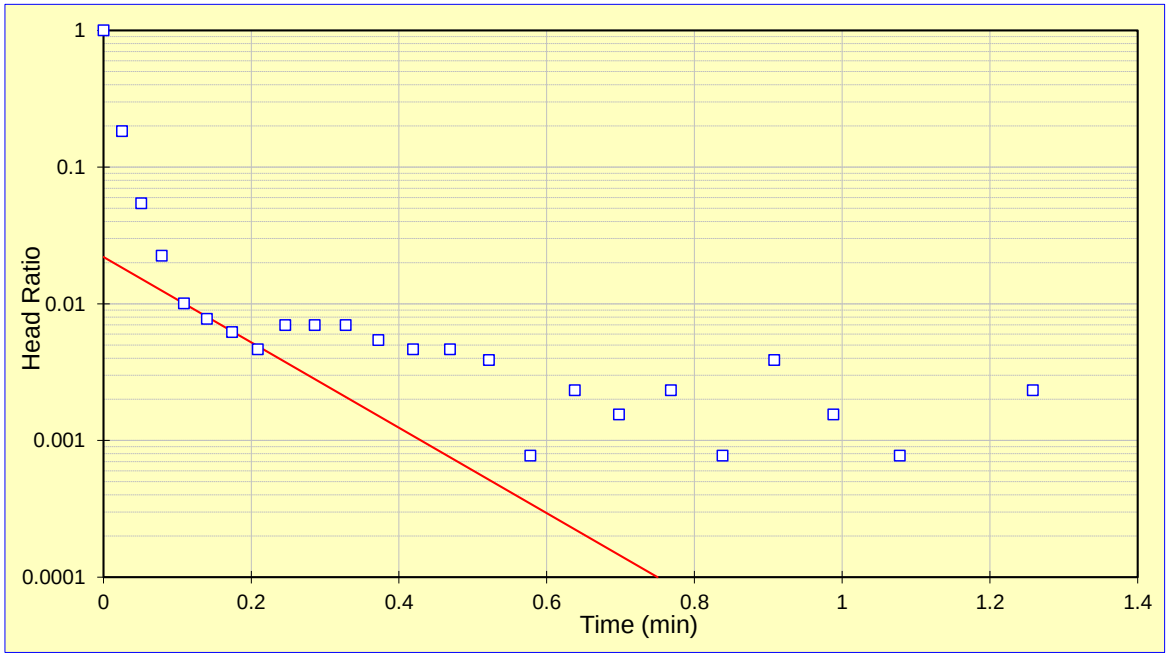
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15 (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.20			
R_e =	0.34			
L_e =	9.417	K=	2.59E-02	cm/sec
t_1 =	0	K=	7.34E+01	ft/day
t_2 =	0.75			
h_1/h_0 =	0.02			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15 (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

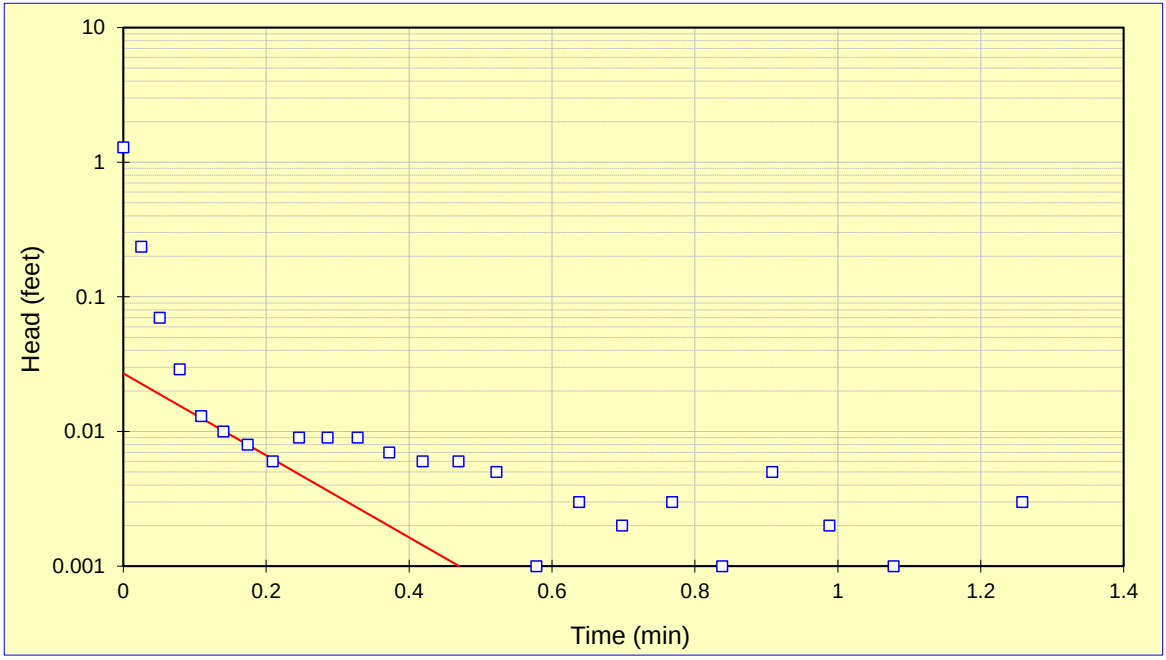
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.20
r_w =	0.34
L_e =	9.417
$\ln(R_e/r_w)$=	2.14
y_0 =	0.03
y_t =	0.001
t =	0.5

RESULTS

K=	1.63E-02	cm/sec
K=	4.63E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

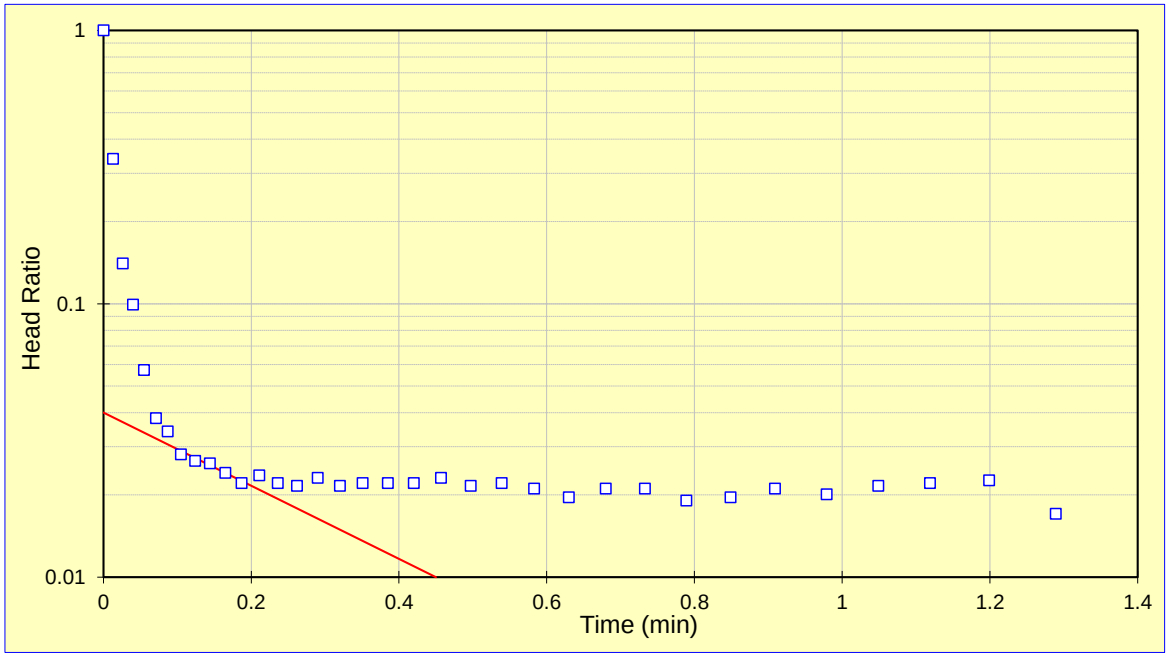
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15 (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.20			
R_e =	0.34			
L_e =	9.348	K=	1.11E-02	cm/sec
t_1 =	0	K=	3.16E+01	ft/day
t_2 =	0.45			
h_1/h_0 =	0.04			
h_2/h_0 =	0.01			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

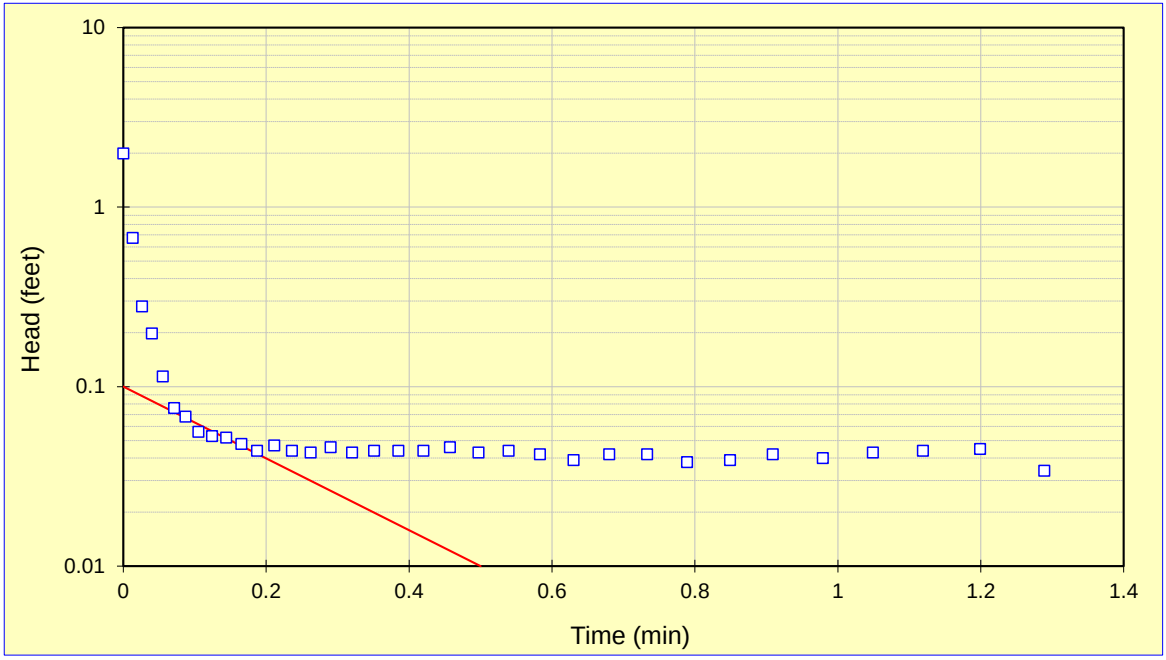
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.20
r_w =	0.34
L_e =	9.348
$\ln(R_e/r_w)$=	2.13
y_0 =	0.10
y_t =	0.010
t =	0.5

RESULTS

K=	1.08E-02	cm/sec
K=	3.05E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

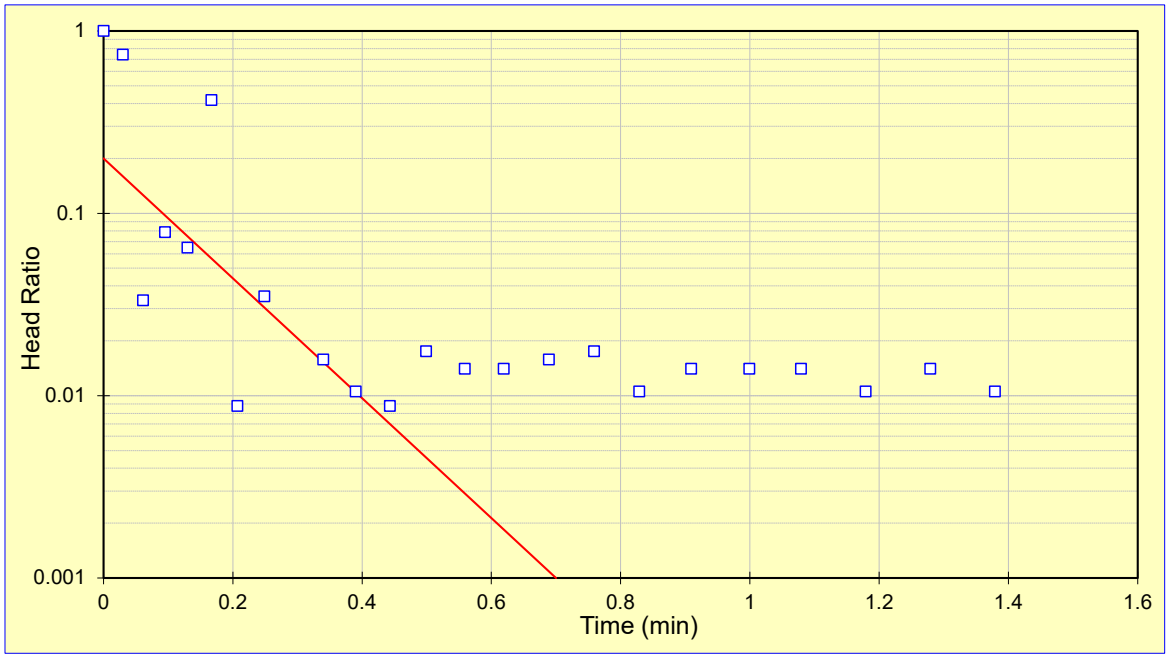
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-15B (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	4.50E-03	cm/sec
t_1 =	0	K=	1.28E+01	ft/day
t_2 =	0.7			
h_1/h_0 =	0.20			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-15B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

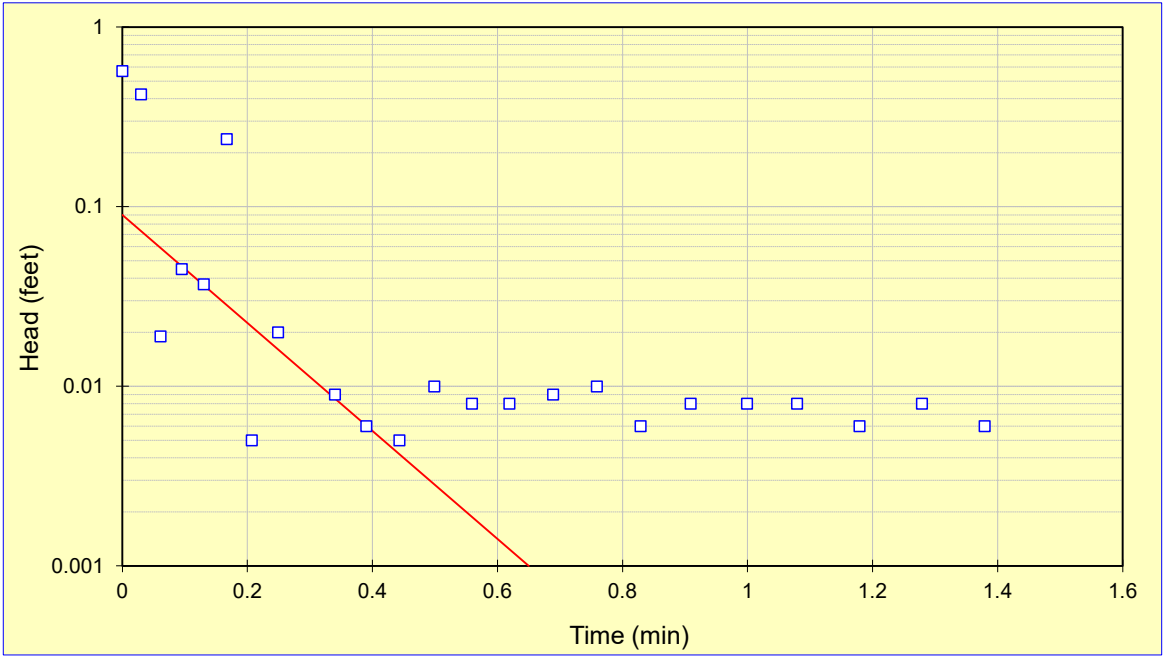
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.83
y_0 =	0.09
y_t =	0.001
t =	0.7

RESULTS

K=	3.45E-03	cm/sec
K=	9.79E+00	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP FALLING HEAD SLUG TEST ANALYSIS
UNDERDAMPED SLUG TEST GAMW-15B (TEST 2)

$$T = b + a \ln T$$

where:

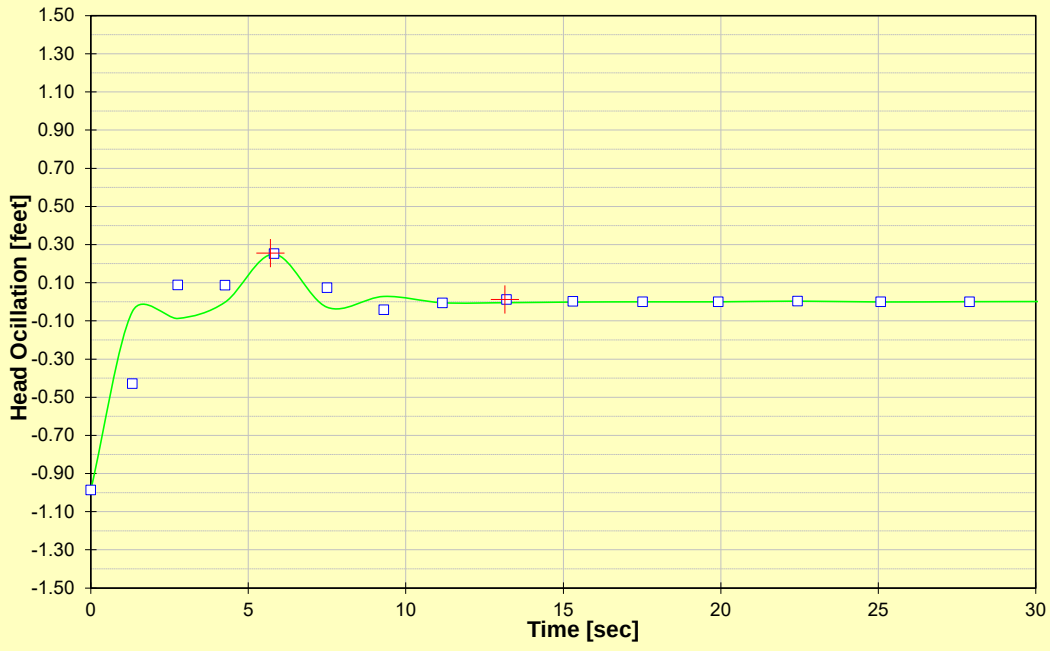
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	0.93787	ft^2
r_s =	0.08	ft	d =	0.4374	ft^{-1}
L_c =	19.23	ft	a =	0.00186	ft^3
L_s =	10.00	ft	t_1 =	5.70	sec
w =	0.8434	ft^{-1}	t_2 =	13.15	sec
g =	0.4102	ft^{-1}	$h(t_1)$ =	0.26	ft
L =	36.60	ft^3/sec^2	$h(t_2)$ =	0.01	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	1.84E-02	ft^2/sec	a < 0.1?	YES
T =	9.76E-03	ft^2/sec	d < 0.7?	YES
T =	8.44E+02	ft^2/day	L_1 =	36.60
K =	2.70E+01	ft/day	L_2 =	24.23
K =	9.53E-03	cm/sec	L_1:L_2 Diff <20% ?	NO



Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-15B (TEST 2)

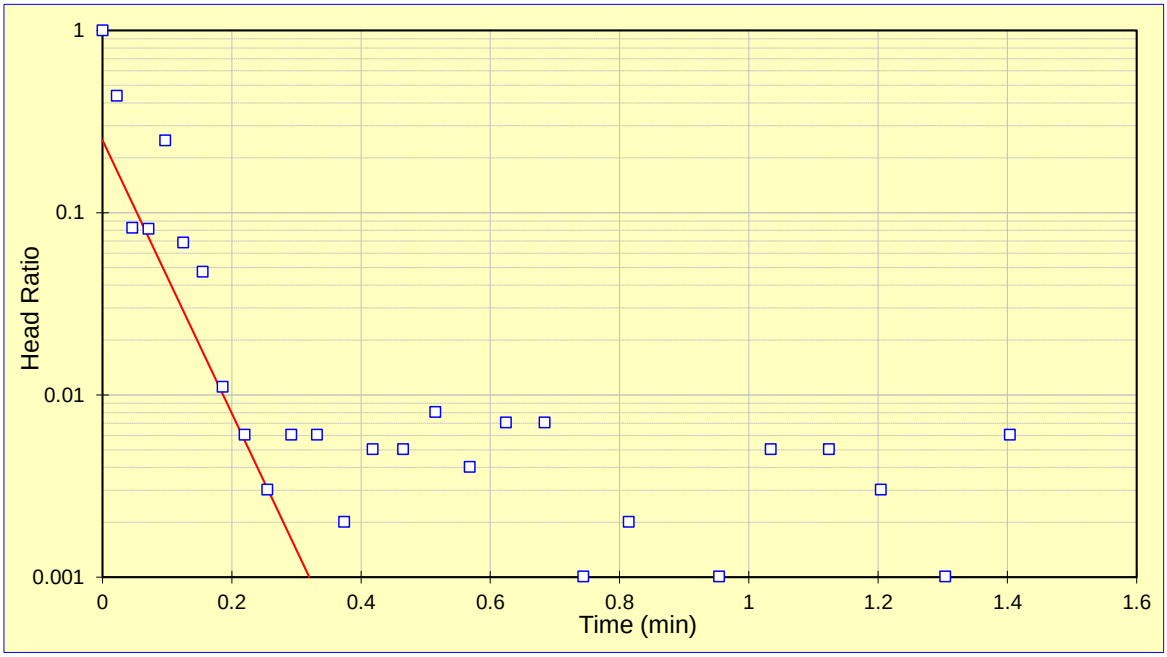
$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	10
t_1 =	0
t_2 =	0.32
h_1/h_0 =	0.25
h_2/h_0 =	0.00

RESULTS

K=	1.03E-02	cm/sec
K=	2.91E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-15B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

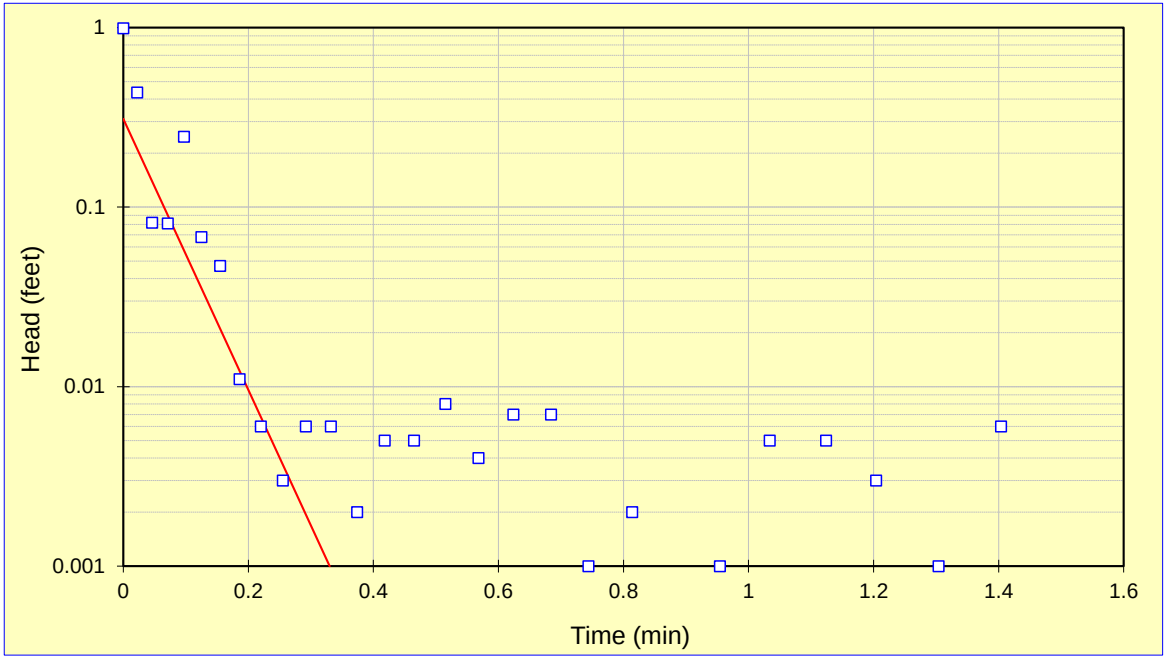
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.85
y_0 =	0.31
y_t =	0.001
t =	0.3

RESULTS

K=	8.75E-03	cm/sec
K=	2.48E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP RISING HEAD SLUG TEST ANALYSIS
UNDERDAMPED SLUG TEST GAMW-15B (TEST 1)

$$T = b + a \ln T$$

where:

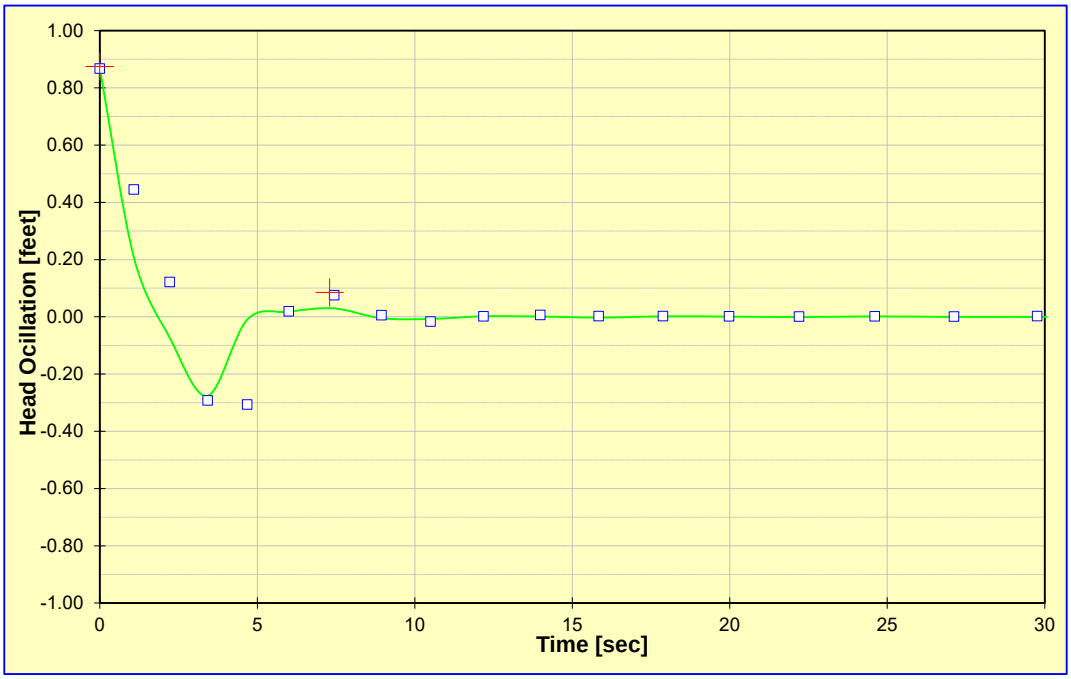
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	0.91806	ft^2
r_s =	0.08	ft	d =	0.3479	ft^{-1}
L_c =	19.23	ft	a =	0.00229	ft^3
L_s =	10.00	ft	t_1 =	0.00	sec
w =	0.8607	ft^{-1}	t_2 =	7.30	sec
g =	0.3194	ft^{-1}	$h(t_1)$ =	0.88	ft
L =	38.19	ft^3/sec^2	$h(t_2)$ =	0.09	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	2.27E-02	ft^2/sec	a < 0.1?	YES
T =	1.27E-02	ft^2/sec	d < 0.7?	YES
T =	1.09E+03	ft^2/day	L_1 =	38.19
K =	3.50E+01	ft/day	L_2 =	24.23
K =	1.24E-02	cm/sec	L_1:L_2 Diff <20% ?	NO



Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/08/16

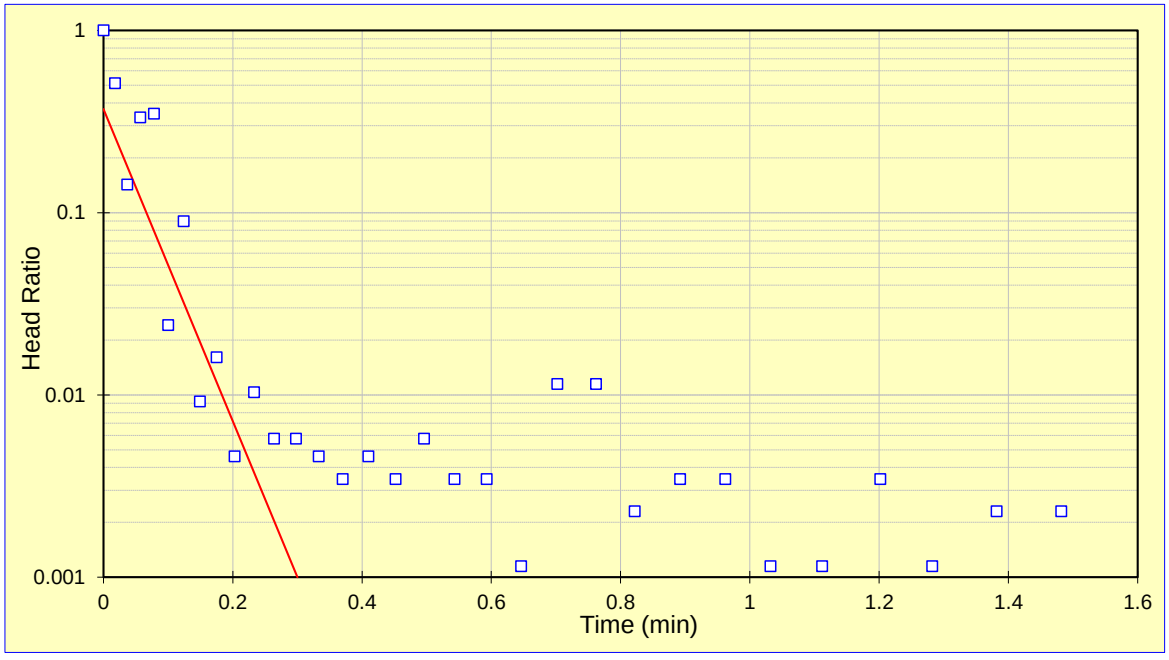
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15B (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	1.17E-02	cm/sec
t_1 =	0	K=	3.32E+01	ft/day
t_2 =	0.3			
h_1/h_0 =	0.37			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

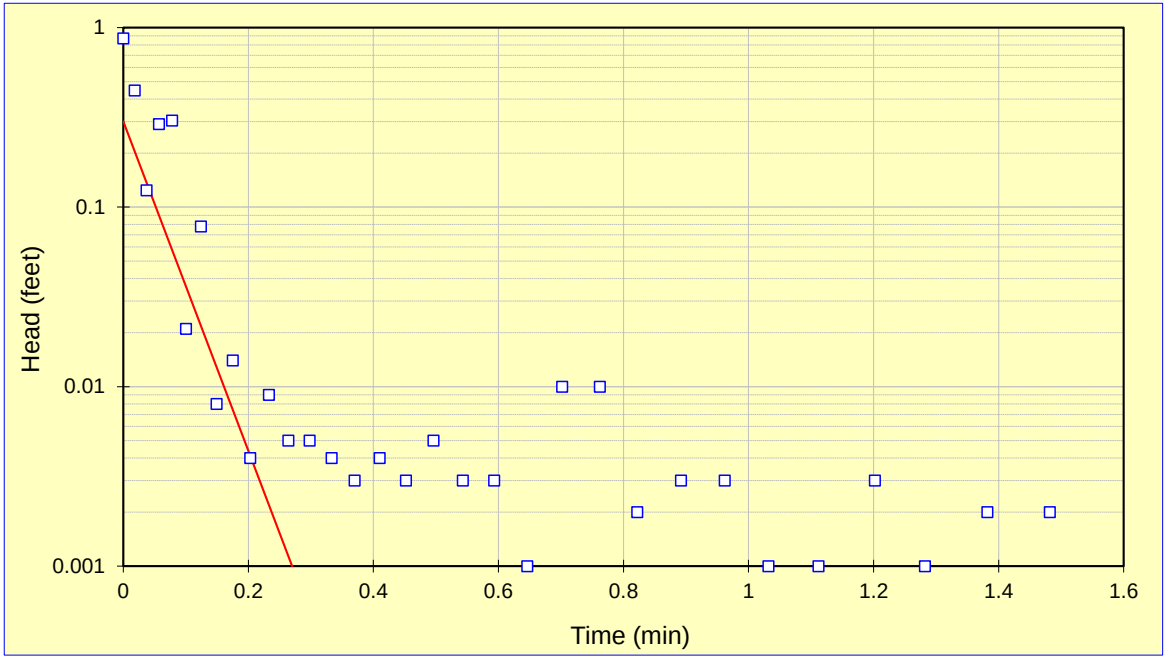
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.85
y_0 =	0.30
y_t =	0.001
t =	0.3

RESULTS

K=	1.06E-02	cm/sec
K=	3.02E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP RISING HEAD SLUG TEST ANALYSIS
UNDERDAMPED SLUG TEST GAMW-15B (TEST 2)

$$T = b + a \ln T$$

where:

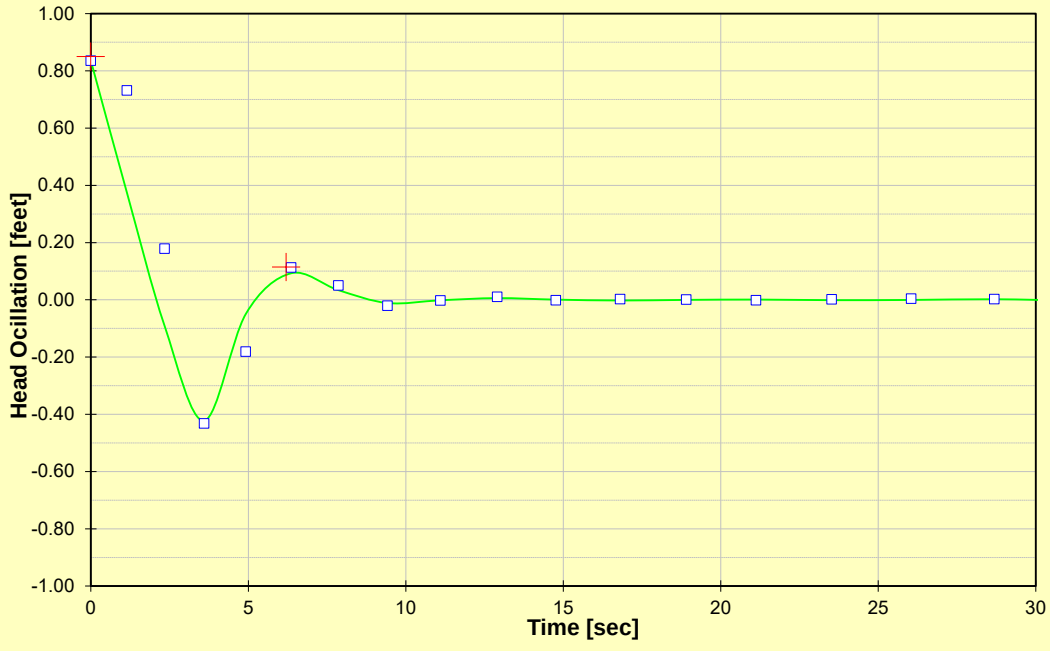
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	1.06353	ft^2
r_s =	0.08	ft	d =	0.3034	ft^{-1}
L_c =	19.22	ft	a =	0.00304	ft^3
L_s =	10.00	ft	t_1 =	0.00	sec
w =	1.0134	ft^{-1}	t_2 =	6.20	sec
g =	0.3226	ft^{-1}	$h(t_1)$ =	0.85	ft
L =	28.46	ft^3/sec^2	$h(t_2)$ =	0.12	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	2.97E-02	ft^2/sec	$a < 0.1$?	YES
T =	1.73E-02	ft^2/sec	$d < 0.7$?	YES
T =	1.50E+03	ft^2/day	L_1 =	28.46
K =	4.80E+01	ft/day	L_2 =	24.22
K =	1.69E-02	cm/sec	L_1:L_2 Diff <20% ?	YES



Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/07/16

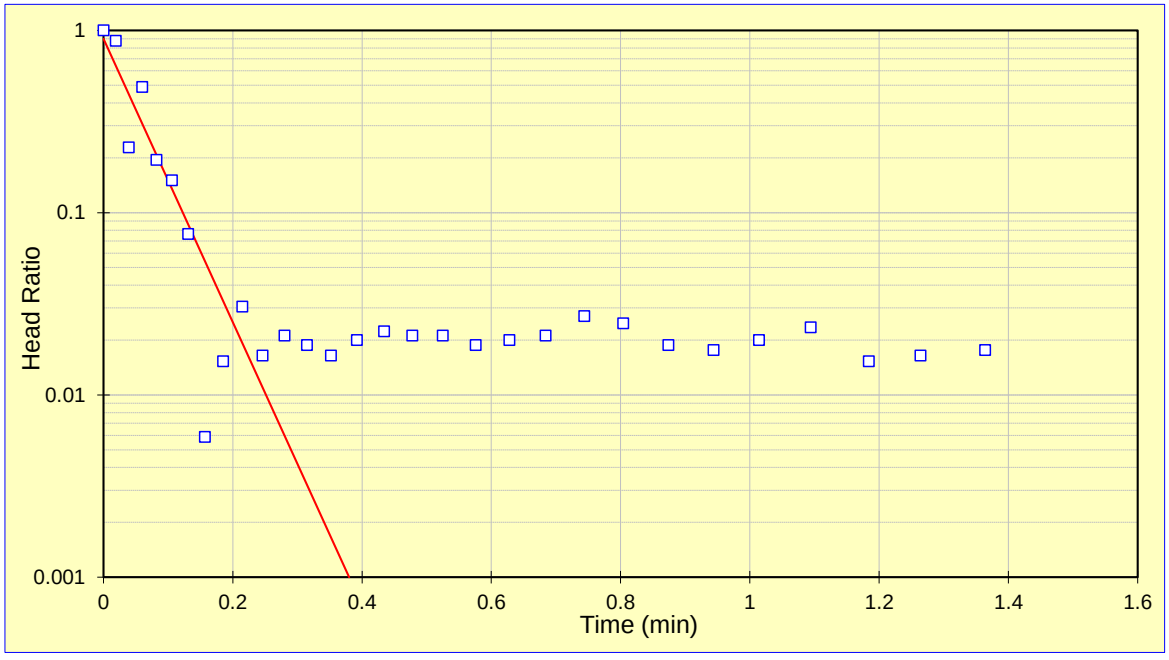
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15B (TEST 2)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	1.06E-02	cm/sec
t_1 =	0	K=	3.02E+01	ft/day
t_2 =	0.38			
h_1/h_0 =	0.90			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-15B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

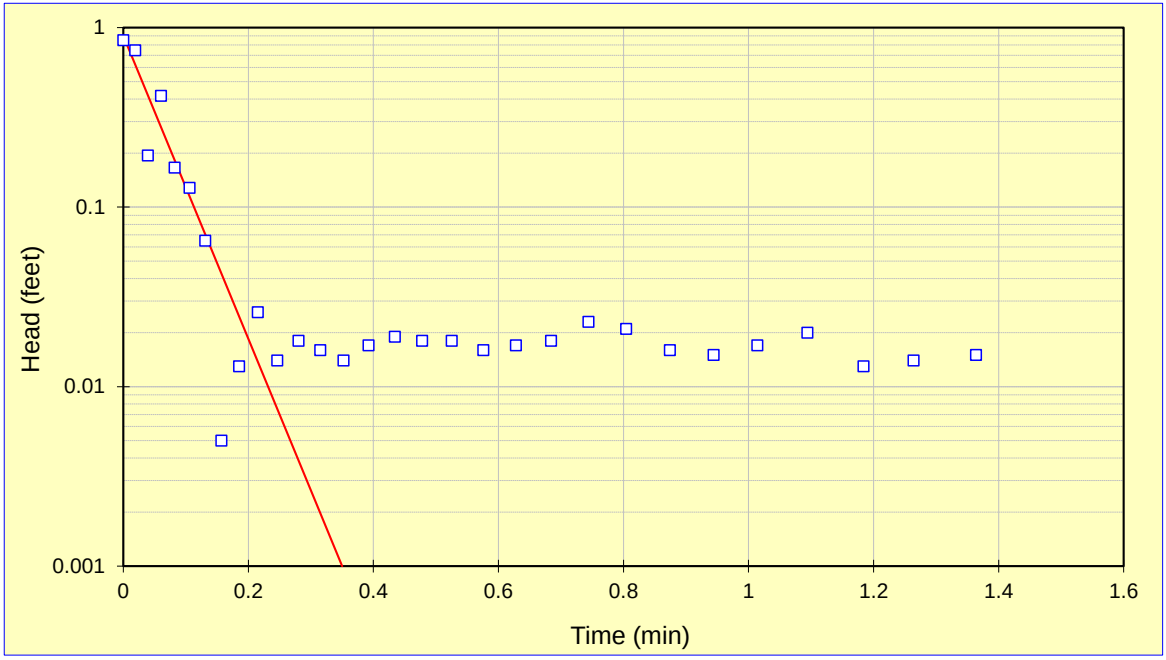
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	2.85
y_0 =	0.90
y_t =	0.001
t =	0.4

RESULTS

K=	9.79E-03	cm/sec
K=	2.77E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

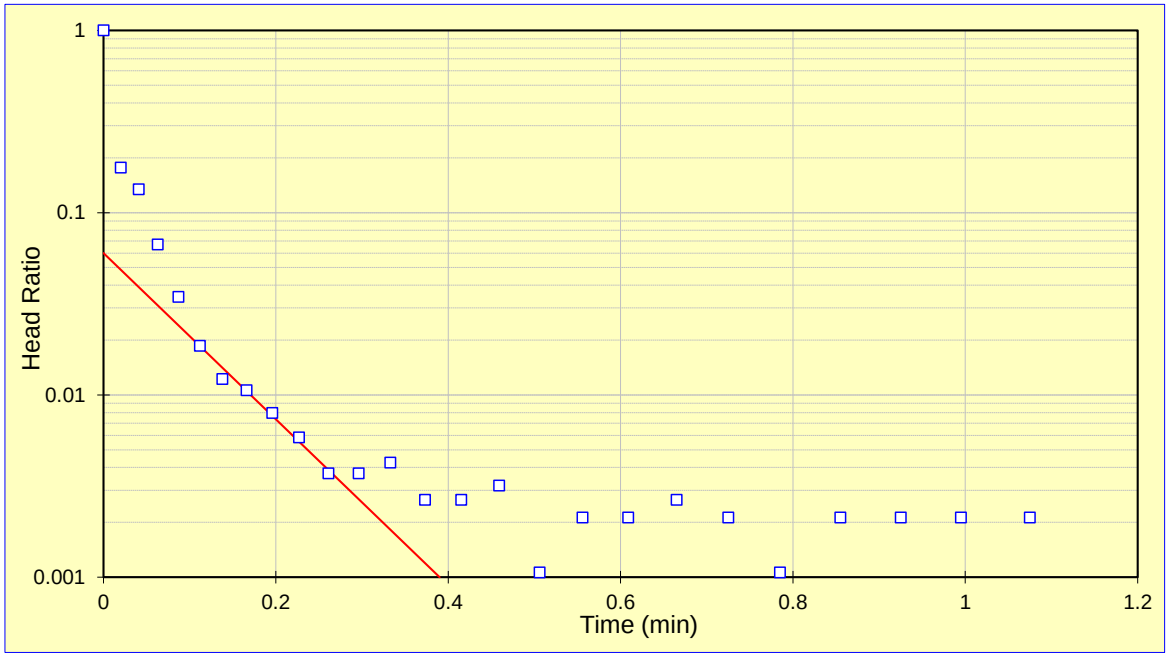
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19 (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left|\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right| 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.20			
R_e =	0.34			
L_e =	9.705	K=	3.70E-02	cm/sec
t_1 =	0	K=	1.05E+02	ft/day
t_2 =	0.39			
h_1/h_0 =	0.06			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19 (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

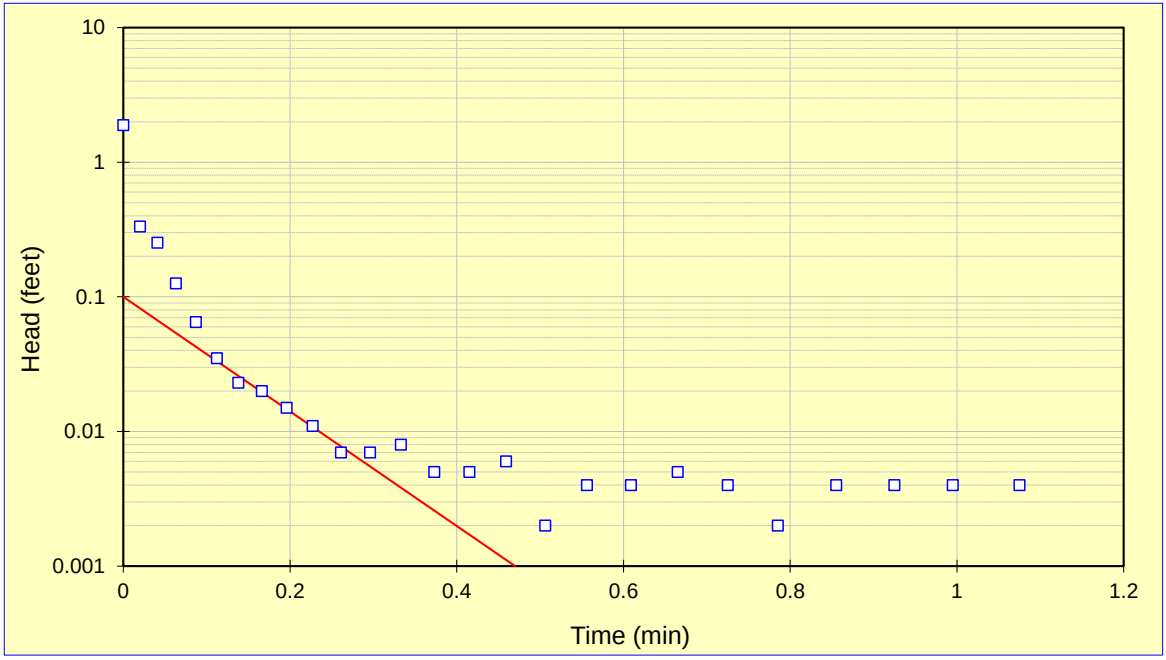
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.20
r_w =	0.34
L_e =	9.705
$\ln(R_e/r_w)$=	2.18
y_0 =	0.10
y_t =	0.001
t =	0.5

RESULTS

K=	2.25E-02	cm/sec
K=	6.38E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19 (TEST 2)

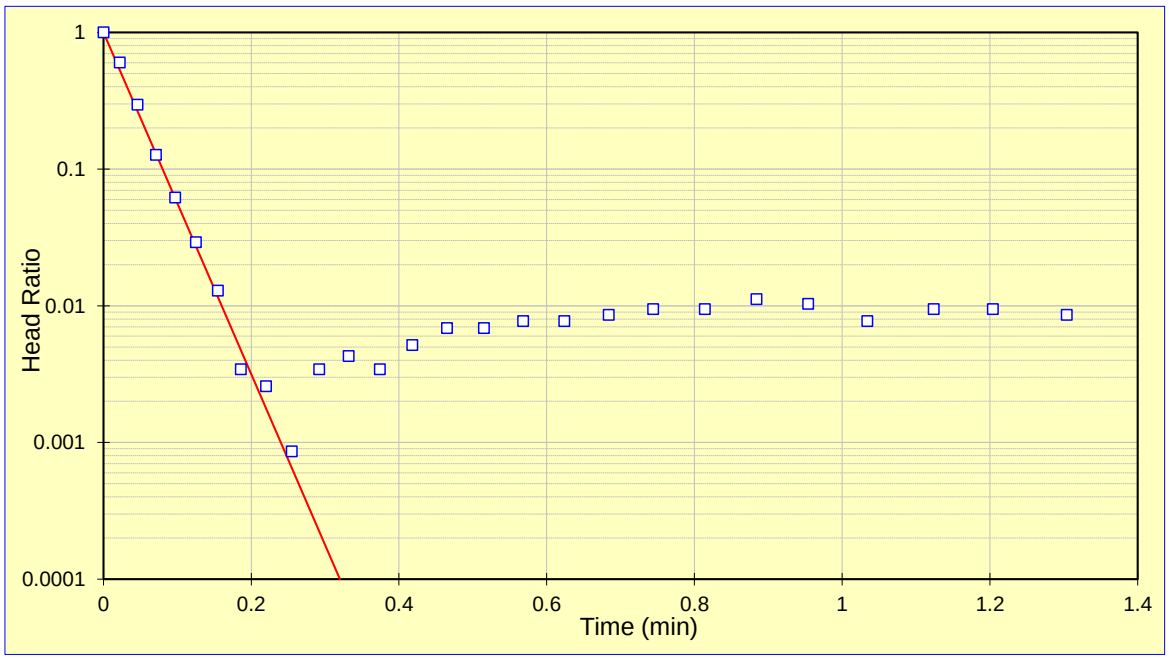
$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.20
R_e =	0.34
L_e =	9.735
t_1 =	0
t_2 =	0.32
h_1/h_0 =	1.00
h_2/h_0 =	0.00

RESULTS

K=	1.01E-01	cm/sec
K=	2.87E+02	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

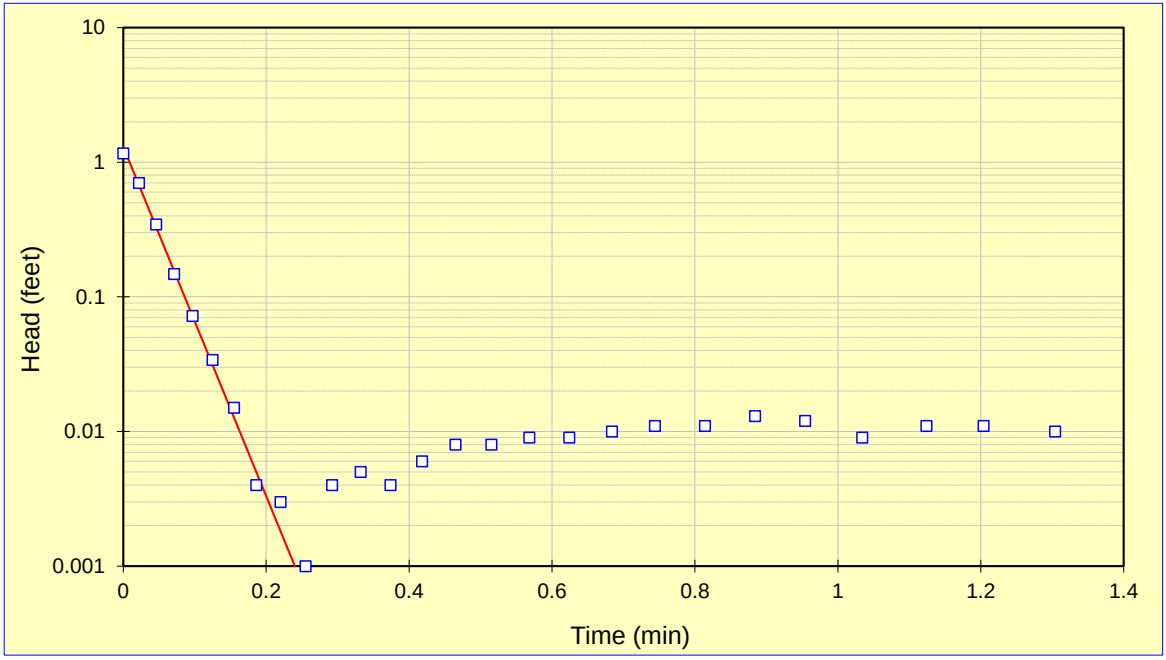
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.20
r_w =	0.34
L_e =	9.735
$\ln(R_e/r_w)$=	2.18
y_0 =	1.30
y_t =	0.001
t =	0.2

RESULTS

K=	6.85E-02	cm/sec
K=	1.94E+02	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

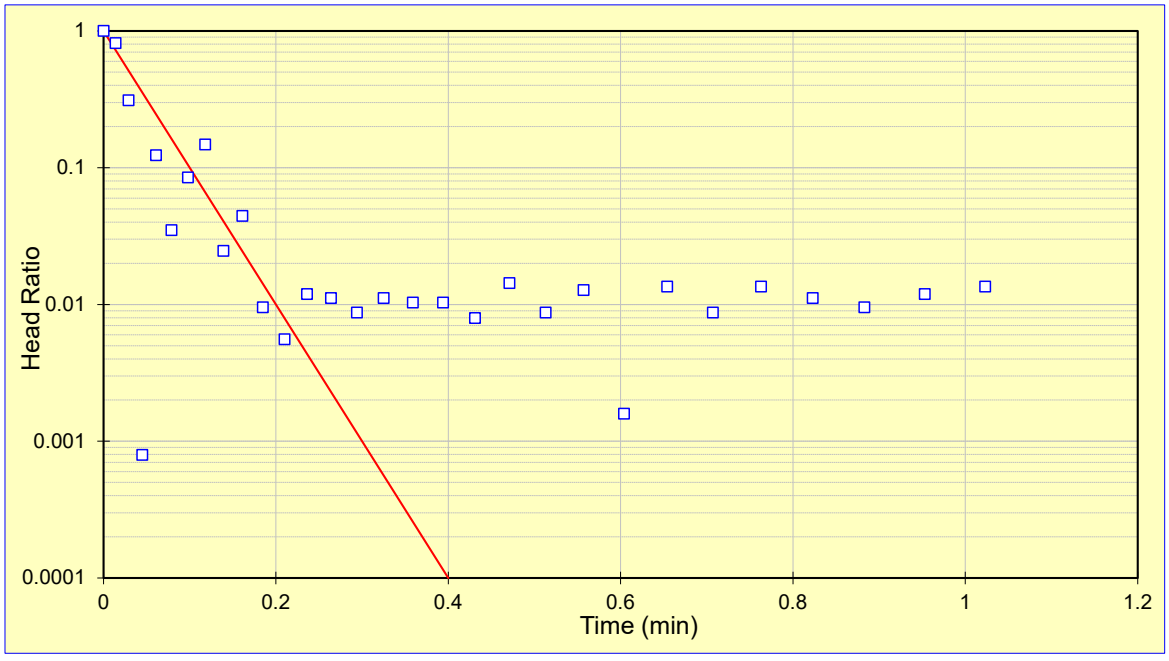
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-19B (TEST 1)

$$K = \frac{r_c^{\,2}}{2L_e} \ln \frac{L_e}{R_e} \left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS		RESULTS		
r_c =	0.08			
R_e =	0.34			
L_e =	10	K=	1.37E-02	cm/sec
t_1 =	0	K=	3.88E+01	ft/day
t_2 =	0.4			
h_1/h_0 =	1.00			
h_2/h_0 =	0.00			



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-19B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

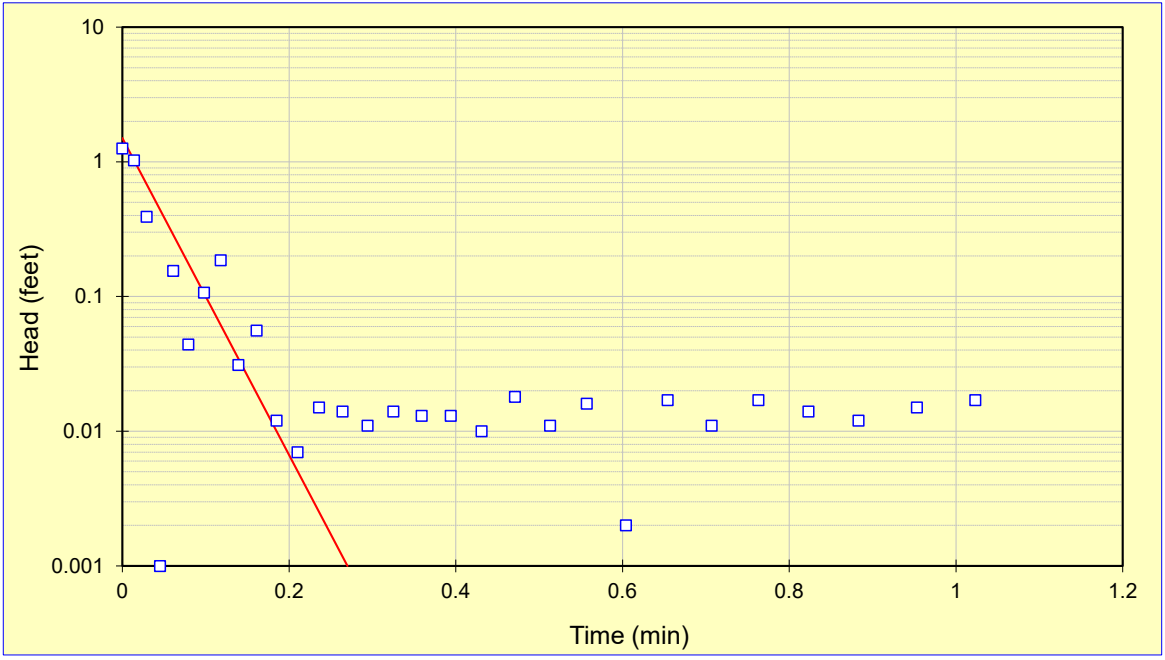
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.02
y_0 =	1.50
y_t =	0.001
t =	0.3

RESULTS

K=	1.44E-02	cm/sec
K=	4.09E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

HVORSLEV SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-19B (TEST 2)

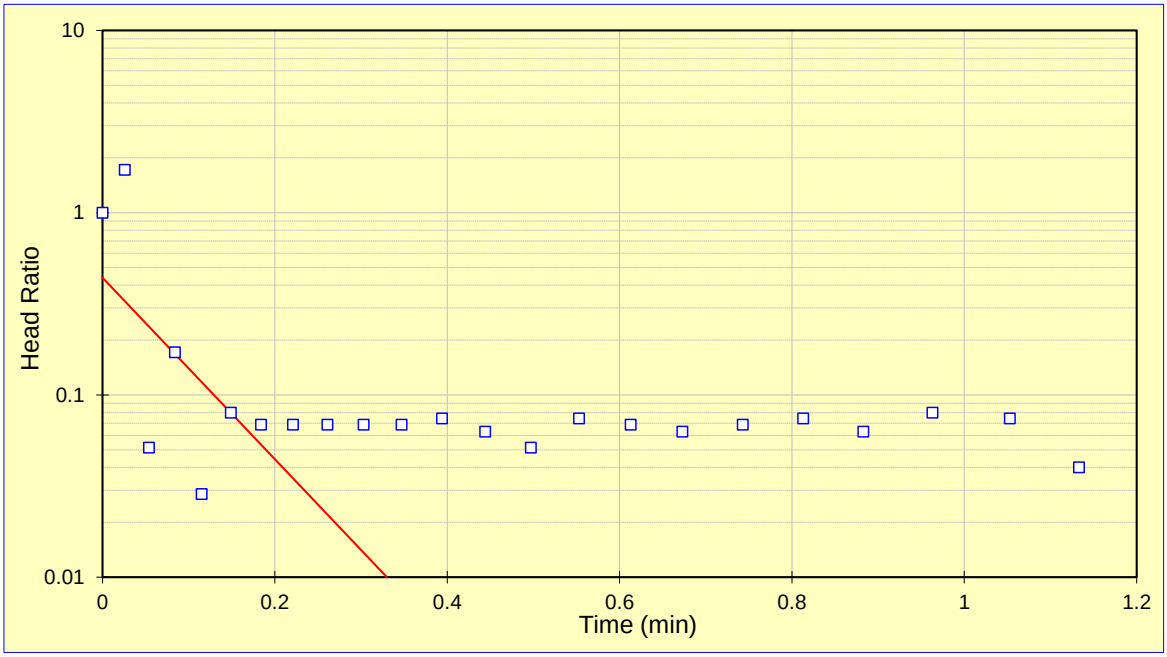
$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	10
t_1 =	0
t_2 =	0.33
h_1/h_0 =	0.44
h_2/h_0 =	0.01

RESULTS

K=	6.82E-03	cm/sec
K=	1.93E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
FALLING HEAD TEST GAMW-19B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

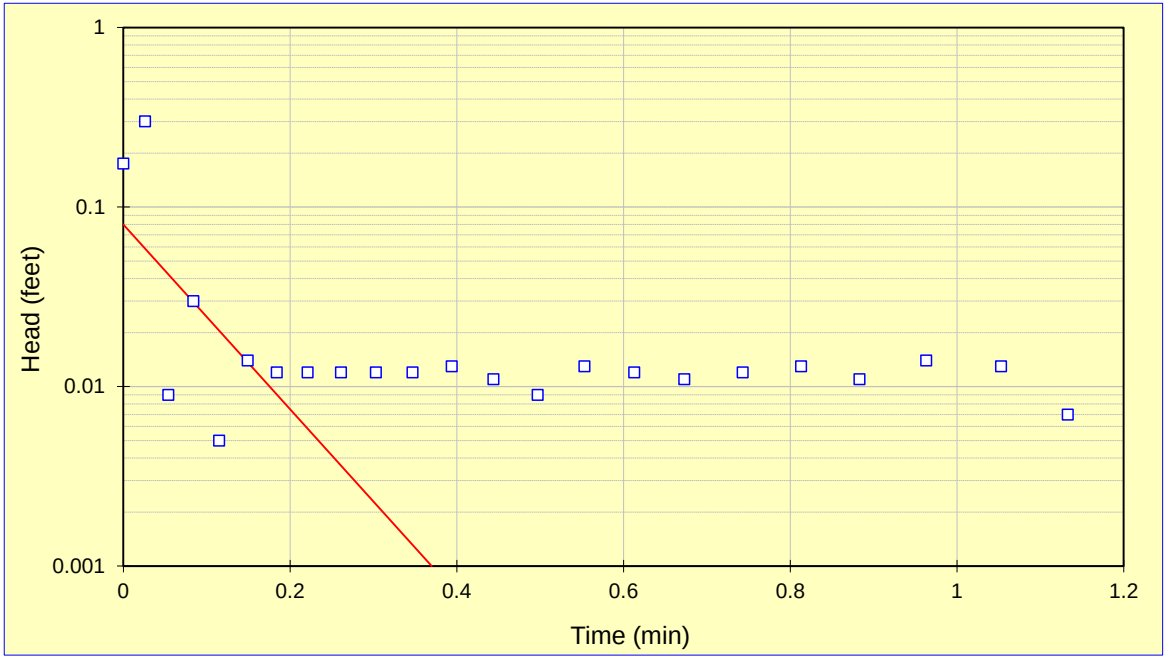
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.02
y_0 =	0.08
y_t =	0.001
t =	0.4

RESULTS

K=	6.31E-03	cm/sec
K=	1.79E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP RISING HEAD SLUG TEST ANALYSIS
UNDERDAMPED SLUG TEST GAMW-19B (TEST 1)

$$T = b + a \ln T$$

where:

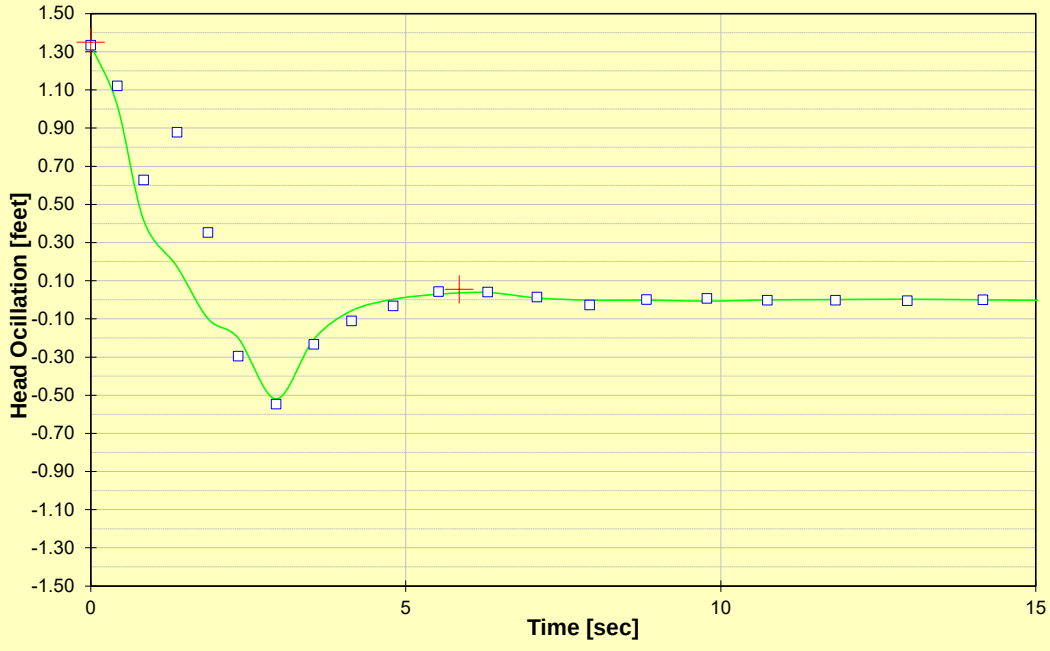
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	1.20536	ft^2
r_s =	0.08	ft	d =	0.4539	ft^{-1}
L_c =	17.92	ft	a =	0.00231	ft^3
L_s =	10.00	ft	t_1 =	0.00	sec
w =	1.0740	ft^{-1}	t_2 =	5.85	sec
g =	0.5471	ft^{-1}	$h(t_1)$ =	1.35	ft
L =	22.16	ft^3/sec^2	$h(t_2)$ =	0.06	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	2.22E-02	ft^2/sec	$a < 0.1$?	YES
T =	1.20E-02	ft^2/sec	$d < 0.7$?	YES
T =	1.04E+03	ft^2/day	L_1 =	22.16
K =	3.67E+01	ft/day	L_2 =	22.92
K =	1.29E-02	cm/sec	L_1:L_2 Diff <20% ?	YES



Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19B (TEST 1)

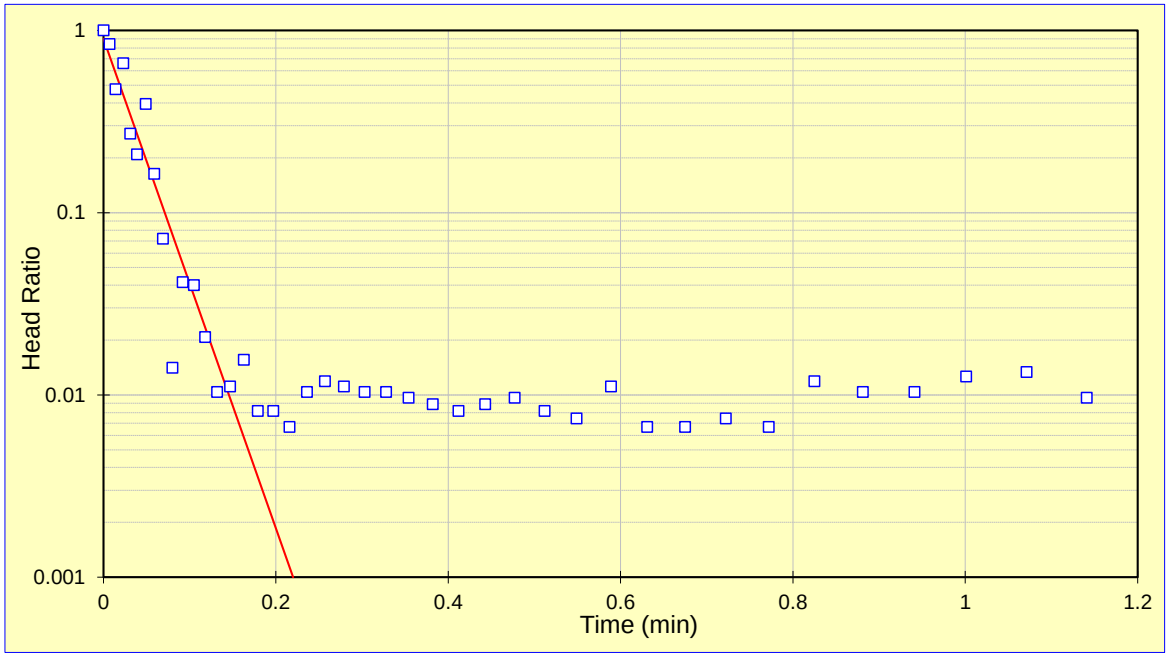
$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left|\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right| 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	10
t_1 =	0
t_2 =	0.22
h_1/h_0 =	0.90
h_2/h_0 =	0.00

RESULTS

K=	1.84E-02	cm/sec
K=	5.21E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

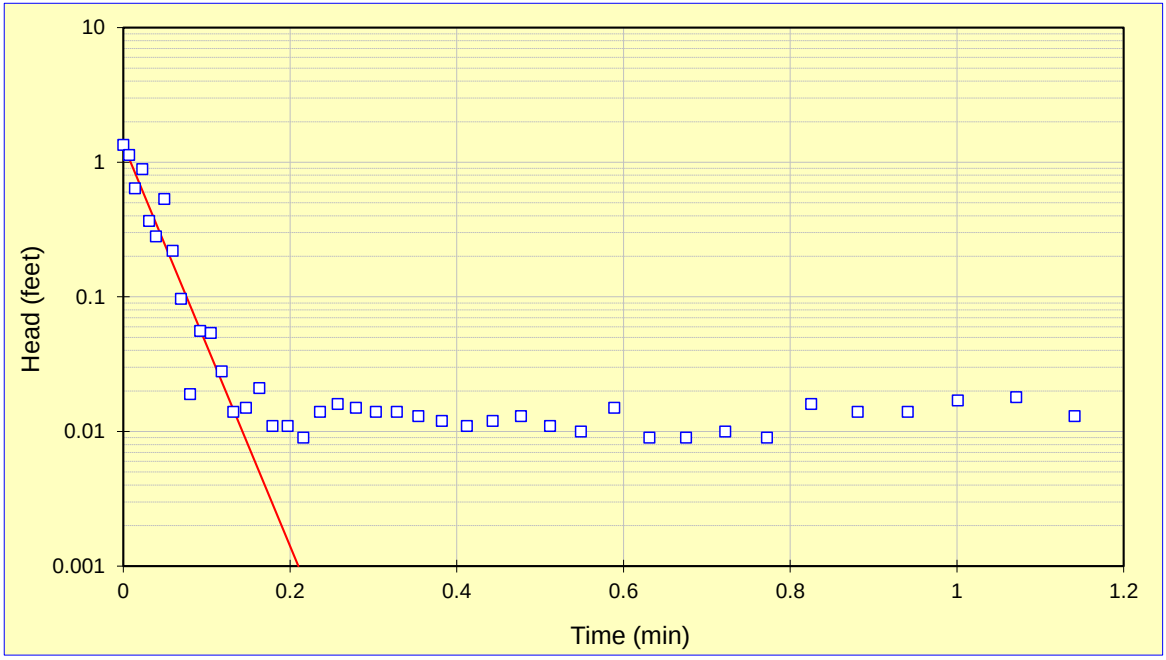
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.02
y_0 =	1.35
y_t =	0.001
t =	0.2

RESULTS

K=	1.83E-02	cm/sec
K=	5.18E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

van der KAMP RISING HEAD SLUG TEST ANALYSIS
UNDERDAMPED SLUG TEST GAMW-19B (TEST 2)

$$T = b + a \ln T$$

where:

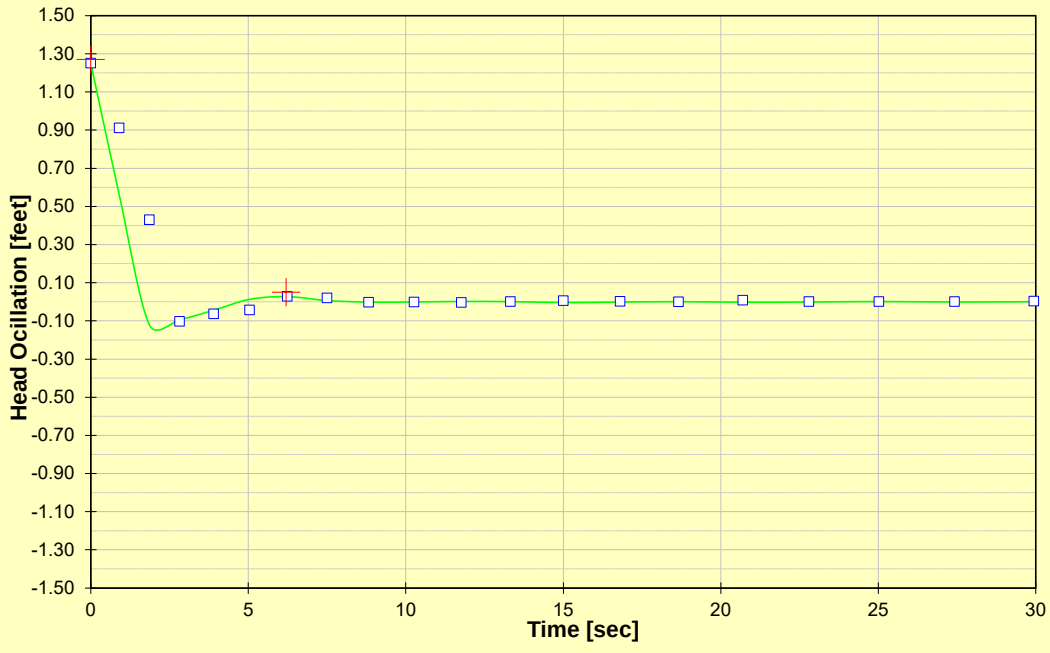
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

INPUT PARAMETERS

r_c =	0.08	ft	$(g/L)^{1/2}$ =	1.13983	ft^2
r_s =	0.08	ft	d =	0.4577	ft^{-1}
L_c =	17.95	ft	a =	0.00216	ft^3
L_s =	10.00	ft	t_1 =	0.00	sec
w =	1.0134	ft^{-1}	t_2 =	6.20	sec
g =	0.5217	ft^{-1}	$h(t_1)$ =	1.27	ft
L =	24.78	ft^3/sec^2	$h(t_2)$ =	0.05	ft
g =	32.19	ft/sec^2	S =	1.00E-02	dim

RESULTS

$b = T_0$ =	2.09E-02	ft^2/sec	$a < 0.1$?	YES
T =	1.12E-02	ft^2/sec	$d < 0.7$?	YES
T =	9.69E+02	ft^2/day	L_1 =	24.78
K =	3.43E+01	ft/day	L_2 =	22.95
K =	1.21E-02	cm/sec	L_1:L_2 Diff <20% ?	YES



Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

HVORSLEV SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19B (TEST 2)

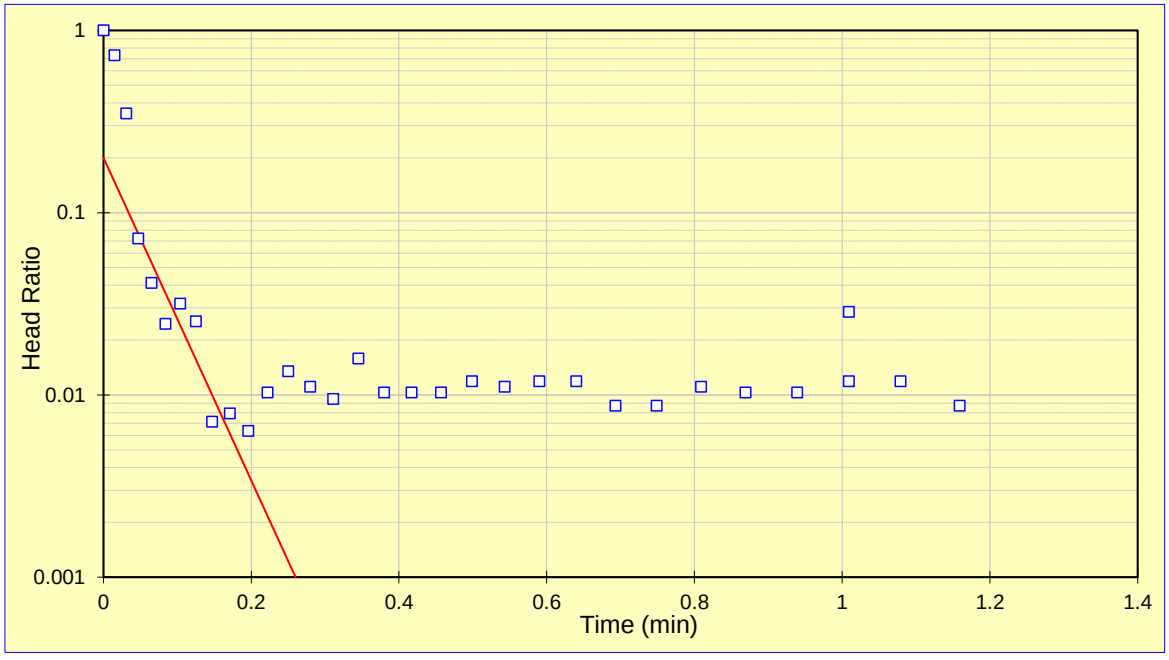
$$K = \frac{r_c^{\,2}}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- r_c = casing radius (feet)
- R_e = equivalent radius (feet)
- L_e = length of screened interval (feet)
- t = time (minutes)
- h_t = head at time t (feet)

INPUT PARAMETERS	
r_c =	0.08
R_e =	0.34
L_e =	10
t_1 =	0
t_2 =	0.26
h_1/h_0 =	0.20
h_2/h_0 =	0.00

RESULTS

K=	1.21E-02	cm/sec
K=	3.43E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

BOUWER AND RICE SLUG TEST ANALYSIS
RISING HEAD TEST GAMW-19B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

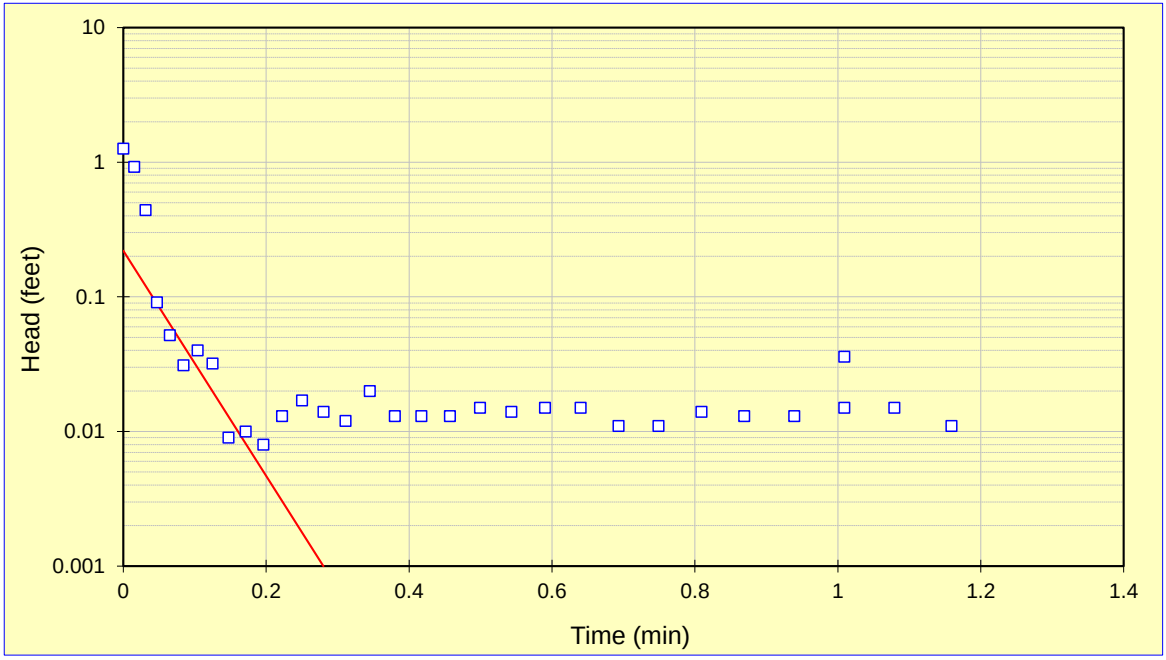
where:

r_c = casing radius (feet);
R_e = effective radius (feet);
L_e = length of screened interval (feet);
r_w = radial distance to undisturbed aquifer (feet)
y_0 = initial drawdown (feet)
y_t = drawdown (feet) at time t (minutes)

INPUT PARAMETERS	
r_c =	0.08
r_w =	0.34
L_e =	10
$\ln(R_e/r_w)$=	3.02
y_0 =	0.22
y_t =	0.001
t =	0.3

RESULTS

K=	1.03E-02	cm/sec
K=	2.91E+01	ft/day



Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

APPENDIX C

Well and Piezometer Borehole Logs

BOREHOLE LOG: OW-1

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 18
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171874.709 E: 2971270.445
GROUND SURFACE ELEV.: 666.35
TOP OF CASING ELEV.: 669.33
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/5/2019 1:30:00 PM
END DATE/TIME: 6/5/2019 1:45:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	FILL- fine sand, dark brown to black, some fly ash, some organics			RS			0' to 1': FILL (SP) SAND, fine, dark brown to black, some fly ash, some organics (roots), non-cohesive, dry.		Bentonite Chips 0-6 ft bgs
665.0	SAND- fine, brown, some medium sand			RS			1' to 2': (SP) SAND, fine, dark brown with some orange brown streaks, non-cohesive, moist.		
				RS			2' to 3.5': (SM) SILTY SAND, fine, yellow-brown to brown, non-cohesive, moist.		
660.0				RS			7' to 11': (SP) SAND, fine, yellow-brown, some medium sand, poorly graded, non-cohesive, moist.		#5 Sand Filter Pack 6-18 ft bgs 2" PVC Screen slot 0.010 8-18 ft bgs
655.0				RS			11' to 15': (SW) SAND, fine, light brown, well-graded, non-cohesive, moist.		
650.0	SAND- medium to coarse, light brown, trace fine sand			RS			17' to 18': (SP) SAND, medium to coarse, light brown, trace fine sand, poorly graded, non-cohesive, wet.		
	Note: Geology contacts are assumed and based on boring OW-2B								
645.0									

LITHOLOGY LEGEND

Fill (made ground)

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: CRH
DATE: 5/6/20

GOLDER

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 5/8/20

BOREHOLE LOG: OW-2

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 18
DEPTH TO BEDROCK: 34

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171859.541 E: 2971270.406
GROUND SURFACE ELEV.: 668.43
TOP OF CASING ELEV.: 668.43
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/5/2019 12:30:00 PM
END DATE/TIME: 6/5/2019 1:05:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	FILL- fine sand, dark brown to black, some fly ash, some organics			RS			0' to 1': FILL (SP) SAND, fine, dark brown to black, some fly ash, some organics (roots), non-cohesive, dry.		Bentonite Chips 0-6 ft bgs
	SAND- fine, brown, some medium sand			RS			1' to 2': (SP) SAND, fine, dark brown with some orange brown streaks, non-cohesive, moist.		
				RS			2' to 3.5': (SM) SILTY SAND, fine, yellow-brown to brown, non-cohesive, moist.		
665.0									
							7' to 11': (SP) SAND, fine, yellow-brown, some medium sand, poorly graded, non-cohesive, moist.		#5 Sand Filter Pack 6-18 ft bgs
660.0				RS					2" PVC Screen slot 0.010 8-18 ft bgs
							11' to 15': (SP) SAND, fine, light brown, poorly graded, non-cohesive, moist.		
655.0				RS					
	SAND- medium to coarse, light brown, trace fine sand			RS			17' to 18': (SP) SAND, medium to coarse, light brown, trace fine sand, poorly graded, non-cohesive, wet.		
650.0	Note: Geology contacts are assumed and based on boring OW-2B								
645.0									

LITHOLOGY LEGEND

Fill (made ground)

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: ANB
CHECKED BY: CRH
DATE: 5/6/20

GOLDER

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 5/8/20

BOREHOLE LOG: OW-2B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 35
DEPTH TO BEDROCK: 34

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171859.733 E: 2971276.297
GROUND SURFACE ELEV.: 665.96
TOP OF CASING ELEV.: 669.22
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/5/2019 10:05:00 AM
END DATE/TIME: 6/5/2019 11:00:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	FILL- fine sand, dark brown to black, some fly ash, some organics			RS			0' to 1': FILL (SP) SAND, fine, dark brown to black, some fly ash, some organics (roots), non-cohesive, dry.		Bentonite Chips 0-22 ft bgs
	SAND- fine, brown, some medium sand			RS			1' to 2': (SP) SAND, fine, dark brown with some orange brown streaks, non-cohesive, moist.		
				RS			2' to 3.5': (SM) SILTY SAND, fine, yellow-brown to brown, non-cohesive, moist.		
660.0				RS			7' to 11': (SP) SAND, fine, yellow-brown, some medium sand, poorly graded, non-cohesive, moist.		
655.0				RS			11' to 15': (SP) SAND, fine, light brown, poorly graded, non-cohesive, moist.		
650.0	SAND- medium to coarse, light brown, trace fine sand			RS			17' to 19': (SP) SAND, medium to coarse, light brown, trace fine sand, poorly graded, non-cohesive, wet.		
				RS			19' to 21': (SP) SAND, medium to coarse, light brown, trace fine sand, poorly graded, non-cohesive, wet.		
645.0	SAND- fine to medium, gray, trace coarse sand			RS			21' to 23': (SP) SAND, fine to medium, gray, trace coarse sand, poorly graded, non-cohesive, wet.		#5 Sand Filter Pack 22-35 ft bgs
									2" PVC Screen slot 0.010 24-34 ft bgs

LITHOLOGY LEGEND

Fill (made ground) | USCS Poorly-graded Sand (SP) | Shale

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: ANB
CHECKED BY: CRH
DATE: 5/6/20

GOLDER

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 5/8/20

BOREHOLE LOG: OW-2B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 35
DEPTH TO BEDROCK: 34

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171859.733 E: 2971276.297
GROUND SURFACE ELEV.: 665.96
TOP OF CASING ELEV.: 669.22
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/5/2019 10:05:00 AM
END DATE/TIME: 6/5/2019 11:00:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	SAMPLE INFORMATION: Type	SAMPLE INFORMATION: PID (ppm)	SAMPLE INFORMATION: Soil Rec./Att. Or Core Rec. %	SAMPLE INFORMATION: Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
640.0	SAND- fine to medium, gray, trace coarse sand			RS			26' to 28': (SP) SAND, medium, gray, non-cohesive, wet.		
				RS			28' to 28.3': (SP) SAND, medium, gray, non-cohesive, wet.		
				RS			28.3' to 29': (SP) SAND, fine to medium, gray, poorly graded, non-cohesive, wet.		
				RS			29.9' to 31': (SP) SAND, fine, dark gray, non-cohesive, wet.		
635.0				RS			31' to 34': (SP) SAND, fine, light gray, trace coarse sand, some thin laminations of shale, poorly graded, non-cohesive, wet.		
	SHALE- gray			RS			34' to 35': SHALE, gray, highly weathered		#5 Sand 34-35 ft bgs
630.0									
625.0									
620.0									

LITHOLOGY LEGEND

Fill (made ground) | USCS Poorly-graded Sand (SP) | Shale

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: ANB
CHECKED BY: CRH
DATE: 5/6/20

GOLDER

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 5/8/20

BOREHOLE LOG: OW-3

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 18
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171845.388 E: 2971269.683
GROUND SURFACE ELEV.: 666.34
TOP OF CASING ELEV.: 668.23
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/5/2019 7:48:00 AM
END DATE/TIME: 6/5/2019 8:40:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	FILL- fine sand, dark brown to black, some fly ash, some organics						0' to 1': FILL (SP) SAND, fine, dark brown to black, some fly ash, some organics (roots), non-cohesive, dry.		Bentonite Chips 0-6 ft bgs
665.0	SAND- fine, brown, some medium sand						1' to 2': (SP) SAND, fine, dark brown with some orange brown streaks, non-cohesive, moist.		
							2' to 3.5': (SP) SILTY SAND, fine, yellow-brown to brown, non-cohesive, moist.		
660.0							7' to 11': (SP) SAND, fine, yellow-brown, some medium sand, poorly graded, non-cohesive, moist.		#5 Sand Filter Pack 6-18 ft bgs 2" PVC Screen slot 0.010 8-18 ft bgs
655.0							11' to 15': (SP) SAND, fine, light brown, poorly graded, non-cohesive, moist.		
650.0	SAND- medium to coarse, light brown, trace fine sand						17' to 18': (SP) SAND, medium to coarse, light brown, trace fine sand, poorly graded, non-cohesive, wet.		
	Note: Geology contacts are assumed and based on boring OW-2B								
645.0									

LITHOLOGY LEGEND

Fill (made ground)

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: CRH
DATE: 5/6/20

GOLDER

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 5/8/20

BOREHOLE LOG: OW-4

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 18
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171895.049 E: 2971285.004
GROUND SURFACE ELEV.: 665.30
TOP OF CASING ELEV.: 667.4
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/6/2019 10:10:00 AM
END DATE/TIME: 6/6/2019 12:30:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	silty SAND- fine, dark brown, some organics			RS			0' to 0.7': (SM) silty SAND, fine, dark brown, some organics, poorly graded, non-cohesive, moist.		Bentonite Chips 0-6 ft bgs
	SAND- fine to coarse, light brown			RS			0.7' to 1.4': (SW) SAND, fine to medium, brown, well-graded, non-cohesive, moist.		
				RS			1.4' to 2.5': (SW) SAND, fine to medium, light brown, well-graded, non-cohesive, moist.		
				RS			2.5' to 3.8': (SP) SAND, fine, light brown, poorly graded, non-cohesive, wet.		
660.0									#5 Sand Filter Pack 6-18 ft bgs
							7' to 10.7': (SW) SAND, fine to coarse, light brown, well-graded, non-cohesive, wet.		2" PVC Screen slot 0.010 8-18 ft bgs
				RS					
655.0	silty SAND- fine, light brown						10.7' to 15.7': (ML) silty SAND, fine, light brown, poorly graded, cohesive, wet.		
				RS					
650.0	SAND- fine to coarse, light brown, some gravel			RS			15.7' to 17.3': (SW) SAND, fine to coarse, light brown, trace fine gravel, well-graded, non-cohesive, wet.		
	Note: Geology contacts are assumed and based on boring OW-5B								
645.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)

USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: CRH
DATE: 5/6/20

GOLDER

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 5/8/20

BOREHOLE LOG: OW-5

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 18
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171898.182 E: 2971295.194
GROUND SURFACE ELEV.: 667.16
TOP OF CASING ELEV.: 667.16
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/6/2019 1:50:00 PM
END DATE/TIME: 6/6/2019 2:00:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
	silty SAND- fine, dark brown, some organics			RS			0' to 0.7': (SM) silty SAND, fine, dark brown, some organics, poorly graded, non-cohesive, moist.		Bentonite Chips 0-6 ft bgs
	SAND- fine to coarse, light brown			RS			0.7' to 1.4': (SW) SAND, fine to medium, brown, well-graded, non-cohesive, moist.		
665.0				RS			1.4' to 2.5': (SW) SAND, fine to medium, light brown, well-graded, non-cohesive, moist.		
				RS			2.5' to 3.7': (SP) SAND, fine, light brown, poorly graded, non-cohesive, wet.		
660.0				RS			7' to 10.7': (SW) SAND, fine to coarse, light brown, well-graded, non-cohesive, wet.		#5 Sand Filter Pack 6-18 ft bgs 2" PVC Screen slot 0.010 8-18 ft bgs
655.0	silty SAND- fine, light brown			RS			10.7' to 15.7': (ML) silty SAND, fine, light brown, poorly graded, cohesive, wet.		
650.0	SAND- fine to coarse, light brown, some gravel			RS			15.7' to 17.3': (SW) SAND, fine to coarse, light brown, trace fine gravel, well-graded, non-cohesive, wet.		
645.0	Note: Geology contacts are assumed and based on boring OW-5B								

LITHOLOGY LEGEND

USCS Silty Sand (SM)

USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: CRH
DATE: 5/6/20

GOLDER

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 5/8/20

BOREHOLE LOG: OW-5B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 33.5
DEPTH TO BEDROCK: 33

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171892.642 E: 2971295.168
GROUND SURFACE ELEV.: 665.23
TOP OF CASING ELEV.: 668.49
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/6/2019 10:55:00 AM
END DATE/TIME: 6/6/2019 12:05:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	silty SAND- fine, dark brown, some organics						0' to 0.7': (SM) silty SAND, fine, dark brown, some organics, poorly graded, non-cohesive, moist.		Bentonite Chips 0-21 ft bgs
	SAND- fine to coarse, light brown						0.7' to 1.4': (SW) SAND, fine to medium, brown, well-graded, non-cohesive, moist.		
							1.4' to 2.5': (SW) SAND, fine to medium, light brown, well-graded, non-cohesive, moist.		
							2.5' to 3.8': (SP) SAND, fine, light brown, poorly graded, non-cohesive, wet.		
660.0							7' to 10.7': (SW) SAND, fine to coarse, light brown, well-graded, non-cohesive, wet.		
655.0	silty SAND- fine, light brown						10.7' to 15.7': (ML) silty SAND, fine, light brown, poorly graded, cohesive, wet.		
650.0	SAND- fine to coarse, light brown, some gravel						15.7' to 17.3': (SW) SAND, fine to coarse, light brown, trace fine gravel, well-graded, non-cohesive, wet.		
645.0							20' to 23.7': (SW) SAND, medium to coarse, light brown, some fine to coarse gravel, trace fine sand, well-graded, non-cohesive, wet.		#5 Sand Filter Pack 21-33 ft bgs 2" PVC Screen slot 0.010 22-33 ft bgs
	SAND- fine to coarse, gray, trace gravel						23.7' to 24.2': (SW) SAND, fine to coarse, dark gray with dark staining, trace rounded fine gravel, well graded, non-cohesive, wet.		

LITHOLOGY LEGEND

USCS Silty Sand (SM) | USCS Well-graded Sand (SW) | Shale

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: CRH
DATE: 5/6/20

GOLDER

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 5/8/20

BOREHOLE LOG: OW-5B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 33.5
DEPTH TO BEDROCK: 33

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171892.642 E: 2971295.168
GROUND SURFACE ELEV.: 665.23
TOP OF CASING ELEV.: 668.49
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/6/2019 10:55:00 AM
END DATE/TIME: 6/6/2019 12:05:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
640.0	SAND- fine to coarse, gray, trace gravel						24.2' to 25.8': (SW) SAND, fine to coarse, gray, trace rounded fine gravel, well-graded, non-cohesive, wet. 27' to 31.2': (SW) SAND, fine to coarse, gray, trace rounded fine gravel, poorly graded, non-cohesive, wet.		
635.0							31.2' to 31.7': (SW) SAND, fine to coarse, dark gray, trace rounded fine gravel, dark staining, no odor, well-graded, non-cohesive, wet. 31.7' to 32.3': (SW) SAND, fine to medium, gray, trace coarse sand, well-graded, non-cohesive, wet.		
	SHALE- gray						33'-33.5': clayey SHALE, gray, wet.		#5 Sand 33-33.5 ft bgs
630.0									
625.0									
620.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM) | USCS Well-graded Sand (SW) | Shale

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: CRH
DATE: 5/6/20

GOLDER

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 5/8/20

BOREHOLE LOG: OW-6

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 18
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171895.216 E: 2971305.3
GROUND SURFACE ELEV.: 665.25
TOP OF CASING ELEV.: 667.15
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/6/2019 2:30:00 PM
END DATE/TIME: 6/6/2019 2:40:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	silty SAND- fine, dark brown, some organics			RS			0' to 0.7': (SM) silty SAND, fine, dark brown, some organics, poorly graded, non-cohesive, moist.		Bentonite Chips 0-6 ft bgs
	SAND- fine to coarse, light brown			RS			0.7' to 1.4': (SW) SAND, fine to medium, brown, well-graded, non-cohesive, moist.		
				RS			1.4' to 2.5': (SW) SAND, fine to medium, light brown, well-graded, non-cohesive, moist.		
				RS			2.5' to 3.8': (SP) SAND, fine, light brown, poorly graded, non-cohesive, wet.		
660.0							7' to 10.7': (SW) SAND, fine to coarse, light brown, well-graded, non-cohesive, wet.		#5 Sand Filter Pack 6-18 ft bgs 2" PVC Screen slot 0.010 8-18 ft bgs
				RS					
655.0	silty SAND- fine, light brown			RS			10.7' to 15.7': (ML) silty SAND, fine, light brown, poorly graded, cohesive, wet.		
650.0	SAND- fine to coarse, light brown, some gravel			RS			15.7' to 17.3': (SW) SAND, fine to coarse, light brown, trace fine gravel, well-graded, non-cohesive, wet.		
	Note: Geology contacts are assumed and based on boring OW-5B								
645.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)

USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: CRH
DATE: 5/6/20

GOLDER

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 5/8/20

BOREHOLE LOG: OW-7

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 18
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171929.173 E: 2971270.629
GROUND SURFACE ELEV.: 665.98
TOP OF CASING ELEV.: 667.76
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/6/2019 9:15:00 AM
END DATE/TIME: 6/6/2019 9:25:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	SILTY SAND- dark brown, some organics			RS			0 to 1.7': (SM) SILTY SAND, dark brown, some organics, well-graded, dry.		Bentonite Chips 0-6 ft bgs
	SAND- fine, orange to dark brown, some silt			RS			1.7 to 2.3': (SP) SAND, fine, orange to dark brown, poorly graded, some silt, moist.		
	SAND- fine to medium, light brown			RS			2.3 to 4.2': (SW) SAND, fine to medium, light brown, well-graded, moist.		
660.0				RS			5 to 7.4': (SW) SAND, fine to medium, light brown, well-graded, wet.		#5 Sand Filter Pack 6-18 ft bgs
	CLAYEY SAND- fine, light brown			RS			7.4 to 8.75': (SC) CLAYEY SAND, fine, light brown, poorly graded, cohesive, wet.		2" PVC Screen slot 0.010 8-18 ft bgs
655.0				RS			10 to 13': (SC) CLAYEY SAND, fine, light brown, cohesive, wet.		
	SAND- fine to coarse, light brown to light gray, trace to some gravel			RS			13 to 13.7': (SW) SAND, fine to coarse, light brown, well-graded, wet.		
				RS			13.7 to 14.8': (SW) SAND, medium to coarse, light brown, some rounded gravel <1 inch, some fine sand, well-graded, wet.		
650.0				RS			16 to 18': (SW) SAND, fine to coarse, light brown, some rounded gravel <1 inch, well-graded, wet.		
	Note: Geology contacts are assumed and based on boring GAMW-18B								
645.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)
USCS Clayey Sand (SC)
USCS Poorly-graded Sand (SP)
USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: CRH
DATE: 5/6/20

GOLDER

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 5/8/20

BOREHOLE LOG: OW-7B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 32
DEPTH TO BEDROCK: 32

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171930.181 E: 2971274.961
GROUND SURFACE ELEV.: 665.72
TOP OF CASING ELEV.: 669.06
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/5/2019 3:20:00 PM
END DATE/TIME: 6/5/2019 3:50:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	SILTY SAND- dark brown, some organics			RS			0 to 1.7': (SM) SILTY SAND, dark brown, some organics, well-graded, dry.		Bentonite Chips 0-20 ft bgs
	SAND- fine, orange to dark brown, some silt			RS			1.7 to 2.3': (SP) SAND, fine, orange to dark brown, poorly graded, some silt, moist.		
	SAND- fine to medium, light brown			RS			2.3 to 4.2': (SW) SAND, fine to medium, light brown, well-graded, moist.		
660.0				RS			5 to 7.4': (SW) SAND, fine to medium, light brown, well-graded, wet.		
	CLAYEY SAND- fine, light brown			RS			7.4 to 8.75': (SC) CLAYEY SAND, fine, light brown, poorly graded, cohesive, wet.		
655.0				RS			10 to 13': (SC) CLAYEY SAND, fine, light brown, poorly graded, cohesive, wet.		
	SAND- fine to coarse, light brown to light gray, trace to some gravel			RS			13 to 13.7': (SW) SAND, fine to coarse, light brown, well-graded, wet.		
				RS			13.7 to 14.8': (SW) SAND, medium to coarse, light brown, some rounded gravel <1 inch, some fine sand, well-graded, wet.		
650.0				RS			16 to 18': (SW) SAND, fine to coarse, light brown, some rounded gravel <1 inch, well-graded, wet.		
645.0				RS			20 to 23.7': (SW) SAND, medium to coarse, light brown, some rounded gravel <1 inch, little fine sand, well-graded, wet.		#5 Sand Filter Pack 20-32 ft bgs 2" PVC Screen slot 0.010 22-32 ft bgs
				RS					

LITHOLOGY LEGEND

USCS Silty Sand (SM)
USCS Clayey Sand (SC)
USCS Poorly-graded Sand (SP)
USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: CRH
DATE: 5/6/20

GOLDER

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 5/8/20

BOREHOLE LOG: OW-7B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 32
DEPTH TO BEDROCK: 32

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171930.181 E: 2971274.961
GROUND SURFACE ELEV.: 665.72
TOP OF CASING ELEV.: 669.06
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/5/2019 3:20:00 PM
END DATE/TIME: 6/5/2019 3:50:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
640.0	SAND- fine to coarse, light brown to light gray, trace to some gravel			RS			24 to 24.9': (SW) SAND, medium to coarse, light brown, some rounded gravel <1 inch, some fine sand, well-graded, wet.		
				RS			24.9 to 25.3': (SW) SAND, medium to coarse, light gray, some rounded gravel <1 inch, trace fine sand, well-graded, wet.		
							25.3 to 28': (SW) SAND, fine to coarse, light gray, trace rounded gravel, well-graded, wet.		
635.0				RS			28 to 32': (SW) SAND, fine to coarse, light gray, trace rounded gravel, well-graded, wet.		
	SHALE- assumed								
	Note: Geology contacts are assumed and based on boring GAMW-18B								
630.0									
625.0									
620.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)
USCS Clayey Sand (SC)
USCS Poorly-graded Sand (SP)
USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: CRH
DATE: 5/6/20

GOLDER

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 5/8/20

BOREHOLE LOG: OW-8

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 18
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171939.981 E: 29712703909
GROUND SURFACE ELEV.: 665.89
TOP OF CASING ELEV.: 667.85
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/6/2019 8:20:00 AM
END DATE/TIME: 6/6/2019 8:30:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	SILTY SAND- dark brown, some organics			RS			0 to 1.7': (SM) SILTY SAND, dark brown, some organics, well-graded, dry.		Bentonite Chips 0-6 ft bgs
	SAND- fine, orange to dark brown, some silt			RS			1.7 to 2.3': (SP) SAND, fine, orange to dark brown, poorly graded, some silt, moist.		
	SAND- fine to medium, light brown			RS			2.3 to 4.2': (SW) SAND, fine to medium, light brown, well-graded, moist.		
660.0				RS			5 to 7.4': (SW) SAND, fine to medium, light brown, well-graded, wet.		#5 Sand Filter Pack 6-18 ft bgs
	CLAYEY SAND- fine, light brown			RS			7.4 to 8.75': (SC) CLAYEY SAND, fine, light brown, poorly graded, cohesive, wet.		2" PVC Screen slot 0.010 8-18 ft bgs
655.0				RS			10 to 13': (SC) CLAYEY SAND, fine, light brown, poorly graded, cohesive, wet.		
	SAND- fine to coarse, light brown to light gray, trace to some gravel			RS			13 to 13.7': (SW) SAND, fine to coarse, light brown, well-graded, wet.		
				RS			13.7 to 14.8': (SW) SAND, medium to coarse, light brown, some rounded gravel <1 inch, some fine sand, well-graded, wet.		
650.0				RS			16 to 18': (SW) SAND, fine to coarse, light brown, some rounded gravel <1 inch, well-graded, wet.		
	Note: Geology contacts are assumed and based on boring GAMW-18B								
645.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)
USCS Clayey Sand (SC)
USCS Poorly-graded Sand (SP)
USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: CRH
DATE: 5/6/20

GOLDER

BOREHOLE LOG: OW-9

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 20
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171894.233 E: 2971175.522
GROUND SURFACE ELEV.: 671.25
TOP OF CASING ELEV.: 671.25
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/5/2019 11:35:00 AM
END DATE/TIME: 6/5/2019 12:05:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
670.0	silty SAND- fine, brown to light brown, some organics			RS			0' to 1.7': (SM) silty SAND, fine, brown, some organics, poorly graded, non-cohesive, dry.		Bentonite Chips 0-8 ft bgs
				RS			1.7' to 2.8': (SM) silty SAND, fine, brown to light brown, poorly graded, cohesive, moist.		
	SAND- fine to coarse, light brown			RS			2.8' to 3.7': (SW) SAND, fine to medium, light brown, well-graded, non-cohesive, moist.		
				RS			3.7' to 4.7': (SP-SM) SAND, fine to coarse, light brown, some silt, poorly graded, non-cohesive, wet.		
665.0				RS			7' to 8.75': (SW) SAND, fine to medium, light brown, well-graded, non-cohesive, wet.		#5 Sand Filter Pack 8-20 ft bgs
				RS			8.75' to 11': (SW) SAND, fine to coarse, light brown, well-graded, non-cohesive, wet.		2" PVC Screen slot 0.010 10-20 ft bgs
660.0	sandy SILT- fine to medium, tan			RS			11' to 12.5': (ML) sandy SILT, fine to medium, tan, poorly graded, non-cohesive, wet.		
				RS			12.5' to 13.5': (SW-SM) SAND, fine to medium, light brown, some silt, well-graded, non-cohesive, wet.		
	SAND- fine to coarse, light brown			RS			13.5' to 13.75': (SW) SAND, fine to coarse, light brown, well-graded, non-cohesive, wet.		
655.0				RS			17' to 18': (SP) SAND, fine to coarse, brown, trace fine gravel, trace silt, poorly graded, non-cohesive, wet.		
	Note: Geology contacts are assumed and based on boring AT-01								
650.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM) | USCS Well-graded Sand (SW) | USCS Sandy Silt (MLS)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: CRH
DATE: 5/6/20

GOLDER

BOREHOLE LOG: OW-10

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 18
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171893.359 E: 2971212.543
GROUND SURFACE ELEV.: 665.75
TOP OF CASING ELEV.: 669.69
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 6/5/2019 2:10:00 PM
END DATE/TIME: 6/5/2019 2:35:00 PM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	silty SAND- fine, brown to light brown, some organics			RS			0' to 1.7': (SM) silty SAND, fine, brown, some organics, poorly graded, non-cohesive, dry.		Bentonite Chips 0-6 ft bgs
				RS			1.7' to 2.8': silty SAND, fine, brown to light brown, poorly graded, cohesive, moist.		
	SAND- fine to coarse, light brown			RS			2.8' to 3.7': (SW) SAND, fine to medium, light brown, well-graded, non-cohesive, moist.		
				RS			3.7' to 4.7': (SP-SM) SAND, fine to coarse, light brown, some silt, poorly graded, non-cohesive, wet.		
660.0				RS			7' to 8.75': (SW) SAND, fine to medium, light brown, well-graded, non-cohesive, wet.		#5 Sand Filter Pack 6-18 ft bgs 2" PVC Screen slot 0.010 8-18 ft bgs
				RS			8.75' to 11': (SW) SAND, fine to coarse, light brown, well-graded, non-cohesive, wet.		
655.0	sandy SILT- fine to medium, tan			RS			11' to 12.5': (ML) sandy SILT, fine to medium, tan, poorly graded, non-cohesive, wet.		
				RS			12.5' to 13.5': (SW-SM) SAND, fine to medium, light brown, some silt, well-graded, non-cohesive, wet.		
	SAND- fine to coarse, brown to gray, trace gravel, trace silt			RS			13.5' to 13.75': (SW) SAND, fine to coarse, light brown, well-graded, non-cohesive, wet.		
650.0							17' to 18': (SP) SAND, fine to coarse, brown, trace fine gravel, trace silt, poorly graded, non-cohesive, wet.		
	Note: Geology contacts are assumed and based on boring AT-01			RS					
645.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)
USCS Poorly-graded Sand (SP)
USCS Well-graded Sand (SW)
USCS Sandy Silt (MLS)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: CRH
DATE: 5/6/20

GOLDER

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 5/8/20

BOREHOLE LOG: GAMW-18

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 15
DEPTH TO BEDROCK:

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171919.782 E: 2971272.405
GROUND SURFACE ELEV.: 666.04
TOP OF CASING ELEV.: 669.07
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 55
START DATE/TIME: 5/24/2016 11:12:00 AM
END DATE/TIME: 5/24/2016 11:28:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	FILL- dark brown SAND, trace fly ash/ boiler slag, trace organics, trace silt		1	SS		2 / 2	0-2': SAND, fine to medium; poorly-graded; dark brown; trace fly ash/boiler slag, trace organics, trace silt, moist, loose. (FILL) SPTs (3-3-3-3)		Bentonite grout mix 0-1 ft-bgs Bentonite chips 1-3 ft-bgs Filter Pack #5 Sand 3-15 ft-bgs 2 PVC Screen slot 0.010 5-15 ft-bgs
660.0	brown fine SAND, trace silt		2	SS		2 / 2	5-6.1': SAND, fine to medium, poorly-graded; dark brown; trace fly ash/ boiler slag, trace organics, trace silt, moist, loose. (FILL) 6.1-7': SAND; fine, poorly-graded; brown; trace silt, moist, loose. (SP) SPTs (2-4-5-6)		
655.0			3	SS		1.3 / 2	10-12': SAND; fine, poorly-graded; brown; trace silt, wet, loose. (SP) SPTs (2-4-4-7)		
650.0									
645.0									

LITHOLOGY LEGEND

Fill (made ground)

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Earth Exploration
DRILLER: Doug Carlson
DRILL RIG: CME 55

LOGGED BY: HV
CHECKED BY: JMR
DATE: 3/22/17

GOLDER

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 5/8/20

BOREHOLE LOG: GAMW-18B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 36
DEPTH TO BEDROCK: 35

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171910.003 E: 2971272.53
GROUND SURFACE ELEV.: 665.94
TOP OF CASING ELEV.: 668.45
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/26/2018 9:35:00 AM
END DATE/TIME: 7/26/2018 10:35:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
665.0	dark brown SILTY SAND, some organics			RS			0-1.7': SILTY SAND, well-graded, dark brown, some organics, dry. (SM)		Bentonite Grout 0-21 ft bgs
	orange to dark brown fine SAND, some silt			RS			1.7-2.3': SAND, fine, poorly-graded, orange to dark brown, some silt, moist. (SP)		
	light brown fine to medium SAND			RS			2.3-4.2': SAND, fine to medium, well-graded, light brown, moist. (SW)		
660.0				RS			5-7.4': SAND, fine to medium, well-graded, light brown, wet. (SW)		
	light brown fine CLAYEY SAND			RS			7.4-8.75': CLAYEY SAND, fine, poorly-graded, light brown, cohesive, wet. (SC)		
655.0				RS			10-13': CLAYEY SAND, fine, poorly-graded, light brown, cohesive, wet. (SC)		
	light brown to light gray fine to coarse SAND, trace to some gravel			RS			13-13.7': SAND, fine to coarse, well-graded, light brown, wet. (SW)		
				RS			13.7-14.8': SAND, medium to coarse, well-graded, light brown, some rounded gravel <1 inch, some fine sand, wet. (SW)		
650.0				RS			16-20': SAND, fine to coarse, well-graded, light brown, some rounded gravel <1 inch, wet. (SW)		
645.0				RS			20-23.7': SAND, medium to coarse, well-graded, light brown, some rounded gravel <1 inch, little fine sand, wet. (SW)		Bentonite Chips 21-23 ft bgs #5 Sand Filter Pack 23-35 ft bgs
				RS					

LITHOLOGY LEGEND

USCS Silty Sand (SM)
USCS Clayey Sand (SC)
USCS Poorly-graded Sand (SP)
Shale
USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/12/18

GOLDER

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 5/8/20

BOREHOLE LOG: GAMW-18B

PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 36
DEPTH TO BEDROCK: 35

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2171910.003 E: 2971272.53
GROUND SURFACE ELEV.: 665.94
TOP OF CASING ELEV.: 668.45
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: ROTOSONIC
CORING METHOD:
DRILL RIG: SDC500-28EA
START DATE/TIME: 7/26/2018 9:35:00 AM
END DATE/TIME: 7/26/2018 10:35:00 AM

Depth Elev.	LITHOLOGY DESCRIPTION	Graphical Log	SAMPLE INFORMATION: Sample No. Or Run No.	Type	PID (ppm)	Soil Rec./Att. Or Core Rec. %	Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description)	Well Graphic	Well Construction Information
640.0	light brown to light gray fine to coarse SAND, trace to some gravel			RS			24-24.9': SAND, medium to coarse, well-graded, light brown, some rounded gravel <1 inch, some fine sand, wet. (SW)		2" PVC Screen slot 0.010 25-35 ft bgs
				RS			24.9-25.3': SAND, medium to coarse, well-graded, light gray, some rounded gravel <1 inch, trace fine sand, wet. (SW)		
							25.3-28': SAND, fine to coarse, well-graded, light gray, trace rounded gravel, wet. (SW)		
635.0				RS			28-32': SAND, fine to coarse, well-graded, light gray, trace rounded gravel, wet. (SW)		
			SB-18B-32'-34'	RS			32-33.75': SAND, fine to coarse, well-graded, light gray, wet. (SW)		
	light gray SHALE			RS		2 / 1	35-35.5': SHALE, light gray, wet, little weathering.		#5 Sand 35-36 ft bgs
630.0	light gray clayey SHALE						35.5-36': CLAYEY SHALE, light gray, wet, little weathering.		
625.0									
620.0									

LITHOLOGY LEGEND

USCS Silty Sand (SM)
USCS Clayey Sand (SC)
USCS Poorly-graded Sand (SP)
Shale
USCS Well-graded Sand (SW)

DRILLING COMPANY: Layne
DRILLER: K. Fehrman
DRILL RIG: SDC500-28EA

LOGGED BY: DFS
CHECKED BY: KMC
DATE: 11/12/18

GOLDER

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 5/8/20

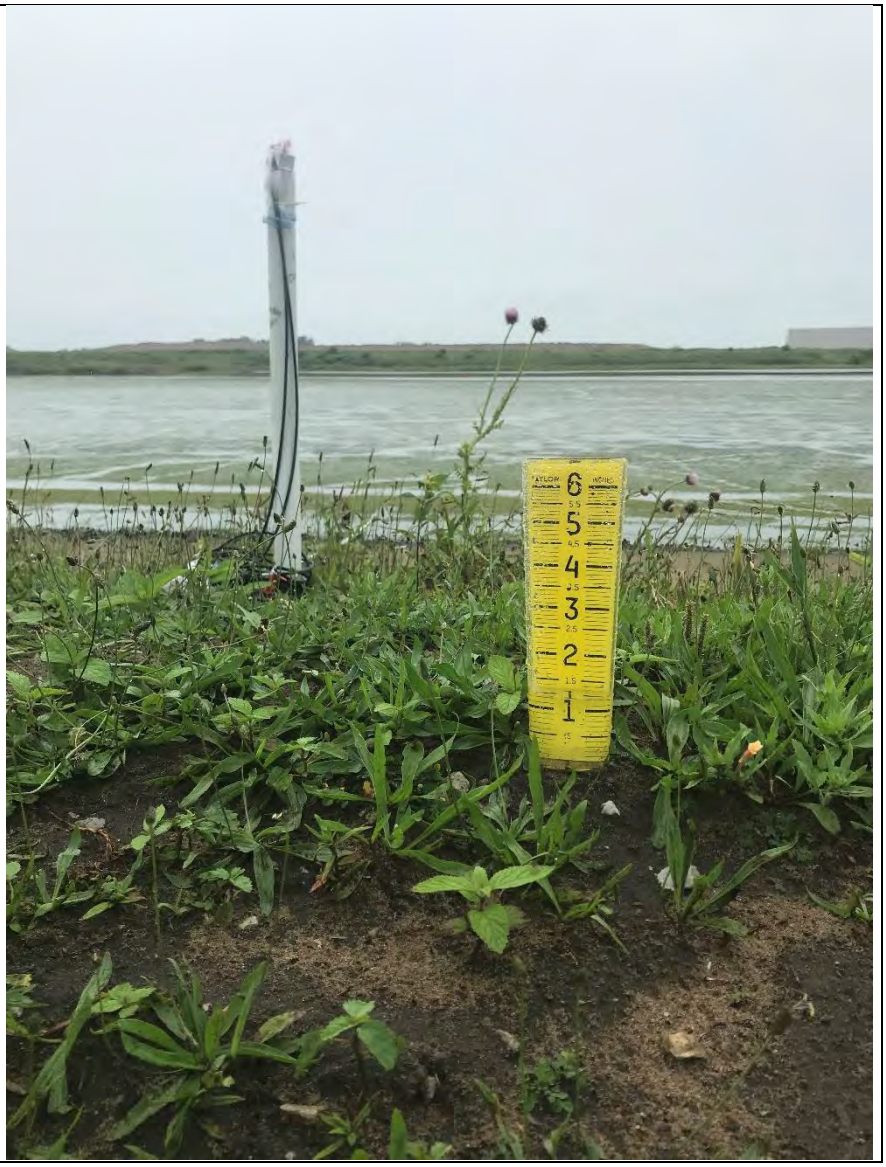
APPENDIX D

Photograph Log

PHOTO 1 View of piezometer OW-10 located east of the Metal Cleaning Waste Basin and metal plates used to cover a trench used to protect the discharge line. View is to the east.	
PHOTO 2 View of pumping well AT-01 and discharge hose. View is to the south.	

PHOTO 3 View of the digital flow meter used during the aquifer test.	

PHOTO 4 View of the aquifer test water discharging into the southeast corner of the Material Storage Runoff Basin. View is to the northwest.	

PHOTO 5 View of the rain gauge placed near piezometer OW-9, located east of the Metal Cleaning Waste Basin. View is to the west.	

APPENDIX E

Aquifer Test Analyses

APPENDIX E-1
THEIS ANALYSIS
TIME DRAWDOWN DATA WELL AT-01
PUMPING WELL AT-01

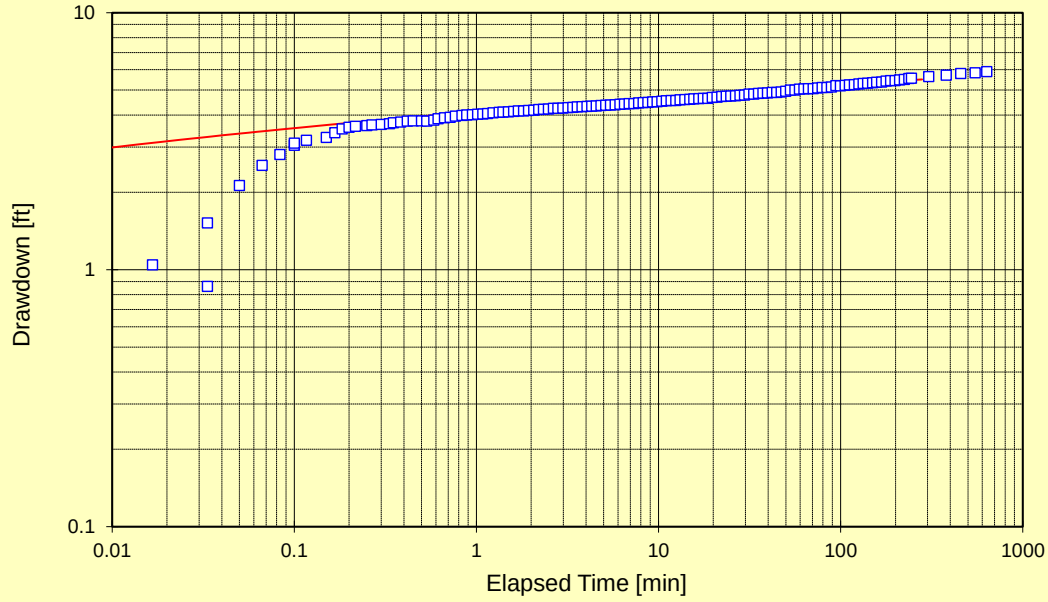
$$s = \frac{Q}{4\pi Kb} W(u) \qquad u = \frac{r^2 S}{4 Kbt}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
K = Horizontal hydraulic conductivity [L/T]
T = Coefficient of transmissivity [L^2/T]
b = Aquifer thickness [L]
r = Distance to pumping well [L]
t = time [T]
S = Storativity [dim]

TEST PARAMETERS		
Q =	163.28	GPM
r =	0.5	Ft
b =	30.0	Ft
MATCH POINT VALUES		
s =	0.25	Ft
t =	0.00	Min
1/u =	1	
W(u) =	1	

RESULTS		
T =	7.64E+04	gpd/ft
T =	1.02E+04	ft^2/day
S =	2.38565E-05	
K =	340.35	ft/day
K =	1.20E-01	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19
Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

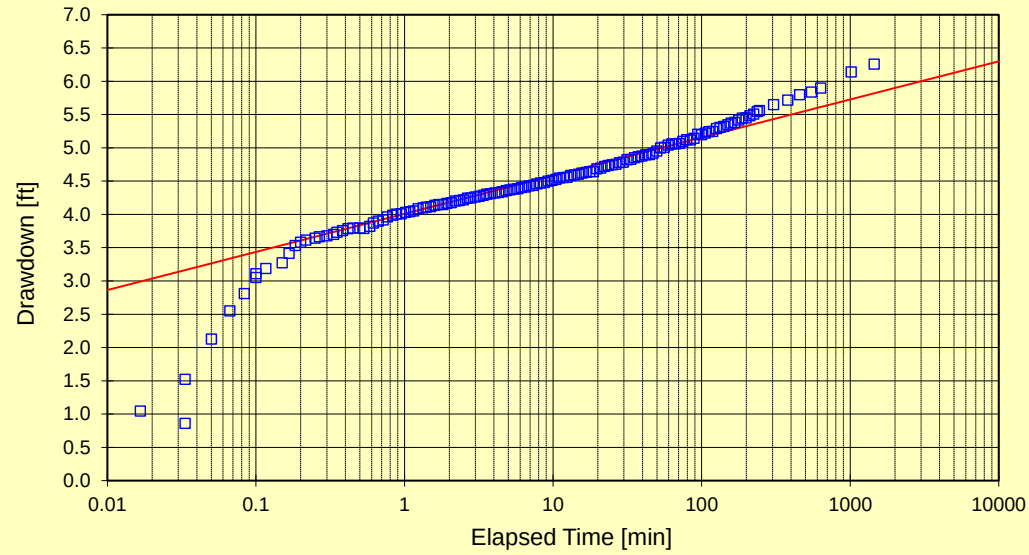
APPENDIX E-2
JACOB ANALYSIS
TIME DRAWDOWN DATA WELL AT-01
PUMPING WELL AT-01

$$T = \frac{264\ Q}{\Delta s} \qquad S = \frac{0.3\,T t_o}{r^2}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
T = Transmissivity [L^2/T]
S = Storativity [dim]
r = Distance from pumping well [L]
t_0 = Projected time for s = 0 [T]

INPUT PARAMETERS			RESULTS		
Δs =	0.57	Ft	T = 7.53E+04		gpd/ft
b =	30.0	Ft	T = 1.01E+04		ft^2/day
Q =	163.28	GPM	S = 6.30E-06		
r =	0.5	Ft	K = 335.40		ft/day
t_0 =	1.00E-07	Min	K = 1.18E-01		cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

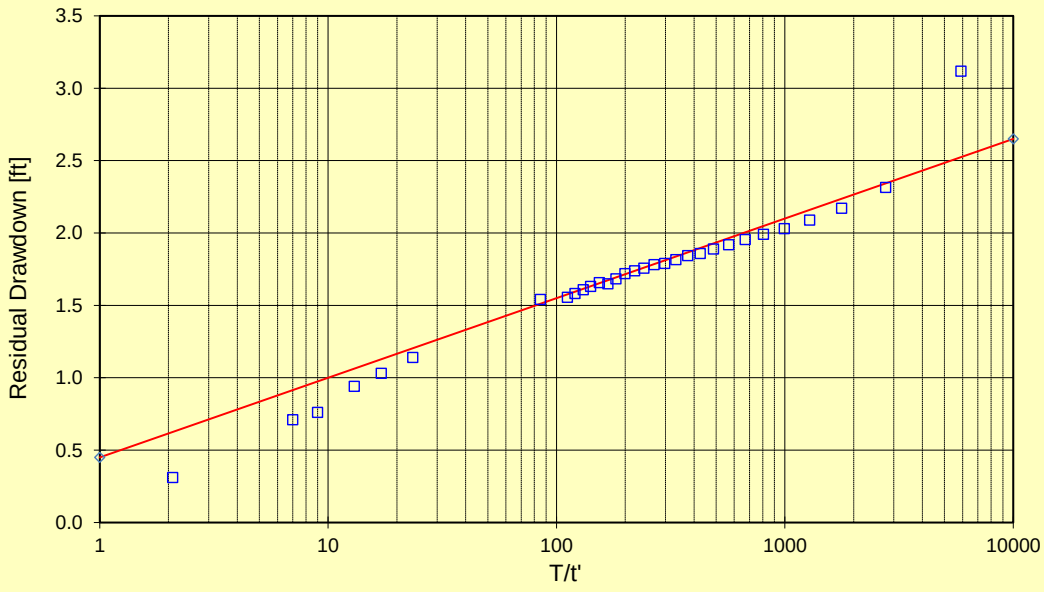
APPENDIX E-3
THEIS RECOVERY ANALYSIS
TIME DRAWDOWN DATA WELL AT-01
PUMPING WELL AT-01

$$T = \frac{264\ Q}{\Delta s'}$$

where:

$\Delta s'$ = Residual Drawdown for one log cycle [L]
Q = Pumping rate [L^3/T]
b = Aquifer thickness [L]
T = Transmissivity [L^2/T]
K = Horizontal hydraulic conductivity [L/T]
t = time since pump turned on [T]
t' = time since pump turned off [T]

INPUT PARAMETERS			RESULTS		
$\Delta s'$ =	0.55	Ft	T =	7.84E+04	gpd/ft
Q =	163.28	GPM	T =	1.05E+04	ft^2/day
b =	30.0	Ft	K =	349.26	ft/day
			K =	1.23E-01	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

APPENDIX E-4
THEIS ANALYSIS
TIME DRAWDOWN DATA WELL OW-1
PUMPING WELL AT-01

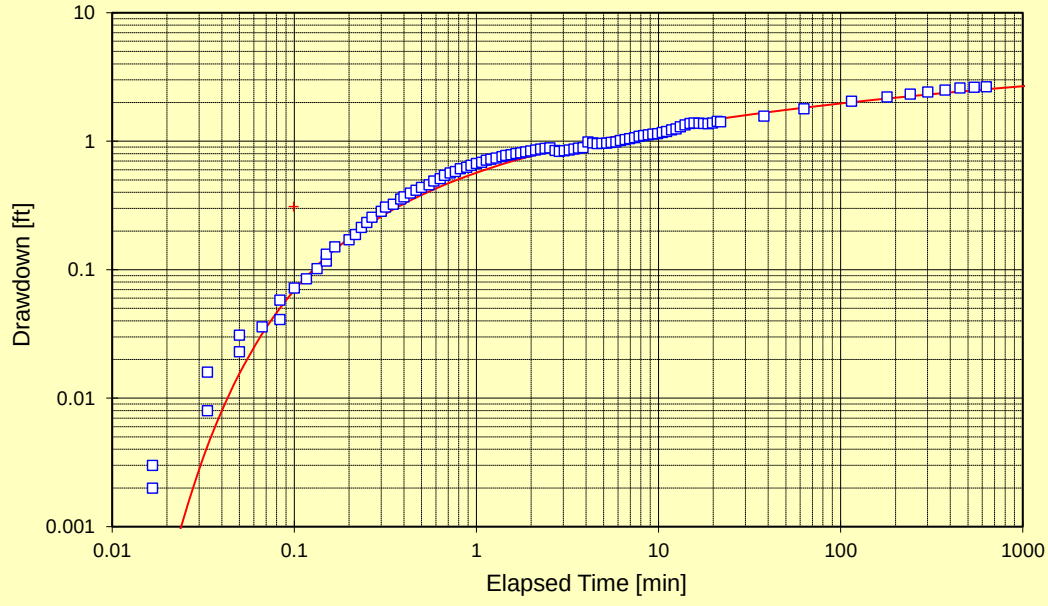
$$s = \frac{Q}{4\pi Kb} W(u) \qquad u = \frac{r^2 S}{4 Kbt}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
K = Horizontal hydraulic conductivity [L/T]
T = Coefficient of transmissivity [L^2/T]
b = Aquifer thickness [L]
r = Distance to pumping well [L]
t = time [T]
S = Storativity [dim]

TEST PARAMETERS		
Q =	163.28	GPM
r =	0.5	Ft
b =	30.0	Ft
MATCH POINT VALUES		
s =	0.31	Ft
t =	0.10	Min
1/u =	1	
W(u) =	1	

RESULTS		
T =	6.04E+04	gpd/ft
T =	8.07E+03	ft^2/day
S =	66.66340892	
K =	268.99	ft/day
K =	9.49E-02	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19
Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

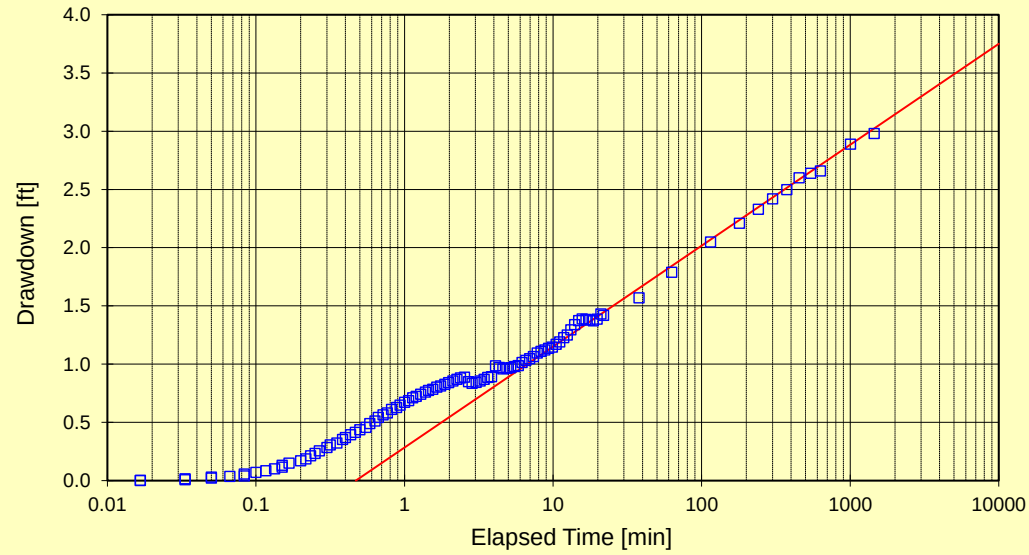
APPENDIX E-5
JACOB ANALYSIS
TIME DRAWDOWN DATA WELL OW-1
PUMPING WELL AT-01

$$T = \frac{264\ Q}{\Delta s} \qquad S = \frac{0.3\,T t_o}{r^2}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
T = Transmissivity [L^2/T]
S = Storativity [dim]
r = Distance from pumping well [L]
t_0 = Projected time for s = 0 [T]

INPUT PARAMETERS			RESULTS		
Δs =	0.87	Ft	T = 4.97E+04		gpd/ft
b =	30.0	Ft	T = 6.65E+03		ft^2/day
Q =	163.28	GPM	S = 1.96E+01		
r =	0.5	Ft	K = 221.70		ft/day
t_0 =	4.70E-01	Min	K = 7.82E-02		cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

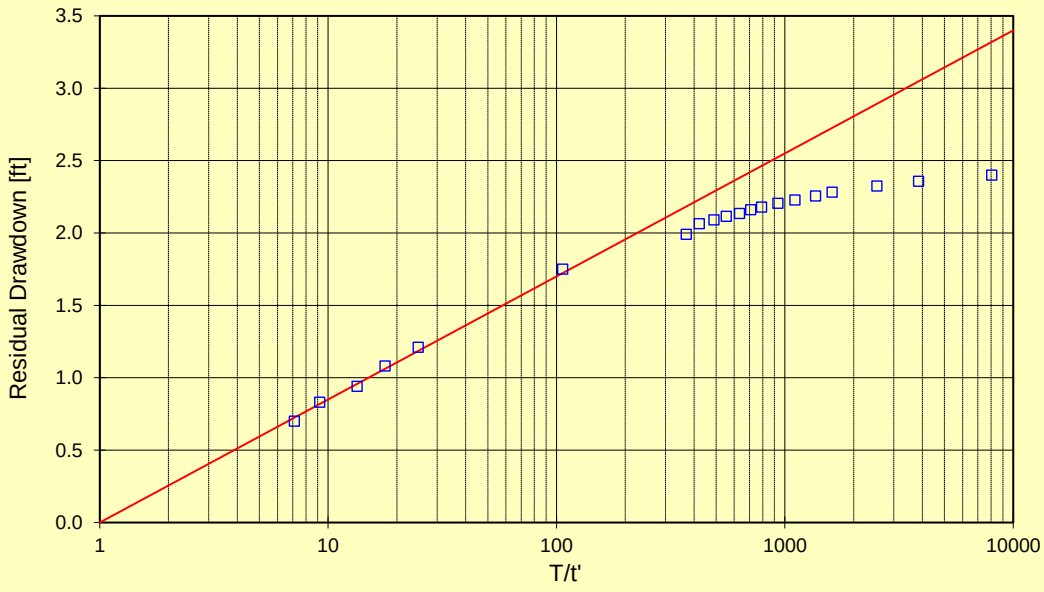
APPENDIX E-6
THEIS RECOVERY ANALYSIS
TIME DRAWDOWN DATA WELL OW-1
PUMPING WELL AT-01

$$T = \frac{264\ Q}{\Delta s'}$$

where:

$\Delta s'$ = Residual Drawdown for one log cycle [L]
Q = Pumping rate [L^3/T]
b = Aquifer thickness [L]
T = Transmissivity [L^2/T]
K = Horizontal hydraulic conductivity [L/T]
t = time since pump turned on [T]
t' = time since pump turned off [T]

INPUT PARAMETERS			RESULTS		
$\Delta s'$ =	0.85	Ft	T =	5.07E+04	gpd/ft
Q =	163.28	GPM	T =	6.78E+03	ft^2/day
b =	30.0	Ft	K =	225.99	ft/day
			K =	7.97E-02	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

APPENDIX E-7
THEIS ANALYSIS
TIME DRAWDOWN DATA WELL OW-2
PUMPING WELL AT-01

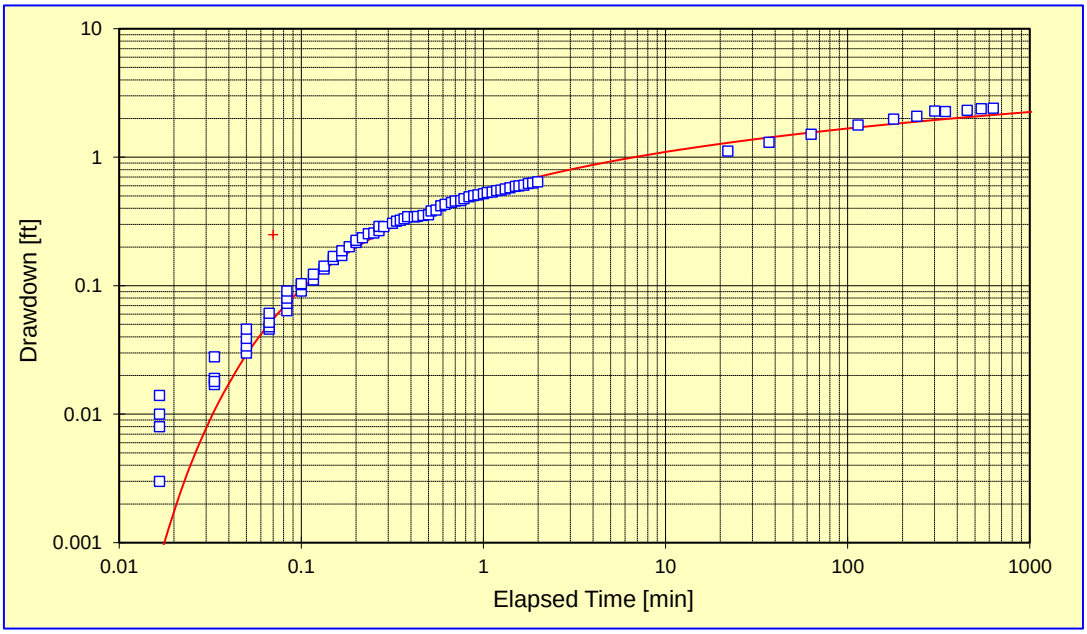
$$s = \frac{Q}{4\pi Kb} W(u) \qquad u = \frac{r^2 S}{4 Kbt}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
K = Horizontal hydraulic conductivity [L/T]
T = Coefficient of transmissivity [L^2/T]
b = Aquifer thickness [L]
r = Distance to pumping well [L]
t = time [T]
S = Storativity [dim]

TEST PARAMETERS		
Q =	163.28	GPM
r =	35.7	Ft
b =	30.0	Ft
MATCH POINT VALUES		
s =	0.25	Ft
t =	0.07	Min
1/u =	1	
W(u) =	1	

RESULTS		
T =	7.48E+04	gpd/ft
T =	1.00E+04	ft^2/day
S =	0.011406443	
K =	333.55	ft/day
K =	1.18E-01	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19
Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

APPENDIX E-8
JACOB ANALYSIS
TIME DRAWDOWN DATA WELL OW-2
PUMPING WELL AT-01

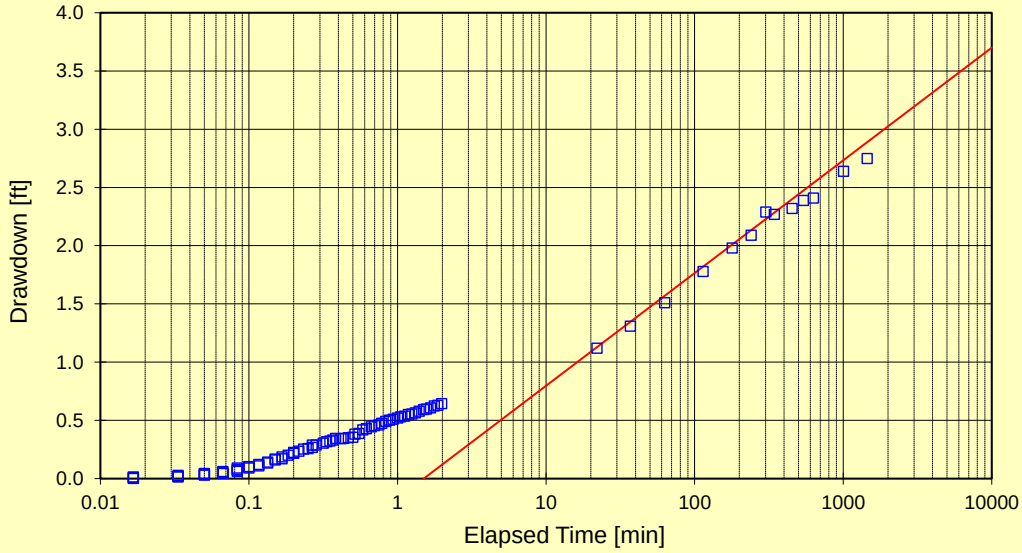
$$T = \frac{264\ Q}{\Delta s} \qquad S = \frac{0.3\,T t_o}{r^2}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
T = Transmissivity [L^2/T]
S = Storativity [dim]
r = Distance from pumping well [L]
t_0 = Projected time for s = 0 [T]

INPUT PARAMETERS		
Δs =	0.97	Ft
b =	30.0	Ft
Q =	163.28	GPM
r =	35.7	Ft
t_0 =	1.50E+00	Min

RESULTS		
T =	4.45E+04	gpd/ft
T =	5.96E+03	ft^2/day
S =	1.09E-02	
K =	198.53	ft/day
K =	7.00E-02	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

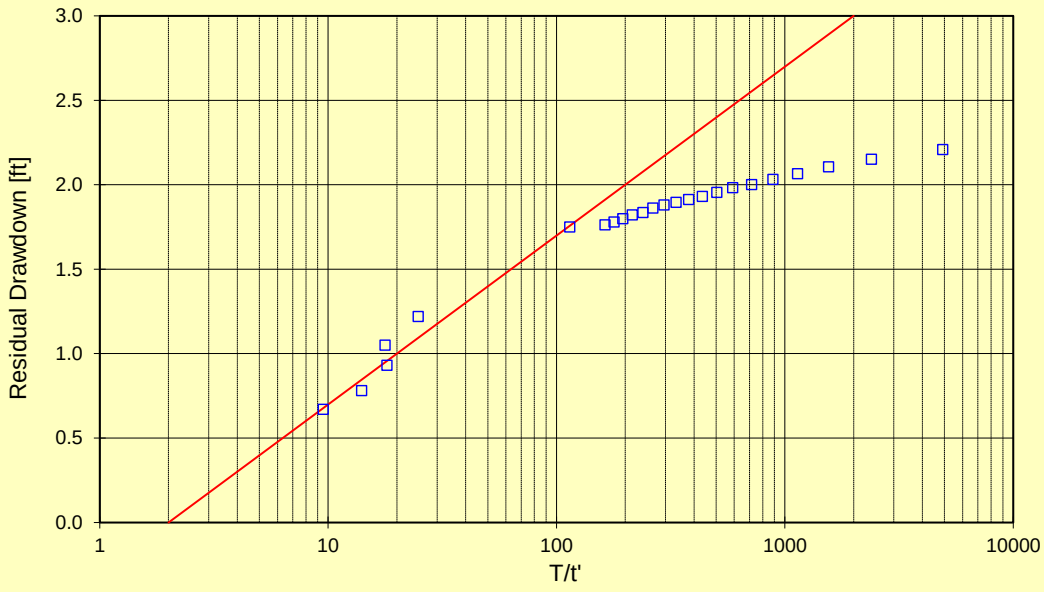
APPENDIX E-9
THEIS RECOVERY ANALYSIS
TIME DRAWDOWN DATA WELL OW-2
PUMPING WELL AT-01

$$T = \frac{264\ Q}{\Delta s'}$$

where:

$\Delta s'$ = Residual Drawdown for one log cycle [L]
Q = Pumping rate [L^3/T]
b = Aquifer thickness [L]
T = Transmissivity [L^2/T]
K = Horizontal hydraulic conductivity [L/T]
t = time since pump turned on [T]
t' = time since pump turned off [T]

INPUT PARAMETERS			RESULTS		
$\Delta s'$ =	1.00	Ft	T =	4.31E+04	gpd/ft
Q =	163.28	GPM	T =	5.76E+03	ft^2/day
b =	30.0	Ft	K =	192.09	ft/day
			K =	6.78E-02	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

APPENDIX E-10
THEIS ANALYSIS
TIME DRAWDOWN DATA WELL OW-2B
PUMPING WELL AT-01

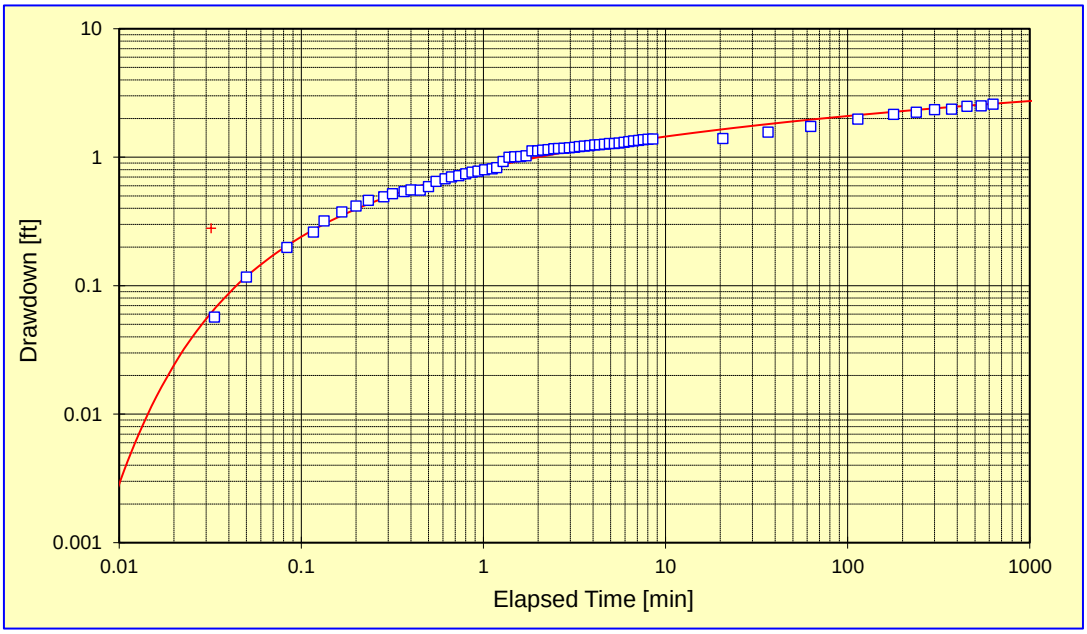
$$s = \frac{Q}{4\pi Kb} W(u) \qquad u = \frac{r^2 S}{4 Kbt}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
K = Horizontal hydraulic conductivity [L/T]
T = Coefficient of transmissivity [L^2/T]
b = Aquifer thickness [L]
r = Distance to pumping well [L]
t = time [T]
S = Storativity [dim]

TEST PARAMETERS		
Q =	163.28	GPM
r =	36.0	Ft
b =	30.0	Ft
MATCH POINT VALUES		
s =	0.28	Ft
t =	0.03	Min
1/u =	1	
W(u) =	1	

RESULTS		
T =	6.68E+04	gpd/ft
T =	8.93E+03	ft^2/day
S =	0.004588648	
K =	297.81	ft/day
K =	1.05E-01	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19
Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

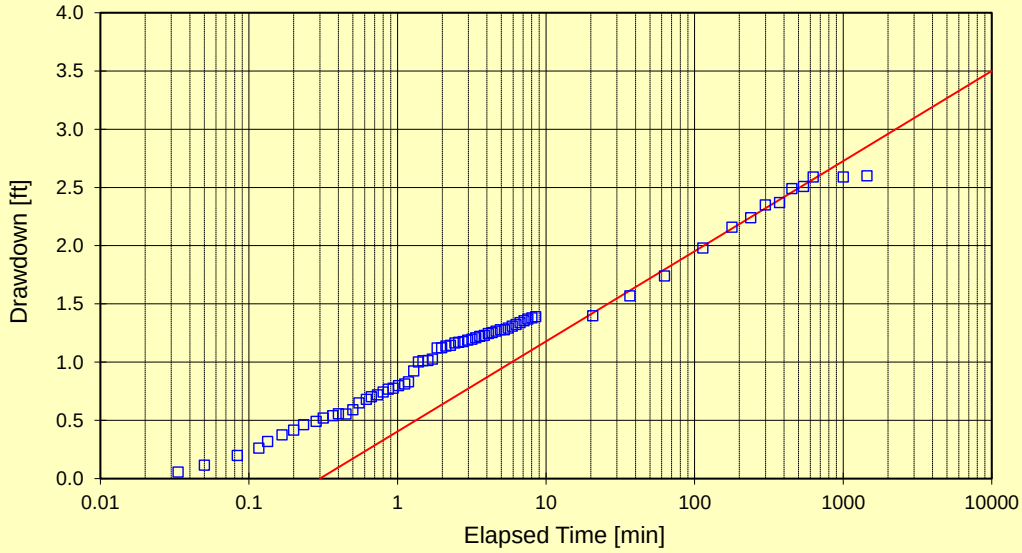
APPENDIX E-11
JACOB ANALYSIS
TIME DRAWDOWN DATA WELL OW-2B
PUMPING WELL AT-01

$$T = \frac{264\ Q}{\Delta s} \qquad S = \frac{0.3\,T t_o}{r^2}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
T = Transmissivity [L^2/T]
S = Storativity [dim]
r = Distance from pumping well [L]
t_0 = Projected time for s = 0 [T]

INPUT PARAMETERS			RESULTS		
Δs =	0.77	Ft	T =	5.57E+04	gpd/ft
b =	30.0	Ft	T =	7.45E+03	ft^2/day
Q =	163.28	GPM	S =	2.69E-03	
r =	36.0	Ft	K =	248.23	ft/day
t_0 =	3.00E-01	Min	K =	8.76E-02	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

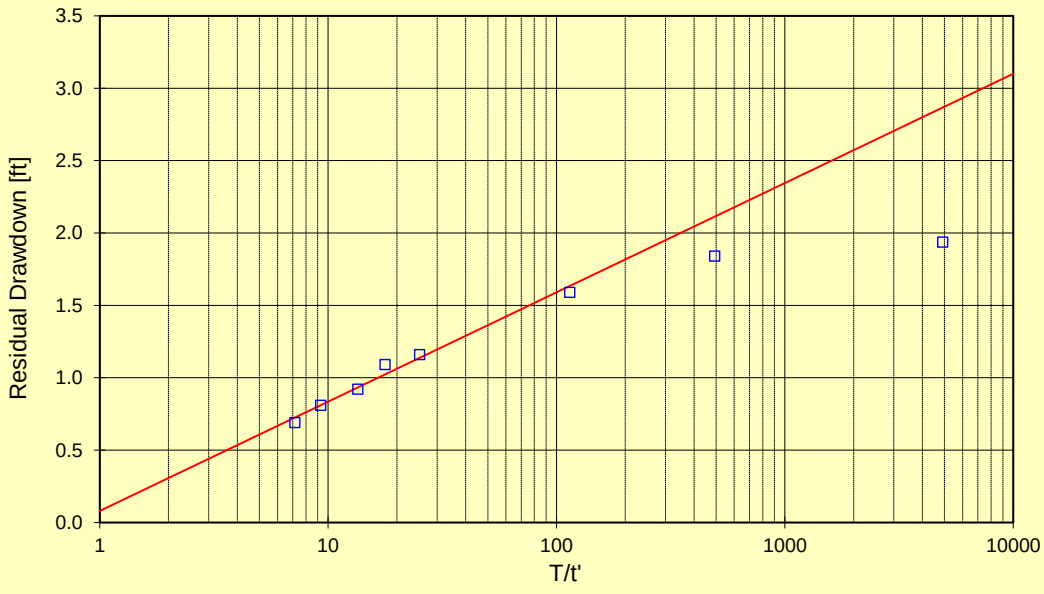
APPENDIX E-12
THEIS RECOVERY ANALYSIS
TIME DRAWDOWN DATA WELL OW-2B
PUMPING WELL AT-01

$$T = \frac{264\ Q}{\Delta s'}$$

where:

$\Delta s'$ = Residual Drawdown for one log cycle [L]
Q = Pumping rate [L^3/T]
b = Aquifer thickness [L]
T = Transmissivity [L^2/T]
K = Horizontal hydraulic conductivity [L/T]
t = time since pump turned on [T]
t' = time since pump turned off [T]

INPUT PARAMETERS			RESULTS		
$\Delta s'$ =	0.76	Ft	T =	5.71E+04	gpd/ft
Q =	163.28	GPM	T =	7.63E+03	ft^2/day
b =	30.0	Ft	K =	254.43	ft/day
			K =	8.97E-02	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

APPENDIX E-13
THEIS ANALYSIS
TIME DRAWDOWN DATA WELL OW-3
PUMPING WELL AT-01

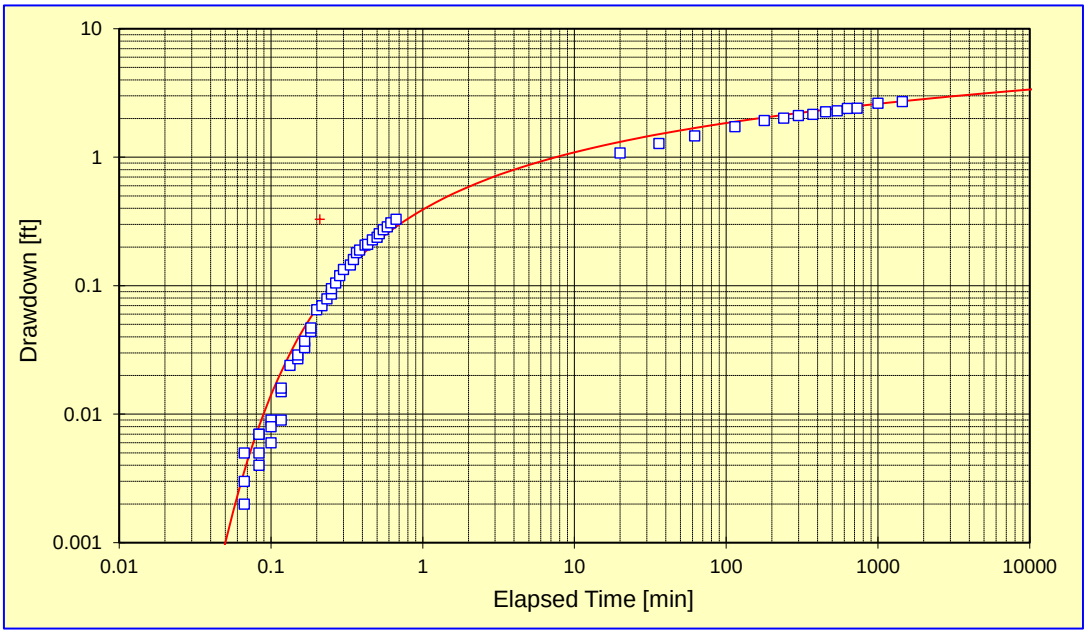
$$s = \frac{Q}{4\pi Kb} W(u) \qquad u = \frac{r^2 S}{4 Kbt}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
K = Horizontal hydraulic conductivity [L/T]
T = Coefficient of transmissivity [L^2/T]
b = Aquifer thickness [L]
r = Distance to pumping well [L]
t = time [T]
S = Storativity [dim]

TEST PARAMETERS		
Q =	163.28	GPM
r =	49.9	Ft
b =	30.0	Ft
MATCH POINT VALUES		
s =	0.33	Ft
t =	0.21	Min
1/u =	1	
W(u) =	1	

RESULTS		
T =	5.67E+04	gpd/ft
T =	7.58E+03	ft^2/day
S =	0.013294364	
K =	252.69	ft/day
K =	8.91E-02	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19
Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

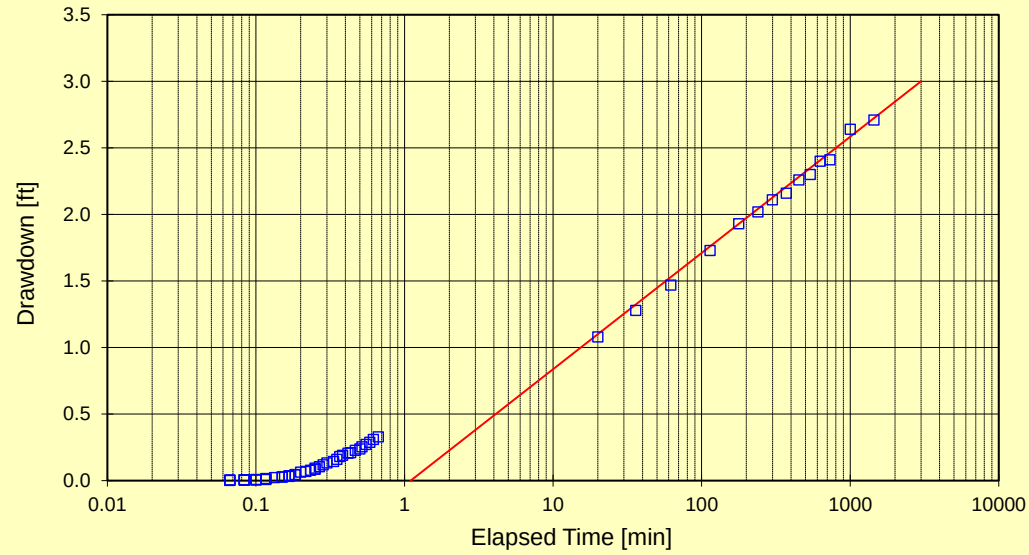
APPENDIX E-14
JACOB ANALYSIS
TIME DRAWDOWN DATA WELL OW-3
PUMPING WELL AT-01

$$T = \frac{264\ Q}{\Delta s} \qquad S = \frac{0.3\,T t_o}{r^2}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
T = Transmissivity [L^2/T]
S = Storativity [dim]
r = Distance from pumping well [L]
t_0 = Projected time for s = 0 [T]

INPUT PARAMETERS			RESULTS		
Δs =	0.87	Ft	T =	4.94E+04	gpd/ft
b =	30.0	Ft	T =	6.60E+03	ft^2/day
Q =	163.28	GPM	S =	4.55E-03	
r =	49.9	Ft	K =	219.99	ft/day
t_0 =	1.10E+00	Min	K =	7.76E-02	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

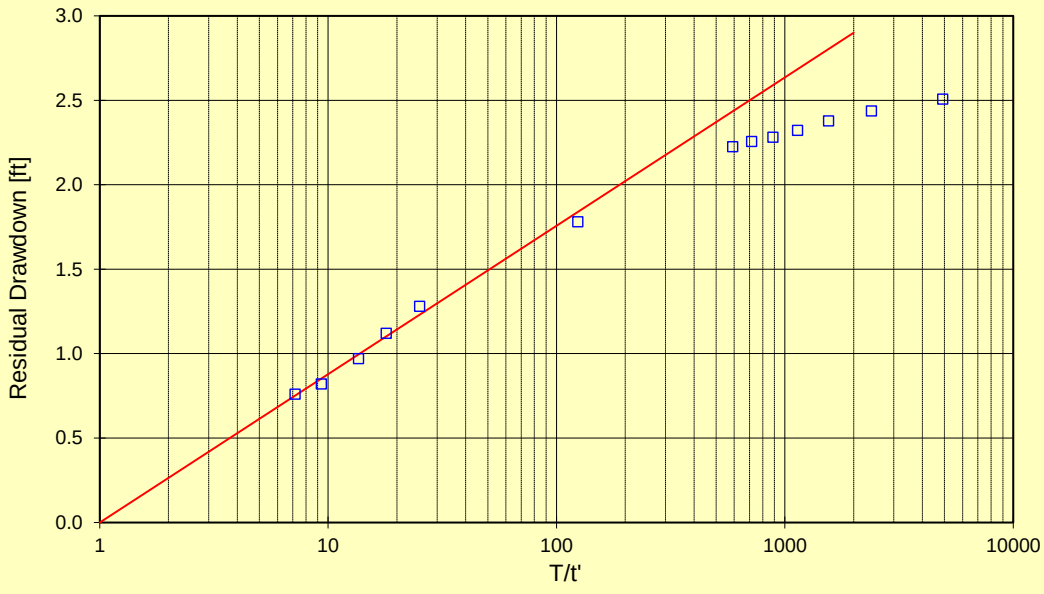
APPENDIX E-15
THEIS RECOVERY ANALYSIS
TIME DRAWDOWN DATA WELL OW-3
PUMPING WELL AT-01

$$T = \frac{264\ Q}{\Delta s'}$$

where:

$\Delta s'$ = Residual Drawdown for one log cycle [L]
Q = Pumping rate [L^3/T]
b = Aquifer thickness [L]
T = Transmissivity [L^2/T]
K = Horizontal hydraulic conductivity [L/T]
t = time since pump turned on [T]
t' = time since pump turned off [T]

INPUT PARAMETERS			RESULTS		
$\Delta s'$ =	0.88	Ft	T =	4.91E+04	gpd/ft
Q =	163.28	GPM	T =	6.56E+03	ft^2/day
b =	30.0	Ft	K =	218.66	ft/day
			K =	7.71E-02	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

APPENDIX E-16
THEIS ANALYSIS
TIME DRAWDOWN DATA WELL OW-4
PUMPING WELL AT-01

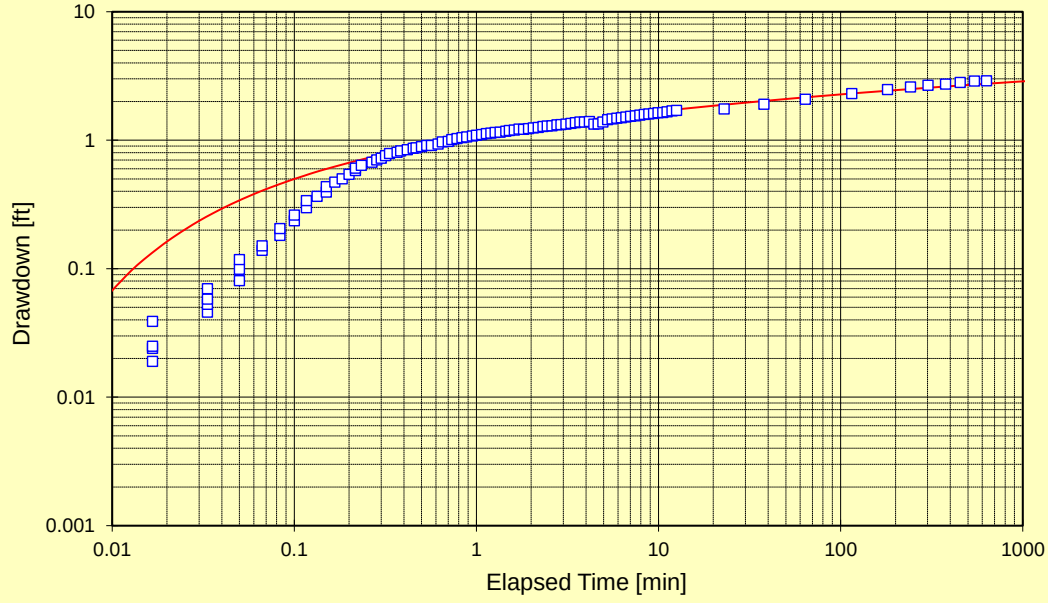
$$s = \frac{Q}{4\pi Kb} W(u) \qquad u = \frac{r^2 S}{4 Kbt}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
K = Horizontal hydraulic conductivity [L/T]
T = Coefficient of transmissivity [L^2/T]
b = Aquifer thickness [L]
r = Distance to pumping well [L]
t = time [T]
S = Storativity [dim]

TEST PARAMETERS		
Q =	163.28	GPM
r =	14.4	Ft
b =	30.0	Ft
MATCH POINT VALUES		
s =	0.26	Ft
t =	0.01	Min
1/u =	1	
W(u) =	1	

RESULTS		
T =	7.20E+04	gpd/ft
T =	9.62E+03	ft^2/day
S =	0.008676794	
K =	320.72	ft/day
K =	1.13E-01	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19
Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

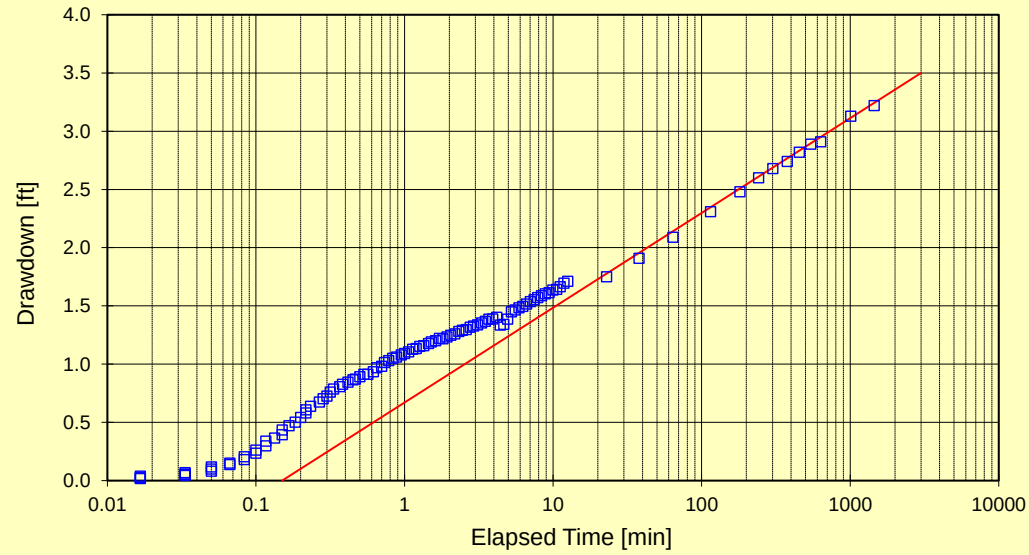
APPENDIX E-17
JACOB ANALYSIS
TIME DRAWDOWN DATA WELL OW-4
PUMPING WELL AT-01

$$T = \frac{264\ Q}{\Delta s} \qquad S = \frac{0.3\,T t_o}{r^2}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
T = Transmissivity [L^2/T]
S = Storativity [dim]
r = Distance from pumping well [L]
t_0 = Projected time for s = 0 [T]

INPUT PARAMETERS			RESULTS		
Δs =	0.81	Ft	T = 5.30E+04		gpd/ft
b =	30.0	Ft	T = 7.08E+03		ft^2/day
Q =	163.28	GPM	S = 7.98E-03		
r =	14.4	Ft	K = 236.06		ft/day
t_0 =	1.50E-01	Min	K = 8.33E-02		cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

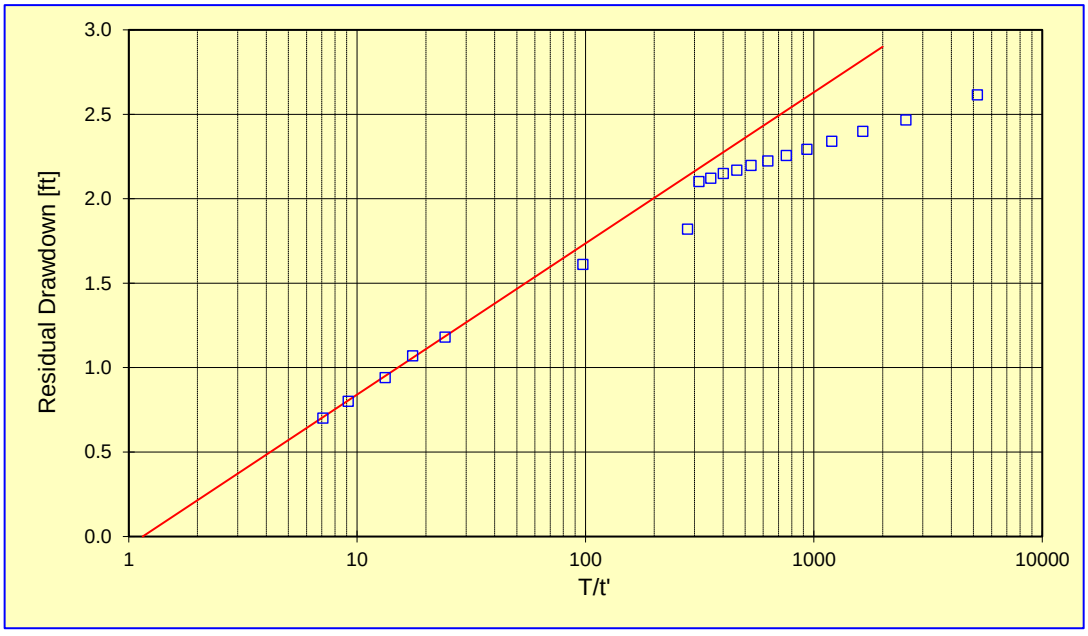
APPENDIX E-18
THEIS RECOVERY ANALYSIS
TIME DRAWDOWN DATA WELL OW-4
PUMPING WELL AT-01

$$T = \frac{264\ Q}{\Delta s'}$$

where:

$\Delta s'$ = Residual Drawdown for one log cycle [L]
Q = Pumping rate [L^3/T]
b = Aquifer thickness [L]
T = Transmissivity [L^2/T]
K = Horizontal hydraulic conductivity [L/T]
t = time since pump turned on [T]
t' = time since pump turned off [T]

INPUT PARAMETERS			RESULTS		
$\Delta s'$ =	0.89	Ft	T =	4.82E+04	gpd/ft
Q =	163.28	GPM	T =	6.44E+03	ft^2/day
b =	30.0	Ft	K =	214.64	ft/day
			K =	7.57E-02	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

APPENDIX E-19
THEIS ANALYSIS
TIME DRAWDOWN DATA WELL OW-5
PUMPING WELL AT-01

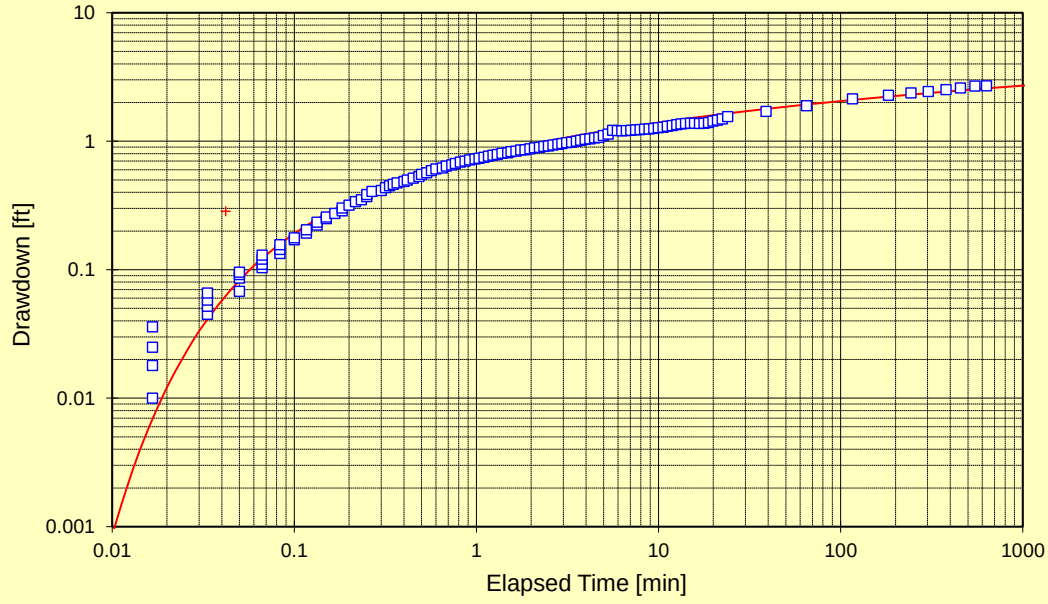
$$s = \frac{Q}{4\pi Kb} W(u) \qquad u = \frac{r^2 S}{4 Kbt}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
K = Horizontal hydraulic conductivity [L/T]
T = Coefficient of transmissivity [L^2/T]
b = Aquifer thickness [L]
r = Distance to pumping well [L]
t = time [T]
S = Storativity [dim]

TEST PARAMETERS		
Q =	163.28	GPM
r =	24.8	Ft
b =	30.0	Ft
MATCH POINT VALUES		
s =	0.29	Ft
t =	0.04	Min
1/u =	1	
W(u) =	1	

RESULTS		
T =	6.57E+04	gpd/ft
T =	8.78E+03	ft^2/day
S =	0.012494482	
K =	292.58	ft/day
K =	1.03E-01	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pump Test
Project No.: 164817101
Test Date: 06/26/19
Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

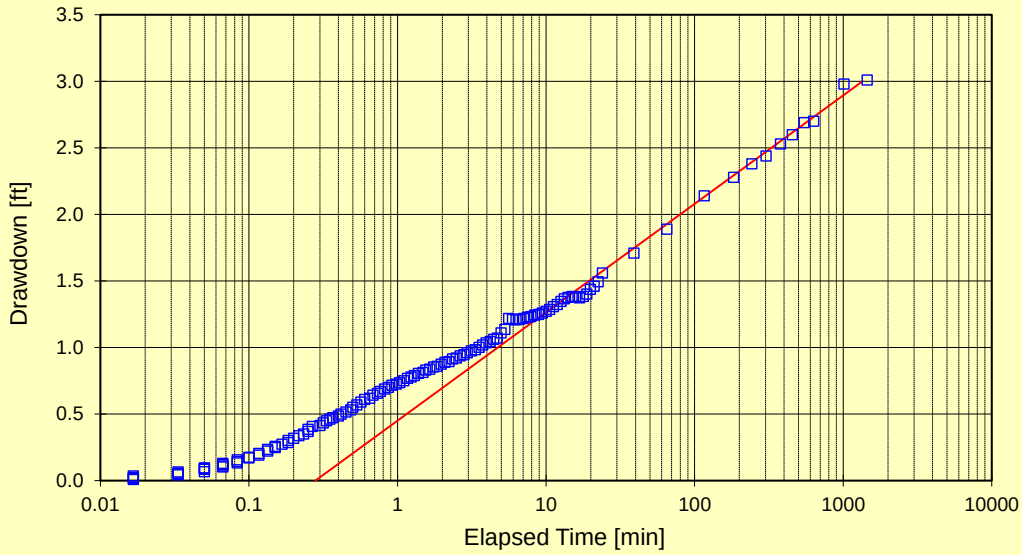
APPENDIX E-20
JACOB ANALYSIS
TIME DRAWDOWN DATA WELL OW-5
PUMPING WELL AT-01

$$T = \frac{264\ Q}{\Delta s} \qquad S = \frac{0.3\,T t_o}{r^2}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
T = Transmissivity [L^2/T]
S = Storativity [dim]
r = Distance from pumping well [L]
t_0 = Projected time for s = 0 [T]

INPUT PARAMETERS			RESULTS		
Δs =	0.81	Ft	T = 5.29E+04		gpd/ft
b =	30.0	Ft	T = 7.08E+03		ft^2/day
Q =	163.28	GPM	S = 5.04E-03		
r =	24.8	Ft	K = 235.84		ft/day
t_0 =	2.80E-01	Min	K = 8.32E-02		cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pump Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

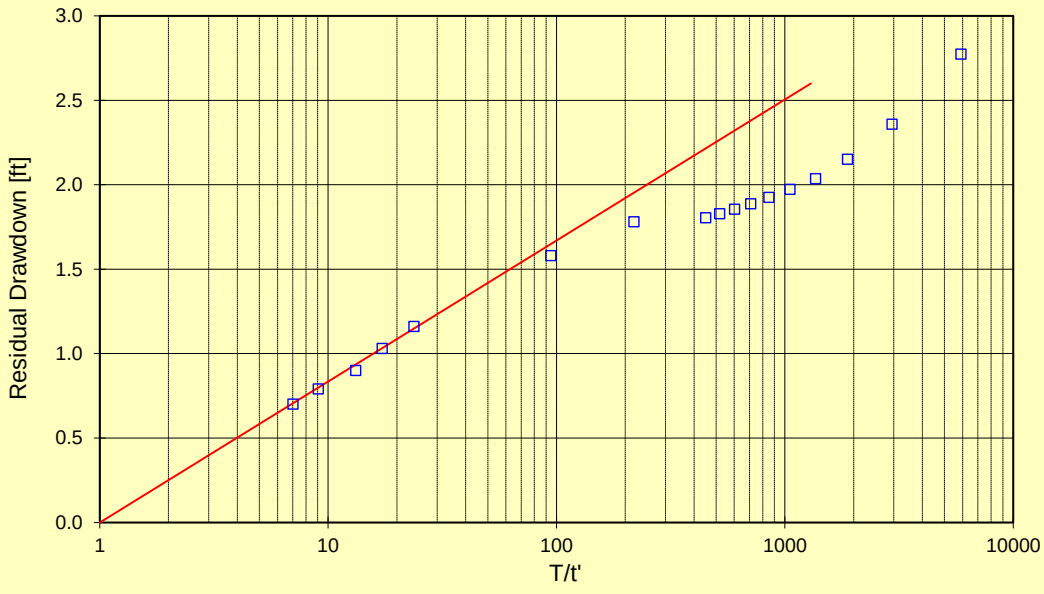
APPENDIX E-21
THEIS RECOVERY ANALYSIS
TIME DRAWDOWN DATA WELL OW-5
PUMPING WELL AT-01

$$T = \frac{264\ Q}{\Delta s'}$$

where:

$\Delta s'$ = Residual Drawdown for one log cycle [L]
Q = Pumping rate [L^3/T]
b = Aquifer thickness [L]
T = Transmissivity [L^2/T]
K = Horizontal hydraulic conductivity [L/T]
t = time since pump turned on [T]
t' = time since pump turned off [T]

INPUT PARAMETERS			RESULTS		
$\Delta s'$ =	0.83	Ft	T =	5.16E+04	gpd/ft
Q =	163.28	GPM	T =	6.90E+03	ft^2/day
b =	30.0	Ft	K =	230.07	ft/day
			K =	8.12E-02	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pump Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

APPENDIX E-22
THEIS ANALYSIS
TIME DRAWDOWN DATA WELL OW-5B
PUMPING WELL AT-01

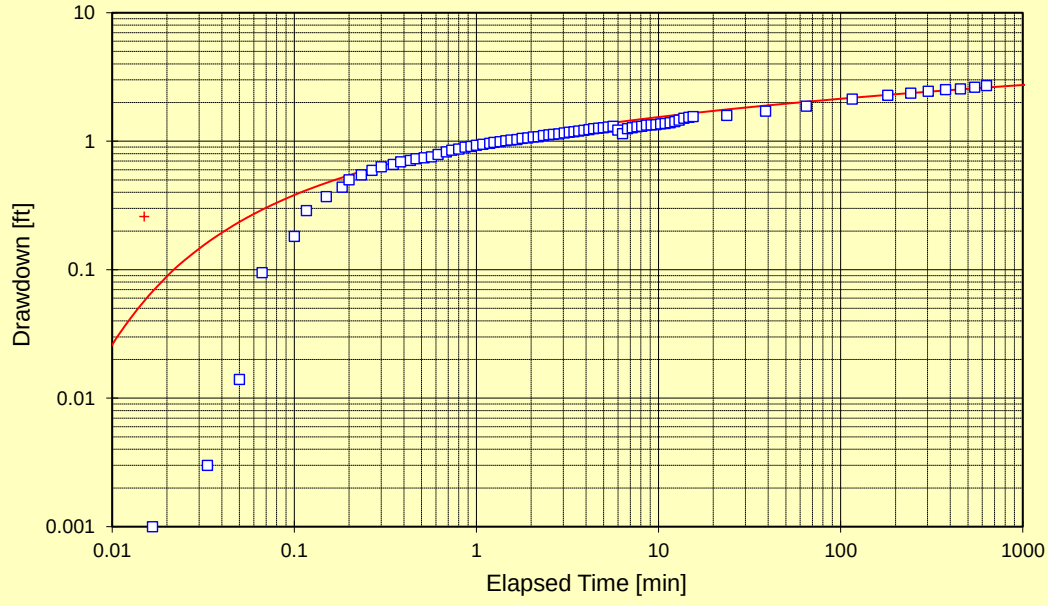
$$s = \frac{Q}{4\pi Kb} W(u) \qquad u = \frac{r^2 S}{4 Kbt}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
K = Horizontal hydraulic conductivity [L/T]
T = Coefficient of transmissivity [L^2/T]
b = Aquifer thickness [L]
r = Distance to pumping well [L]
t = time [T]
S = Storativity [dim]

TEST PARAMETERS		
Q =	163.28	GPM
r =	24.8	Ft
b =	30.0	Ft
MATCH POINT VALUES		
s =	0.26	Ft
t =	0.02	Min
1/u =	1	
W(u) =	1	

RESULTS		
T =	7.20E+04	gpd/ft
T =	9.62E+03	ft^2/day
S =	0.004891384	
K =	320.72	ft/day
K =	1.13E-01	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19
Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

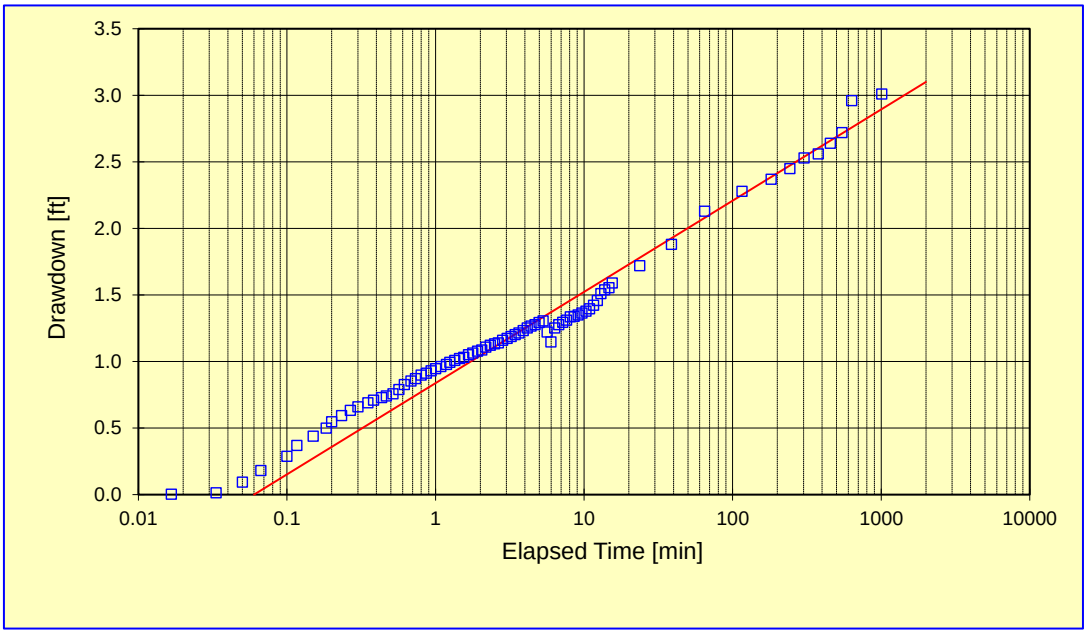
APPENDIX E-23
JACOB ANALYSIS
TIME DRAWDOWN DATA WELL OW-5B
PUMPING WELL AT-01

$$T = \frac{264\ Q}{\Delta s} \qquad S = \frac{0.3\,T t_o}{r^2}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
T = Transmissivity [L^2/T]
S = Storativity [dim]
r = Distance from pumping well [L]
t_0 = Projected time for s = 0 [T]

INPUT PARAMETERS			RESULTS		
Δs =	0.69	Ft	T = 6.29E+04		gpd/ft
b =	30.0	Ft	T = 8.41E+03		ft^2/day
Q =	163.28	GPM	S = 1.28E-03		
r =	24.8	Ft	K = 280.26		ft/day
t_0 =	6.00E-02	Min	K = 9.89E-02		cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

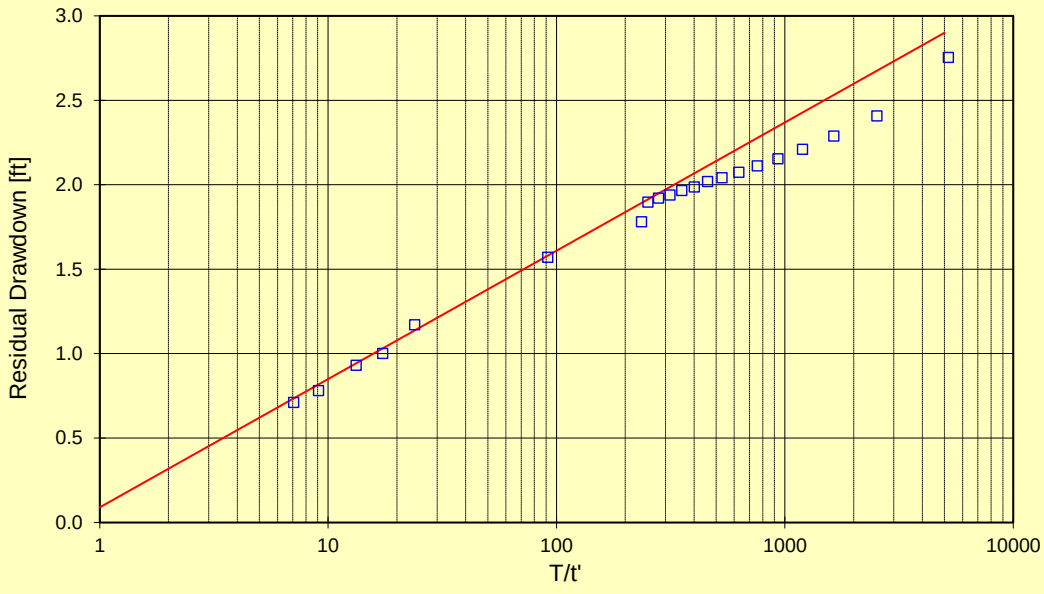
APPENDIX E-24
THEIS RECOVERY ANALYSIS
TIME DRAWDOWN DATA WELL OW-5B
PUMPING WELL AT-01

$$T = \frac{264\ Q}{\Delta s'}$$

where:

$\Delta s'$ = Residual Drawdown for one log cycle [L]
Q = Pumping rate [L^3/T]
b = Aquifer thickness [L]
T = Transmissivity [L^2/T]
K = Horizontal hydraulic conductivity [L/T]
t = time since pump turned on [T]
t' = time since pump turned off [T]

INPUT PARAMETERS			RESULTS		
$\Delta s'$ =	0.76	Ft	T =	5.67E+04	gpd/ft
Q =	163.28	GPM	T =	7.59E+03	ft^2/day
b =	30.0	Ft	K =	252.86	ft/day
			K =	8.92E-02	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

APPENDIX E-25
THEIS ANALYSIS
TIME DRAWDOWN DATA WELL OW-6
PUMPING WELL AT-01

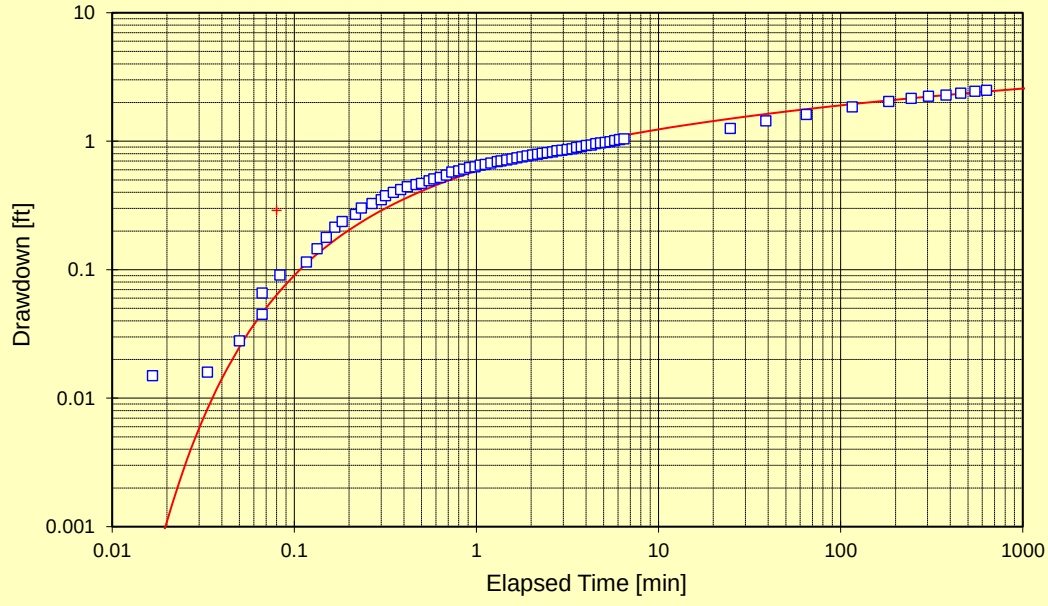
$$s = \frac{Q}{4\pi Kb} W(u) \qquad u = \frac{r^2 S}{4 Kbt}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
K = Horizontal hydraulic conductivity [L/T]
T = Coefficient of transmissivity [L^2/T]
b = Aquifer thickness [L]
r = Distance to pumping well [L]
t = time [T]
S = Storativity [dim]

TEST PARAMETERS		
Q =	163.28	GPM
r =	34.7	Ft
b =	30.0	Ft
MATCH POINT VALUES		
s =	0.29	Ft
t =	0.08	Min
1/u =	1	
W(u) =	1	

RESULTS		
T =	6.45E+04	gpd/ft
T =	8.63E+03	ft^2/day
S =	0.011908256	
K =	287.54	ft/day
K =	1.01E-01	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19
Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

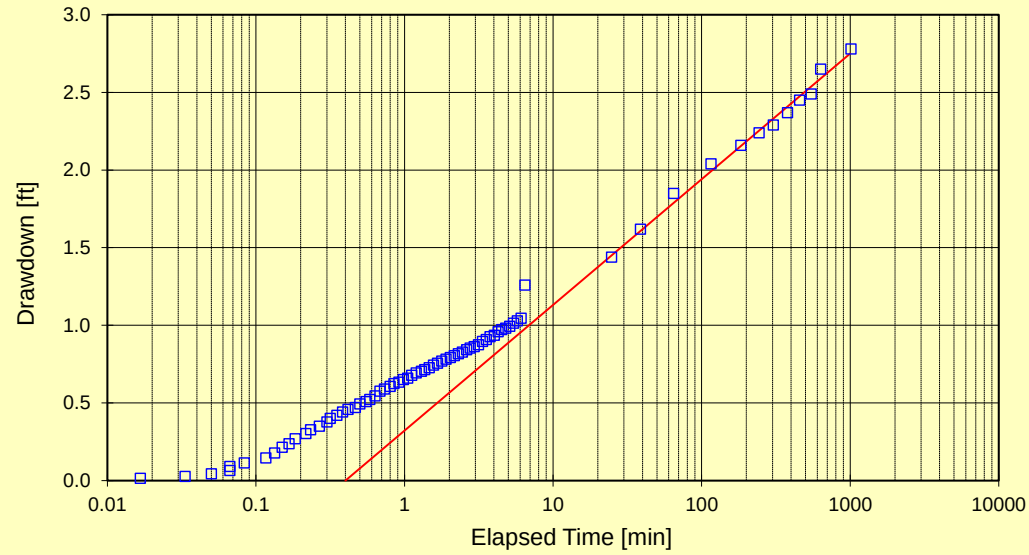
APPENDIX E-26
JACOB ANALYSIS
TIME DRAWDOWN DATA WELL OW-6
PUMPING WELL AT-01

$$T = \frac{264\ Q}{\Delta s} \qquad S = \frac{0.3\,T t_o}{r^2}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
T = Transmissivity [L^2/T]
S = Storativity [dim]
r = Distance from pumping well [L]
t_0 = Projected time for s = 0 [T]

INPUT PARAMETERS			RESULTS		
Δs =	0.81	Ft	T =	5.33E+04	gpd/ft
b =	30.0	Ft	T =	7.12E+03	ft^2/day
Q =	163.28	GPM	S =	3.69E-03	
r =	34.7	Ft	K =	237.35	ft/day
t_0 =	4.00E-01	Min	K =	8.37E-02	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

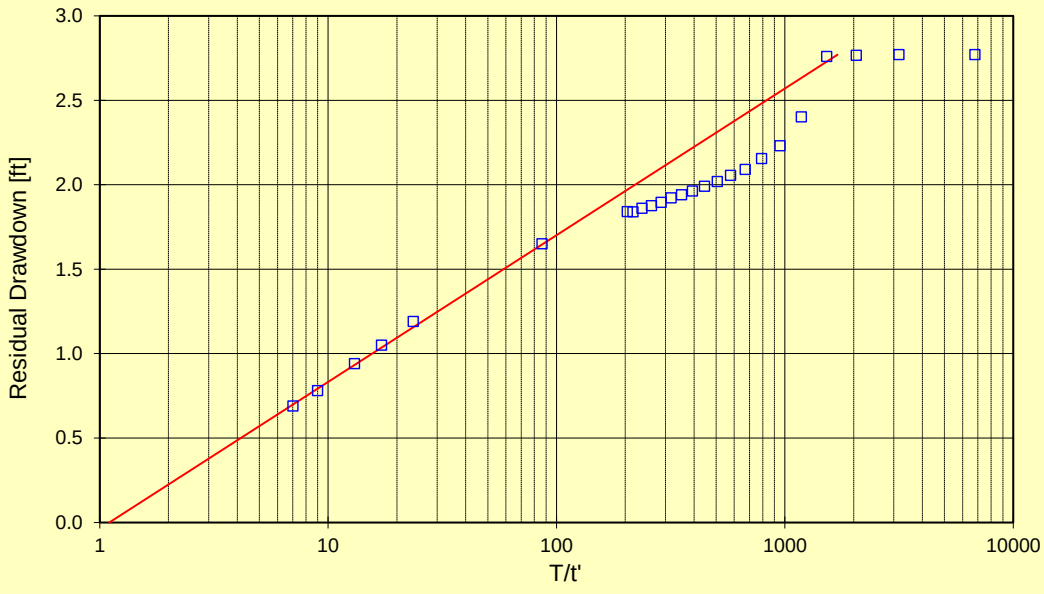
APPENDIX E-27
THEIS RECOVERY ANALYSIS
TIME DRAWDOWN DATA WELL OW-6
PUMPING WELL AT-01

$$T = \frac{264\ Q}{\Delta s'}$$

where:

$\Delta s'$ = Residual Drawdown for one log cycle [L]
Q = Pumping rate [L^3/T]
b = Aquifer thickness [L]
T = Transmissivity [L^2/T]
K = Horizontal hydraulic conductivity [L/T]
t = time since pump turned on [T]
t' = time since pump turned off [T]

INPUT PARAMETERS			RESULTS		
$\Delta s'$ =	0.87	Ft	T =	4.96E+04	gpd/ft
Q =	163.28	GPM	T =	6.63E+03	ft^2/day
b =	30.0	Ft	K =	221.15	ft/day
			K =	7.80E-02	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

APPENDIX E-28
THEIS ANALYSIS
TIME DRAWDOWN DATA WELL AT-01
PUMPING WELL AT-01

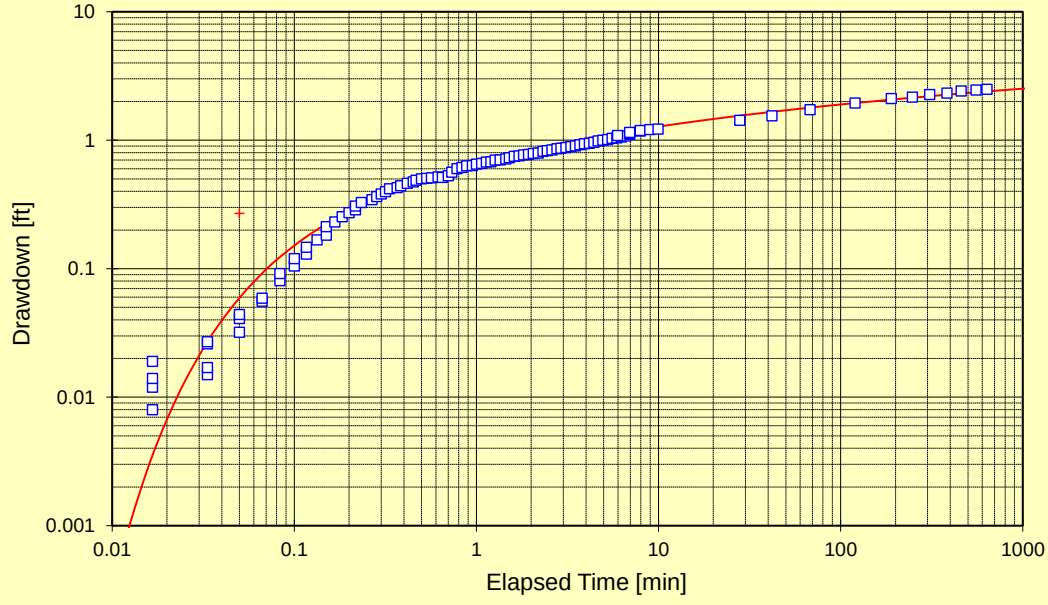
$$s = \frac{Q}{4\pi Kb} W(u) \qquad u = \frac{r^2 S}{4 Kbt}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
K = Horizontal hydraulic conductivity [L/T]
T = Coefficient of transmissivity [L^2/T]
b = Aquifer thickness [L]
r = Distance to pumping well [L]
t = time [T]
S = Storativity [dim]

TEST PARAMETERS		
Q =	163.28	GPM
r =	0.5	Ft
b =	30.0	Ft
MATCH POINT VALUES		
s =	0.27	Ft
t =	0.05	Min
1/u =	1	
W(u) =	1	

RESULTS		
T =	6.93E+04	gpd/ft
T =	9.27E+03	ft^2/day
S =	38.65629773	
K =	308.84	ft/day
K =	1.09E-01	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19
Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

APPENDIX E-29
JACOB ANALYSIS
TIME DRAWDOWN DATA WELL AT-01
PUMPING WELL AT-01

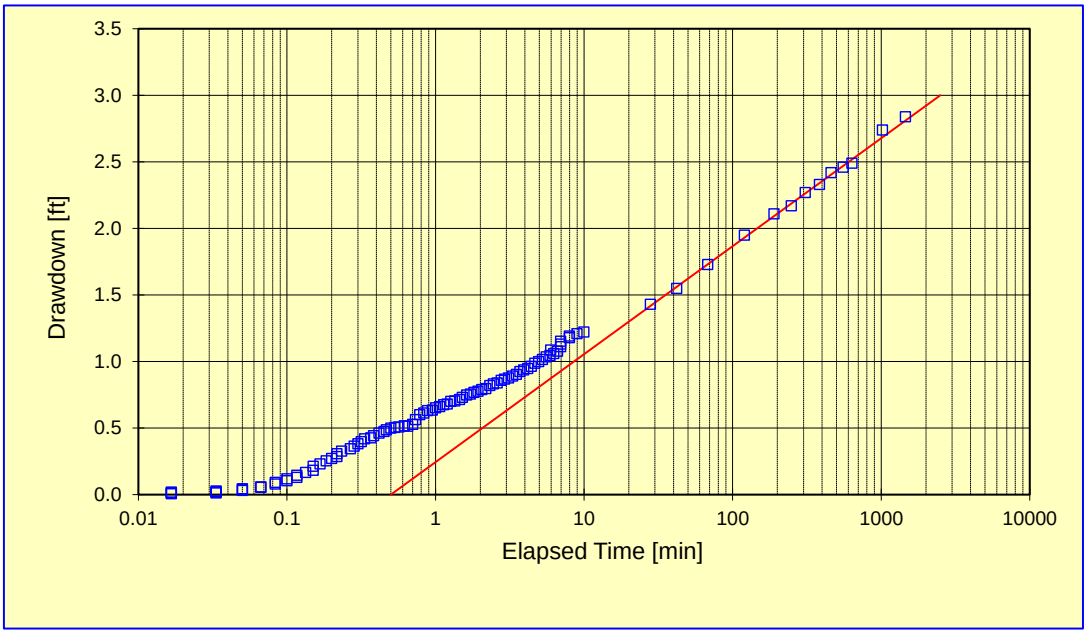
$$T = \frac{264\ Q}{\Delta s} \qquad S = \frac{0.3\,T t_o}{r^2}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
T = Transmissivity [L^2/T]
S = Storativity [dim]
r = Distance from pumping well [L]
t_0 = Projected time for s = 0 [T]

INPUT PARAMETERS		
Δs =	0.81	Ft
b =	30.0	Ft
Q =	163.28	GPM
r =	0.5	Ft
t_0 =	5.00E-01	Min

RESULTS		
T =	5.31E+04	gpd/ft
T =	7.11E+03	ft^2/day
S =	2.22E+01	
K =	236.85	ft/day
K =	8.35E-02	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

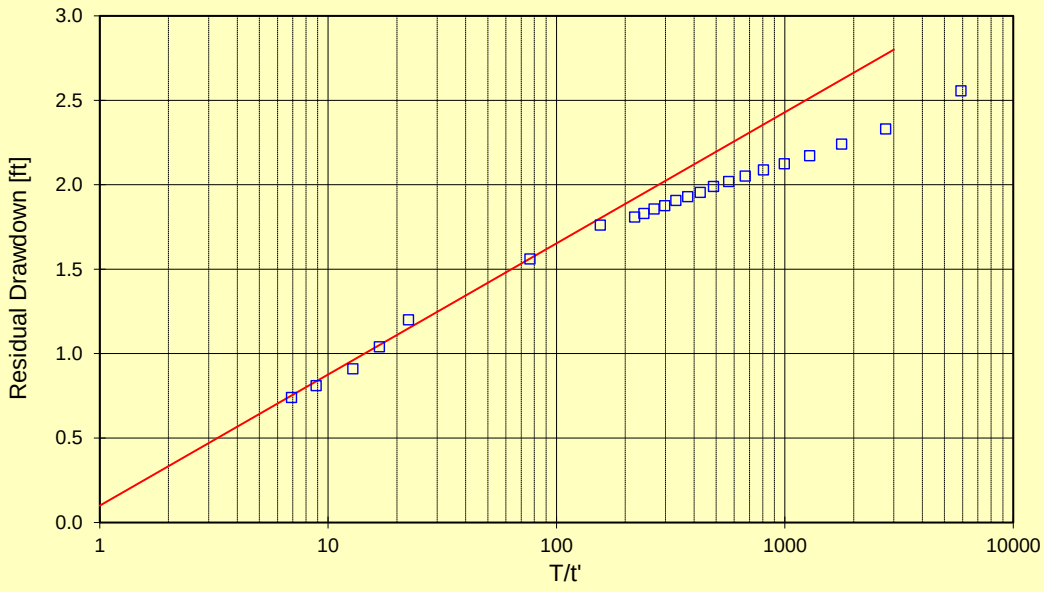
APPENDIX E-30
THEIS RECOVERY ANALYSIS
TIME DRAWDOWN DATA WELL AT-01
PUMPING WELL AT-01

$$T = \frac{264\ Q}{\Delta s'}$$

where:

$\Delta s'$ = Residual Drawdown for one log cycle [L]
Q = Pumping rate [L^3/T]
b = Aquifer thickness [L]
T = Transmissivity [L^2/T]
K = Horizontal hydraulic conductivity [L/T]
t = time since pump turned on [T]
t' = time since pump turned off [T]

INPUT PARAMETERS			RESULTS		
$\Delta s'$ =	0.78	Ft	T =	5.55E+04	gpd/ft
Q =	163.28	GPM	T =	7.42E+03	ft^2/day
b =	30.0	Ft	K =	247.38	ft/day
			K =	8.73E-02	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

APPENDIX E-31
THEIS ANALYSIS
TIME DRAWDOWN DATA WELL OW-7B
PUMPING WELL AT-01

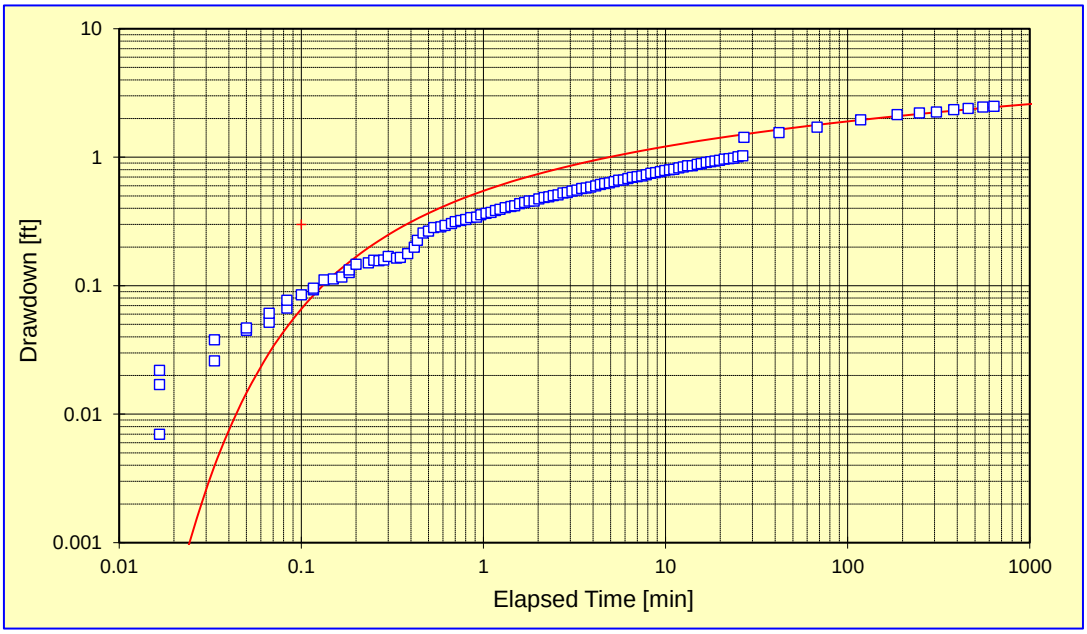
$$s = \frac{Q}{4\pi Kb} W(u) \qquad u = \frac{r^2 S}{4 Kbt}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
K = Horizontal hydraulic conductivity [L/T]
T = Coefficient of transmissivity [L^2/T]
b = Aquifer thickness [L]
r = Distance to pumping well [L]
t = time [T]
S = Storativity [dim]

TEST PARAMETERS		
Q =	163.28	GPM
r =	35.2	Ft
b =	30.0	Ft
MATCH POINT VALUES		
s =	0.30	Ft
t =	0.10	Min
1/u =	1	
W(u) =	1	

RESULTS		
T =	6.24E+04	gpd/ft
T =	8.34E+03	ft^2/day
S =	0.013999167	
K =	277.95	ft/day
K =	9.80E-02	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19
Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

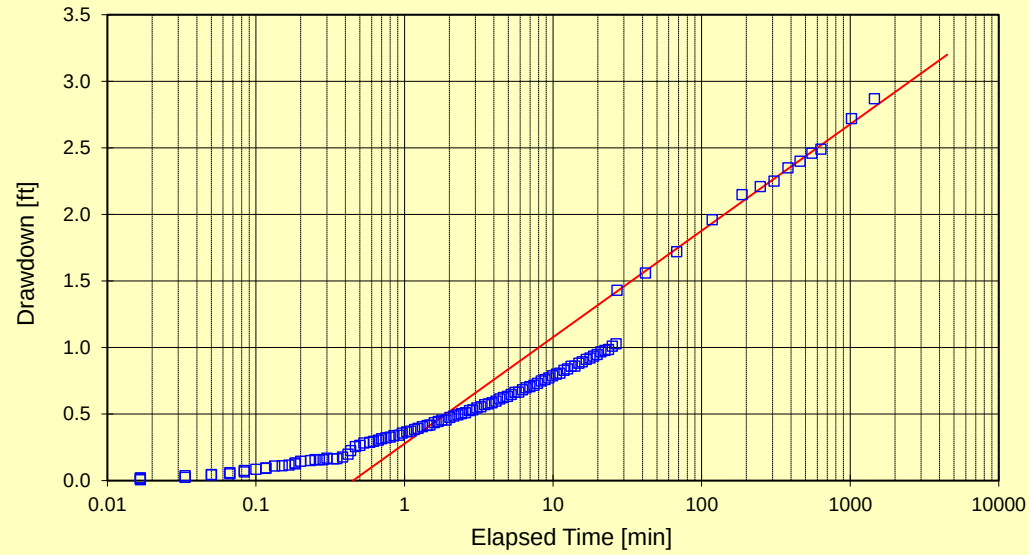
APPENDIX E-32
JACOB ANALYSIS
TIME DRAWDOWN DATA WELL OW-7B
PUMPING WELL AT-01

$$T = \frac{264\ Q}{\Delta s} \qquad S = \frac{0.3\,T t_o}{r^2}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
T = Transmissivity [L^2/T]
S = Storativity [dim]
r = Distance from pumping well [L]
t_0 = Projected time for s = 0 [T]

INPUT PARAMETERS			RESULTS		
Δs =	0.80	Ft	T =	5.39E+04	gpd/ft
b =	30.0	Ft	T =	7.20E+03	ft^2/day
Q =	163.28	GPM	S =	4.08E-03	
r =	35.2	Ft	K =	240.12	ft/day
t_0 =	4.50E-01	Min	K =	8.47E-02	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

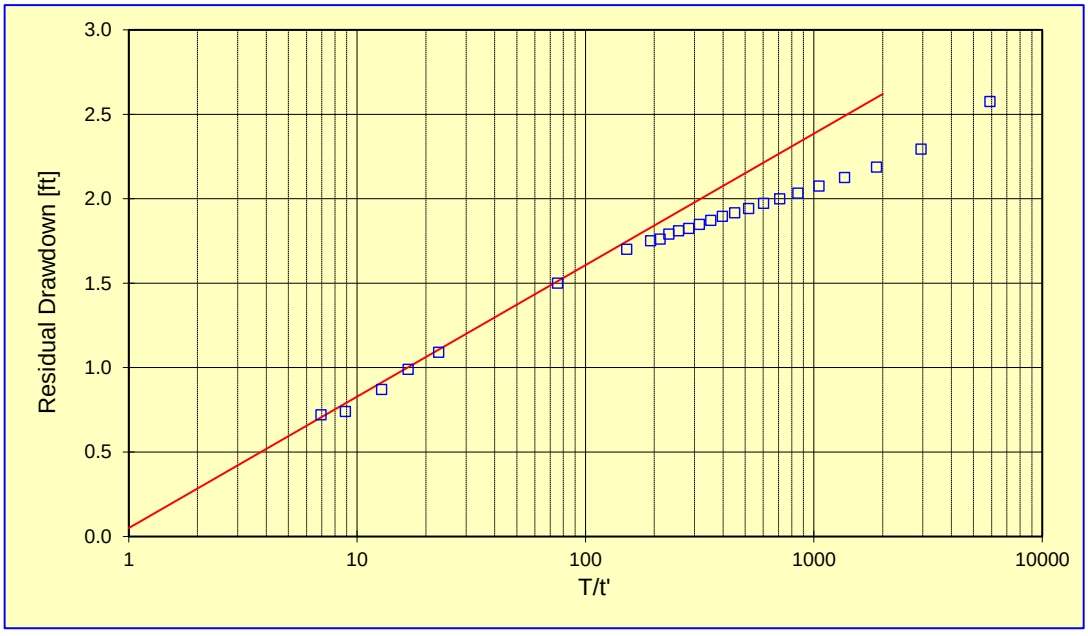
APPENDIX E-33
THEIS RECOVERY ANALYSIS
TIME DRAWDOWN DATA WELL OW-7B
PUMPING WELL AT-01

$$T = \frac{264\ Q}{\Delta s'}$$

where:

$\Delta s'$ = Residual Drawdown for one log cycle [L]
Q = Pumping rate [L^3/T]
b = Aquifer thickness [L]
T = Transmissivity [L^2/T]
K = Horizontal hydraulic conductivity [L/T]
t = time since pump turned on [T]
t' = time since pump turned off [T]

INPUT PARAMETERS			RESULTS		
$\Delta s'$ =	0.78	Ft	T =	5.54E+04	gpd/ft
Q =	163.28	GPM	T =	7.40E+03	ft^2/day
b =	30.0	Ft	K =	246.73	ft/day
			K =	8.70E-02	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

APPENDIX E-34
THEIS ANALYSIS
TIME DRAWDOWN DATA WELL OW-8
PUMPING WELL AT-01

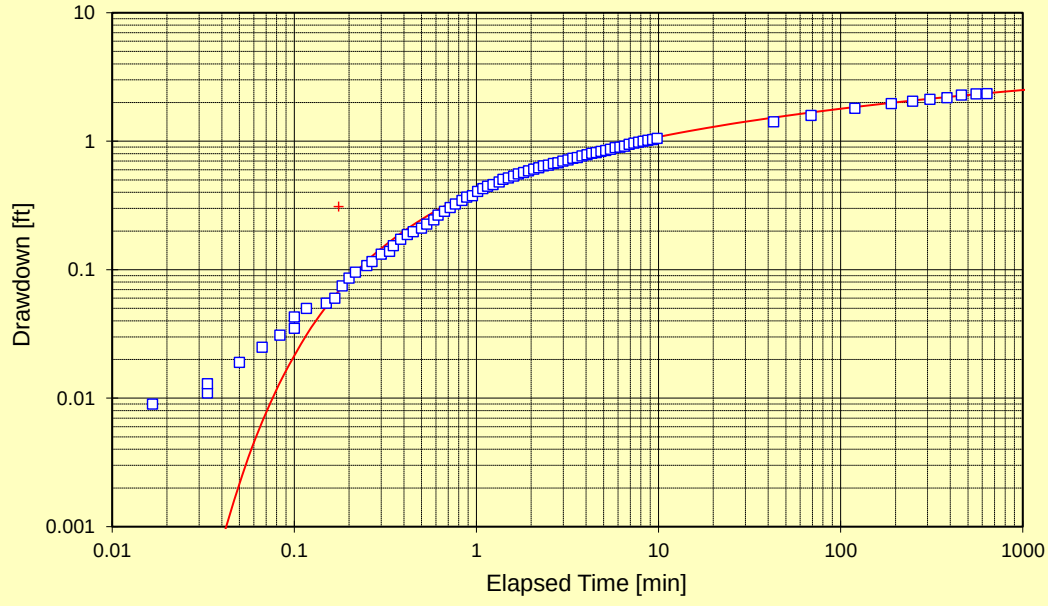
$$s = \frac{Q}{4\pi Kb} W(u) \qquad u = \frac{r^2 S}{4 Kbt}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
K = Horizontal hydraulic conductivity [L/T]
T = Coefficient of transmissivity [L^2/T]
b = Aquifer thickness [L]
r = Distance to pumping well [L]
t = time [T]
S = Storativity [dim]

TEST PARAMETERS		
Q =	163.28	GPM
r =	44.7	Ft
b =	30.0	Ft
MATCH POINT VALUES		
s =	0.31	Ft
t =	0.18	Min
1/u =	1	
W(u) =	1	

RESULTS		
T =	6.04E+04	gpd/ft
T =	8.07E+03	ft^2/day
S =	0.014678515	
K =	268.99	ft/day
K =	9.49E-02	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19
Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

APPENDIX E-35
JACOB ANALYSIS
TIME DRAWDOWN DATA WELL OW-8
PUMPING WELL AT-01

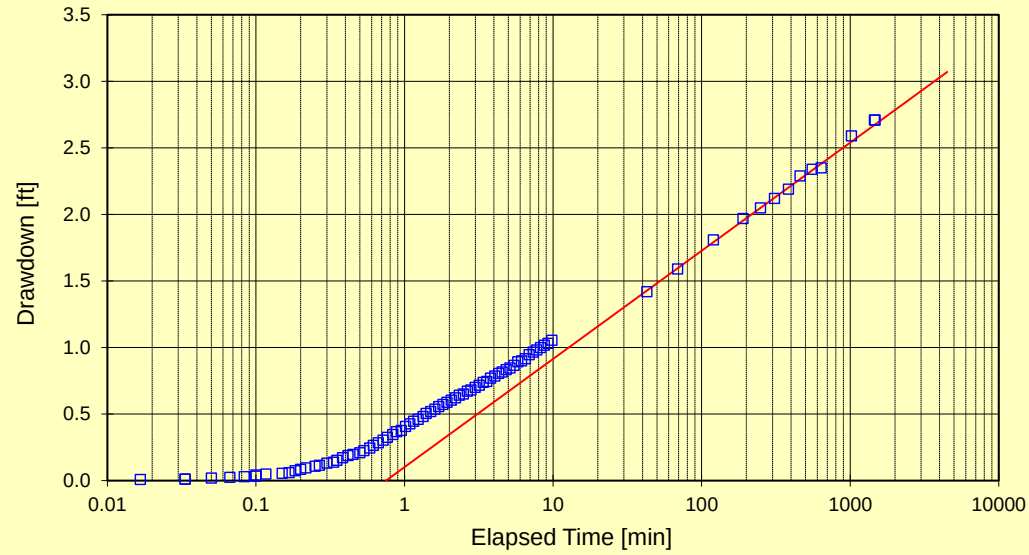
$$T = \frac{264\ Q}{\Delta s} \qquad S = \frac{0.3\,T t_o}{r^2}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
T = Transmissivity [L^2/T]
S = Storativity [dim]
r = Distance from pumping well [L]
t_0 = Projected time for s = 0 [T]

INPUT PARAMETERS		
Δs =	0.81	Ft
b =	30.0	Ft
Q =	163.28	GPM
r =	44.7	Ft
t_0 =	7.50E-01	Min

RESULTS		
T =	5.30E+04	gpd/ft
T =	7.09E+03	ft^2/day
S =	4.15E-03	
K =	236.40	ft/day
K =	8.34E-02	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

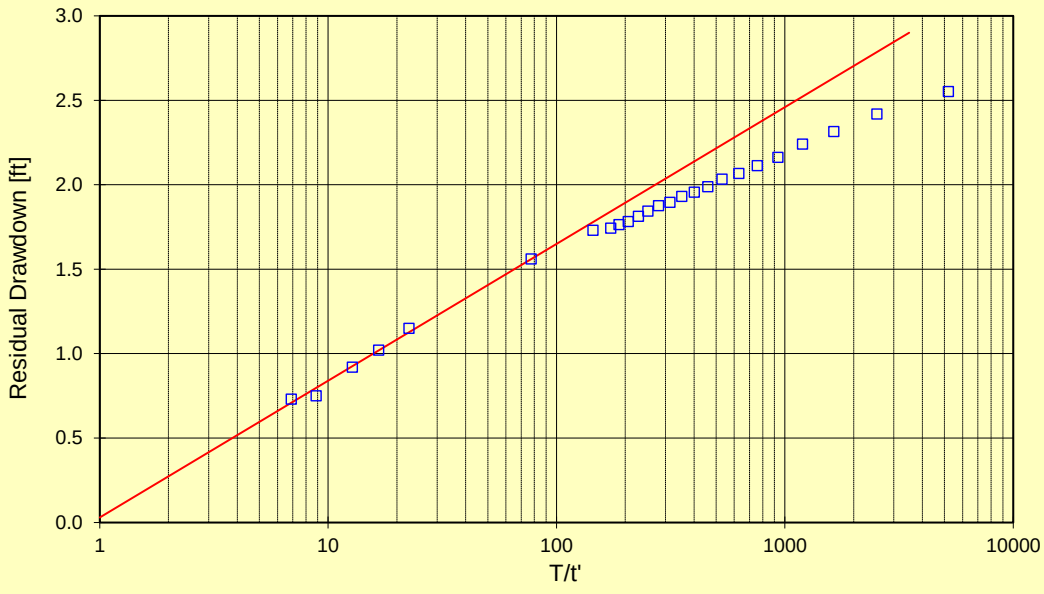
APPENDIX E-36
THEIS RECOVERY ANALYSIS
TIME DRAWDOWN DATA WELL OW-8
PUMPING WELL AT-01

$$T = \frac{264\ Q}{\Delta s'}$$

where:

$\Delta s'$ = Residual Drawdown for one log cycle [L]
Q = Pumping rate [L^3/T]
b = Aquifer thickness [L]
T = Transmissivity [L^2/T]
K = Horizontal hydraulic conductivity [L/T]
t = time since pump turned on [T]
t' = time since pump turned off [T]

INPUT PARAMETERS			RESULTS		
$\Delta s'$ =	0.81	Ft	T =	5.32E+04	gpd/ft
Q =	163.28	GPM	T =	7.12E+03	ft^2/day
b =	30.0	Ft	K =	237.21	ft/day
			K =	8.37E-02	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

APPENDIX E-37
THEIS ANALYSIS
TIME DRAWDOWN DATA WELL OW-9
PUMPING WELL AT-01

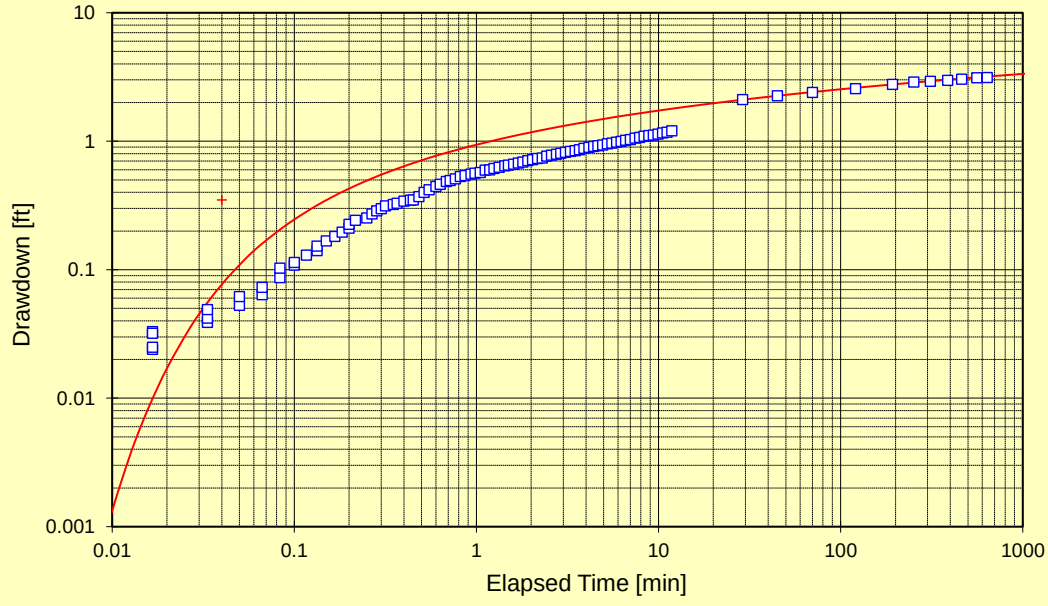
$$s = \frac{Q}{4\pi Kb} W(u) \qquad u = \frac{r^2 S}{4 Kbt}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
K = Horizontal hydraulic conductivity [L/T]
T = Coefficient of transmissivity [L^2/T]
b = Aquifer thickness [L]
r = Distance to pumping well [L]
t = time [T]
S = Storativity [dim]

TEST PARAMETERS		
Q =	163.28	GPM
r =	95.1	Ft
b =	30.0	Ft
MATCH POINT VALUES		
s =	0.35	Ft
t =	0.04	Min
1/u =	1	
W(u) =	1	

RESULTS		
T =	5.35E+04	gpd/ft
T =	7.15E+03	ft^2/day
S =	0.000657096	
K =	238.25	ft/day
K =	8.40E-02	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19
Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

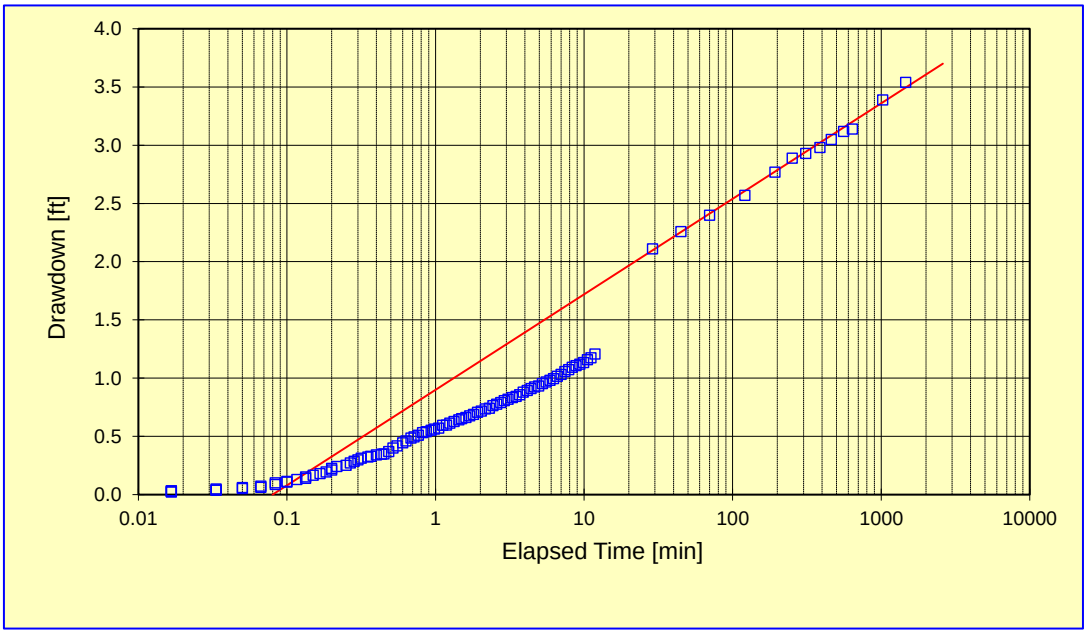
APPENDIX E-38
JACOB ANALYSIS
TIME DRAWDOWN DATA WELL OW-9
PUMPING WELL AT-01

$$T = \frac{264\ Q}{\Delta s} \qquad S = \frac{0.3\,T t_o}{r^2}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
T = Transmissivity [L^2/T]
S = Storativity [dim]
r = Distance from pumping well [L]
t_0 = Projected time for s = 0 [T]

INPUT PARAMETERS			RESULTS		
Δs =	0.82	Ft	T =	5.26E+04	gpd/ft
b =	30.0	Ft	T =	7.03E+03	ft^2/day
Q =	163.28	GPM	S =	9.69E-05	
r =	95.1	Ft	K =	234.24	ft/day
t_0 =	8.00E-02	Min	K =	8.26E-02	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

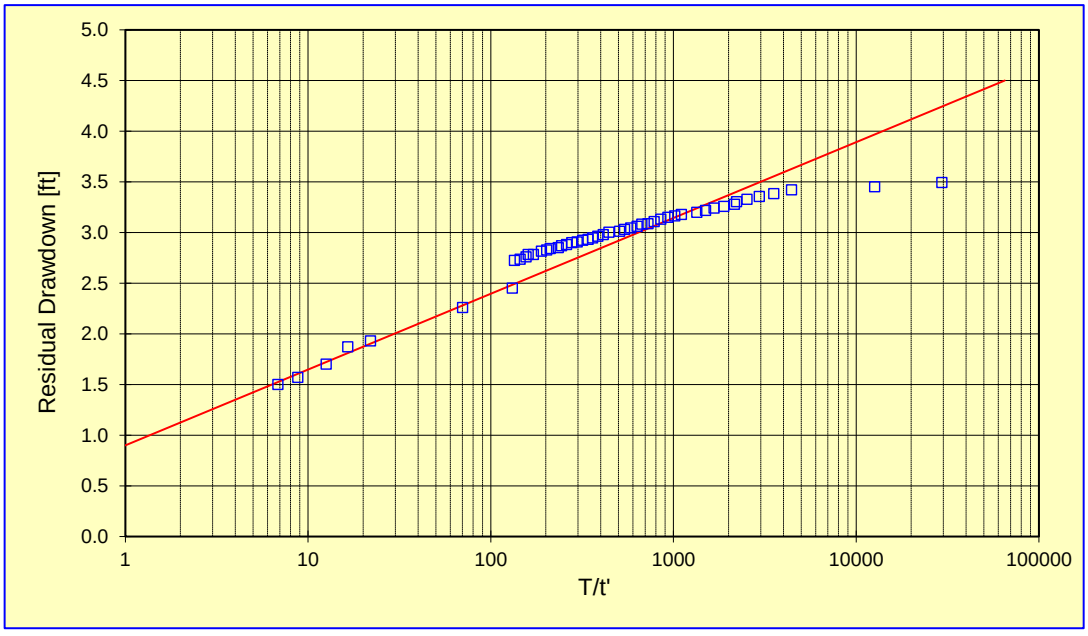
APPENDIX E-39
THEIS RECOVERY ANALYSIS
TIME DRAWDOWN DATA WELL OW-9
PUMPING WELL AT-01

$$T = \frac{264\ Q}{\Delta s'}$$

where:

$\Delta s'$ = Residual Drawdown for one log cycle [L]
Q = Pumping rate [L^3/T]
b = Aquifer thickness [L]
T = Transmissivity [L^2/T]
K = Horizontal hydraulic conductivity [L/T]
t = time since pump turned on [T]
t' = time since pump turned off [T]

INPUT PARAMETERS			RESULTS		
$\Delta s'$ =	0.75	Ft	T =	5.76E+04	gpd/ft
Q =	163.28	GPM	T =	7.70E+03	ft^2/day
b =	30.0	Ft	K =	256.81	ft/day
			K =	9.06E-02	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

APPENDIX E-40
THEIS ANALYSIS
TIME DRAWDOWN DATA WELL OW-10
PUMPING WELL AT-01

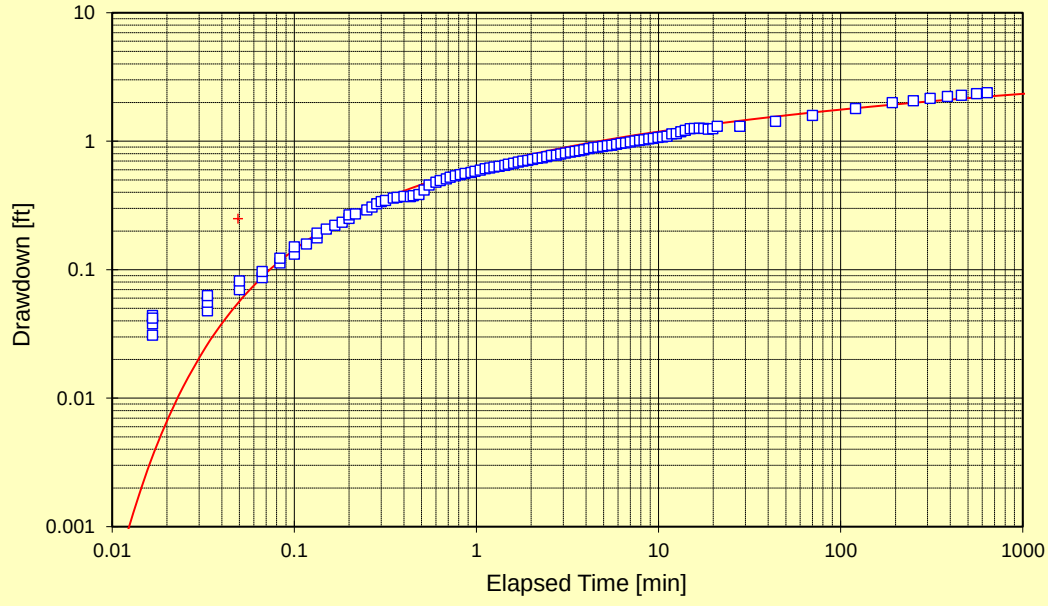
$$s = \frac{Q}{4\pi Kb} W(u) \qquad u = \frac{r^2 S}{4 Kbt}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
K = Horizontal hydraulic conductivity [L/T]
T = Coefficient of transmissivity [L^2/T]
b = Aquifer thickness [L]
r = Distance to pumping well [L]
t = time [T]
S = Storativity [dim]

TEST PARAMETERS		
Q =	163.28	GPM
r =	58.1	Ft
b =	30.0	Ft
MATCH POINT VALUES		
s =	0.25	Ft
t =	0.05	Min
1/u =	1	
W(u) =	1	

RESULTS		
T =	7.48E+04	gpd/ft
T =	1.00E+04	ft^2/day
S =	0.003022158	
K =	333.55	ft/day
K =	1.18E-01	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19
Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

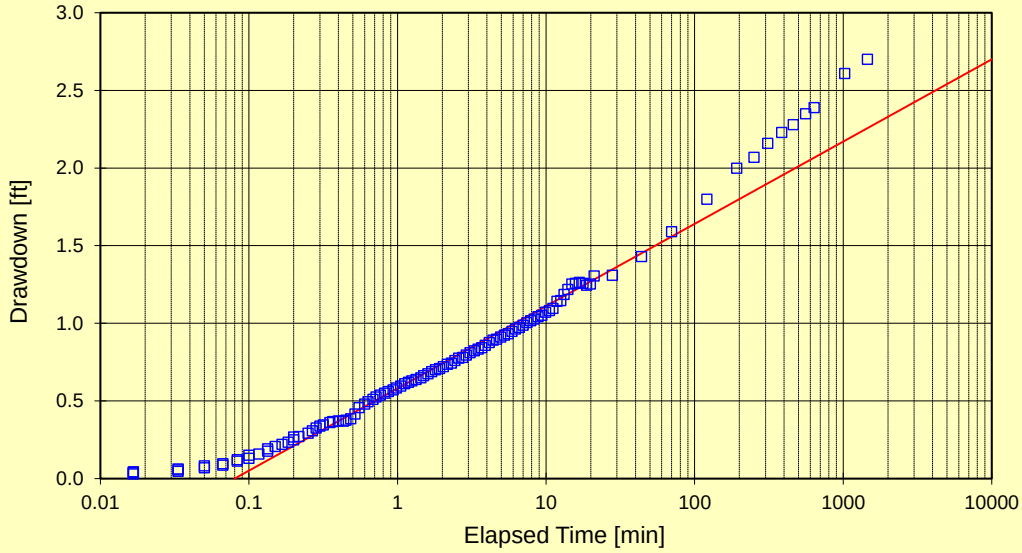
APPENDIX E-41
JACOB ANALYSIS
TIME DRAWDOWN DATA WELL OW-10
PUMPING WELL AT-01

$$T = \frac{264\ Q}{\Delta s} \qquad S = \frac{0.3\,T t_o}{r^2}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
T = Transmissivity [L^2/T]
S = Storativity [dim]
r = Distance from pumping well [L]
t_0 = Projected time for s = 0 [T]

INPUT PARAMETERS			RESULTS		
Δs =	0.53	Ft	T = 8.14E+04		gpd/ft
b =	30.0	Ft	T = 1.09E+04		ft^2/day
Q =	163.28	GPM	S = 4.02E-04		
r =	58.1	Ft	K = 362.62		ft/day
t_0 =	8.00E-02	Min	K = 1.28E-01		cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

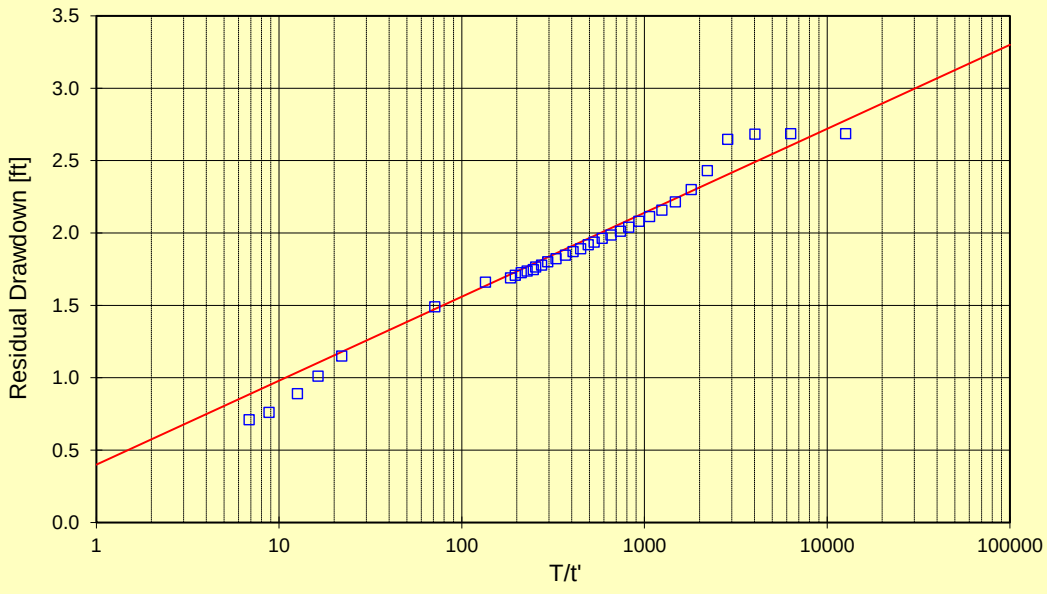
APPENDIX E-42
THEIS RECOVERY ANALYSIS
TIME DRAWDOWN DATA WELL OW-10
PUMPING WELL AT-01

$$T = \frac{264\ Q}{\Delta s'}$$

where:

$\Delta s'$ = Residual Drawdown for one log cycle [L]
Q = Pumping rate [L^3/T]
b = Aquifer thickness [L]
T = Transmissivity [L^2/T]
K = Horizontal hydraulic conductivity [L/T]
t = time since pump turned on [T]
t' = time since pump turned off [T]

INPUT PARAMETERS			RESULTS		
$\Delta s'$ =	0.58	Ft	T =	7.43E+04	gpd/ft
Q =	163.28	GPM	T =	9.94E+03	ft^2/day
b =	30.0	Ft	K =	331.20	ft/day
			K =	1.17E-01	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

APPENDIX E-43
THEIS ANALYSIS
TIME DRAWDOWN DATA WELL GAMW-18
PUMPING WELL AT-01

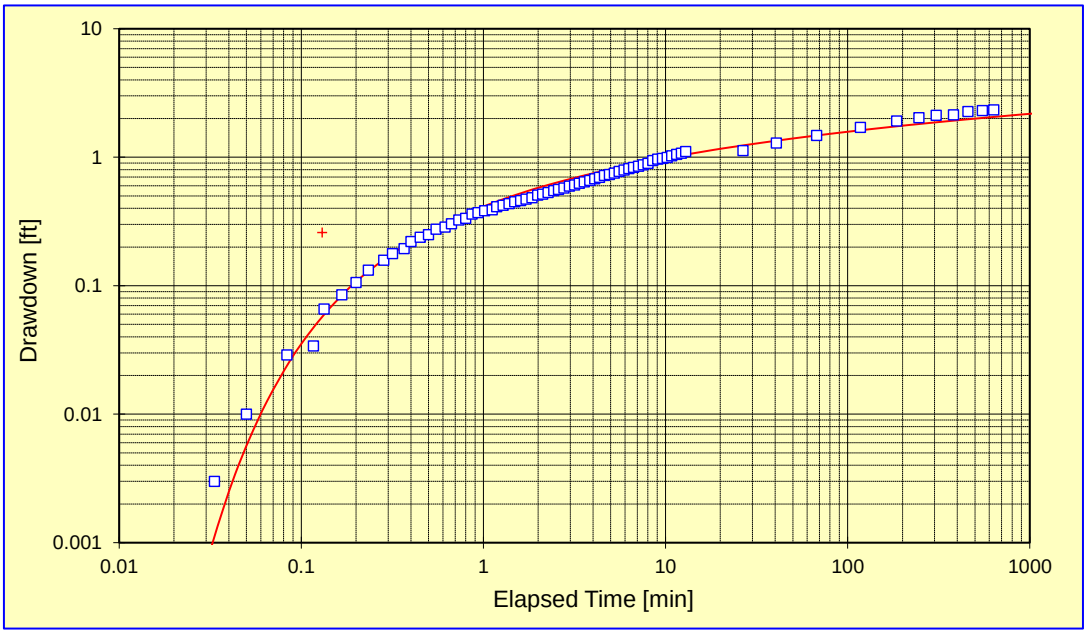
$$s = \frac{Q}{4\pi Kb} W(u) \qquad u = \frac{r^2 S}{4 Kbt}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
K = Horizontal hydraulic conductivity [L/T]
T = Coefficient of transmissivity [L^2/T]
b = Aquifer thickness [L]
r = Distance to pumping well [L]
t = time [T]
S = Storativity [dim]

TEST PARAMETERS		
Q =	163.28	GPM
r =	24.6	Ft
b =	30.0	Ft
MATCH POINT VALUES		
s =	0.26	Ft
t =	0.13	Min
1/u =	1	
W(u) =	1	

RESULTS		
T =	7.20E+04	gpd/ft
T =	9.62E+03	ft^2/day
S =	0.043015141	
K =	320.72	ft/day
K =	1.13E-01	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19
Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

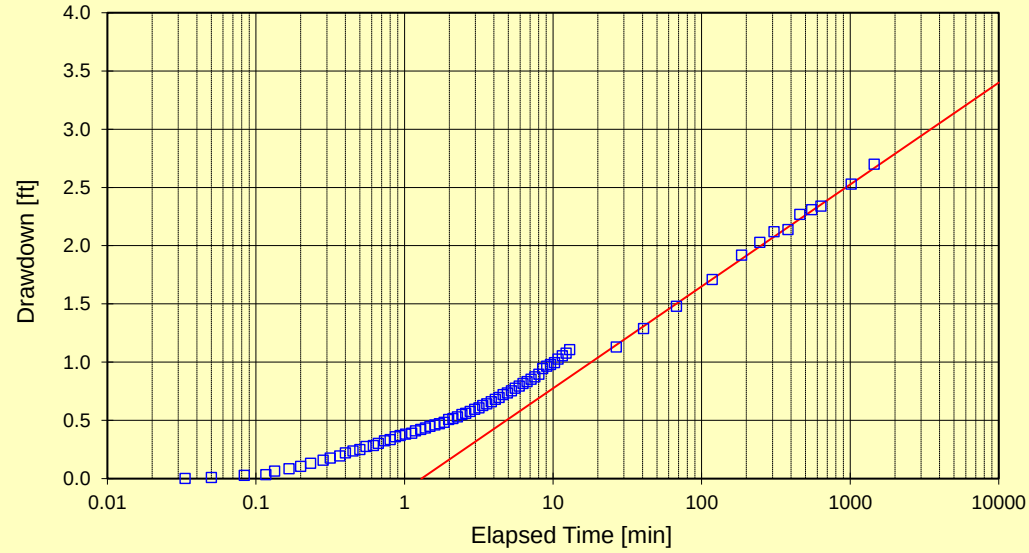
APPENDIX E-44
JACOB ANALYSIS
TIME DRAWDOWN DATA WELL GAMW-18
PUMPING WELL AT-01

$$T = \frac{264\ Q}{\Delta s} \qquad S = \frac{0.3\,T t_o}{r^2}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
T = Transmissivity [L^2/T]
S = Storativity [dim]
r = Distance from pumping well [L]
t_0 = Projected time for s = 0 [T]

INPUT PARAMETERS			RESULTS		
Δs =	0.87	Ft	T =	4.93E+04	gpd/ft
b =	30.0	Ft	T =	6.59E+03	ft^2/day
Q =	163.28	GPM	S =	2.21E-02	
r =	24.6	Ft	K =	219.56	ft/day
t_0 =	1.30E+00	Min	K =	7.74E-02	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By:
Analysis Date:

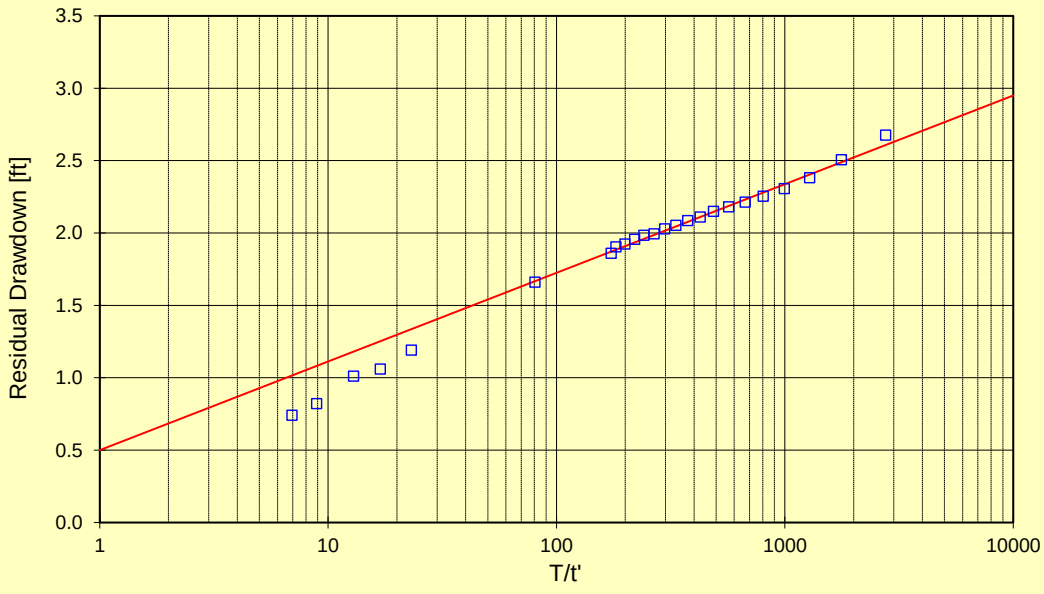
APPENDIX E-45
THEIS RECOVERY ANALYSIS
TIME DRAWDOWN DATA WELL GAMW-18
PUMPING WELL AT-01

$$T = \frac{264\ Q}{\Delta s'}$$

where:

$\Delta s'$ = Residual Drawdown for one log cycle [L]
Q = Pumping rate [L^3/T]
b = Aquifer thickness [L]
T = Transmissivity [L^2/T]
K = Horizontal hydraulic conductivity [L/T]
t = time since pump turned on [T]
t' = time since pump turned off [T]

INPUT PARAMETERS			RESULTS		
$\Delta s'$ =	0.61	Ft	T =	7.04E+04	gpd/ft
Q =	163.28	GPM	T =	9.41E+03	ft^2/day
b =	30.0	Ft	K =	313.62	ft/day
			K =	1.11E-01	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

APPENDIX E-46
THEIS ANALYSIS
TIME DRAWDOWN DATA WELL GAMW-18B
PUMPING WELL AT-01

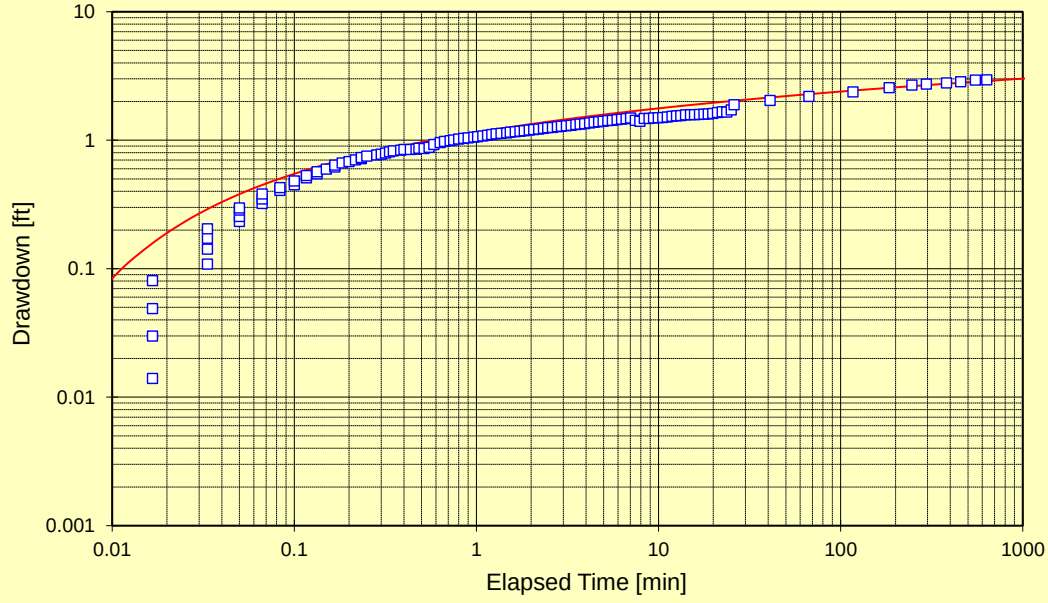
$$s = \frac{Q}{4\pi Kb} W(u) \qquad u = \frac{r^2 S}{4 Kbt}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
K = Horizontal hydraulic conductivity [L/T]
T = Coefficient of transmissivity [L^2/T]
b = Aquifer thickness [L]
r = Distance to pumping well [L]
t = time [T]
S = Storativity [dim]

TEST PARAMETERS		
Q =	163.28	GPM
r =	14.9	Ft
b =	30.0	Ft
MATCH POINT VALUES		
s =	0.27	Ft
t =	0.01	Min
1/u =	1	
W(u) =	1	

RESULTS		
T =	6.93E+04	gpd/ft
T =	9.27E+03	ft^2/day
S =	0.00697435	
K =	308.84	ft/day
K =	1.09E-01	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19
Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

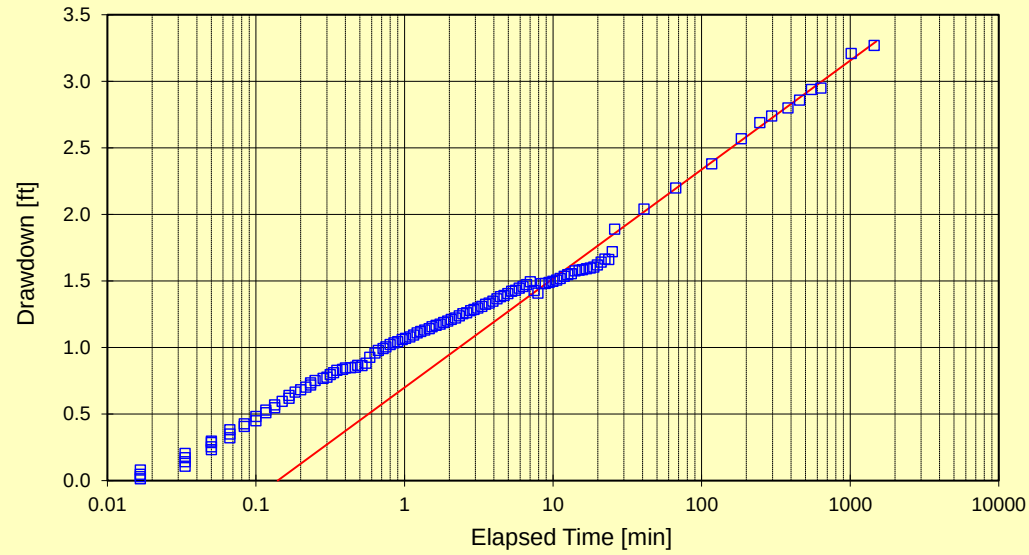
APPENDIX E-47
JACOB ANALYSIS
TIME DRAWDOWN DATA WELL GAMW-18B
PUMPING WELL AT-01

$$T = \frac{264\ Q}{\Delta s} \qquad S = \frac{0.3\,T t_o}{r^2}$$

where:

s = Drawdown [L]
Q = Pumping rate [L^3/T]
T = Transmissivity [L^2/T]
S = Storativity [dim]
r = Distance from pumping well [L]
t_0 = Projected time for s = 0 [T]

INPUT PARAMETERS			RESULTS		
Δs =	0.82	Ft	T =	5.26E+04	gpd/ft
b =	30.0	Ft	T =	7.04E+03	ft^2/day
Q =	163.28	GPM	S =	6.95E-03	
r =	14.9	Ft	K =	234.59	ft/day
t_0 =	1.40E-01	Min	K =	8.27E-02	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020

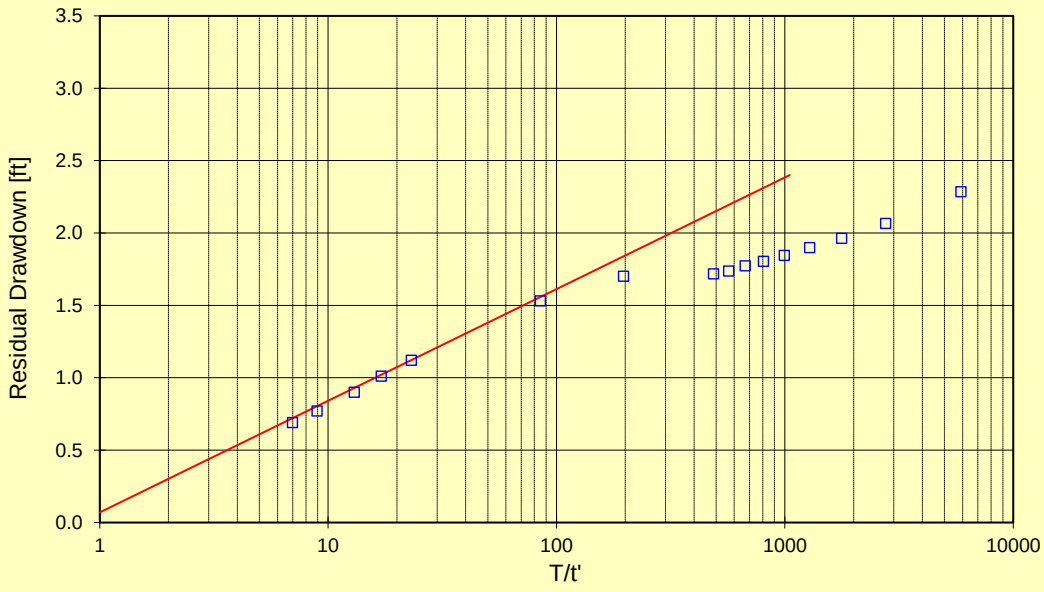
APPENDIX E-48
THEIS RECOVERY ANALYSIS
TIME DRAWDOWN DATA WELL GAMW-18B
PUMPING WELL AT-01

$$T = \frac{264\ Q}{\Delta s'}$$

where:

$\Delta s'$ = Residual Drawdown for one log cycle [L]
Q = Pumping rate [L^3/T]
b = Aquifer thickness [L]
T = Transmissivity [L^2/T]
K = Horizontal hydraulic conductivity [L/T]
t = time since pump turned on [T]
t' = time since pump turned off [T]

INPUT PARAMETERS			RESULTS		
$\Delta s'$ =	0.77	Ft	T =	5.59E+04	gpd/ft
Q =	163.28	GPM	T =	7.47E+03	ft^2/day
b =	30.0	Ft	K =	249.08	ft/day
			K =	8.79E-02	cm/sec



Project Name: NIPSCO-RMSGS/AT-01 Pumping Test
Project No.: 164817101
Test Date: 06/26/19

Analysis By: ANB
Checked By: JRS
Analysis Date: 2/3/2020



golder.com

APPENDIX D

Well Development Records

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME SCHAEFER GEN. STA. JOB NO. 14181-03 WELL NO GAMW-01

DEVELOPED BY RG DATE OF INSTALL. ____ SHEET ___ OF ___

STARTED DEVEL. 060616 / 0920 (DATE / TIME) COMPLETED DEVEL. 060616 / ____ (DATE / TIME)

W.L. BEFORE DEVEL. 8.95 / 060616 / 0917 (DEPTH / DATE / TIME) AFTER DEVEL. 8.95 ~~8.95~~ / 060616 / ____ (DEPTH / DATE / TIME)

WELL DEPTH: BEFORE DEVEL. 18.90 AFTER DEVEL. 18.90 WELL DIA. (In) 2

STANDING WATER COLUMN (FT.) ____ STANDING WELL VOLUME ____ gal.

SCREEN LENGTH ____ DRILLING WATER LOSS ____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO ~~OTHER~~ 1.15	REMARKS ORP	TURB
0606 0930	5.0	475	15.1	6.61	~~10.3~~	-68.3	85.2
0606 0940	10.0	461	12.6	5.92	0.75	-66.2	36.4
0606 0950	15.0	474	12.1	6.41	0.81	-93.1	7.99
0606 1000	20.0	475	12.6	6.83	0.56	-117.2	1.67
0606 1010	25.0	465	12.2	7.09	0.74	-131.1	0.93
0606 1020	30.0	478	12.0	7.00	0.53	-121.9	0.71
		= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD: ____

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/RMSGS/FN

DEVELOPED BY RG

STARTED DEVEL. 8/20/18 / 1340 (DATE / TIME)

W.L. BEFORE DEVEL. 8.34 / 08/20 / 1335 (DEPTH / DATE / TIME)

WELL DEPTH: BEFORE DEVEL. 39.05

STANDING WATER COLUMN (FT.)

SCREEN LENGTH

JOB NO. 164817101/04/03 WELL NO. BAMW-01B

DATE OF INSTALL. SHEET OF

COMPLETED DEVEL. 8/20/18 / 1630 (DATE / TIME)

AFTER DEVEL. 8.86 / 08/20 / 1634 (DEPTH / DATE / TIME)

AFTER DEVEL. 39.06 WELL DIA. (In) 2

STANDING WELL VOLUME gal.

DRILLING WATER LOSS gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
8/20/18 1340	5.0	772	13.9	7.40	3.62	-124.4	OVER RANGE
" 1420	100.0	717	14.0	7.19	2.88	-131.1	OVER RANGE
" 1500	200.0	707	13.8	7.14	1.10	-121.5	12.9
" 1540	300.0	702	13.7	7.06	1.02	-109.6	8.88
" 1620	400.0	700	13.5	7.05	1.00	-96.7	4.91
" 1625	410.0	698	13.6	7.05	1.00	-91.8	4.80
" 1630	420.0	698	13.5	7.04	0.99	-89.8	4.88
	420.0	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME SCHAEFER GEN. STA. JOB NO. 1648171-03 WELL NO. GAMW-03

DEVELOPED BY RG DATE OF INSTALL. ____ SHEET ___ OF ___

STARTED DEVEL. 060316 / 1055 (DATE / TIME) COMPLETED DEVEL. 060316 / 1215 (DATE / TIME)

W.L. BEFORE DEVEL. 6.62 / 060316 / 1053 (DEPTH / DATE / TIME) 17.62 AFTER DEVEL. 6.68 / 060316 / 1217 (DEPTH / DATE / TIME) 17.67

WELL DEPTH: BEFORE DEVEL. ~~17.62~~ AFTER DEVEL. ~~17.67~~ WELL DIA. (In) 2

STANDING WATER COLUMN (FT.) ____ STANDING WELL VOLUME ____ gal.

SCREEN LENGTH ____ DRILLING WATER LOSS ____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO ~~OTHER~~	REMARKS ORP	TURB
0603 1105	5.0	~~DUP~~ 526	14.1	6.74	0.37	-27.5	OVERANGE
0603 1115	10.0	520	12.1	6.96	0.80	-10.4	821
0603 1125	15.0	524	12.0	6.68	0.73	-11.8	3344
0603 1135	20.0	519	12.2	6.70	0.85	-12.7	2237
0603 1145	25.0	524	12.1	6.74	0.98	-16.7	142
0603 1155	30.0	534	11.6	6.79	0.84	-22.9	10.7
0603 1205	35.0	532	11.4	6.59	0.72	-15.6	7.31
0603 1215	40.0	532	11.4	6.48	0.80	-10.8	4.96
		= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD: ____

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME: SCHAFFER GEN. STA.
JOB NO.: 1648171-03
WELL NO.: GAMW-03B
DEVELOPED BY: RG
DATE OF INSTALL.: ____ SHEET ____ OF ____
STARTED DEVEL.: 060316 (DATE) 0935 (TIME)
COMPLETED DEVEL.: 060316 (DATE) 1045 (TIME)
W.L. BEFORE DEVEL.: 6.50 (DEPTH) 060316 (DATE) 0925 (TIME)
AFTER DEVEL.: 6.58 (DEPTH) 060316 (DATE) ____ (TIME)
WELL DEPTH: BEFORE DEVEL.: 37.70
AFTER DEVEL.: 37.83
WELL DIA. (In): 2
STANDING WATER COLUMN (FT.): ____
STANDING WELL VOLUME: ____ gal.
SCREEN LENGTH: ____
DRILLING WATER LOSS: ____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	D.O. ~~OTHER~~	REMARKS ORP	REMARKS TURB
0603 0935	5.0	680	13.9	6.25	1.09	-2.9	821
0603 1005	10.0	711	12.8	6.63	1.28	-36.7	110
0603 1016	15.0	703	12.6	6.62	1.20	-34.6	~~40~~ 40.2
0603 1025	20.0	674	12.4	6.52	0.94	-31.8	24.0
0603 1035	25.0	675	12.4	6.53	0.80	-23.5	3.90
0603 1045	30.0	~~677~~ 675	12.2	6.58	0.74	-23.0	2.10
		= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD: ____

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME SCHAFER GEN. STA. JOB NO. 164871-03 WELL NO. GAMW-04

DEVELOPED BY RG DATE OF INSTALL. ____ SHEET ___ OF ___

STARTED DEVEL. 060316 / 1235 (DATE / TIME) COMPLETED DEVEL. 060316 / 1355 (DATE / TIME)

W.L. BEFORE DEVEL. 8.45 (DEPTH) 0603 / 1230 (DATE / TIME) AFTER DEVEL. 8.66 (DEPTH) 0603 / 1356 (DATE / TIME)

WELL DEPTH: BEFORE DEVEL. 17.90 AFTER DEVEL. 18.16 WELL DIA. (In) 2

STANDING WATER COLUMN (FT.) ____ STANDING WELL VOLUME ____ gal.

SCREEN LENGTH ____ DRILLING WATER LOSS ____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO ~~OTHER~~	REMARKS ORP	TURB
0603 1245	5.0	944	12.8	6.98	1.27	-24.6	OVERRANGE
0603 1255	10.0	930	12.0	6.87	0.75	-14.5	OVERRANGE
0603 1305	15.0	882	11.4	6.90	0.91	-21.4	3859
0603 1315	20.0	877	11.0	6.92	0.86	-22.5	57.2
0603 1325	25.0	846	10.9	6.75	0.99	-20.1	10.7
0603 1335	30.0	845	10.9	6.62	0.86	-14.9	4.69
0603 1345	35.0	821	10.9	6.69	0.99	-21.4	3.27
0603 1355	40.0	819	10.9	6.67	0.96	-23.0	2.63
	= TOTAL VOLUME REMOVED (gal.)						

DEVELOPMENT METHOD: ____

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME SCHAEFER GEN. STA. JOB NO. 1648171-03 WELL NO. GAMW-07

DEVELOPED BY RG DATE OF INSTALL. ____ SHEET ____ OF ____

STARTED DEVEL. 060916 (DATE) 1210 (TIME) COMPLETED DEVEL 060916 (DATE) 1320 (TIME)

W.L. BEFORE DEVEL. 10.05 (DEPTH) 10609 (DATE) 1208 (TIME) AFTER DEVEL. 10.08 (DEPTH) 10609 (DATE) 1322 (TIME)

WELL DEPTH: BEFORE DEVEL. 18.95 AFTER DEVEL. 18.95 WELL DIA. (In) 2

STANDING WATER COLUMN (FT.) ____ STANDING WELL VOLUME ____ gal.

SCREEN LENGTH ____ DRILLING WATER LOSS ____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	D.O. ~~OTHER~~	REMARKS ORP	TURB
0609 1220	5.0	994	13.7	7.15	2.23	-11.5	4827
0609 1230	10.0	997	12.8	7.25	1.34	-16.6	1057
0609 1240	15.0	1004	12.8	7.16	1.01	-17.4	28.7
0609 1250	20.0	1006	12.8	7.15	0.94	-18.8	13.8
0609 1300	25.0	1003	12.9	7.13	0.71	-19.5	4.90
0609 1310	30.0	1008	12.9	7.12	0.70	-19.2	4.33
0609 1320	35.0	1004	12.8	7.11	0.74	-18.8	4.12
		= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD: ____

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME: NIPSCO RMSGS
DEVELOPED BY: TGB
STARTED DEVEL.: 08/02/18 / 10.90 DATE / TIME
W.L. BEFORE DEVE: DEPTH / DATE / TIME 08/02/18 / 0926
WELL DEPTH: BEFORE DEVEL.: 43.9
STANDING WATER COLUMN (FT.)
SCREEN LENGTH

JOB NO.
DATE OF INSTALL.
COMPLETED DEVEL.: 08/02/18 / DATE / TIME
W.L. AFTER DEVEL.: 9.93 / 08/02/18 / 12:10 DEPTH / DATE / TIME
AFTER DEVEL.: 42.4
WELL DIA. (In)
STANDING WELL VOLUME gal.
DRILLING WATER LOSS gal.

WELL NO. 6AMW-7B
SHEET 1 of 1

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC COND. (ms/cm)	ORP (mV)	TEMP (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
0940	~	Started Purging Water ~						DTW 11.40 ~3.5 gal/min
1020		4.720	-78.0	19.62	6.58	8.26	32.9	~3.5 gal/min
1040		4.883	-146.1	16.94	7.79	3.06	22.0	" "
1100		4.985	-142.2	15.17	8.01	4.44	14.5	DTW 11.43 " "
1105		5.097	-148.8	15.22	8.06	3.75	13.2	" "
1110		4.886	-148.9	15.15	8.05	5.23	11.8	" "
1125		5.004	-132.4	17.13	8.01	2.10	14.6	" "
1130		5.052	-140.0	14.62	8.07	4.00	10.7	" "
1135		5.140	-122.7	18.62	8.04	2.31	14.8	" "
1140		4.917	-142.6	15.91	8.07	8.23	8.93	" "
1145		4.989	-150.3	14.86	8.07	4.23	9.13	" "
1155		4.175	-153.0	15.97	8.06	1.85	7.86	" "
1200		5.022	-149.9	15.00	8.08	2.46	7.32	" "
1205		4.960	-142.1	15.22	8.05	2.41	7.34	" "
		= TOTAL VOLUME REMOVED (gal.)						

DEVELOPMENT METHOD:

Insect Repellant Used? Y/N

NOTES:

G:\FORMS\Well Development Form

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME SCHAFER GDL. STA. JOB NO. 1648171-03 WELL NO. GAMW-08

DEVELOPED BY RG DATE OF INSTALL. ____ SHEET ____ OF ____

STARTED DEVEL. 060816 / 1535 (DATE / TIME) COMPLETED DEVEL. 060816 / 1645 (DATE / TIME)

W.L. BEFORE DEVEL. 10.82 / 060816 / 1530 (DEPTH / DATE / TIME) AFTER DEVEL. 10.82 / 060816 / 1648 (DEPTH / DATE / TIME)

WELL DEPTH: BEFORE DEVEL. 18.95 AFTER DEVEL. 18.97 WELL DIA. (In) 2

STANDING WATER COLUMN (FT.) ____ STANDING WELL VOLUME ____ gal.

SCREEN LENGTH ____ DRILLING WATER LOSS ____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	D.O. ~~OTHER~~	REMARKS ORP	TURB.
0608 1545	10.0	1791	13.6	7.02	1.63	-56.7	765
0608 1555	20.0	1767	13.5	7.11	1.39	-40.9	696
0608 1605	30.0	1768	13.4	7.05	1.06	-43.1	120
0608 1615	40.0	1772	13.3	7.05	1.13	-41.9	8.11
0608 1625	45.0	1781	13.5	7.06	0.99	-40.0	3.47
0608 1635	50.0	1775	13.3	7.07	1.21	-40.1	2.83
0608 1645	55.0	1782	13.2	7.07	1.16	-39.2	1.76
		= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD: ____

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME: NTPSCO-RMXES
DEVELOPED BY: D. Syna
STARTED DEVEL.: 7/28/18 (DATE) / 1400 (TIME)
W.L. BEFORE DEVEL.: 8.61 (DEPTH) / 7/28/18 (DATE) 1352 (TIME)
WELL DEPTH: BEFORE DEVEL.: 38.69
STANDING WATER COLUMN (FT.): 30.08
SCREEN LENGTH: 10

JOB NO.: 164817101
DATE OF INSTALL.: 7/25/18
COMPLETED DEVEL.: 7/28/18 (DATE) / 1650 (TIME)
W.L. AFTER DEVEL.: 8.79 (DEPTH) / 7/28/18 (DATE) 1640 (TIME)
AFTER DEVEL.: 38.79
WELL NO.: GAMW-08
SHEET 1 of 1
WELL DIA. (In): 2
STANDING WELL VOLUME: _____ gal.
DRILLING WATER LOSS: _____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC COND. (ms/cm)	ORP (mV)	TEMP. (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
7/28/18 1400	pumped started 5gal/2min							
1430	75	3.882	-157.6	15.48	7.96	3.16	clear	8.58
1500	150	3.999	-151.2	14.99	7.94	3.46	clear	8.77
1530	225	3.935	-126.6	14.69	7.89	3.69	clear	8.81
1550	275	2.810	-127.7	14.63	7.86	4.01	clear	8.79
1555	287.5	4.025	-138.6	14.36	7.87	3.68	clear	8.79
1600	300	2.934	-161.9	14.49	7.89	2.10	clear	8.79
1605	312.5	3.992	-158.7	14.45	7.92	2.52	clear	8.79
1610	325	3.778	-165.5	14.45	7.91	2.42	clear	8.79
1615	337.5	2.799	-157.2	14.53	7.90	1.47	clear	8.79
1620	350	4.007	-148.6	14.50	7.91	2.42	clear	8.79
1625	362.5	3.959	-141.6	14.46	7.90	2.80	clear	8.79
1630	375	3.968	-150.9	14.41	7.90	3.41	clear	8.79
1635	387.5							
1640	400	3.951	-143.8	14.46	7.90	3.15	clear	8.79
1650	425	pump stopped						

425 = TOTAL VOLUME REMOVED (gal.)

DEVELOPMENT METHOD: bladder pump

Insect Repellant Used? Y/N

NOTES: assume ~200 gal used in drilling
pump at about 33 ft toc

G:\FORMS\Well Development Form.XLS

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME Schaefer Gen. Sta.
DEVELOPED BY RG
STARTED DEVEL. 060616 / 1430 (DATE / TIME)
W.L. BEFORE DEVEL. 9.04 0606 / 1429 (DEPTH / DATE / TIME)
WELL DEPTH: BEFORE DEVEL. 18.08
STANDING WATER COLUMN (FT.) _____
SCREEN LENGTH _____

JOB NO. 1648171-03 WELL NO. GAMW-09
DATE OF INSTALL. _____ SHEET ___ OF ___
COMPLETED DEVEL. 060616 / 1510 (DATE / TIME)
AFTER DEVEL. 9.03 / 0606 / 1512 (DEPTH / DATE / TIME)
AFTER DEVEL. 18.08 WELL DIA. (In) 2
STANDING WELL VOLUME _____ gal.
DRILLING WATER LOSS _____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	D.O. ~~OTHER~~	REMARKS ORP	TURB
0606 1440	5.0	1895	12.9	7.34	5.81	-65.2	45
0606 1445	10.0	1780	12.7	7.34	5.60	-30.0	36.6
0606 1450	15.0	1787	12.5	7.34	5.35	-19.4	20.7
0606 1455	20.0	1822	12.7	7.38	5.14	-2.2	10.6
0606 1500	25.0	1832	12.6	7.35	4.88	5.5	~~5.1~~ 5.1
0606 1505	30.0	1844	12.6	7.36	4.91	6.7	3.7
0606 1510	35.0	1862	12.7	7.36	4.87	7.2	2.9
		= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD: _____

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME SCHAEFER GEN. STA. JOB NO. 164871-03 WELL NO. GAMW-09B

DEVELOPED BY RG DATE OF INSTALL. ____ SHEET ___ OF ___

STARTED DEVEL. 060616 (DATE) 1350 (TIME) COMPLETED DEVEL. 060616 (DATE) 1425 (TIME)

W.L. BEFORE DEVEL. 8.73 (DEPTH) 060616 (DATE) 1348 (TIME) AFTER DEVEL. 8.74 (DEPTH) 060616 (DATE) 1428 (TIME)

WELL DEPTH: BEFORE DEVEL. 37.42 AFTER DEVEL. 37.80 WELL DIA. (In) 2

STANDING WATER COLUMN (FT.) ____ STANDING WELL VOLUME ____ gal.

SCREEN LENGTH ____ DRILLING WATER LOSS ____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	D.O. ~~OTHER~~	REMARKS ORP	TURB
060616 1355	5.0	2420	14.3	7.03	1.76	-5.6	1849
060616 1400	10.0	2487	14.0	7.07	1.21	-57.7	36.2
060616 1405	15.0	2505	13.7	7.11	1.01	-71.7	33.0
060616 1410	20.0	2503	14.0	7.10	0.75	-77.6	20.2
060616 1415	25.0	2511	13.7	7.13	0.93	-80.0	6.57
060616 1420	30.0	2515	13.7	7.15	1.05	-81.6	4.19
060616 1425	35.0	2516	13.7	7.17	1.01	-82.0	3.88
		= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD: ____

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME: SUMTER GEN. STA. JOB NO. 1648171-03 WELL NO. GAMW-12

DEVELOPED BY: RG DATE OF INSTALL. ____ SHEET ____ OF ____

STARTED DEVEL. 05311614 1426 (DATE TIME) COMPLETED DEVEL 05311614 1525 (DATE TIME)

W.L. BEFORE DEVEL. 8.35 (DEPTH) 1053 (DATE) 1430 (TIME) AFTER DEVEL. 8.30 (DEPTH) 1053 (DATE) 1528 (TIME)

WELL DEPTH: BEFORE DEVEL. 18.24 AFTER DEVEL. 18.34 WELL DIA. (In) 2

STANDING WATER COLUMN (FT.) ____ STANDING WELL VOLUME ____ gal.

SCREEN LENGTH ____ DRILLING WATER LOSS ____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	D.O. ~~OTHER~~	REMARKS ORP	TURB
0531 1436	5.0	721	12.1	6.23	0.75	-19.7	OVERRANGE
0531 1446	10.0	684	11.5	5.76	0.69	-13.6	457G
0531 1456	15.0	653	11.4	5.79	0.16	-28.9	54.6
0531 1506	20.0	653	11.4	5.91	0.12	-33.8	9.07
0531 1516	25.0	653	11.5	6.06	0.12	-40.6	6.40
0531 1525	30.0	652	11.0	6.10	0.12	-42.8	4.61
		= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD: ____

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/RMSGS/IN

DEVELOPED BY RG

STARTED DEVEL. 8/21/18 / 1520 (DATE / TIME)

W.L. BEFORE DEVEL. 8.08 / 08/21 / 1517 (DEPTH / DATE / TIME)

WELL DEPTH: BEFORE DEVEL. 37.82

STANDING WATER COLUMN (FT.) _____

SCREEN LENGTH _____

JOB NO. 1648171 01/04/03 WELL NO. GAMW-12B

DATE OF INSTALL. _____ SHEET ___ OF ___

COMPLETED DEVEL. 8/21/18 / 1810 (DATE / TIME)

AFTER DEVEL. 8.14 / 08/21 / 1815 (DEPTH / DATE / TIME)

AFTER DEVEL. 37.83 WELL DIA. (In) 2

STANDING WELL VOLUME _____ gal.

DRILLING WATER LOSS _____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
8/21/18 1520	5.0	789	15.8	7.17	2.06	-112.9	OVERRANGE
" 1600	100.0	764	13.7	7.21	2.15	-122.7	32.1
" 1640	200.0	750	13.6	7.19	2.22	-102.3	15.8
" 1720	300.0	746	13.5	7.10	2.20	-95.6	7.71
" 1800	400.0	750	13.5	7.10	2.16	-91.4	4.89
" 1805	410.0	748	13.5	7.09	2.13	-89.9	4.80
" 1810	420.0	750	13.5	7.09	2.14	-89.5	4.84
	420.0	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD: _____

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME SCHAEFER GEN. STA. JOB NO. 1648/11-03 WELL NO. GMW-13

DEVELOPED BY RG DATE OF INSTALL. ____ SHEET ___ OF ___

STARTED DEVEL. 052716 1230 (DATE TIME) COMPLETED DEVEL. 052716 ____ (DATE TIME)

W.L. BEFORE DEVEL. 8.51 052716 (DEPTH DATE TIME) AFTER DEVEL. 8.52 052716 (DEPTH DATE TIME)

WELL DEPTH: BEFORE DEVEL. 18.35 AFTER DEVEL. 18.49 WELL DIA. (In) ____

STANDING WATER COLUMN (FT.) ____ STANDING WELL VOLUME ____ gal.

SCREEN LENGTH ____ DRILLING WATER LOSS ____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	D.O ~~OTHER~~	REMARKS ORP	TURB.
0527 1240	5.0	677	16.3	6.91	2.31	-80.0	OVERRANGE
0527 1250	10.0	632	12.2	6.82	0.78	-82.5	24.37
0527 1300	15.0	628	11.6	6.53	0.57	-71.7	38.7
0527 1310	20.0	627	11.6	6.48	0.74	-80.7	6.28
0527 1320	25.0	626	11.6	6.56	0.56	-88.6	5.43
0527 1330	30.0	625	11.6	6.65	0.41	-93.2	3.06
		= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD: ____

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME Schaffer Gen. Stn. JOB NO. _____ WELL NO. GAMW-13B

DEVELOPED BY RG DATE OF INSTALL. _____ SHEET ___ OF ___

STARTED DEVEL. 052716 / 1342 (DATE / TIME) COMPLETED DEVEL 052716 / _____ (DATE / TIME)

W.L. BEFORE DEVEL. 8.35 (DEPTH) 052716 (DATE) 1339 (TIME) AFTER DEVEL. 8.39 (DEPTH) 052716 (DATE) _____ (TIME)

WELL DEPTH: BEFORE DEVEL. 38.72 AFTER DEVEL. 38.72 WELL DIA. (In) 2"

STANDING WATER COLUMN (FT.) _____ STANDING WELL VOLUME _____ gal.

SCREEN LENGTH _____ DRILLING WATER LOSS _____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	D.O. ~~OTHER~~	REMARKS ORP	TURB
0527 1352	5.0	672	14.3	7.64	0.88	-47.0	72.0
0527 1402	10.0	664	13.4	7.51	0.77	-63.6	62.0
0527 1412	15.0	610	14.1	7.43	0.89	-82.4	15.8
0527 1422	20.0	608	13.6	7.46	0.91	-86.8	4.11
0527 1432	25.0	608	13.9	7.42	0.98	-90.1	1.95
		= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD: _____

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME SCHAFFER GEN. STA. JOB NO. 1648171-03 WELL NO. GAMW-14

DEVELOPED BY RG DATE OF INSTALL. _____ SHEET ___ OF ___

STARTED DEVEL. 052616 / 1525 (DATE / TIME) COMPLETED DEVEL. _____ / 1710 (DATE / TIME)

W.L. BEFORE DEVEL. 9.26 / 0526 / 1500 (DEPTH / DATE / TIME) AFTER DEVEL. 9.27 / 0526 / 1720 (DEPTH / DATE / TIME)

WELL DEPTH: BEFORE DEVEL. 18.38 AFTER DEVEL. 18.51 WELL DIA. (In) 2"

STANDING WATER COLUMN (FT.) _____ STANDING WELL VOLUME _____ gal.

SCREEN LENGTH _____ DRILLING WATER LOSS _____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	D.O. ~~OTHER~~	REMARKS ORP	TURB
0526 1535	5.0	516	11.0	6.56	0.45	72.0	-71
0526 1545	10.0	512	10.9	6.96	0.33	27.3	-85
0526 1550	15.0	511	10.9	7.03	0.39	14.9	75.2
0526 1600	20.0	506	11.0	7.02	0.61	9.6	87.9
0526 1610	25.0	508	10.9	7.00	0.60	1.0	35.6
0526 1620	30.0	506	10.9	6.99	0.66	-2.5	16.9
0526 1630	35.0	505	10.9	6.96	0.74	-5.1	9.2
0526 1640	40.0	505	11.0	6.96	0.75	-6.5	6.1
0526 1650	45.0	500	10.7	6.91	0.80	-5.4	7.0
0526 1700	50.0	504	10.7	6.91	0.86	-3.3	6.3
0526 1710	55.0	504	10.7	6.90	0.81	-2.6	4.9
		= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD: _____

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME Shaffer Gen. Sta. JOB NO. 1648171-03 WELL NO. GAMW-14B

DEVELOPED BY RG DATE OF INSTALL. _____ SHEET ___ OF ___

STARTED DEVEL. 052716 / 1016 (DATE / TIME) COMPLETED DEVEL. 052716 / 1149 (DATE / TIME)

W.L. BEFORE DEVEL. 9.24 / 052716 / 1016 (DEPTH / DATE / TIME) AFTER DEVEL. 9.25 / 052716 / 1149 (DEPTH / DATE / TIME)

WELL DEPTH: BEFORE DEVEL. 39.08 AFTER DEVEL. 39.10 WELL DIA. (In) 2"

STANDING WATER COLUMN (FT.) _____ STANDING WELL VOLUME _____ gal.

SCREEN LENGTH _____ DRILLING WATER LOSS _____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	D.O ~~OTHER~~	REMARKS ORP	TURB.
0527 1025	5.0	3242	15.7	6.87	1.03	214.7	-93
0527 1035	10.0	3135	14.7	7.25	0.66	67.2	2287
0527 1045	15.0	4225	14.5	7.11	0.58	-44.4	2655
0527 1055	20.0	3150	13.02	7.11	0.11	-59.6	742
0527 1105	25.0	3192	12.9	7.11	0.09	-76.1	48.3
0527 1115	30.0	3202	12.8	7.16	0.10	-84.9	18.1
0527 1125	35.0	3201	12.8	7.17	0.09	-89.8	8.3
0527 1135	40.0	3208	12.8	7.19	0.10	-94.8	5.4
0527 1145	45.0	3210	12.8	7.20	0.09	-96.6	4.6
		= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD: _____

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME SCHAFFER GOV. STA. JOB NO. 1648171-03 WELL NO. GAMW-15

DEVELOPED BY RG DATE OF INSTALL. _____ SHEET ___ OF ___

STARTED DEVEL. 06/016 / 1000 (DATE / TIME) COMPLETED DEVEL. 06/016 / 1040 (DATE / TIME)

W.L. BEFORE DEVEL. 8.49 / 10/10 / 0852 (DEPTH / DATE / TIME) AFTER DEVEL. 8.50 / 10/10/1044 (DEPTH / DATE / TIME)

WELL DEPTH: BEFORE DEVEL. 18.70 AFTER DEVEL. 18.79 WELL DIA. (In) 2

STANDING WATER COLUMN (FT.) _____ STANDING WELL VOLUME _____ gal.

SCREEN LENGTH _____ DRILLING WATER LOSS _____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	D.O ~~OTHER~~	REMARKS ORP	TURB
0610 1010	10.0	1074	12.0	7.13	1.49	-119.7	180.0
0610 1015	20.0	1055	12.1	6.89	1.34	-115.1	84.6
0610 1020	30.0	1033	11.8	6.86	1.85	-119.5	71.3
0610 1025	40.0	1038	11.8	6.82	1.10	-115.8	10.2
0610 1030	50.0	1030	11.7	6.82	1.85	-112.5	2.61
0610 1035	60.0	1022	11.6	6.80	1.79	-109.8	1.70
0610 1040	70.0	1013	11.7	6.77	1.61	-108.1	1.31
		= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD: _____

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME Schaefer Gen. Sta.

JOB NO. 1648171-03 WELL NO. GAMW-15B

DEVELOPED BY RG

DATE OF INSTALL. _____ SHEET ___ OF ___

STARTED DEVEL. 061016 / ~~0850~~ 0900 (DATE / TIME)

COMPLETED DEVEL. 061016 / 0955 (DATE / TIME)

W.L. BEFORE DEVEL. 8.29 / 0610 / 0850 (DEPTH / DATE / TIME)

AFTER DEVEL. 8.31 / 0610 / 0958 (DEPTH / DATE / TIME)

WELL DEPTH: BEFORE DEVEL. 39.07

AFTER DEVEL. 39.20 WELL DIA. (In) 2

STANDING WATER COLUMN (FT.) _____

STANDING WELL VOLUME _____ gal.

SCREEN LENGTH _____

DRILLING WATER LOSS _____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	D.O ~~OTHER~~	REMARKS ORP	TURB
0610 0905	10.0	1258	13.3	7.35	1.45	-118.2	4867
0610 0910	20.0	1344	12.6	6.93	0.64	-107.1	207
0610 0915	30.0	1368	12.0	6.71	1.38	-93.7	105.4
0610 0920	40.0	1367	12.1	6.98	0.84	-113.6	91.1
0610 0925	50.0	1372	12.3	7.10	0.91	-116.1	26.0
0610 0930	55.0	1378	12.0	7.11	0.96	-116.2	21.0
0610 0935	60.0	1388	12.0	7.12	1.26	-111.8	13.9
0610 0940	65.0	1378	11.9	7.13	1.04	-114.2	8.75
0610 0945	70.0	1387	12.0	7.18	1.36	-115.5	5.21
0610 0950	75.0	1390	11.9	7.20	1.26	-117.1	4.86
0610 0955	80.0	1392	11.9	7.21	1.10	-118.9	4.11
		= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD: _____

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME SCHAFER GEN. STA. JOB NO. 1648171-03 WELL NO. GMW-16

DEVELOPED BY RG DATE OF INSTALL. ____ SHEET ____ OF ____

STARTED DEVEL. 06/10/16 / 1445 (DATE / TIME) COMPLETED DEVEL. 06/10/16 / 1545 (DATE / TIME)

W.L. BEFORE DEVEL. 9.13 / 06/10 / 1129 (DEPTH / DATE / TIME) AFTER DEVEL. 9.13 / 06/10 / 1547 (DEPTH / DATE / TIME)

WELL DEPTH: BEFORE DEVEL. 18.21 AFTER DEVEL. 18.26 WELL DIA. (In) 2

STANDING WATER COLUMN (FT.) ____ STANDING WELL VOLUME ____ gal.

SCREEN LENGTH ____ DRILLING WATER LOSS ____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	D.O ~~OTHER~~	REMARKS ORP	TURB
0610 1455	10.0	1254	13.1	7.57	1.54	-151.7	34.1
0610 1505	20.0	1250	13.8	7.57	1.52	-150.4	12.2
0610 1515	30.0	1260	13.8	7.55	1.10	-153.3	8.64
0610 1525	40.0	1286	13.7	7.55	0.60	-160.1	4.16
0610 1535	50.0	1280	13.5	7.56	0.63	-162.9	3.11
0610 1545	60.0	1276	13.5	7.55	0.69	-164.7	2.96
		= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD: ____

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME SCHAFER GEN. STA. JOB NO. 1648171-03 WELL NO. GAMW-16B

DEVELOPED BY RG DATE OF INSTALL. ____ SHEET ____ OF ____

STARTED DEVEL. 060116 / 1130 (DATE / TIME) COMPLETED DEVEL. 060116 / 1430 (DATE / TIME)

W.L. BEFORE DEVEL. 8.52 / 0610 / 1128 (DEPTH / DATE / TIME) AFTER DEVEL. 8.50 / 0610 / 1435 (DEPTH / DATE / TIME)

WELL DEPTH: BEFORE DEVEL. 40.16 AFTER DEVEL. 40.21 WELL DIA. (In) 2

STANDING WATER COLUMN (FT.) ____ STANDING WELL VOLUME ____ gal.

SCREEN LENGTH ____ DRILLING WATER LOSS ____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	D.O. ~~OTHER~~	REMARKS ORP	TURB
0610 1150	10.0	1259	14.1	7.30	0.76	-125.8	OVERRANGE
0610 1205	20.0	1326	13.9	7.46	0.74	-129.6	8106
0610 1220	30.0	1322	13.3	7.51	0.71	-137.1	8000
0610 1235	40.0	1333	13.2	7.52	0.83	-138.6	7600
0610 1245	50.0	1342	13.1	7.50	0.66	-143.2	4059
0610 1300	60.0	1233	14.2	7.54	0.78	-145.7	1726
0610 1315	70.0	1338	13.7	7.53	0.53	-147.0	1846
0610 1330	80.0	1340	13.2	7.54	0.81	-144.9	3774
0610 1340	90.0	1355	13.1	7.52	1.68	-140.7	1932
0610 1345	100.0	1357	13.4	7.50	0.76	-143.1	1482
0610 1400	110.0	1363	13.4	7.49	0.50	-144.0	1411
0610 1405	120.0	1369	13.4	7.49	1.12	-145.2	51.4
0610 1410	130.0	1371	13.1	7.48	1.41	-141.7	12.1
0610 1415	140.0	1360	13.1	7.47	1.47	-140.4	7.29
0610 1420	150.0	1375	13.1	7.48	1.54	-138.7	4.98
0610 1425	160.0	1378	13.2	7.47	1.14	-142.6	4.86
0610 1430	170.0	1372	13.1	7.47	1.19	-140.9	4.91
		= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD: ____

NOTES: SLOW START, VERY MUDDY / SAND / SILT.

GOLDER

WELL DEVELOPMENT FIELD RECORD

JOB NAME: NIPSCO LUCIRMSGSIN
DEVELOPED BY: KAB
STARTED DEVEL: 9/24/20 1222 (DATE / TIME)
W.L. BEFORE DEVEL: 9.31 (DEPTH (FT)) 9/24/20 (DATE) 1207 (TIME)
WELL DEPTH (FT): BEFORE DEVEL: 21.80
STANDING WATER COLUMN (FT): 12.49
SCREEN LENGTH (FT): TO

JOB #: 20142163
DATE OF INSTALL: 9/23/20
COMPLETED DEVEL: 9/24/20 1332 (DATE / TIME)
AFTER DEVEL: 9.28 (DEPTH (FT)) 9/24/20 (DATE) 1343 (TIME)
AFTER DEVEL: 21.80
WELL DIA (IN): 2"
STANDING WELL VOLUME: 2.04 gal
DRILLING WATER LOSS: — gal

WELL ID: GAMW-16
SHEET ___ OF ___

DATE	TIME	VOLUME REMOVED (GALLONS)	FIELD PARAMETERS: SPEC. COND. (µS/cm)	ORP (mV)	TEMP (°C)	pH (S.U.)	Diss. Oxygen (mg/L)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
9/24/20	1222	0.0	—	—	—	—	—	—	
	1232	25.0	551	7.6	24.0	7.44	2.55	976.67	
	~~1237~~								KB
	1242	50.0	1327	-28.4	22.9	7.26	2.25	36.39	
	1252	75.0	1504	-28.2	23.1	7.08	2.08	61.90	
	1302	100.0	1609	-6.7	22.9	7.11	2.32	3.11	
	1307	112.5	1644	-22.2	22.7	7.10	2.20	73.36	
	1312	125.0	1681	-27.0	22.7	7.11	2.23	9.49	
	1317	137.5	1703	-28.9	22.6	7.11	2.52	2.89	
	1322	150.0	1732	-29.7	22.5	7.13	2.23	1.86	
	1327	162.5	1747	-29.0	22.6	7.12	2.24	0.97	
	1332	175.0	1759	-30.0	22.5	7.10	2.25	0.91	

175.0 = TOTAL VOLUME REMOVED (gal.)

DEVELOPMENT METHOD: Tornado pump

NOTES:

Flow rate = 2.5 gal/min

1" DIA. CASING CONTAINS .041 Gal./Ft. 2" DIA. CASING CONTAINS .163 Gal./Ft. 4" DIA. CASING CONTAINS .652 Gal./Ft.

GOLDER

WELL DEVELOPMENT FIELD RECORD

JOB NAME: NIPSCO LCR/MSSSIN
JOB #: 20142163
WELL ID: GAMW-16B
DEVELOPED BY: NAB
DATE OF INSTALL:
SHEET ___ OF ___
STARTED DEVEL: 9/24/20 1356 (DATE / TIME)
COMPLETED DEVEL: 9/24/20 1516 (DATE / TIME)
W.L. BEFORE DEVEL: 9.43 9/24/20 1154 (DEPTH (FT.) / DATE / TIME)
AFTER DEVEL: 9.45 9/24/20 1522 (DEPTH (FT.) / DATE / TIME)
WELL DEPTH (FT.) BEFORE DEVEL: 42.30
AFTER DEVEL: 42.45
WELL DIA (IN.): 2"
STANDING WATER COLUMN (FT.): 32.87
STANDING WELL VOLUME: 5.37 gal
SCREEN LENGTH (FT): 10
DRILLING WATER LOSS: — gal

DATE	TIME	VOLUME REMOVED (GALLONS)	FIELD PARAMETERS: SPEC. COND. (µS/cm)	ORP (mV)	TEMP (°C)	pH (S.U.)	Diss. Oxygen (mg/L)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
9/24/20	1356	0.0	—	—	—	—	—	—	
	1406	25.0	1905	-42.5	18.7	7.17	2.31	122.42	
	1416	50.0	2048	-44.4	18.6	7.27	1.81	429.18	
	1426	75.0	2061	-44.7	18.6	7.30	1.81	225.72	
	1436	100.0	2070	-45.5	18.5	7.34	1.82	124.50	
	1446	125.0	2084	-44.1	18.1	7.40	1.86	19.20	
	1456	150.0	2086	-43.9	18.2	7.30	2.00	11.60	
	1501	162.5	2124	-44.5	18.0	7.30	1.87	10.79	
	1506	175.0	2120	-42.8	17.9	7.32	1.80	4.67	
	1511	187.5	2122	-44.2	17.6	7.30	1.82	3.24	
	1516	200.0	2127	-43.5	17.7	7.28	1.80	2.25	
		200.0 = TOTAL VOLUME REMOVED (gal.)							

DEVELOPMENT METHOD: Tornado pump

NOTES:

flow rate = 2.5 gal/min

1" DIA. CASING CONTAINS .041 Gal./Ft. 2" DIA. CASING CONTAINS .163 Gal./Ft. 4" DIA. CASING CONTAINS .652 Gal./Ft.

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME Schaffer Gov. Sta. JOB NO. _____ WELL NO. GAMW-17

DEVELOPED BY RG DATE OF INSTALL. _____ SHEET ___ OF ___

STARTED DEVEL. 060916 / 1040 (DATE / TIME) COMPLETED DEVEL. 060916 / 1200 (DATE / TIME)

W.L. BEFORE DEVEL. 13.04 / 06091 / 0913 (DEPTH / DATE / TIME) AFTER DEVEL. 13.04 / 06091 / 1203 (DEPTH / DATE / TIME)

WELL DEPTH: BEFORE DEVEL. 17.97 AFTER DEVEL. 18.08 WELL DIA. (In) 2

STANDING WATER COLUMN (FT.) _____ STANDING WELL VOLUME _____ gal.

SCREEN LENGTH _____ DRILLING WATER LOSS _____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	D.O ~~OTHER~~	REMARKS ORP	TURB
0609 1100	10.0	1237	14.9	7.34	4.21	-77.4	6780
0609 1110	15.0	1230	14.2	7.36	4.29	-46.0	6150
0609 1120	20.0	1177	14.3	7.40	4.05	-31.9	3200
0609 1130	25.0	1184	14.3	7.35	3.66	-28.2	122
0609 1140	30.0	1189	14.2	7.36	3.97	-27.7	4.91
0609 1150	35.0	1187	14.2	7.37	3.86	-25.9	2.10
0609 1200	40.0	1187	14.2	7.39	3.66	-25.1	1.05
		= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD: _____

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME Schaefer Gen. Sta. JOB NO. _____ WELL NO. GAMW-17B

DEVELOPED BY RG DATE OF INSTALL. _____ SHEET ___ OF ___

STARTED DEVEL. 060916 (DATE) 0925 (TIME) COMPLETED DEVEL. 060916 (DATE) 1035 (TIME)

W.L. BEFORE DEVEL. 11.71 (DEPTH) 0609 (DATE) 0912 (TIME) AFTER DEVEL. 11.70 (DEPTH) 0609 (DATE) 1038 (TIME)

WELL DEPTH: BEFORE DEVEL. 40.30 AFTER DEVEL. 40.41 WELL DIA. (In) 2

STANDING WATER COLUMN (FT.) _____ STANDING WELL VOLUME _____ gal.

SCREEN LENGTH _____ DRILLING WATER LOSS _____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	D.O. ~~OTHER~~	REMARKS ORP	TURB
0609 0935	10.0	2269	15.3	6.49	1.21	-25.3	806
0609 0945	20.0	2800	14.9	7.06	0.87	-108.4	617
0609 0955	25.0	2398	14.8	7.09	0.81	-108.9	6.68
0609 1005	30.0	2333	14.8	7.14	0.77	-111.6	5.46
0609 1015	35.0	2343	14.8	7.19	0.78	-113.8	1.59
0609 1025	40.0	2374	14.8	7.20	1.00	-113.9	1.27
0609 1035	45.0	2379	14.8	7.21	0.86	-110.2	1.10
		= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD: _____

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME: SCHAEFER GEN. STA. JOB NO. 1648171-03 WELL NO. GAMW-18

DEVELOPED BY: RG DATE OF INSTALL. ____ SHEET ____ OF ____

STARTED DEVEL. 060616 (DATE) 1040 (TIME) COMPLETED DEVEL. 060616 (DATE) 1330 (TIME)

W.L. BEFORE DEVEL. 8.75 (DEPTH) 060616 (DATE) 1037 (TIME) AFTER DEVEL. 8.78 (DEPTH) 060616 (DATE) 1335 (TIME)

WELL DEPTH: BEFORE DEVEL. 18.35 AFTER DEVEL. 18.63 WELL DIA. (In) 2

STANDING WATER COLUMN (FT.) ____ STANDING WELL VOLUME ____ gal.

SCREEN LENGTH ____ DRILLING WATER LOSS ____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO ~~OTHER~~	REMARKS ORP	TURB
0606 ~~1030~~	5.0	1610	15.2	6.95	4.84	-48.3	112
0606 ~~1300~~	10.0	1674	14.4	7.04	7.95	54.9	37.2
0606 1310	15.0	1660	14.5	7.00	4.85	55.5	15.8
0606 1315	20.0	1688	13.4	6.92	5.25	56.2	13.2
0606 1320	25.0	1693	13.3	6.71	4.91	66.0	3.13
0606 1325	30.0	1685	13.2	6.60	4.86	73.4	1.78
0606 1330	35.0	1698	13.1	6.65	5.02	70.0	1.58
		= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD: ____

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME Schaffer Gas. Sta. JOB NO. 1648171-03 WELL NO. GAMW-20

DEVELOPED BY RG DATE OF INSTALL. _____ SHEET ___ OF ___

STARTED DEVEL. 060716 / 1345 (DATE / TIME) COMPLETED DEVEL. 060716 / 1425 (DATE / TIME)

W.L. BEFORE DEVEL. 8.60 / 060716 / 1104 (DEPTH / DATE / TIME) AFTER DEVEL. 8.60 / 060716 / (DEPTH / DATE / TIME)

WELL DEPTH: BEFORE DEVEL. 18.93 AFTER DEVEL. 19.02 WELL DIA. (In) 2

STANDING WATER COLUMN (FT.) _____ STANDING WELL VOLUME _____ gal.

SCREEN LENGTH _____ DRILLING WATER LOSS _____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	D.O ~~OTHER~~	REMARKS ORP	TURB
060716 1325	10.0	1498	12.5	7.16	0.83	-132.8	2499
060716 1335	20.0	1345	12.5	7.05	0.32	-129.8	3999
060716 1345	30.0	1313	12.2	7.06	0.91	-123.7	1055
060716 1355	40.0	1292	12.1	7.05	0.71	-121.3	19.4
060716 1405	50.0	1276	11.9	7.02	0.55	-117.7	~~4.4~~ 4.4
060716 1415	60.0	1260	12.0	7.02	0.62	-115.6	3.6
060716 1425	70.0	1254	12.0	7.02	0.68	-113.2	2.2
		= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD: _____

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME Schaffer Gen. Sta. JOB NO. 1648171-03 WELL NO. GAMW-21

DEVELOPED BY RG DATE OF INSTALL. _____ SHEET ____ OF ____

STARTED DEVEL. 060816 / 1350 (DATE / TIME) COMPLETED DEVEL. 060816 / 1500 (DATE / TIME)

W.L. BEFORE DEVEL. 10.30 / 060816 / 1226 (DEPTH / DATE / TIME) AFTER DEVEL. 10.31 / 060816 / 1503 (DEPTH / DATE / TIME)

WELL DEPTH: BEFORE DEVEL. 30.34 AFTER DEVEL. 20.42 WELL DIA. (In) 2

STANDING WATER COLUMN (FT.) _____ STANDING WELL VOLUME _____ gal.

SCREEN LENGTH _____ DRILLING WATER LOSS _____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	D.O. ~~CITTER~~	REMARKS ORP	TURB
060816 1400	10.0	690	12.0	7.15	2.32	-91.0	155.4
060816 1410	20.0	682	11.6	7.03	2.91	-77.7	55.1
060816 1420	25.0	682	11.6	6.94	1.18	-79.6	50.5
060816 1430	35.0	667	11.7	6.94	0.99	-79.0	6.85
060816 1440	45.0	664	11.5	6.96	1.31	-83.8	2.98
060816 1450	55.0	659	11.4	7.01	1.86	-83.5	2.37
060816 1500	65.0	661	11.3	7.00	1.58	-83.8	1.78
	= TOTAL VOLUME REMOVED (gal.)						

DEVELOPMENT METHOD: _____

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME SCHAEFER GEN. STA. JOB NO. 1648171-03 WELL NO. GAMW-21B

DEVELOPED BY RG DATE OF INSTALL. SHEET OF

STARTED DEVEL. 060816 / 1215 (DATE / TIME) COMPLETED DEVEL. 060816 / 1335 (DATE / TIME)

W.L. BEFORE DEVEL. 11.28 / 060816 / 1205 (DEPTH / DATE / TIME) AFTER DEVEL. 11.29 / 060816 / 1339 (DEPTH / DATE / TIME)

WELL DEPTH: BEFORE DEVEL. 36.36 AFTER DEVEL. 36.41 WELL DIA. (In) 2

STANDING WATER COLUMN (FT.) STANDING WELL VOLUME gal.

SCREEN LENGTH DRILLING WATER LOSS gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	D.O ~~OTHER~~	REMARKS ORP	TURB.
060816 1225	10.0	1326	12.0	7.26	5.30	-103.6	2905
060816 1235	20.0	1181	11.6	7.30	1.41	-110.6	108.8
060816 1245	30.0	1106	11.6	7.27	1.21	-114.3	101.2
060816 1255	40.0	1111	11.7	7.28	2.76	-115.6	26.4
060816 1305	45.0	1127	11.7	7.28	1.48	-111.2	11.3
060816 1310	50.0	1134	11.8	7.29	2.24	-118.5	4.81
060816 1325	55.0	1142	11.8	7.29	2.13	-112.1	4.22
060816 1335	60.0	1157	11.7	7.29	1.49	-114.2	4.01
		= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME SCHAEFER GEN. STA. JOB NO. 1648171-03 WELL NO. GAMW-22

DEVELOPED BY RG DATE OF INSTALL. ____ SHEET ____ OF ____

STARTED DEVEL. 060816 / 1055 (DATE / TIME) COMPLETED DEVEL. 060816 / 1155 (DATE / TIME)

W.L. BEFORE DEVEL. 10.41 / 0608 / 0912 (DEPTH / DATE / TIME) AFTER DEVEL. 10.49 / 0608 / 1158 (DEPTH / DATE / TIME)

WELL DEPTH: BEFORE DEVEL. 20.40 AFTER DEVEL. 20.44 WELL DIA. (In) 2

STANDING WATER COLUMN (FT.) ____ STANDING WELL VOLUME ____ gal.

SCREEN LENGTH ____ DRILLING WATER LOSS ____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	D.O ~~OTHER~~	REMARKS ~~ORP~~	TURB
0608 1105	10.0	844	12.3	7.13	1.43	-106.5	4025
0608 1115	20.0	686	12.1	7.09	2.14	-98.9	1728
0608 1125	30.0	682	12.1	7.06	4.43	-90.1	32.1
0608 1135	40.0	681	11.6	7.05	3.88	-85.4	4.44
0608 1145	50.0	678	11.8	7.05	3.98	-85.0	3.21
0608 1155	60.0	676	12.1	7.04	~~3.90~~ 3.90	-85.1	1.98
		= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD: ____

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME Schaffer Gov. Sta. JOB NO. 1648171-03 WELL NO. GAMW-22B

DEVELOPED BY RG DATE OF INSTALL. ____ SHEET ____ OF ____

STARTED DEVEL. 060816 / 0925 (DATE / TIME) COMPLETED DEVEL. 060816 / 1035 (DATE / TIME)

W.L. BEFORE DEVEL. 11.14 / 060816 / 0910 (DEPTH / DATE / TIME) AFTER DEVEL. 11.15 / 060816 / 1039 (DEPTH / DATE / TIME)

WELL DEPTH: BEFORE DEVEL. 37.07 AFTER DEVEL. 37.19 WELL DIA. (In) 2

STANDING WATER COLUMN (FT.) ____ STANDING WELL VOLUME ____ gal.

SCREEN LENGTH ____ DRILLING WATER LOSS ____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	D.O ~~OTHER~~	REMARKS ORP	TURB
0608 0935	10.0	9854	12.8	6.80	2.46	-40.7	317.5
0608 0945	20.0	9775	11.6	7.17	1.91	-96.3	99.8
0608 0955	30.0	9845	11.6	7.29	1.53	-111.2	73.3
0608 1005	40.0	9740	11.6	7.31	1.34	-115.3	12.2
0608 1015	50.0	9527	11.6	7.33	2.63	-114.7	4.96
0608 1025	60.0	9740	11.5	7.34	2.46	-114.0	3.74
0608 1035	70.0	9707	11.6	7.35	2.71	-115.1	2.92
		= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD: ____

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME SCHAFER GEN. STA. JOB NO. 1648171-03 WELL NO. GAMW-23

DEVELOPED BY RG DATE OF INSTALL. ____ SHEET ____ OF ____

STARTED DEVEL. 060716 (DATE) 1600 (TIME) COMPLETED DEVEL. 060716 (DATE) 1650 (TIME)

W.L. BEFORE DEVEL. 10.02 (DEPTH) 060716 (DATE) 1447 (TIME) AFTER DEVEL. 10.02 (DEPTH) 060716 (DATE) 1654 (TIME)

WELL DEPTH: BEFORE DEVEL. 20.37 AFTER DEVEL. 20.38 WELL DIA. (In) 2

STANDING WATER COLUMN (FT.) ____ STANDING WELL VOLUME ____ gal.

SCREEN LENGTH ____ DRILLING WATER LOSS ____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	D.O. ~~OTHER~~	REMARKS ORP	TURB
060716 1610	10.0	2818	12.6	8.31	0.13	-327.3	-14
060716 1620	20.0	2688	11.8	8.33	0.46	-317.6	6.28
060716 1630	30.0	2605	11.7	8.30	0.34	319.6	4.32
060716 1640	40.0	2648	11.9	8.27	0.55	-317.9	2.67
060716 1650	50.0	2640	11.8	8.27	0.28	-320.1	1.81
		= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD: ____

NOTES: STRONG LEACHATE ODOR, AND APPEARANCE,

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME SCHAEFER GEN. STA. JOB NO. 1648171-03 WELL NO. GAMW-23B

DEVELOPED BY RG DATE OF INSTALL. _____ SHEET ___ OF ___

STARTED DEVEL. 060716 / 1445 (DATE / TIME) COMPLETED DEVEL. 060716 / 1555 (DATE / TIME)

W.L. BEFORE DEVEL. 11.70 / 10607 / ~~1442~~ 1442 (DEPTH / DATE / TIME) AFTER DEVEL. 11.66 / 10607 / 1557 (DEPTH / DATE / TIME)

WELL DEPTH: BEFORE DEVEL. 37.90 AFTER DEVEL. 38.01 WELL DIA. (In) 2

STANDING WATER COLUMN (FT.) _____ STANDING WELL VOLUME _____ gal.

SCREEN LENGTH _____ DRILLING WATER LOSS _____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO ~~OTHER~~	REMARKS ORP	TURB
0607 1455	10.0	13.140	12.8	7.84	0.87	-193.4	3256
0607 1505	20.0	18.440	12.8	8.37	0.33	-270.9	862
0607 1515	30.0	14.480	12.6	8.37	0.34	-281.9	67.3
0607 1525	40.0	14.540	12.6	8.39	0.34	-291.6	13.8
0607 1535	50.0	14.280	12.7	8.42	0.78	-287.6	7.11
0607 1545	60.0	14.260	12.9	8.39	0.25	-311.7	4.37
0607 1555	70.0	14.250	12.8	8.36	0.10	-320.6	3.10
		= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD: _____

NOTES: STRONG LEACHATE ODOR, AND APPEARANCE.

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/RMSGS/IN
DEVELOPED BY RG
STARTED DEVEL. 10/4/16 (DATE) 1045 (TIME)
W.L. BEFORE DEVEL. 5.03 (DEPTH) 10/4/16 (DATE) 0855 (TIME)
WELL DEPTH: BEFORE DEVEL. 19.50
STANDING WATER COLUMN (FT.) 14.47
SCREEN LENGTH 10.0

JOB NO. 1648171-03 WELL NO. GAMW-24
DATE OF INSTALL. SHEET 1 OF 1
COMPLETED DEVEL. 10/4/16 (DATE) 1128 (TIME)
AFTER DEVEL. 5.03 (DEPTH) 10/4/16 (DATE) 1130 (TIME)
AFTER DEVEL. 20.31 WELL DIA. (In) 2"
STANDING WELL VOLUME 2.4 gal.
DRILLING WATER LOSS — gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
10/4/1050	10	302	16.0	8.77	0.52	-259.6	0/2
10/4/1056	20	375	15.7	8.86	0.77	-175.9	353/
10/4/1102	30	378	15.8	8.83	0.64	-181.1	1940
10/4/1107	40	378	15.8	8.82	0.63	-186.6	120.8
10/4/1112	50	386	15.8	8.78	0.98	-169.2	8.45
10/4/1118	60	393	15.9	8.67	0.68	-164.8	4.39
10/4/1123	70	402	15.9	8.56	0.76	-163.3	4.31
10/4/1128	80	403	15.9	8.49	0.73	-165.1	4.49
	80	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/RMSGS/IN

DEVELOPED BY RG

STARTED DEVEL. 10/4/16 / 0900 (DATE / TIME)

W.L. BEFORE DEVEL. 4.96 / 1004 / 0856 (DEPTH / DATE / TIME)

WELL DEPTH: BEFORE DEVEL. 35.28

STANDING WATER COLUMN (FT.) 30.32

SCREEN LENGTH 10.0

JOB NO. 1648171-03 WELL NO. GAMW-24B

DATE OF INSTALL. _____ SHEET 1 OF 1

COMPLETED DEVEL. 10/4/16 / 1026 (DATE / TIME)

AFTER DEVEL. 4.97 / 1004 / 1028 (DEPTH / DATE / TIME)

AFTER DEVEL. 35.38 WELL DIA. (In) 2"

STANDING WELL VOLUME 4.96 gal.

DRILLING WATER LOSS — gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
1004/0905	10	606	13.2	6.44	0.34	168.2	O/R
1004/0908	20	370	12.3	6.62	0.59	-22.3	O/R
1004/0914	30	356	12.3	6.63	0.24	-200.2	O/R
1004/0919	40	352	12.4	6.97	0.58	-221.6	O/R
1004/0927	50	346	12.4	6.89	0.72	-238.9	O/R
1004/0935	60	342	12.3	6.82	0.49	-257.4	2980
1004/0940	70	339	12.4	6.85	0.65	-271.3	1066
1004/0946	80	338	12.4	6.98	1.01	-271.2	86.1
1004/0951	90	338	12.4	7.07	0.99	-270.4	29.3
1004/0957	100	337	12.4	7.11	0.81	-272.4	20.7
1004/1002	110	336	12.4	7.11	0.69	-278.9	10.6
1004/1008	120	335	12.4	7.12	0.73	-271.3	6.18
1004/1014	130	334	12.5	7.14	0.72	-273.8	4.99
1004/1020	140	333	12.4	7.16	0.88	-268.9	4.46
1004/1026	150	333	12.4	7.17	0.76	-270.3	4.32
	150	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/RMSGS/IN
DEVELOPED BY RG
STARTED DEVEL. 10/10/16 (DATE) 1100 (TIME)
W.L. BEFORE DEVEL. 8.99 (DEPTH) 10/10 (DATE) 0910 (TIME)
WELL DEPTH: BEFORE DEVEL. 18.72
STANDING WATER COLUMN (FT.) 9.73
SCREEN LENGTH 10.0

JOB NO. 1648171-03 WELL NO. GMW-25
DATE OF INSTALL. ____ SHEET 1 OF 1
COMPLETED DEVEL. 10/10/16 (DATE) 1230 (TIME)
AFTER DEVEL. 9.02 (DEPTH) 10/10 (DATE) 1233 (TIME)
AFTER DEVEL. 19.43 WELL DIA. (In) 2"
STANDING WELL VOLUME 1.7 gal.
DRILLING WATER LOSS — gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
1010/1110	10	458	16.9	7.10	1.32	-77.8	O/R
1010/1120	20	427	16.2	7.29	0.91	-54.7	O/R
1010/1130	30	421	16.1	7.19	0.86	-47.2	O/R
1010/1140	40	416	16.2	7.16	0.46	-54.0	3827
1010/1150	50	414	16.2	7.15	0.38	-58.6	3769
1010/1200	60	424	16.3	7.13	0.60	-59.9	160
1010/1210	70	427	16.3	7.14	0.70	-58.3	4.86
1010/1220	80	425	16.2	7.11	0.70	-54.8	3.50
1010/1230	90	423	16.1	7.12	0.72	-61.3	1.44
	90	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/RENSSELAER/IN
JOB NO. 1648171-03 WELL NO. GPMW-25B
DEVELOPED BY DG
DATE OF INSTALL. SHEET 1 OF 1
STARTED DEVEL. 10/10/16 (DATE) 0915 (TIME)
COMPLETED DEVEL. 10/10/16 (DATE) 1055 (TIME)
W.L. BEFORE DEVEL. 8.92 (DEPTH) 10/10 (DATE) 0910 (TIME)
AFTER DEVEL. 8.99 (DEPTH) 10/10 (DATE) 1058 (TIME)
WELL DEPTH: BEFORE DEVEL. 36.87
AFTER DEVEL. 37.00 WELL DIA. (In) 2"
STANDING WATER COLUMN (FT.) 27.92
STANDING WELL VOLUME 4.6 gal.
SCREEN LENGTH 10.0
DRILLING WATER LOSS — gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
1010/0925	10	857	12.9	7.51	2.88	223.9	O/R
1010/0935	20	528	12.4	6.72	0.46	-42.8	O/R
1010/0945	30	529	12.3	6.69	0.73	-36.1	O/R
1010/0955	40	525	12.1	6.65	0.70	-42.9	O/R
1010/1005	50	528	12.2	6.77	1.12	-48.3	219.5
1010/1015	60	518	12.3	6.89	0.66	-68.8	58.1
1010/1025	70	515	12.2	6.89	1.01	-70.6	46.5
1010/1035	80	515	12.4	6.95	0.80	-76.5	3.85
1010/1045	90	514	12.3	6.94	0.58	-79.3	3.03
1010/1055	100	511	12.3	6.97	0.85	-78.7	2.83
	100	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIBCO/ELKHART/IN
JOB NO. 1648171-03 WELL NO. GAMW-26
DEVELOPED BY RG
DATE OF INSTALL. ____ SHEET 1 OF 1
STARTED DEVEL. 10/10/16 1455 (DATE TIME)
COMPLETED DEVEL. 10/10/16 1605 (DATE TIME)
W.L. BEFORE DEVEL. 9.85 10/10/1257 (DEPTH DATE TIME)
AFTER DEVEL. 9.85 10/10/1608 (DEPTH DATE TIME)
WELL DEPTH: BEFORE DEVEL. 19.28
AFTER DEVEL. 20.00
WELL DIA. (In) 2
STANDING WATER COLUMN (FT.) 9.43
STANDING WELL VOLUME 1.7 gal.
SCREEN LENGTH 10.0
DRILLING WATER LOSS / gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
1010/1505	10	536	17.9	11.1	0.61	-182.0	1920
1010/1515	20	474	18.5	10.3	0.45	-156.2	136.1
1010/1525	30	487	17.9	9.76	0.60	-131.2	115.5
1010/1535	40	456	18.0	9.38	0.55	-120.0	24.7
1010/1545	50	484	17.9	9.22	0.76	-45.4	3.35
1010/1555	60	510	17.9	9.19	0.92	-27.0	2.09
1010/1605	70	513	18.0	9.14	0.90	-33.3	1.44
	70	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/RMSGS/IN
DEVELOPED BY RG
STARTED DEVEL. 10/10/16 / 1300 (DATE / TIME)
W.L. BEFORE DEVEL. 9.90 / 10/10/16 / 1251 (DEPTH / DATE / TIME)
WELL DEPTH: BEFORE DEVEL. 36.88
STANDING WATER COLUMN (FT.) 26.98
SCREEN LENGTH 10.0

JOB NO. 1648171-03 WELL NO. GAMW-26B
DATE OF INSTALL. ____ SHEET 1 OF 1
COMPLETED DEVEL. 10/10/16 / 1450 (DATE / TIME)
AFTER DEVEL. 9.93 / 10/10 / 1453 (DEPTH / DATE / TIME)
AFTER DEVEL. 37.08 WELL DIA. (In) 2"
STANDING WELL VOLUME 4.4 gal.
DRILLING WATER LOSS — gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
1010/1310	10	437	13.0	7.40	0.68	-71.7	D/R
1010/1320	20	464	12.5	7.49	0.52	-53.2	D/R
1010/1330	30	445	12.2	7.48	0.69	-55.2	D/R
1010/1340	40	430	12.3	7.47	0.98	-52.1	2990
1010/1350	50	435	12.5	7.48	0.86	-72.2	1104
1010/1400	60	434	12.5	7.45	0.66	-77.5	26.3
1010/1410	70	436	12.3	7.40	0.63	-79.7	17.0
1010/1420	80	434	12.3	7.40	0.57	-77.2	7.10
1010/1430	90	435	12.4	7.40	0.62	-80.9	4.86
1010/1440	100	436	12.5	7.44	0.78	-83.4	4.52
1010/1450	110	437	12.6	7.46	0.76	-83.8	3.93
	110	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/RAGGS/IN
DEVELOPED BY RG
STARTED DEVEL. 10/6/16 (DATE) 1555 (TIME)
W.L. BEFORE DEVEL. 7.79 (DEPTH) 10/06/16 (DATE) 1438 (TIME)
WELL DEPTH: BEFORE DEVEL. 19.60
STANDING WATER COLUMN (FT.) 11.81
SCREEN LENGTH 10.0

JOB NO. 164171-03 WELL NO. GAMW-27
DATE OF INSTALL. ____ SHEET 1 OF 1
COMPLETED DEVEL. 10/6/16 (DATE) 1645 (TIME)
AFTER DEVEL. 7.78 (DEPTH) 10/06/16 (DATE) 1647 (TIME)
AFTER DEVEL. 20.00 WELL DIA. (In) 2"
STANDING WELL VOLUME 2.0 gal.
DRILLING WATER LOSS — gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
10/06/1600	10	1579	17.0	7.63	1.02	-90.1	O/R
10/06/1605	20	1441	16.7	7.29	1.10	-76.5	O/R
10/06/1610	30	1454	16.8	7.13	0.90	-74.2	3875
10/06/1615	40	1456	16.9	7.17	0.80	-72.0	1862
10/06/1620	50	1453	17.0	7.17	0.88	-71.2	647
10/06/1625	60	1452	17.0	7.17	1.00	-67.7	16.0
10/06/1630	70	1450	17.2	7.18	0.98	-64.9	8.83
10/06/1635	80	1450	17.1	7.16	0.78	-65.4	4.78
10/06/1640	90	1450	17.1	7.15	0.67	-66.0	4.52
10/06/1645	100	1444	17.1	7.15	0.61	-68.7	4.11
	100	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/RMSGS/IN
DEVELOPED BY RG
STARTED DEVEL. 10/6/16 / 1440 (DATE / TIME)
W.L. BEFORE DEVEL. 7.70 / 1006 / 1438 (DEPTH / DATE / TIME)
WELL DEPTH: BEFORE DEVEL. 34.60
STANDING WATER COLUMN (FT.) 26.90
SCREEN LENGTH 10.0

JOB NO. 1648171-03 WELL NO. GAMW-27B
DATE OF INSTALL. SHEET 1 OF 1
COMPLETED DEVEL. 10/6/16 / 1545 (DATE / TIME)
AFTER DEVEL. 7.71 / 1006 / 1547 (DEPTH / DATE / TIME)
AFTER DEVEL. 34.73 WELL DIA. (In) 2"
STANDING WELL VOLUME 4.4 gal.
DRILLING WATER LOSS — gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
1006/1445	10.0	8065	14.6	7.05	9.73	-70.1	O/R
1006/1450	20	8651	14.2	7.17	1.01	-76.7	O/R
1006/1455	30	8594	13.6	7.21	1.12	-77.6	O/R
1006/1500	40	10640	13.2	7.18	2.04	-77.0	O/R
1006/1505	50	9161	13.3	7.24	1.18	-77.2	O/R
1006/1510	60	8902	13.3	7.23	1.40	-77.9	4226
1006/1515	70	9905	13.3	7.21	0.95	-74.7	2176
1006/1520	80	9072	13.4	7.24	0.74	-70.5	118
1006/1525	90	9022	13.6	7.22	1.07	-78.0	18.5
1006/1530	100	9044	13.6	7.21	0.80	-79.3	9.68
1006/1535	110	9015	13.7	7.21	1.08	-79.6	4.79
1006/1540	120	9032	13.7	7.22	1.07	-78.6	4.31
1006/1545	130	9021	13.7	7.21	1.05	-78.3	4.09
	130	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/RMSGS/IN
DEVELOPED BY R6
STARTED DEVEL. 10/6/16 1310 (DATE TIME)
W.L. BEFORE DEVEL. 7.62 10/06/16 1150 (DEPTH DATE TIME)
WELL DEPTH: BEFORE DEVEL. 20.05
STANDING WATER COLUMN (FT.) 12.43
SCREEN LENGTH 10.0

JOB NO. 1648171-03 WELL NO. GAMW-28
DATE OF INSTALL. SHEET 1 OF 1
COMPLETED DEVEL. 10/6/16 1 (DATE TIME)
AFTER DEVEL. 10/06/16 (DEPTH DATE TIME)
AFTER DEVEL. 20.15 WELL DIA. (In) 2"
STANDING WELL VOLUME 2.0 gal.
DRILLING WATER LOSS — gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
10/06/1315	10	1140	17.8	7.57	0.39	-108.7	O/R
10/06/1320	20	1206	16.7	7.53	1.61	-97.8	O/R
10/06/1325	30	1175	17.0	7.44	0.71	-88.6	O/R
10/06/1330	40	1194	17.0	7.36	0.96	-80.4	3409
10/06/1335	50	1181	17.1	7.35	0.91	-77.6	1450
10/06/1340	60	1207	17.0	7.34	0.49	-77.4	110
10/06/1345	70	1191	16.9	7.33	0.75	-76.0	17.6
10/06/1350	80	1220	17.0	7.32	1.10	-73.5	10.7
10/06/1355	90	1250	17.1	7.31	0.79	-72.1	6.35
10/06/1400	100	1205	17.1	7.30	0.86	-73.4	4.92
10/06/1405	110	1215	17.0	7.29	0.92	-71.6	4.26
10/06/1410	120	1220	16.9	7.28	1.01	-69.7	3.59
	120	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/RMSGS/IN

DEVELOPED BY RG

STARTED DEVEL. 10/6/16 / 1155 (DATE / TIME)

W.L. BEFORE DEVEL. 7.73 / 1006 / 1150 (DEPTH / DATE / TIME)

WELL DEPTH: BEFORE DEVEL. 32.84

STANDING WATER COLUMN (FT.) 25.11

SCREEN LENGTH 10.0

JOB NO. 1648171-03 WELL NO. GAMW-28B

DATE OF INSTALL. SHEET 1 OF 1

COMPLETED DEVEL. 10/6/16 / 1250 (DATE / TIME)

AFTER DEVEL. 7.76 / 1006 / 1252 (DEPTH / DATE / TIME)

AFTER DEVEL. 32.92 WELL DIA. (In) 2"

STANDING WELL VOLUME 4.1 gal.

DRILLING WATER LOSS — gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
1006/1200	10	2056	13.8	6.92	0.69	-66.4	O/R
1006/1205	20	2090	13.3	7.05	1.08	-74.9	O/R
1006/1210	30	2086	13.3	7.02	0.94	-74.8	2294
1006/1215	40	2066	13.4	7.08	0.61	-77.0	1118
1006/1220	50	2097	13.3	7.09	0.97	-77.2	757
1006/1225	60	2058	13.3	7.12	0.87	-76.8	55.4
1006/1230	70	2048	13.2	7.12	0.87	-78.9	14.4
1006/1235	80	2046	13.3	7.11	0.94	-79.6	7.23
1006/1240	90	2045	13.3	7.13	0.99	-77.4	4.96
1006/1245	100	2057	13.4	7.12	1.02	-78.3	4.47
1006/1250	110	2054	13.4	7.13	1.08	-77.4	4.11
	110	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/RMSGS/IN
JOB NO. 1648171-03 WELL NO. GAMW-29
DEVELOPED BY RG
DATE OF INSTALL. SHEET 1 OF 1
STARTED DEVEL. 10/5/16 1520 (DATE TIME)
COMPLETED DEVEL. 10/5/16 1615 (DATE TIME)
W.L. BEFORE DEVEL. 12.00 1005 1520 (DEPTH DATE TIME)
AFTER DEVEL. 12.06 1005 1618 (DEPTH DATE TIME)
WELL DEPTH: BEFORE DEVEL. 19.72
AFTER DEVEL. 20.39
WELL DIA. (In) 2"
STANDING WATER COLUMN (FT.) 7.72
STANDING WELL VOLUME 1.4 gal.
SCREEN LENGTH 10.0
DRILLING WATER LOSS / gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
1005/1530	10	2897	16.6	7.17	4.35	-67.4	OR
1005/1535	20	3029	15.9	7.22	1.00	-61.0	3869
1005/1540	30	2991	15.9	7.11	0.70	-55.7	3765
1005/1545	40	2992	15.6	7.07	0.57	-52.7	2662
1005/1550	50	3040	15.8	7.08	0.92	-47.4	195.3
1005/1555	60	3021	15.9	7.05	0.63	-50.4	115
1005/1600	70	3044	15.9	7.03	0.76	-51.5	13.2
1005/1605	80	3032	15.8	7.04	0.90	-48.0	2.82
1005/1610	90	3042	15.7	7.04	0.75	-44.9	1.10
1005/1615	100	3036	15.7	7.03	0.96	-46.5	0.56
	100	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/RMGS/IN
DEVELOPED BY RG
STARTED DEVEL. 10/3/16 | 1620 (DATE | TIME)
W.L. BEFORE DEVEL. 11.92 | 11003 | 1545 (DEPTH | DATE | TIME)
WELL DEPTH: BEFORE DEVEL. 40.44
STANDING WATER COLUMN (FT.) 4.7
SCREEN LENGTH ~~NA~~ 10.0

JOB NO. 1648171-03 WELL NO. GAMW-29B
DATE OF INSTALL. 10/3/16 SHEET 1 OF 1
COMPLETED DEVEL. 10/3/16 | 1748 (DATE | TIME)
AFTER DEVEL. 11.92 | 11003 | 1750 (DEPTH | DATE | TIME)
AFTER DEVEL. 40.52 WELL DIA. (In) 2"
STANDING WELL VOLUME 4.7 gal.
DRILLING WATER LOSS ~~NA~~ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
1003/1625	10.0	11.450	14.3	6.81	1.38	178.5	O/R
1003/1635	20.0	20240	13.3	7.15	1.01	-62.1	O/R
1003/1642	30.0	16.070	13.1	7.37	0.20	-89.8	3110
1003/1647	40.0	16.230	12.9	7.39	0.51	-102.1	1512
1003/1656	50.0	16.860	12.9	7.44	1.34	-104.5	38.5
1003/1705	60.0	17.070	13.0	7.45	0.92	-101.7	18.2
1003/1711	70.0	17.090	12.8	7.46	1.24	-107.6	11.4
1003/1717	80.0	17.180	12.9	7.47	1.32	-100.8	8.01
1003/1723	90.0	17.350	13.0	7.47	0.68	-104.8	6.24
1003/1731	100.0	17.490	12.9	7.48	1.13	-109.8	5.05
1003/1736	110.0	17.460	12.6	7.48	0.80	-112.3	3.86
1003/1742	120.0	17.550	12.6	7.48	0.90	-141.9	3.39
1003/1748	130.0	17.440	12.5	7.48	0.81	-160.2	3.02
	130.0	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIBCO/RMSGS/IN
DEVELOPED BY RG
STARTED DEVEL. 10/6/16 (DATE) 1025 (TIME)
W.L. BEFORE DEVEL. 9.23 (DEPTH) 10/06/16 (DATE) 0858 (TIME)
WELL DEPTH: BEFORE DEVEL. 20.25
STANDING WATER COLUMN (FT.) 11.02
SCREEN LENGTH 10.0

JOB NO. 164171-03 WELL NO. GAMW-30
DATE OF INSTALL. SHEET 1 OF 1
COMPLETED DEVEL. 10/6/16 (DATE) 1115 (TIME)
AFTER DEVEL. 9.22 (DEPTH) 10/06/16 (DATE) 1117 (TIME)
AFTER DEVEL. 20.40 WELL DIA. (In) 2"
STANDING WELL VOLUME 1.8 gal.
DRILLING WATER LOSS — gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
10/06/1030	10	2301	16.8	7.05	0.54	-72.7	O/R
10/06/1035	20	1970	16.9	6.73	0.80	-60.2	O/R
10/06/1040	30	1902	16.6	6.71	0.79	-48.6	3819
10/06/1045	40	1905	16.6	6.67	0.77	-41.4	2609
10/06/1050	50	1905	16.7	6.62	0.95	-41.7	186
10/06/1055	60	1904	16.8	6.62	0.69	-39.4	17.4
10/06/1100	70	1903	16.8	6.62	0.61	-38.8	5.29
10/06/1105	80	1901	16.8	6.61	1.07	-39.2	2.58
10/06/1110	90	1895	16.7	6.61	0.62	-36.3	1.69
10/06/1115	100	1891	16.7	6.60	0.91	-36.5	1.43
	100	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/RMSGS/IN
JOB NO. 1648171-03 WELL NO. GAMW-30B
DEVELOPED BY RS
DATE OF INSTALL. ____ SHEET 1 OF 1
STARTED DEVEL. 10/6/16 | 0900 (DATE | TIME)
COMPLETED DEVEL. 10/6/16 | 1010 (DATE | TIME)
W.L. BEFORE DEVEL. 8.66 | 10/6 | 0858 (DEPTH | DATE | TIME)
AFTER DEVEL. 8.66 | 10/6 | 1013 (DEPTH | DATE | TIME)
WELL DEPTH: BEFORE DEVEL. 35.44
AFTER DEVEL. 35.49
WELL DIA. (In) 2"
STANDING WATER COLUMN (FT.) 26.78
STANDING WELL VOLUME 4.4 gal.
SCREEN LENGTH 10.0
DRILLING WATER LOSS — gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
10/6/0905	10	8868	13.6	6.58	0.75	175.3	OR
10/6/0910	20	8373	13.3	6.48	0.80	-41.0	OR
10/6/0915	30	7699	13.3	6.70	1.13	-51.4	OR
10/6/0920	40	9183	13.4	6.76	0.91	-63.1	OR
10/6/0925	50	8525	13.4	6.80	0.60	-63.8	3684
10/6/0930	60	8432	13.4	6.83	1.17	-66.4	1299
10/6/0935	70	8411	13.4	6.84	0.76	-67.5	805
10/6/0940	80	8556	13.4	6.86	0.74	-70.8	39.6
10/6/0945	90	8573	13.4	6.86	1.12	-71.0	10.9
10/6/0950	100	8527	13.4	6.87	0.83	-70.4	5.77
10/6/0955	110	8556	13.4	6.87	0.68	-70.0	5.22
10/6/1000	120	8528	13.5	6.87	0.68	-71.1	4.93
10/6/1005	130	8542	13.4	6.89	0.64	-71.9	4.64
10/6/1010	140	8511	13.5	6.88	0.64	-72.4	4.70
	140	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/PNSGS/IN
DEVELOPED BY RG
STARTED DEVEL. 10/7/16 (DATE) 1110 (TIME)
W.L. BEFORE DEVEL. 7.72 (DEPTH) 10/7/16 (DATE) 0910 (TIME)
WELL DEPTH: BEFORE DEVEL. 18.54
STANDING WATER COLUMN (FT.) 10.82
SCREEN LENGTH 10.0

JOB NO. 1648171-03 WELL NO. GAMW-31
DATE OF INSTALL. ____ SHEET 1 OF 1
COMPLETED DEVEL. 10/7/16 (DATE) 1235 (TIME)
AFTER DEVEL. 7.68 (DEPTH) 10/7/16 (DATE) 1237 (TIME)
AFTER DEVEL. 19.26 WELL DIA. (In) 2"
STANDING WELL VOLUME 1.9 gal.
DRILLING WATER LOSS — gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
10/7/1105	10	570	16.2	7.59	1.41	-87.3	O/R
10/7/1110	15	507	16.1	7.17	0.58	-65.4	O/R
10/7/1120	20	500	16.2	7.09	0.60	-59.7	O/R
10/7/1125	30	477	15.7	7.06	0.40	-56.1	O/R
10/7/1135	40	500	15.8	7.00	0.53	-54.4	O/R
10/7/1145	50	507	16.2	7.03	0.43	-52.1	3652
10/7/1155	60	520	15.9	7.06	0.57	-54.7	122
10/7/1205	70	525	16.1	7.01	0.70	-50.3	11.9
10/7/1215	80	530	16.2	6.98	0.69	-48.7	3.85
10/7/1225	90	536	15.9	7.00	0.63	-50.3	3.65
10/7/1235	100	540	16.0	6.96	0.65	-47.6	2.58
	100	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/RMSGS/IN
DEVELOPED BY RG
STARTED DEVEL. 10/7/16 0925 (DATE TIME)
W.L. BEFORE DEVEL. 7.72 (DEPTH) 10/07/16 (DATE) 0910 (TIME)
WELL DEPTH: BEFORE DEVEL. 31.97
STANDING WATER COLUMN (FT.) 24.25
SCREEN LENGTH 10.0

JOB NO. 1648171-03 WELL NO GAMW-31B
DATE OF INSTALL. ____ SHEET 1 OF 1
COMPLETED DEVEL. 10/7/16 1055 (DATE TIME)
AFTER DEVEL. 7.74 (DEPTH) 10/07/16 (DATE) 1058 (TIME)
AFTER DEVEL. 32.10 WELL DIA. (In) 2"
STANDING WELL VOLUME 4.0 gal.
DRILLING WATER LOSS — gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
10/07/0930	10	4552	12.5	6.58	0.91	217.7	O/R
10/07/0935	20	5142	12.1	6.62	0.70	-10.2	O/R
10/07/0940	30	4564	12.1	6.64	0.65	-25.2	O/R
10/07/0945	40	4152	12.1	6.70	0.56	-34.7	O/R
10/07/0950	50	2290	12.2	6.97	0.57	-32.1	O/R
10/07/0955	60	2414	12.4	6.91	0.63	-38.2	3143
10/07/1000	70	2396	12.3	6.84	0.61	-44.9	2027
10/07/1005	80	2521	12.4	6.88	0.60	-52.6	140
10/07/1010	90	2554	12.4	6.85	0.59	-54.0	44.9
10/07/1015	100	2574	12.4	6.90	0.60	-58.0	31.8
10/07/1020	110	2550	12.5	6.89	0.68	-60.6	14.4
10/07/1025	120	2557	12.6	6.90	0.65	-62.6	13.2
10/07/1030	130	2586	12.4	6.88	0.67	-63.3	11.8
10/07/1035	140	2590	12.5	6.90	0.65	-64.7	11.2
10/07/1040	150	2598	12.5	6.94	0.64	-66.5	8.89
10/07/1045	160	2626	12.6	6.93	0.64	-66.9	4.86
10/07/1050	170	2618	12.5	6.91	0.67	-65.3	4.68
10/07/1055	180	2610	12.5	6.90	0.70	-64.4	4.72
	180	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/RMSGS/IN
DEVELOPED BY RG
STARTED DEVEL. 10/7/16 (DATE) 1430 (TIME)
W.L. BEFORE DEVEL. 10.32 (DEPTH) 10/07 (DATE) 1430 (TIME)
WELL DEPTH: BEFORE DEVEL. 20.85
STANDING WATER COLUMN (FT.) 10.58
SCREEN LENGTH 10.0

JOB NO. 164871-03 WELL NO. GAMW-32
DATE OF INSTALL. SHEET 1 OF 1
COMPLETED DEVEL. 10/7/16 (DATE) 1550 (TIME)
AFTER DEVEL. 10.34 (DEPTH) 10/07 (DATE) 1553 (TIME)
AFTER DEVEL. 21.07 WELL DIA. (In) 2"
STANDING WELL VOLUME 1.8 gal.
DRILLING WATER LOSS — gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
10/07/1440	10	510	16.4	7.41	0.99	-110.2	O/R
10/07/1450	20	501	16.3	7.33	0.80	-98.1	O/R
10/07/1500	30	493	16.2	7.27	0.76	-86.7	1808
10/07/1510	40	481	16.0	7.14	0.44	-79.8	30.0
10/07/1520	50	481	16.0	7.11	0.58	-74.0	8.34
10/07/1530	60	480	15.9	7.08	0.58	-71.4	4.36
10/07/1540	70	480	15.8	7.08	0.56	-71.1	3.76
10/07/1550	80	479	15.8	7.07	0.55	-70.6	3.33
	80	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/RMSGS/EN
DEVELOPED BY RG
STARTED DEVEL. 10/7/16 (DATE) 1245 (TIME)
W.L. BEFORE DEVEL. 10.52 (DEPTH) 10/7 (DATE) 1 (TIME)
WELL DEPTH: BEFORE DEVEL. 36.74
STANDING WATER COLUMN (FT.) 26.22
SCREEN LENGTH 10.0

JOB NO. 164871-03 WELL NO. GMW-32B
DATE OF INSTALL. ____ SHEET 1 OF 1
COMPLETED DEVEL. 10/7/16 (DATE) 1425 (TIME)
AFTER DEVEL. 10.55 (DEPTH) 10/7 (DATE) 1427 (TIME)
AFTER DEVEL. 36.93 WELL DIA. (In) 2"
STANDING WELL VOLUME 4.3 gal.
DRILLING WATER LOSS — gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
10/7/1255	10	1950	13.5	6.85	3.91	-57.7	O/R
10/7/1305	20	2479	13.1	6.84	1.21	-62.2	O/R
10/7/1315	30	2897	13.0	6.93	1.12	-59.9	O/R
10/7/1325	40	2933	12.9	6.87	0.77	-61.1	3372
10/7/1335	50	2983	12.8	6.91	0.67	-62.4	1290
10/7/1345	60	3004	12.8	6.85	0.58	-63.4	63.8
10/7/1355	70	3031	12.9	6.83	0.49	-64.5	15.4
10/7/1405	80	3041	12.9	6.84	0.62	-65.4	4.89
10/7/1415	90	3033	12.9	6.83	0.71	-63.5	4.52
10/7/1425	100	3035	12.9	6.81	0.70	-62.8	4.31
	100	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/RMSGS/IN
DEVELOPED BY RG
STARTED DEVEL. 10/4/16 (DATE) 1325 (TIME)
W.L. BEFORE DEVEL. 8.10 (DEPTH) 10/04/16 (DATE) 1200 (TIME)
WELL DEPTH: BEFORE DEVEL. 20.10
STANDING WATER COLUMN (FT.) 12.00
SCREEN LENGTH 10.0

JOB NO. 164871-03 WELL NO. GAMW-33
DATE OF INSTALL. ____ SHEET 1 OF 1
COMPLETED DEVEL. 10/4/16 (DATE) 1445 (TIME)
AFTER DEVEL. 8.10 (DEPTH) 10/04/16 (DATE) 1417 (TIME)
AFTER DEVEL. 20.33 WELL DIA. (In) 2"
STANDING WELL VOLUME 2.0 gal.
DRILLING WATER LOSS — gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
10/4/1330	10	1008	17.7	7.70	0.52	-161.7	O/R
10/4/1335	20	415	16.5	7.62	0.75	-125.4	O/R
10/4/1340	30	404	17.2	7.35	0.73	-110.6	2439
10/4/1345	40	421	17.4	7.26	0.79	-96.5	332.4
10/4/1350	50	436	17.2	7.23	0.77	-93.0	11.4
10/4/1355	60	448	17.3	7.20	0.62	-82.6	8.42
10/4/1400	70	462	17.4	7.17	0.69	-80.6	5.68
10/4/1405	80	474	17.2	7.14	0.40	-77.4	4.23
10/4/1410	90	481	17.2	7.14	0.66	-71.8	3.18
10/4/1415	100	488	17.2	7.13	0.62	-70.2	3.07
	100	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/RMSGS/IN
DEVELOPED BY RG
STARTED DEVEL. 10/4/16 1205 (DATE TIME)
W.L. BEFORE DEVEL. 7.69 1004 1200 (DEPTH DATE TIME)
WELL DEPTH: BEFORE DEVEL. 35.18
STANDING WATER COLUMN (FT.) 27.49
SCREEN LENGTH 10.0

JOB NO. 164871-03 WELL NO. GAMW-33B
DATE OF INSTALL. ____ SHEET 1 OF 1
COMPLETED DEVEL. 10/4/16 1321 (DATE TIME)
AFTER DEVEL. 7.72 1004 1324 (DEPTH DATE TIME)
AFTER DEVEL. 35.35 WELL DIA. (In) 2"
STANDING WELL VOLUME 4.5 gal.
DRILLING WATER LOSS — gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
1004/1211	10	18.890	13.3	7.62	4.68	-108.8	O/R
1004/1216	20	20.420	13.0	7.45	0.67	-117.9	O/R
1004/1221	30	23.950	13.1	7.36	0.98	-102.9	O/R
1004/1226	40	21.380	13.0	7.32	0.96	-114.0	3216
1004/1231	50	21.140	13.1	7.29	1.21	-114.7	688
1004/1236	60	21.180	13.1	7.27	1.32	-118.1	90.1
1004/1241	70	21.260	13.0	7.25	0.79	-124.6	27.6
1004/1246	80	21.320	13.0	7.24	0.94	-130.2	17.2
1004/1251	90	21.310	13.1	7.22	0.99	-140.1	12.3
1004/1256	100	21.390	13.2	7.22	0.96	-141.2	8.89
1004/1301	110	21.400	13.4	7.21	0.93	-146.2	6.69
1004/1306	120	21.380	13.4	7.20	0.94	-145.8	4.86
1004/1311	130	21.300	13.3	7.20	0.94	-147.6	4.60
1004/1316	140	21.300	13.2	7.19	0.90	-149.8	4.41
1004/1321	150	21.310	13.1	7.19	0.91	-154.4	4.22
	150	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/RMSGS/IN
DEVELOPED BY RG
STARTED DEVEL. 10/4/16 (DATE) 1550 (TIME)
W.L. BEFORE DEVEL. 6.46 (DEPTH) 10/4/16 (DATE) 1435 (TIME)
WELL DEPTH: BEFORE DEVEL. 20.10
STANDING WATER COLUMN (FT.) 13.64
SCREEN LENGTH 10.0

JOB NO. 164871-03 WELL NO. GMW-34
DATE OF INSTALL. _____ SHEET 1 OF 1
COMPLETED DEVEL. 10/4/16 (DATE) 1635 (TIME)
AFTER DEVEL. 6.45 (DEPTH) 10/4/16 (DATE) 1637 (TIME)
AFTER DEVEL. 20.28 WELL DIA. (In) 2"
STANDING WELL VOLUME 2.3 gal.
DRILLING WATER LOSS — gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
10/4/1555	10	1088	16.8	7.93	1.06	-121.9	O/R
10/4/1600	20	529	16.7	7.32	1.03	-84.6	O/R
10/4/1605	30	505	16.8	7.10	0.80	-73.2	460
10/4/1610	40	495	16.6	7.06	0.73	-71.7	23.2
10/4/1615	50	487	16.9	7.01	0.82	-67.5	10.6
10/4/1620	60	484	17.0	6.96	0.68	-67.0	6.81
10/4/1625	70	481	16.9	6.95	0.84	-63.3	4.62
10/4/1630	80	477	16.8	6.93	0.72	-62.2	4.10
10/4/1635	90	475	16.7	6.91	0.67	-57.7	3.97
	90	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/RMSGS/IN
DEVELOPED BY RG
STARTED DEVEL. 10/4/16 / 1440 (DATE / TIME)
W.L. BEFORE DEVEL. 4.23 / 1004 / 1435 (DEPTH / DATE / TIME)
WELL DEPTH: BEFORE DEVEL. 30.35
STANDING WATER COLUMN (FT.) 26.12
SCREEN LENGTH 10.0

JOB NO. 1648177-03 WELL NO. GAMW-34B
DATE OF INSTALL. _____ SHEET 1 OF 1
COMPLETED DEVEL. 10/4/16 / 1545 (DATE / TIME)
AFTER DEVEL. 4.20 / 1004 / 1547 (DEPTH / DATE / TIME)
AFTER DEVEL. 30.48 WELL DIA. (In) 2"
STANDING WELL VOLUME 4.3 gal.
DRILLING WATER LOSS — gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
1004/1445	10	15.470	14.7	7.48	1.37	-138.6	O/R
1004/1450	20	15.000	14.2	7.60	0.67	-147.1	1818
1004/1455	30	14.890	14.1	7.63	1.14	-145.1	1406
1004/1500	40	15.460	13.7	7.68	1.37	-144.2	125
1004/1505	50	15.400	13.9	7.71	1.15	-146.8	84.7
1004/1510	60	15.530	13.5	7.72	0.75	-150.1	48.3
1004/1515	70	15.520	13.4	7.72	0.64	-156.4	30.4
1004/1520	80	15.450	13.7	7.72	0.90	-154.4	20.3
1004/1525	90	15.430	13.5	7.73	0.59	-156.8	12.1
1004/1530	100	15.540	13.6	7.73	0.48	-156.0	8.67
1004/1535	110	15.670	13.5	7.74	0.58	-154.6	4.90
1004/1540	120	15.520	13.6	7.73	0.80	-154.3	4.48
1004/1545	130	15.460	13.7	7.73	0.81	-154.8	4.19
	130	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIRSCO/RAMSGS/FN
DEVELOPED BY RG
STARTED DEVEL. 10/5/16 1320 (DATE TIME)
W.L. BEFORE DEVEL. 5.10 (DEPTH) 10/05/16 (DATE) 1325 (TIME)
WELL DEPTH: BEFORE DEVEL. 26.55
STANDING WATER COLUMN (FT.) 21.45
SCREEN LENGTH 10.0

JOB NO. 1648171-03 WELL NO. GMW-35
DATE OF INSTALL. _____ SHEET 1 OF 1
COMPLETED DEVEL. 10/5/16 1425 (DATE TIME)
AFTER DEVEL. 5.13 (DEPTH) 10/05/16 (DATE) 1428 (TIME)
AFTER DEVEL. 26.66 WELL DIA. (In) 2"
STANDING WELL VOLUME 3.5 gal.
DRILLING WATER LOSS — gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
10/05/16 1330	10	414	15.6	7.48	8.23	-85.6	O/R
10/05/16 1335	20	409	14.5	7.34	1.33	-75.5	O/R
10/05/16 1340	30	412	14.6	7.30	0.71	-77.9	O/R
10/05/16 1345	40	407	14.6	7.34	0.75	-78.5	O/R
10/05/16 1350	50	408	14.6	7.36	0.85	-76.8	332
10/05/16 1355	60	407	14.7	7.41	0.94	-68.9	198
10/05/16 1400	70	407	14.7	7.34	0.77	-71.8	158
10/05/16 1405	80	405	14.7	7.31	0.71	-75.4	29.8
10/05/16 1410	90	405	14.6	7.33	0.58	-78.7	13.0
10/05/16 1415	100	405	14.7	7.32	0.80	-78.7	4.70
10/05/16 1420	110	405	14.7	7.31	0.84	-77.7	4.13
10/05/16 1425	120	405	14.6	7.30	0.82	-76.5	3.96
	120	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/RAMSGS/FN
DEVELOPED BY DG
STARTED DEVEL. 10/5/16 (DATE) 1050 (TIME)
W.L. BEFORE DEVEL. 7.09 (DEPTH) 10/05/16 (DATE) 0905 (TIME)
WELL DEPTH: BEFORE DEVEL. 20.22
STANDING WATER COLUMN (FT.) 13.13
SCREEN LENGTH 10.0

JOB NO. 1648171-03 WELL NO. GMW-36
DATE OF INSTALL. ____ SHEET 1 OF 1
COMPLETED DEVEL. 10/5/16 (DATE) 1150 (TIME)
AFTER DEVEL. 7.12 (DEPTH) 10/05/16 (DATE) 1154 (TIME)
AFTER DEVEL. 20.28 WELL DIA. (In) 2"
STANDING WELL VOLUME 2.2 gal.
DRILLING WATER LOSS — gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
10/05/1055	10	465	16.1	7.20	0.79	-60.5	O/R
10/05/1100	20	460	16.1	7.06	0.68	-38.4	O/R
10/05/1105	30	463	16.3	7.01	0.89	-35.9	1227
10/05/1110	40	460	16.3	7.00	0.50	-37.4	144
10/05/1115	50	459	16.3	7.00	0.88	-38.9	55.4
10/05/1120	60	458	16.4	6.98	0.98	-37.8	26.0
10/05/1125	70	456	16.4	6.94	0.72	-36.3	14.4
10/05/1130	80	455	16.6	6.93	0.70	-37.2	10.8
10/05/1135	90	453	16.6	6.97	0.71	-32.7	4.39
10/05/1140	100	454	10.5	6.96	0.59	-33.9	4.50
10/05/1145	110	453	16.4	6.94	0.69	-33.4	4.53
10/05/1150	120	451	16.3	6.93	0.78	-32.3	4.31
	120	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/RMSGS/TN
DEVELOPED BY RG
STARTED DEVEL. 10/5/16 (DATE) 0930 (TIME)
W.L. BEFORE DEVEL. 4.88 (DEPTH) 10/05 (DATE) 0905 (TIME)
WELL DEPTH: BEFORE DEVEL. 35.30
STANDING WATER COLUMN (FT.) 30.42
SCREEN LENGTH 10.0

JOB NO. 164871-03 WELL NO GAMW-36B
DATE OF INSTALL. SHEET 1 OF 1
COMPLETED DEVEL. 10/5/16 (DATE) 1040 (TIME)
AFTER DEVEL. 4.90 (DEPTH) 10/05 (DATE) 1044 (TIME)
AFTER DEVEL. 35.33 WELL DIA. (In) 2"
STANDING WELL VOLUME 5.0 gal.
DRILLING WATER LOSS — gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
1005/0935	10	448	13.1	7.66	0.84	162.5	O/R
1005/0940	20	441	12.6	7.07	0.69	19.8	O/R
1005/0945	30	438	12.5	6.71	0.86	-23.4	O/R
1005/0950	40	444	12.6	6.89	0.76	-43.2	1454
1005/0955	50	443	12.6	7.08	0.81	-58.2	170
1005/1000	60	444	12.5	7.09	0.71	-63.5	129
1005/1005	70	444	12.5	7.12	0.84	-65.5	37.3
1005/1010	80	443	12.6	7.18	0.65	-66.5	17.4
1005/1015	90	442	12.5	7.22	0.61	-69.5	7.85
1005/1020	100	442	12.6	7.22	0.73	-71.0	6.39
1005/1025	110	442	12.6	7.26	0.70	-73.2	5.15
1005/1030	120	443	12.8	7.23	0.65	-78.8	4.52
1005/1035	130	442	12.7	7.25	0.77	-77.0	4.52
1005/1040	140	443	12.7	7.27	0.88	-78.0	4.46
	140	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/RMSGS/IN
DEVELOPED BY RG
STARTED DEVEL. 10/5/16 1220 (DATE TIME)
W.L. BEFORE DEVEL. 6.78 10/05/16 1215 (DEPTH DATE TIME)
WELL DEPTH: BEFORE DEVEL. 27.68
STANDING WATER COLUMN (FT.) 20.90
SCREEN LENGTH 10.0

JOB NO. 164871-03 WELL NO. GAMW-37
DATE OF INSTALL. _____ SHEET 1 OF 1
COMPLETED DEVEL. 10/5/16 1310 (DATE TIME)
AFTER DEVEL. 6.80 10/05/16 1312 (DEPTH DATE TIME)
AFTER DEVEL. 27.78 WELL DIA. (In) 2"
STANDING WELL VOLUME 3.4 gal.
DRILLING WATER LOSS — gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
10/05/1225	10	533	14.5	7.15	0.69	-61.6	O/R
10/05/1230	20	531	14.2	7.09	0.96	-50.3	O/R
10/05/1235	30	529	14.4	7.09	0.78	-46.7	2911
10/05/1240	40	532	14.6	7.13	1.10	-48.3	1548
10/05/1245	50	531	14.6	7.12	0.52	-51.4	38.5
10/05/1250	60	529	14.5	7.11	1.03	-54.6	15.6
10/05/1255	70	530	14.5	7.15	0.95	-61.8	6.89
10/05/1300	80	530	14.5	7.12	0.88	-54.0	4.61
10/05/1305	90	530	14.5	7.14	0.81	-58.6	4.51
10/05/1310	100	530	14.5	7.13	0.79	-57.2	4.19
	100	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME: NIPSCO
DEVELOPED BY: TGB
STARTED DEVEL.: 05/15/18 (DATE) / 1350 (TIME)
W.L. BEFORE DEVEL.: 4.35 (DEPTH) / 05/15 (DATE) / 1350 (TIME)
WELL DEPTH: BEFORE DEVEL.: 17.97
STANDING WATER COLUMN (FT.): —
SCREEN LENGTH: 10 ft

JOB NO.: 1648171
DATE OF INSTALL.:
COMPLETED DEVEL.: 05/15/18 (DATE) / 1430 (TIME)
W.L. AFTER DEVEL.: 4.31 (DEPTH) / 05/15 (DATE) / 1430 (TIME)
AFTER DEVEL.: 17.97
STANDING WELL VOLUME: — gal.
DRILLING WATER LOSS: — gal.

WELL NO. GAMW-38
SHEET 1 of 1
WELL DIA. (In) 2

DATE/TIME		VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC COND. (ms/cm)	ORP (mV)	TEMP. (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.) DTW	Rate
	1350	~~2~~ —	736	-72.6	9.88	7.16	2.53	11.3	4.30	4
1400	~~[illegible]~~	40	723	-64.4	10.82	7.10	1.57	42.3	4.50	↓
	1410	80	750	-66.9	9.85	7.07	1.75	10.2	4.51	↓
	1420	120	746	-63.0	10.50	7.08	1.65	4.77	↓	↓
	1425	140	750	-62.6	9.62	7.08	2.77	3.09	↓	↓
	1430	160	758	-61.4	9.46	7.09	3.74	2.82	4.57	4
			= TOTAL VOLUME REMOVED (gal.)							

DEVELOPMENT METHOD: Submersible pump.

Insect Repellant Used? Y/N

NOTES:

G:\FORMS\...

WELL DEVELOPMENT FIELD RECORD

Golder Associates

JOB NAME: NIPSCO
DEVELOPED BY: JGB
STARTED DEVEL.: 05/15/2018 / " " / " "
W.L. BEFORE DEVEL.: 4.35 / " " / " "
DEPTH / DATE / TIME
WELL DEPTH: BEFORE DEVEL.: 32.00
STANDING WATER COLUMN (FT.): —
SCREEN LENGTH: 10ft

JOB NO.: 1648171
DATE OF INSTALL.:
COMPLETED DEVEL.: 05/15/2018 /
W.L. AFTER DEVEL.: 4.31 / " " / " "
DEPTH / DATE / TIME
AFTER DEVEL.: 31.98
STANDING WELL VOLUME: =
DRILLING WATER LOSS: =

WELL NO. GAMW-38B
SHEET 1 of 1
WELL DIA. (In) 2
gal.
gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS: SPEC COND. (ms/cm)	ORP (mV)	TEMP. (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.): DTW	Rate
1246	—	2751	-109.0	11.40	6.96	0.99	22.1	4.57	4
1255	40	4158	-88.6	11.20	6.94	3.85	5.15	↓	↓
1305	80	4264	-70.6	11.14	6.91	2.48	2.14	↓	
1315	120	4284	-68.9	10.96	6.89	1.36	2.89	4.58	
1320	140	4323	-70.1	10.86	6.88	1.69	2.01	↓	
1325	160	4332	-74.0	11.15	6.89	1.25	1.57	↓	↓
1330	180	4314	-69.2	11.39	6.90	1.94	1.44	4.58	4
		= TOTAL VOLUME REMOVED (gal.)							

DEVELOPMENT METHOD: Submersible pump

Insect Repellant Used? Y/N

NOTES:

WELL DEVELOPMENT FIELD RECORD

Golder Associates

JOB NAME: NIPSCO
DEVELOPED BY: TGB
STARTED DEVEL.: 05/15/18 / (DATE / TIME)
W.L. BEFORE DEVEL.: 4.36 / " " / " " (DEPTH / DATE / TIME)
WELL DEPTH: BEFORE DEVEL.: 17.95
STANDING WATER COLUMN (FT.): —
SCREEN LENGTH: 10ft

JOB NO.: 1648171
DATE OF INSTALL.:
COMPLETED DEVEL.: 05/15/18 / (DATE / TIME)
W.L. AFTER DEVEL.: 4.25 / " " / " " (DEPTH / DATE / TIME)
AFTER DEVEL.: 17.95
STANDING WELL VOLUME: — gal.
DRILLING WATER LOSS: — gal.

WELL NO. GAMW-39
SHEET ____ of ____
WELL DIA. (In) ____

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC COND. (ms/cm)	ORP (mV)	TEMP. (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.) DTW	Rate
1005	20	2057	-53.9	10.84	6.62	1.33	55.2	4.49	4
1010	40	2066	-44.8	11.03	6.67	2.32	13.3	4.51	
1020	60	2059	-36.3	11.54	6.68	2.17	6.43	4.51	
1025	80	2029	-36.0	10.86	6.64	0.88	5.59	4.52	
1030	100	2000	-38.8	11.65	6.64	0.75	3.36		
1035	120	2024	-37.1	10.96	6.69	2.76	4.45		
1040	140	2018	-39.8	11.10	6.70	2.85	3.98	4.52	4

= TOTAL VOLUME REMOVED (gal.)

DEVELOPMENT METHOD: Submersible pump.

Insect Repellant Used? Y/N

NOTES:

G:\FORMS\Well Development Form

WELL DEVELOPMENT FIELD RECORD

Golder Associates

JOB NAME: NIPSCO
DEVELOPED BY: TGB
STARTED DEVEL.: 05/15/18 (DATE) / 0845 (TIME)
W.L. BEFORE DEVEL.: 4.32 ft (DEPTH) / 05/15/18 (DATE) / 0845 (TIME)
WELL DEPTH: BEFORE DEVEL.: 31.15
STANDING WATER COLUMN (FT.):
SCREEN LENGTH: 10ft

JOB NO.: 1648171
DATE OF INSTALL.:
COMPLETED DEVEL.: 05/15/18 (DATE) / 0955 (TIME)
W.L. AFTER DEVEL.: 4.38 (DEPTH) / 05/15/18 (DATE) / 1000 (TIME)
AFTER DEVEL.: ~~31.15~~
STANDING WELL VOLUME:
DRILLING WATER LOSS:

WELL NO. GAMW-39B
SHEET 1 of 1
WELL DIA. (In) 2
gal.
gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS: SPEC COND. (ms/cm)	ORP (mV)	TEMP. (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.): DTW	Rate
0845	~~20~~ →						1.58	4.32	4
0855	~~40~~ 40						19.3	4.56	
0905	80						2.84	4.61	
0910	100	6505	-55.3	12.07	6.80	1.43	2.01	4.64	
0915	120	6642	-64.3	12.09	6.84	1.85	1.55	4.66	
0920	140	6719	-68.3	12.06	6.82	0.95	1.83	4.67	
0930	180	6808	-68.6	12.10	6.85	1.31	191	4.68	
0935	200	6826	-69.5	12.14	6.85	0.71	13.5	4.66	
0940	220	6885	-69.5	12.19	6.86	0.84	6.26	4.65	
0945	240	6930	-70.0	12.10	6.85	0.47	3.36	4.65	
0950	260	6900	-69.8	12.17	6.87	1.11	3.63	4.65	↓
0955	280	6898	-70.2	12.30	6.86	0.61	3.85	4.65	4
	= TOTAL VOLUME REMOVED (gal.)								

DEVELOPMENT METHOD: submersible pump. Moved pump up and down in water column to simulate surge block.

Insect Repellant Used? Y/N

NOTES:

WELL DEVELOPMENT FIELD RECORD

Golder Associates

JOB NAME: NIPSCO
DEVELOPED BY: TGB
STARTED DEVEL.: 05/14/18 (DATE) / 0845 (TIME)
W.L. BEFORE DEVEL.: 7.42 (DEPTH) / 05/14/18 (DATE) / 1445 (TIME)
WELL DEPTH: BEFORE DEVEL.: 19.94
STANDING WATER COLUMN (FT.):
SCREEN LENGTH: 10ft

JOB NO.: 1648171
DATE OF INSTALL.:
COMPLETED DEVEL.: 05/14/18 (DATE) / 1615 (TIME)
W.L. AFTER DEVEL.: 7.38 (DEPTH) / 05/14 (DATE) / 1615 (TIME)
AFTER DEVEL.: 19.94
STANDING WELL VOLUME: =
DRILLING WATER LOSS: =

WELL NO. GAMW-40
SHEET 1 of 1
WELL DIA. (In) 2
gal.
gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS: SPEC COND. (ms/cm)	ORP (mV)	TEMP. (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.): DTW	Rate
1445	20	2185	-29.6	13.13	6.53	1.44	5.23	7.70	4
1450	40	2207	-23.5	13.35	6.56	1.83	ERROR	7.72	
1455	60	2203	-22.4	13.51	6.56	1.78	217	7.72	
1500	80	2161	-23.1	12.91	6.53	2.32	130	7.72	
1505	100	2183	-24.4	12.78	6.52	1.65	40.6	7.72	
1510	120	2188	-28.0	12.74	6.50	0.49	20.9	7.74	
1515	140	2202	-26.4	12.74	6.52	0.16	13.2	7.73	
1520	160	2206	-28.0	12.67	6.59	1.87	9.06	7.73	
1525	180	2203	-22.3	12.85	6.59	1.88	9.21	7.73	
1530	200	2206	-21.4	12.82	6.50	1.91	ERROR	7.73	
1535	220	2188	-20.3	12.25	6.59	1.49	308	7.73	
1540	240	2241	-19.0	12.64	6.59	1.79	29.1	7.74	
1545	260	2231	-21.4	12.78	6.59	1.58	16.9	↓	
1550	280	2244	-23.3	12.79	6.58	1.26	12.3	↓	
1555	300	2259	-23.4	12.67	6.60	1.44	9.94	7.73	
1600	320	2261	-22.6	12.81	6.59	0.08	6.63	7.74	
1605	340	2263	-23.4	13.81	6.59	5.60	4.31	↓	↓
1610	360	2277	-22.3	13.37	6.62	2.18	4.97	↓	4
1615	380	2259	-18.6	12.66	6.58	1.30	3.99	↓	4
		= TOTAL VOLUME REMOVED (gal.)							

DEVELOPMENT METHOD: submersible pump.

Insect Repellant Used? Y/N

NOTES:

WELL DEVELOPMENT FIELD RECORD

JOB NAME
DEVELOPED BY
STARTED DEVEL. 05/14/18 / 13.10 (DATE / TIME)
W.L. BEFORE DEVEL. 7.29 (DEPTH) / 05/14/18 (DATE) / (TIME)
WELL DEPTH: BEFORE DEVEL. 34.47
STANDING WATER COLUMN (FT.) —
SCREEN LENGTH 10 ft

JOB NO. 1648171
DATE OF INSTALL.
COMPLETED DEVEL. 05 (DATE) / 14:25 (TIME)
W.L. AFTER DEVEL. 7.47 (DEPTH) / " (DATE) / " (TIME)
AFTER DEVEL. 35.16
STANDING WELL VOLUME —
DRILLING WATER LOSS —

WELL NO. GAMW-40B
SHEET 1 of 1
WELL DIA. (In)
gal.
gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS: SPEC COND. (ms/cm)	ORP (mV)	TEMP. (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.): DTW	Rate
1310	20						—	7.29	4
1315	40						23.2	7.51	
1320	60						7.42	7.51	
1325	80						3.64	7.52	
1330	100						59.4	7.52	
1335	120	12394	-108.5	13.89	7.55	0.79	53.9	7.53	
1340	140	12477	-111.0	13.60	7.59	1.11	12.2	7.53	
1350	180	12803	-82.1	13.88	7.57	0.73	20.9	7.54	
1355	200	12826	-102.0	14.24	7.58	1.32	10.0		
14:00	220	12670	-101.2	14.07	7.59	1.80	18.2		
1405	240	12765	-107.9	13.91	7.59	0.83	10.4		
1410	260	12797	-107.9	14.24	7.60	0.55	4.02		
1415	280	12794	-110.3	14.40	7.61	1.30	3.22		
1420	300	12590	-102.7	14.53	7.60	1.72	2.56	↓	↓
1425	320	12813	-104.4	14.08	7.61	1.51	2.35	7.54	4
	= TOTAL VOLUME REMOVED (gal.)								

DEVELOPMENT METHOD: submersible pump.

Insect Repellant Used? (Y)N

NOTES:

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO R.M. Schahfer Station
JOB NO.
WELL NO. GMW-42
DEVELOPED BY TGB
DATE OF INSTALL. 07/24
SHEET 1 of 1
STARTED DEVEL. 08/01/18 / 09:21 (DATE / TIME)
COMPLETED DEVEL. 08/01/18 / (DATE / TIME)
W.L. BEFORE DEVE 7.43 / 08/01/18 / (DEPTH / DATE / TIME)
W.L. AFTER DEVEL. 7.43 / 08/01/18 / 1210 (DEPTH / DATE / TIME)
WELL DEPTH: BEFORE DEVEL. 17.97
AFTER DEVEL. 17.99
WELL DIA. (In) 2
STANDING WATER COLUMN (FT.)
STANDING WELL VOLUME gal.
SCREEN LENGTH 10 ft
DRILLING WATER LOSS — gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS: SPEC COND. (ms/cm)	ORP (mV)	TEMP (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
08/01/18 0925		~ Began Development ~						4 gal/min
0945		—	—	—	—	—	—	4 gal/min
1005		0.318	11.4	14.45	6.47	8.16	44.5	DTW: 8.42 / 4 gal/min
1030		0.283	-39.6	[illegible]	0.78	4.87	41.1	" / "
1100		0.277	-44.0	16.23	7.07	4.39	36.7	" / "
1130		0.270	-46.7	13.61	7.17	5.69	26.3	" / "
1140		0.268	-40.1	13.41	7.08	6.68	23.5	" / "
1150		0.267	-46.0	13.27	7.12	5.83	24.6	" / "
1200		0.267	-48.1	13.18	7.13	5.18	25.6	" / "
		= TOTAL VOLUME REMOVED (gal.)						

DEVELOPMENT METHOD:

Insect Repellant Used? Y/N

NOTES:

G:\FORMS\Well Development Form

WELL DEVELOPMENT FIELD RECORD

Golder Associates

JOB NAME: NIPSCO
DEVELOPED BY: TGB
STARTED DEVEL.: 08/01/18 (DATE) / 12:15 (TIME)
W.L. BEFORE DEVE: 7.33 (DEPTH) / 08/01/18 (DATE) / 12:10 (TIME)
WELL DEPTH: BEFORE DEVEL.: 36.70
STANDING WATER COLUMN (FT.):
SCREEN LENGTH: 10 ft (

JOB NO.:
DATE OF INSTALL.: 07/24
COMPLETED DEVEL.: 08/01/18 (DATE) / (TIME)
W.L. AFTER DEVEL.: 7.33 (DEPTH) / 08/01 (DATE) / 1630 (TIME)
AFTER DEVEL.: 36.70
STANDING WELL VOLUME: gal.
DRILLING WATER LOSS: gal.

WELL NO. GAMW 42B
SHEET 1 of 1
WELL DIA. (In):

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS: SPEC COND. (ms/cm)	ORP (mV)	TEMP (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
08/01/18 12:15		~ STARTED	PURGING	~				3 gals/min
1230		0.397	-80.3	13.86	7.20	6.43	111	" "
1245		0.397	-111	16.84	7.65	258	101	" "
1300		0.365	-115.4	14.58	7.53	2.13	84.8	8.81 " "
1315		0.356	-103.5	14.70	7.60	2.99	73.5	8.81 " "
1330		0.349	-105.1	13.43	7.73	3.48	60.5	8.81 " "
1350		0.341	-101.6	13.39	7.74	3.25	59.2	8.81 " "
1400		0.336	-91.9	14.80	7.59	2.65	46.9	" "
1415		0.334	-95.0	15.77	7.68	2.48	40.9	± 8.82 " "
1430		0.331	-94.1	14.13	7.64	3.00	31.6	± 8.82 " "
1445		0.331	-85.3	15.10	7.57	3.37	26.7	" "
1500		0.332	-70.7	16.04	7.47	2.35	25.7	" "
1515		0.328	-81.5	14.48	7.64	2.65	26.9	" "
1530		0.325	-88.0	12.95	7.81	4.83	18.7	" "
1545		0.324	-89.4	12.85	7.81	3.72	15.3	" "
1550		0.322	-90.0	13.41	7.61	2.57	15.0	" "
1555		0.320	-87.5	12.86	7.62	3.07	14.8	" "
1600		~ Finished Development ~						
		= TOTAL VOLUME REMOVED (gal.)						

DEVELOPMENT METHOD:

Insect Repellant Used? Y/(N)

NOTES:

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO RMSGS — JOB NO. 164817101 — WELL NO. GAMW-42C
DEVELOPED BY ANB — DATE OF INSTALL. — SHEET 1 of
STARTED DEVEL. 6/17/19 12:45 (DATE / TIME) — COMPLETED DEVEL. / (DATE / TIME)
W.L. BEFORE DEVE 7.22' 6/17/19 ~~12:30~~ 12:53 (DEPTH / DATE / TIME) — W.L. AFTER DEVEL. / / (DEPTH / DATE / TIME)
WELL DEPTH: BEFORE DEVEL. 52.91' — AFTER DEVEL. — WELL DIA. (In)
STANDING WATER COLUMN (FT.) — STANDING WELL VOLUME gal.
SCREEN LENGTH — DRILLING WATER LOSS gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS: SPEC COND. (ms/cm)	ORP (mV)	TEMP (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
6/17/19 12:54		1.027	~~1.02~~	12.80	7.66	8.54	over	DTW: 7.22' 2.5gpm
12:56		0.663	-103.5	~~12~~ 11.9	~~7.65~~	1.65	over	
12:58	Dry	0.659	-129.0	11.52	7.48	1.82	over	13:03 DTW: 46.56'
								13:13 DTW: 38.22' 16:45 DTW:
6/18/19 10:50								DTW: 7.22'
10:55		1.062	172.1	13.5	7.27	4.96	over	
10:57		0.485	43.3	12.00	7.56	7.31	over	
10:59							over	
11:00	Dry							16:05 DTW: 14.09'
6/19/19 8:30								DTW: 7.22'
8:40		0.880	41.8	13.39	~~6.8~~ 7.23	3.35	over	
8:46	Dry	0.835	-31.2	13.11	7.48	3.73	over	
6/20/19 8:13		0.625	-66.7	12.65	7.31	3.16	over	
8:15		0.582	-41.3	12.68	7.24	2.18	over	
8:17	Dry							15:55: DTW: 7.82'
		= TOTAL VOLUME REMOVED (gal.)						

DEVELOPMENT METHOD:

Insect Repellant Used? Y/N

NOTES:

G:\FORMS\Well Development Form

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME: NIPSCO - RMSGS
DEVELOPED BY: D Syna
STARTED DEVEL.: 5/18/18 (DATE) / 1640 (TIME)
W.L. BEFORE DEVEL.: 6.78 (DEPTH) / 5/18/18 (DATE) / 1637 (TIME)
WELL DEPTH: BEFORE DEVEL.: 16.29
STANDING WATER COLUMN (FT.): 9.51
SCREEN LENGTH: 10

JOB NO.: 164817101
DATE OF INSTALL.: 5/16/18
COMPLETED DEVEL.: 5/18/18 (DATE) / 1820 (TIME)
W.L. AFTER DEVEL.: 7.51 (DEPTH) / 5/18/18 (DATE) / 1810 (TIME)
AFTER DEVEL.: 16.29
WELL NO.: GAMW-4B
SHEET 1 of 1
WELL DIA. (In): 2
STANDING WELL VOLUME: 1.55 gal.
DRILLING ~~WATER LOSS~~ development: 225 gal.

DATE/TIME		VOLUME REMOVED (GALS)	FIELD PARAMETERS: SPEC. COND. (µS/cm)	ORP (mV)	TEMP. (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
5/18	1640		Start pumping @ 10 ft BTOC and 25 gal/min						
	1645	12.5	234	-97.7	10.26	7.48	2.01	45.6	7.51 (DTW)
	1650	25	214	-78.7	10.16	7.18	2.19	63.5	
	1655	37.5	214	-76.7	10.07	7.17	2.35	44.0	
	1700	50	220	-74.5	9.97	7.14	1.88	35.7	
	1705	62.5	220	-72.8	9.89	7.11	1.84	30.7	
	1710	75	219	-71.4	10.07	7.09	1.99	26.4	
	1715	87.5	217	-70.0	10.08	7.09	2.10	25.6	
	1720	100	221	-68.5	9.86	7.08	2.18	24.2	
	1725	112.5	222	-67.2	9.98	7.07	2.24	22.5	
	1730	125	228	-67.2	9.86	7.06	2.03	20.8	
	1735	137.5	228	-90.4	10.04	7.19	2.48	29.2	
	1740	150	223	-88.4	9.87	7.12	2.28	19.0	
	1745	162.5	229	-27.3	10.07	7.06	2.70	19.2	
	1750	175	223	-54.3	9.90	7.03	2.33	19.1	
	1755	187.5	228	-58.1	9.87	6.74	2.24	18.4	
	1800	200	147	-61.3	9.80	6.88	2.58	17.6	
	1805	212.5	225	-62.0	9.90	6.89	2.68	15.5	
	1810	225	228	-64.3	9.97	6.89	2.62	17.3	
	1815	237.5	lower pump to bottom of well						
	1820	250	Stopped pumping						
			= TOTAL VOLUME REMOVED (gal.) 250						

DEVELOPMENT METHOD: bladder pump

Insect Repellant Used? Y/N

NOTES:

G:\FORMS\Well Development Form.XLS

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME: NIPSCO-RMSGS
DEVELOPED BY: D. Sylvia
STARTED DEVEL.: 5/18/18 (DATE) / 1452 (TIME)
W.L. BEFORE DEVEL.: 6.73 (DEPTH) / 5/18/18 (DATE) / 1450 (TIME)
WELL DEPTH: BEFORE DEVEL.: 37.73
STANDING WATER COLUMN (FT.): 31
SCREEN LENGTH: 10

JOB NO.: 16481701
DATE OF INSTALL.: 5/16/18
COMPLETED DEVEL.: 5/18/18 (DATE) / 1637 (TIME)
W.L. AFTER DEVEL.: 6.98 (DEPTH) / 5/18/18 (DATE) / 1637 (TIME)
AFTER DEVEL.: 38.28
WELL NO.: GMW-43B
SHEET 1 of 1
WELL DIA. (In): 2
STANDING WELL VOLUME: 5.05 gal.
DRILLING ~~WATER LOSS~~ development: 225 gal.

DATE/TIME		VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC COND. (~~ms~~ µs/cm)	ORP (mV)	TEMP. (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
5/18	1452	~~12~~ 10	Started pump @ 27 ft btoc, 2.5 gal/min						
	1457	12.5	250	-75.0	11.54	7.76	-75.0	Took up to measure THTM	
	1502	25	227	-90.1	11.50	7.70	-90.1	THTM	6.88
	1507	37.5	250	-107.1	11.53	7.80	-107.1	153	6.93
	1512	50							
	1517	62.5	248	-117.6	11.49	7.79	-117.6	31.8	6.96
	1522	75	247	-136.3	11.46	7.81	-136.3	18.6	6.96
	1527	87.5	245	-140.3	11.45	7.82	-140.3	14.1	6.96
	1532	100	244	-141.7	11.47	7.82	-140.4	11.7	6.96
	1537	112.5	244	-142.3	11.47	7.83	-141.7	10.6	6.97
	1542	125	243	-133.2	11.49	7.82	-142.3	9.06	6.97
	1547	137.5	243	-131.2	11.53	7.82	-133.2	8.78	6.97
	1552	150	242	-123.3	11.52	7.81	-131.2	6.91	6.98
	1557	162.5	239	-123.3	11.49	7.81	-123.3	6.37	6.98
	1602	175	242	-113.6	11.51	7.81	-113.6	6.30	6.98
	1607	187.5	241	-115.1	11.54	7.83	-115.1	5.17	6.98
	1612	200	236	-151.5	11.40	7.83	-151.5	4.77	6.98
	1617	212.5	241	-132.9	11.44	7.82	-132.9	4.46	6.98
	1622	225	226	-123.6	11.48	7.82	-123.6	4.53	6.98
	1627	237.5	231	-126.8	11.49	7.82	-126.8	4.33	6.98
	1632	250	~~228~~ 23	moved pump to bottom of well					
	1637	262.5	~~226~~ 23	stopped pumping					
			= TOTAL VOLUME REMOVED (gal.) 262.5						

DEVELOPMENT METHOD: bladder pump

Insect Repellant Used? Y/N

NOTES:

G:\FORMS\Well Development Form.XLS

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME: RUSGS-NIPSCO
DEVELOPED BY: D. Sinha
STARTED DEVEL.: 5/18/18 / 1412 (DATE / TIME)
W.L. BEFORE DEVEL.: 7.60 / 5/15/18 / 1410 (DEPTH / DATE / TIME)
WELL DEPTH: BEFORE DEVEL.: 16.02
STANDING WATER COLUMN (FT.): 8.42
SCREEN LENGTH: 10

JOB NO.: 164817101
DATE OF INSTALL.: 5/16/18
COMPLETED DEVEL.: 5/18/18 / 1419 (DATE / TIME)
W.L. AFTER DEVEL.: / / (DEPTH / DATE / TIME)
AFTER DEVEL.: 16.02
STANDING WELL VOLUME: 05 ~~8~~ 1.4 gal.
DRILLING WATER ~~LOSS~~ development: 275 gal.

WELL NO.: GAMW-44
SHEET 1 of 1
WELL DIA. (In): 2

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC COND. (ms/cm)	ORP (mV)	TEMP. (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
5/18/18 1414		Pump started at 15 BTOC					33	gal/min
5/18/18 1419		well pumped dry to top of pump						
		16.5 = TOTAL VOLUME REMOVED (gal.)						

DEVELOPMENT METHOD: bladder pump

Insect Repellant Used? Y/N

NOTES:

G:\FORMS\Well Development Form.XLS

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME: NIPSCO-RMSGS
DEVELOPED BY: D. Sylvia
STARTED DEVEL.: 5/18/18 / 1232 (DATE / TIME)
W.L. BEFORE DEVEL.: 7.53 / 5/18 / 1230 (DEPTH / DATE / TIME)
WELL DEPTH: BEFORE DEVEL.: 38.47
STANDING WATER COLUMN (FT.): 30.94
SCREEN LENGTH: 10

JOB NO.: 1648171
DATE OF INSTALL.: 5/16/18
COMPLETED DEVEL.: 5/18/18 / 1402 (DATE / TIME)
W.L. AFTER DEVEL.: 7.72 / 5/18 / 1400 (DEPTH / DATE / TIME)
AFTER DEVEL.: 38.82
STANDING WELL VOLUME: 5.04 gal.
DRILLING ~~WATER LOSS~~ development: 225 gal.

WELL NO. GAMW-4YB
SHEET 1 of 1
WELL DIA. (In): 2

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS: SPEC COND. µ (ms/cm)	ORP (mV)	TEMP. (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
5/18 1232	Start purge at 5 gal / 90 sec @ 28 ft btoc							
1237	16.5	260	36.4	11.69	7.73	3.55	14.4	7.55
1242	33	253	-90.3	11.55	7.73	3.22	45.8	7.70
1247	49.5	252	-115.1	11.59	7.75	2.56	12.5	7.72
1252	66	254	-135.7	11.47	7.76	2.37	5.13	7.72
1257	82.5	moved pump to 33 ft btoc						
1302	99	254	-121.1	11.50	7.77	2.35	20.4	7.72
1307	115.5	255	-116.6	11.56	7.79	2.05 1.81	17.5	7.72
1312	132	256	-126.3	11.56	7.80	1.94	6.10	7.72
1317	148.5	257	-123.7	11.57	7.81	1.85	24.7	7.72
1322	165	236	-126.2	11.61	7.81	2.07	14.9	7.72
1327	181.5	259	-124.7	11.60	7.82	1.96	9.54	7.72
1332	198	260	-127.6	11.62	7.83	1.95	7.37	7.72
1337	214.5	259	-130.1	11.56	7.83	1.90	5.81	7.72
1342	231	259	-120.6	11.60	7.83	1.94	4.47	7.72
1347	247.5	261	-127.8	11.50	7.84	1.87	3.69	7.72
1352	264	261	-121.1	11.51	7.84	2.03	4.18	7.72
1357	280.5	moved pump to bottom of well 7.72						
1402	297	stopped pumping						
		= TOTAL VOLUME REMOVED (gal.) 297						

DEVELOPMENT METHOD: bladder pump

Insect Repellant Used? Y/N

NOTES:

G:\FORMS\Well Development Form.XLS

WELL DEVELOPMENT FIELD RECORD

Golder Associates

JOB NAME: NIPSCO
DEVELOPED BY: TGB
STARTED DEVEL.: 05/16/18 / (DATE) / (TIME)
W.L. BEFORE DEVEL.: 6.42 / 05/16 / 1135 (DEPTH / DATE / TIME)
WELL DEPTH: BEFORE DEVEL.: 17.5
STANDING WATER COLUMN (FT.): —
SCREEN LENGTH: 10ft

JOB NO.: 1648171
DATE OF INSTALL.:
COMPLETED DEVEL.: 05/16/18 / (DATE) / (TIME)
W.L. AFTER DEVEL.: 4.62 / 05/16 / 1300 (DEPTH / DATE / TIME)
AFTER DEVEL.: 17.5
STANDING WELL VOLUME: —
DRILLING WATER LOSS: —

WELL NO. GAMW-46
SHEET 1 of 1
WELL DIA. (In)
— gal.
— gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS: SPEC COND. (ms/cm)	ORP (mV)	TEMP. (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.): DTW	Rate
1135	—	—	—	9.65	—	—	—	4.62	4
1145	40	—	—	9.29	—	—	—	4.93	↓
1155	80	250	-74.2	9.61	8.11	3.81	ERROR	4.94	↓
1205	120	241	-41.1	9.76	8.21	5.47	152	↓	↓
1215	160	241	-24.4	9.30	8.25	3.50	66.9	↓	↓
1225	200	243	-20.3	9.57	8.26	4.70	22.7	↓	↓
1230	220	241	-18.5	9.41	8.25	4.71	15.5	↓	↓
1235	240	242	-33.9	9.38	8.24	3.66	17.3	↓	↓
1240	260	242	-42.0	9.56	8.24	3.65	11.5	↓	↓
1245	280	243	-40.6	9.49	8.25	3.78	7.72	4.94	4
1250	300	242	-39.4	9.57	8.24	3.93	4.90	↓	↓
1255	320	242	-47.7	9.27	8.24	4.17	4.56	↓	↓
1300	340	242	-42.2	9.49	8.24	3.82	5.00	4.94	4
	= TOTAL VOLUME REMOVED (gal.)								

DEVELOPMENT METHOD: Submersible pump.

Insect Repellant Used? (Y)/N

NOTES:

WELL DEVELOPMENT FIELD RECORD

Golder Associates

JOB NAME: NIPSCO
DEVELOPED BY: TGB
STARTED DEVEL.: 05/15/18 (DATE) / 0950 (TIME)
W.L. BEFORE DEVEL.: 6.41 (DEPTH) / " (DATE) / " (TIME)
WELL DEPTH: BEFORE DEVEL.: 33.00
STANDING WATER COLUMN (FT.): —
SCREEN LENGTH: 10 FT

JOB NO.: 1648171
DATE OF INSTALL.:
COMPLETED DEVEL.: 05/15 (DATE) / 1110 (TIME)
W.L. AFTER DEVEL.: 6.41 (DEPTH) / " (DATE) / " (TIME)
AFTER DEVEL.: 33.00
STANDING WELL VOLUME: —
DRILLING WATER LOSS: —

WELL NO.: GAMW-4GB
SHEET 1 of 1
WELL DIA. (In)
gal.
gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS: SPEC COND. (ms/cm)	ORP (mV)	TEMP. (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.): DTW	Rate
0950	—	—	—	—	—	—	—	6.41	4
1000	40	—	—	—	—	—	~~830~~	6.55	↓
1010	80	373	-52.9	11.11	7.22	3.94	2.44	6.57	
1020	120	367	-106.4	10.87	7.59	3.63	196	6.57	
1030	160	364	-102.3	10.90	7.64	3.34	81.1	6.57	
1035	180	363	-109.8	10.85	7.69	3.79	12.0	6.58	
1040	200	364	-106.3	10.85	7.70	3.28	9.27	↓	
1050	240	357	-110.1	10.87	7.69	3.07	5.83		
1100	260	363	-120.6	10.95	7.71	3.27	4.62		
1105	280	357	-123.2	10.85	7.72	3.75	4.22	↓	↓
1110	300	363	-118.2	10.89	7.72	3.02	2.45	6.58	4
		= TOTAL VOLUME REMOVED (gal.)							

DEVELOPMENT METHOD: submersible pump.

Insect Repellant Used? (Y)N

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/RMGS/IW
DEVELOPED BY RG
STARTED DEVEL. 8/13/18 1130 (DATE / TIME)
W.L. BEFORE DEVEL. 8.38 (DEPTH) 8/13 (DATE) 1454 RG (TIME)
WELL DEPTH: BEFORE DEVEL. 16.87
STANDING WATER COLUMN (FT.) 8.49 ft.
SCREEN LENGTH

JOB NO. 1498771101/04/03 WELL NO. GAMW-48
DATE OF INSTALL. SHEET OF
COMPLETED DEVEL. 8/13/18 1450 (DATE / TIME)
AFTER DEVEL. 8.42 (DEPTH) 8/13 (DATE) 1454 (TIME)
AFTER DEVEL. 17.35 WELL DIA. (In) 2
STANDING WELL VOLUME 1.5 gal.
DRILLING WATER LOSS gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
8/13/18 1135	5.0	344	18.9	6.36	2.1	17.5	OUT RANGE
" 1235	100.0	329	16.0	7.48	3.1	-23.9	15.2
" 1335	200.0	335	17.6	7.58	3.1	-37.1	7.39
" 1435	300.0	333	16.3	7.86	3.3	-15.9	4.96
" 1440	310.0	330	15.4	7.72	3.2	-30.7	4.60
" 1445	320.0	328	15.3	7.78	3.3	-34.6	4.53
" 1450	330.0	328	15.3	7.81	3.2	-37.8	4.46
	330.0	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO / RMSG / IN

DEVELOPED BY RG

STARTED DEVEL. 8/13/18 / (DATE / TIME)

W.L. BEFORE DEVEL. 8.34 / 08/13 / 1132 (DEPTH / DATE / TIME)

WELL DEPTH: BEFORE DEVEL. 31.90

STANDING WATER COLUMN (FT.) 23.56

SCREEN LENGTH

JOB NO. 1648/7101/04/03 WELL NO. GAMW-48B

DATE OF INSTALL. SHEET OF

COMPLETED DEVEL. 8/13/18 / 1925 (DATE / TIME)

AFTER DEVEL. 8.40 / 08/13 / 1928 (DEPTH / DATE / TIME)

AFTER DEVEL. 32.44 WELL DIA. (In) 2

STANDING WELL VOLUME 4.0 gal.

DRILLING WATER LOSS gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
8/13/18 1500	5.0	562	15.8	7.75	2.25	-134.4	OVER RANGE
" 1540	100.0	489	13.4	7.68	1.44	-144.8	141
" 1620	200.0	478	13.4	7.68	1.22	-125.6	65.9
" 1700	300.0	472	13.4	7.53	1.31	-113.3	25.0
" 1745	400.0	468	13.5	7.50	1.39	-102.0	18.8
" 1830	500.0	467	13.4	7.53	1.42	-101.6	10.1
" 1915	600.0	467	13.3	7.56	1.44	-100.2	4.94
" 1920	610.0	465	13.3	7.59	1.48	-99.6	4.75
" 1925	620.0	464	13.3	7.60	1.48	-99.1	4.51
	620.0	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/RMSGS/IN

DEVELOPED BY RG

STARTED DEVEL. 8/15/18 / 0950 (DATE / TIME)

W.L. BEFORE DEVEL. 7.70 / 08/15 / 0945 (DEPTH / DATE / TIME)

WELL DEPTH: BEFORE DEVEL. 14.24

STANDING WATER COLUMN (FT.) 6.54

SCREEN LENGTH

JOB NO. 164817101/04/03 WELL NO. GAMW-49

DATE OF INSTALL. SHEET OF

COMPLETED DEVEL. 8/15/18 / 1120 (DATE / TIME)

AFTER DEVEL. 7.72 / 08/15 / 1125 (DEPTH / DATE / TIME)

AFTER DEVEL. 14.50 WELL DIA. (In) 2

STANDING WELL VOLUME 1.1 gal.

DRILLING WATER LOSS gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
8/15/18 0950	5.0	519	20.4	5.80	5.33	84.2	OVER RANGE
" 1030	100.0	487	19.4	6.63	41.9	-1.9	8.46
" 1112	200.0	483	18.8	6.65	2.71	5.6	4.56
" 1116	210.0	483	18.7	6.64	2.64	5.9	4.32
" 1120	220.0	484	18.6	6.63	2.58	6.2	4.24
	220.0	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIRSCO/RMSGS/IN
DEVELOPED BY RG
STARTED DEVEL. 8/15/18 / 1130 (DATE / TIME)
W.L. BEFORE DEVEL. 7.48 / 08/15 / (DEPTH / DATE / TIME)
WELL DEPTH: BEFORE DEVEL. 34.68
STANDING WATER COLUMN (FT.) 27.20
SCREEN LENGTH

JOB NO. 164817101/04/03 WELL NO. GAMW-49B
DATE OF INSTALL. SHEET OF
COMPLETED DEVEL. 8/15/18 / 1500 (DATE / TIME)
AFTER DEVEL. 7.50 / 08/15 / 1505 (DEPTH / DATE / TIME)
AFTER DEVEL. 34.86 WELL DIA. (In) 2
STANDING WELL VOLUME 4.5 gal.
DRILLING WATER LOSS gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
8/15/18 1130	5.0	3032	14.8	7.00	1.12	-121.2	OVERRANGE
" 1213	100.0	3668	13.7	7.15	2.14	-98.7	47.6
" 1250	200.0	3927	13.6	7.16	2.22	-88.6	22.7
" 1330	300.0	4038	13.3	7.15	2.18	-84.7	13.2
" 1410	400.0	4135	13.2	7.16	2.14	-78.2	9.44
" 1450	500.0	4228	13.2	7.15	2.20	-80.7	4.78
" 1455	510.0	4210	13.1	7.16	2.18	-80.6	4.59
" 1500	520.0	4195	13.1	7.16	2.16	-80.1	4.62
	520.0	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIASCO/RMSGS/IW
JOB NO. 14487101/04/03 WELL NO. GAMW-50
DEVELOPED BY RG
DATE OF INSTALL. SHEET OF
STARTED DEVEL. 8/14/18 (DATE) 1000 (TIME)
COMPLETED DEVEL. 8/14/18 (DATE) 1159 (TIME)
W.L. BEFORE DEVEL. 8.0 (DEPTH) 08/14 (DATE) 0958 (TIME)
AFTER DEVEL. 8.0 (DEPTH) 08/14 (DATE) 1203 (TIME)
WELL DEPTH: BEFORE DEVEL. 18.35
AFTER DEVEL. 18.46
WELL DIA. (In) 2
STANDING WATER COLUMN (FT.) 10.35
STANDING WELL VOLUME 1.7 gal.
SCREEN LENGTH
DRILLING WATER LOSS gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
8/14/18 1000	5.0	636	16.7	6.09	8.08	113.6	329
" 1056	100.0	608	16.5	6.95	2.71	-65.5	15.0
" 1149	200.0	594	15.5	6.98	2.24	-67.3	4.56
" 1154	210.0	578	15.5	6.98	2.16	-65.8	4.23
" 1159	220.0	574	15.3	7.50	2.14	-63.4	4.14
	220.0	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/RMSGS/IN

DEVELOPED BY RG

STARTED DEVEL. 8/14/18 / 1210 (DATE / TIME)

W.L. BEFORE DEVEL. 7.70 / 08/14 / 1000 (DEPTH / DATE / TIME)

WELL DEPTH: BEFORE DEVEL. 31.70

STANDING WATER COLUMN (FT.) 24.00

SCREEN LENGTH

JOB NO. 164817101/04/03 WELL NO. GAMW-50B

DATE OF INSTALL. SHEET OF

COMPLETED DEVEL. 8/14/18 / 1605 (DATE / TIME)

AFTER DEVEL. 7.72 / 08/14 / 1610 (DEPTH / DATE / TIME)

AFTER DEVEL. 32.06 WELL DIA. (In) 2

STANDING WELL VOLUME 4.0 gal.

DRILLING WATER LOSS gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
8/14/18 1210	5.0	533	13.2	7.15	1.75	-117.7	OVER RANGE
" 1248	100.0	551	13.2	7.40	2.24	-133.3	30.0
" 1330	200.0	545	13.5	7.37	2.05	-105.8	16.4
" 1414	300.0	543	13.3	7.29	1.99	-96.8	9.68
" 1500	400.0	542	13.4	7.22	1.92	-90.8	7.01
" 1555	500.0	537	13.4	7.26	1.99	-88.2	4.90
" 1600	510.0	539	13.5	7.25	1.96	-89.2	4.80
" 1605	520.0	540	13.4	7.24	1.93	-89.1	4.83
	520.0	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates — WELL DEVELOPMENT FIELD RECORD

JOB NAME: NIRCO - RMSGS
DEVELOPED BY: D. SWAN
STARTED DEVEL.: 7/28/18 (DATE) / 1205 (TIME)
W.L. BEFORE DEVEL.: 10.50 (DEPTH) / 7/28/18 (DATE) / 1201 (TIME)
WELL DEPTH: BEFORE DEVEL.: 18.66
STANDING WATER COLUMN (FT.): 8.16
SCREEN LENGTH: 10

JOB NO.: 1648171a
DATE OF INSTALL.: 7/25/18
COMPLETED DEVEL.: 7/28/18 (DATE) / 1335 (TIME)
WELL NO.: GAMW-51
SHEET: 1 of 1
W.L. AFTER DEVEL.: 11.64 (DEPTH) / 7/28/18 (DATE) / 1335 (TIME)
AFTER DEVEL.: 18.58
WELL DIA. (In): ____
STANDING WELL VOLUME: ____ gal.
DRILLING WATER LOSS: ____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS: SPEC COND. (ms/cm)	ORP (mV)	TEMP. (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
7/28/18 1205	pump started @ 5 gal/2min							
1225	50	0.968	-86.4	14.52	7.40	4.30	clear	11.61
1245	100	0.832	-75.7	14.74	7.09	3.70	clear	11.65
1255	125	0.576	-69.5	14.52	7.04	3.54	clear	11.64
1305	150	0.830	-63.8	14.48	7.02	3.92	clear	11.62
1310	162.5	1.093	-62.2	14.43	7.01	4.09	clear	11.63
1315	175	0.976	-61.9	14.29	7.01	4.39	clear	11.63
1320	187.5	1.098	-69.0	14.30	7.00	2.74	clear	11.63
1325	200	1.099	-64.6	14.31	7.00	3.32	clear	11.63
1330	212.5	~~0.883~~	-66.4	14.	6.99	3.35	clear	11.64
1335	225	1.1810	stop pump					
		225 = TOTAL VOLUME REMOVED (gal.)						

DEVELOPMENT METHOD: bladder pump

Insect Repellant Used? Y (N)

NOTES: pump at about 18 ft toc
~100 gallon used during chlorox min 150 gal developing

G:\FORMS\Well Development Form.XLS

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME: NTOSCO - RMSGS
DEVELOPED BY: D. Sung
STARTED DEVEL.: 7/28/18 (DATE) / 0934 (TIME)
W.L. BEFORE DEVEL.: 10.43 (DEPTH) / 7/28/18 (DATE) 0915 (TIME)
WELL DEPTH: BEFORE DEVEL.: 41.1
STANDING WATER COLUMN (FT.): 30.68
SCREEN LENGTH: 10 ft

JOB NO.: 1448171 01
DATE OF INSTALL.: 7/25/18
COMPLETED DEVEL.: 7/28/18 (DATE) / 1204 (TIME)
W.L. AFTER DEVEL.: 10.69 (DEPTH) / 7/28/18 (DATE) 1204 (TIME)
AFTER DEVEL.: 39.69
WELL DIA. (In): 2
STANDING WELL VOLUME: _____ gal.
DRILLING WATER LOSS: _____ gal.

WELL NO.: GAMW-5
SHEET 1 of 1

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC COND. (ms/cm)	ORP (mV)	TEMP. (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
7/28 0934	Start pump			~5	gal/2 min			
1009	87.5	2.434	-87.3	15.03	6.51	7.09	Clear	10.64
1104	225	2.537	-106.3	14.70	7.46	5.50	Clear	10.67
1129	287.5	2.061	-86.4	14.38	7.49	5.50	Clear	10.69
1134	300	2.040	-87.8	14.29	7.47	4.91	Clear	10.69
1139	312.5	2.027	-90.3	14.32	7.49	4.03	Clear	10.69
1144	325	2.007	-92.3	14.53	7.49	3.34	Clear	10.69
1149	337.5	2.043	-95.1	14.51	7.50	3.96	Clear	10.69
1154	350	2.086	-89.9	14.54	7.50	3.72	Clear	10.69
1159	362.5	2.073	-91.6	14.48	7.51	3.85	Clear	10.69
1204	375	pumped		Stopped				

375 = TOTAL VOLUME REMOVED (gal.)

DEVELOPMENT METHOD: bladder pump

Insect Repellant Used? Y/N

NOTES: ~200 gallons used to drill well, min development 300 gallons (2 hours), pump at ~36 ft to 6 no turbidity meter

G:\FORMS\Well Development Form.XLS

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/RMSGS/IN
DEVELOPED BY RG
STARTED DEVEL. 8/16/18 / 1440 (DATE / TIME)
W.L. BEFORE DEVEL. 8.81 / 08/16 / (DEPTH / DATE / TIME)
WELL DEPTH: BEFORE DEVEL. 39.87
STANDING WATER COLUMN (FT.) 31.06
SCREEN LENGTH

JOB NO. 164817101/04/03 WELL NO. GAMW-52B
DATE OF INSTALL. SHEET OF
COMPLETED DEVEL. 8/16/18 / 1610 (DATE / TIME)
AFTER DEVEL. 8.83 / 08/16 / 1615 (DEPTH / DATE / TIME)
AFTER DEVEL. 39.92 WELL DIA. (In) 2
STANDING WELL VOLUME 5.1 gal.
DRILLING WATER LOSS gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
8/16/18 1440	5.0	2433	17.6	7.27	0.79	-116.8	OVERRANGE
" 1520	100.0	2389	17.4	7.32	0.91	-107.1	5.56
" 1600	200.0	2310	17.0	7.32	0.95	-95.6	2.91
" 1605	210.0	2308	17.0	7.32	0.98	-96.8	3.00
" 1610	220.0	2309	16.9	7.33	0.99	-96.9	2.95
HAG							
	220.0	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

WELL DEVELOPMENT FIELD RECORD

JOB NAME: NIPSCO RMSGS
DEVELOPED BY: TGB
STARTED DEVEL.: 08/03/18 (DATE) / 0945 (TIME)
W.L. BEFORE DEVE: 8.80 (DEPTH) / 08/02/18 (DATE) / (TIME)
WELL DEPTH: BEFORE DEVEL.: 17.49
STANDING WATER COLUMN (FT.): —
SCREEN LENGTH: —

JOB NO.: 1648171
DATE OF INSTALL.:
COMPLETED DEVEL.: 08/03/18 (DATE) / (TIME)
W.L. AFTER DEVEL.: 8.89 (DEPTH) 08/03/18 (DATE) 1230 (TIME)
AFTER DEVEL.: 17.5
STANDING WELL VOLUME: — gal.
DRILLING WATER LOSS: — gal.

WELL NO. GAMW-53
SHEET 2 of 2
WELL DIA. (In) 2

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS: SPEC COND. (ms/cm)	ORP (mV)	TEMP (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
08/03 1015		0.570	-52.8	21.75	7.08	2.99	43.9	
1045		0493	-42.8	20.34	7.03	7.91	21.1	
1100		0.487	-37.7	20.59	6.71	3.51	16.6	
1115		0.493	-35.9	20.10	6.75	4.98	16.8	DTW 9.78 3.5 gal/min
1130		0.495	-28.6	20.38	6.78	5.85	14.5	" " " "
1145		0.497	-33.9	19.94	6.77	5.88	13.3	" " " "
1200		0.500	-33.3	20.11	6.73	5.09	11.9	DTW: 9.78 3.5 gal/min
1205		0.499	-32.7	20.15	6.75	6.02	13.3	" "
1210		0.499	-32.2	19.93	6.73	5.73	12.2	" "
1215		0.502	-33.6	21.21	6.81	4.32	11.9	" "
		= TOTAL VOLUME REMOVED (gal.)						

DEVELOPMENT METHOD:

Insect Repellant Used? Y/N

NOTES:

WELL DEVELOPMENT FIELD RECORD

Golder Associates

JOB NAME: NIPSCO RMSGS
DEVELOPED BY: TGB
STARTED DEVEL.: 08/03/18 (DATE) / ~~1400~~ (TIME)
W.L. BEFORE DEVE: 8.89 (DEPTH) / 08/02/18 (DATE) / 1355 (TIME)
WELL DEPTH: BEFORE DEVEL.: 40.10
STANDING WATER COLUMN (FT.): —
SCREEN LENGTH: —

JOB NO.: 1648171
DATE OF INSTALL.: 07/30
COMPLETED DEVEL.: 08/03/18 (DATE) / 1510 (TIME)
W.L. AFTER DEVEL.: 8.91 (DEPTH) / 08/03 (DATE) / 1520 (TIME)
AFTER DEVEL.: 40.10
STANDING WELL VOLUME: — gal.
DRILLING WATER LOSS: — gal.

WELL NO.: GAMW-53B
SHEET 1 of 1
WELL DIA. (In): 2

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS: SPEC COND. (ms/cm)	ORP (mV)	TEMP (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
08/02 1400	~	~	START	PURGING	~	~	~	
1430		2.358	-84.9	20.14	7.37	2.42	10.5	
1500		2.310	-90.7	22.04	7.33	3.60	4.04	
1505		2.308	-76.7	21.48	7.25	7.13	5.36	
1510		2.316	-82.3	21.85	7.28	3.28	4.14	
		= TOTAL VOLUME REMOVED (gal.)						

DEVELOPMENT METHOD:

Insect Repellant Used? Y (N)

NOTES:

WELL DEVELOPMENT FIELD RECORD

Golder Associates

JOB NAME
DEVELOPED BY
STARTED DEVEL. 08/03 (DATE) / 1530 (TIME)
W.L. BEFORE DEVE 7.63 (DEPTH) / 08/03 (DATE) / 1530 (TIME)
WELL DEPTH: BEFORE DEVEL. [illegible] 15.46
STANDING WATER COLUMN (FT.)
SCREEN LENGTH

JOB NO. 1648171
DATE OF INSTALL. 07/30
COMPLETED DEVEL. 08/06 (DATE) / 0940 (TIME)
W.L. AFTER DEVEL. 7.66 (DEPTH) / 08/06 (DATE) / 0945 (TIME)
AFTER DEVEL. [illegible] 15.45
STANDING WELL VOLUME gal.
DRILLING WATER LOSS gal.

WELL NO. GAMW-54
SHEET ___ of ___
WELL DIA. (In) 2

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS: SPEC COND. (ms/cm)	ORP (mV)	TEMP (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
08/03 1530		[illegible] START PURGING						
1545		0.825	-37.9	18.72	7.05	4.45	24.2	
1600		0.865	-26.9	17.81	6.98	6.68	23.5	
1610		0.870	-22.8	17.90	6.97	6.29	25.5	
1620		0.896	-12.8	17.82	6.90	6.91	16.9	
1630		0.887	-16.3	18.02	6.85	6.88	18.7	
08/06 0840		0.829	100.2	19.46	7.86	7.91	13.4	
0930		0.791	-22.7	19.11	7.62	7.85	12.1	
		= TOTAL VOLUME REMOVED (gal.)						

DEVELOPMENT METHOD:

Insect Repellant Used? Y (N)

NOTES:

WELL DEVELOPMENT FIELD RECORD

Golder Associates

JOB NAME: NIPSCO BMSGS
DEVELOPED BY: TGB
STARTED DEVEL.: 08/03/18 (DATE) 1305 (TIME)
W.L. BEFORE DEVE: 7.81 (DEPTH) / 08/03/18 (DATE) / 1305 (TIME)
WELL DEPTH: BEFORE DEVEL.:
STANDING WATER COLUMN (FT.):
SCREEN LENGTH:

JOB NO.: 1618171
DATE OF INSTALL.: 07/27/18
COMPLETED DEVEL.: 08/03/18 (DATE) / 1525 (TIME)
W.L. AFTER DEVEL.: 7.83 (DEPTH) / 08/03 (DATE) / 1525 (TIME)
AFTER DEVEL.: 35.99
STANDING WELL VOLUME: gal.
DRILLING WATER LOSS: — gal.

WELL NO.: GAMW-54B
SHEET 1 of 1
WELL DIA. (In): 2

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS: SPEC COND. (ms/cm)	ORP (mV)	TEMP (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
08/03 1305		START	PURGING					
1335		1.854	-101.5	21.83	7.06	14.50	46.7	DTW: 3 gals/min
1405		2.333	-105.9	16.72	7.15	1.20	271	
1435		2.296	-106.5	16.73	7.13	0.83	29.7	
1505		2.283	-107.9	16.72	7.13	0.62	18.6	
1515		2.267	-108.2	16.70	7.14	0.51	6.02	
1520		2.265	-105.8	16.67	7.14	0.55	5.69	
1525		2.263	-98.6	16.73	7.14	1.33	3.28	
		= TOTAL VOLUME REMOVED (gal.)						

DEVELOPMENT METHOD:

Insect Repellant Used? Y (N)

NOTES: Pump was working intermitently

G:\FORMS\Well Development Form

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIRSO/RMSGS/IN
DEVELOPED BY RG
STARTED DEVEL. 8/20/18 (DATE) 0955 (TIME)
W.L. BEFORE DEVEL. 8.88 (DEPTH) 8/20/18 (DATE) 0950 (TIME)
WELL DEPTH: BEFORE DEVEL. 18.66
STANDING WATER COLUMN (FT.) 9.78
SCREEN LENGTH

JOB NO. 1648T1101/04/03 WELL NO. GMW-55
DATE OF INSTALL. SHEET OF
COMPLETED DEVEL. 8/20/18 (DATE) 1146 (TIME)
AFTER DEVEL. 8.82 (DEPTH) 8/20/18 (DATE) 1150 (TIME)
AFTER DEVEL. 18.68 WELL DIA. (In) 2
STANDING WELL VOLUME 1.6 gal.
DRILLING WATER LOSS gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
8/20/18 0955	5.0	1512	19.8	7.07	2.35	-34.0	OUT OF RANGE
" 1055	100.0	1537	20.1	7.15	2.15	-36.5	27.0
" 1138	200.0	1540	20.2	7.18	2.10	-27.2	3.86
" 1142	210.0	1538	20.1	7.18	2.08	-26.9	3.97
" 1146	220.0	1537	20.0	7.19	2.04	-27.1	3.90
	220.0	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

WELL DEVELOPMENT FIELD RECORD

JOB NAME: NIPSCO RMSGS
DEVELOPED BY: ANB
STARTED DEVEL.: 6/13/19 (DATE) 15:20 (TIME)
W.L. BEFORE DEVEL.: 8.63 ft. (DEPTH) 6/13/19 (DATE) 15:20 (TIME)
WELL DEPTH: BEFORE DEVEL. 16.22 ft.
STANDING WATER COLUMN (FT.)
SCREEN LENGTH: 10 Ft.

JOB NO.: 164817101
DATE OF INSTALL.:
COMPLETED DEVEL.: 6/13/19 (DATE) 17:20 (TIME)
W.L. AFTER DEVEL.: 8.63 (DEPTH) 6/13/19 (DATE) 17:25 (TIME)
AFTER DEVEL.: 16.31
STANDING WELL VOLUME: gal.
DRILLING WATER LOSS: gal.

WELL NO.: GAMW-55R
SHEET 1 of 1
WELL DIA. (In): 2

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS: SPEC COND. (ms/cm)	ORP (mV)	TEMP (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
6/13/19 16:45		1.173	-55.0	16.23	7.41	2.36	15.5	2.5 gpm DTW
16:55		1.166	-46.1	16.19	7.48	2.30	3.56	
17:05		1.165	-45.0	16.35	7.46	2.56	3.27	
17:15		1.167	-47.9	16.08	7.49	2.45	3.21	8~9.
		= TOTAL VOLUME REMOVED (gal.)						

DEVELOPMENT METHOD:

Insect Repellant Used? Y/N

NOTES:

G:\FORMS\Well Development Form

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO/RMSGS/FW
JOB NO. 1648/7101/04/03 WELL NO. GMW-55B
DEVELOPED BY RG
DATE OF INSTALL. ____ SHEET ___ OF ___
STARTED DEVEL. 8/20/18 (DATE) 1155 (TIME)
COMPLETED DEVEL. 8/20/18 (DATE) 1320 (TIME)
W.L. BEFORE DEVEL. 8.78 (DEPTH) 08/20/18 (DATE) 0950 (TIME)
AFTER DEVEL. 8.79 (DEPTH) 08/20/18 (DATE) 1325 (TIME)
WELL DEPTH: BEFORE DEVEL. 37.25
AFTER DEVEL. 37.79
WELL DIA. (In) 2
STANDING WATER COLUMN (FT.) 28.97
STANDING WELL VOLUME ____ gal.
SCREEN LENGTH ____
DRILLING WATER LOSS ____ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
8/20/18 1155	5.0	2804	18.1	7.17	2.38	-42.7	OVERRANGE
" 1230	100.0	2557	19.0	7.24	2.10	-94.8	2.56
" 1310	200.0	2560	19.0	7.23	2.01	-97.9	2.48
" 1315	210.0	2558	19.0	7.23	1.96	-101.2	2.41
" 1320	220.0	2565	19.0	7.22	1.93	-102.9	2.35
	220.0	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD: ____

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIRSCO / RMSGS / IN

DEVELOPED BY RG

STARTED DEVEL. 8/21/18 / 0930 (DATE / TIME)

W.L. BEFORE DEVEL. 9.00 / 08/21 / 0920 (DEPTH / DATE / TIME)

WELL DEPTH: BEFORE DEVEL. 15.45

STANDING WATER COLUMN (FT.) 6.45

SCREEN LENGTH

JOB NO. 1648171 01/04/03 WELL NO. BAMW-56

DATE OF INSTALL. SHEET OF

COMPLETED DEVEL. 8/21/18 / 1230 (DATE / TIME)

AFTER DEVEL. 9.00 / 08/21 / 1235 (DEPTH / DATE / TIME)

AFTER DEVEL. 15.80 WELL DIA. (In) 2

STANDING WELL VOLUME 1.1 gal.

DRILLING WATER LOSS gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
8/21/18 0930	5.0	811	18.6	6.30	3.10	-92.8	OVER RANGE
" 1020	100.0	749	16.9	6.62	2.20	-76.3	16.84
" 1100	200.0	737	16.9	6.78	1.45	-67.1	8.88
" 1140	300.0	728	16.8	6.78	1.42	-67.2	6.90
" 1220	400.0	730	16.6	6.83	1.32	-64.4	4.91
" 1225	410.0	727	16.5	6.85	1.21	-63.1	4.96
" 1230	420.0	726	16.5	6.85	1.11	-62.6	4.90
	420.0	TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

Golder Associates

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO / RMSGS / IN

DEVELOPED BY RG

STARTED DEVEL. 8/21/18 / 1250 (DATE / TIME)

W.L. BEFORE DEVEL. 8.90 / 08/21 / 0922 (DEPTH / DATE / TIME)

WELL DEPTH: BEFORE DEVEL. 36.82

STANDING WATER COLUMN (FT.) 27.92

SCREEN LENGTH

JOB NO. 1648171 01/04/08 WELL NO. GMW-56B

DATE OF INSTALL. SHEET ___ OF ___

COMPLETED DEVEL. 8/21/18 / 1500 (DATE / TIME)

AFTER DEVEL. 8.88 / 08/21 / 1504 (DEPTH / DATE / TIME)

AFTER DEVEL. 36.90 WELL DIA. (In) 2

STANDING WELL VOLUME 4.6 gal.

DRILLING WATER LOSS ___ gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	DO (mg/l)	ORP (millivolts)	TURBIDITY (NTU)
8/21/18 1250	5.0	1080	19.0	6.88	1.01	-64.0	OVERRANGE
" 1330	100.0	1086	13.6	7.09	0.96	-94.4	19.1
" 1410	200.0	1124	13.4	7.04	0.98	-78.2	20.1
" 1450	300.0	1121	13.4	7.06	0.96	-78.5	4.65
" 1455	310.0	1117	13.4	7.06	0.96	-78.3	4.51
" 1500	320.0	1115	13.3	7.05	0.95	-77.9	4.35
	320.0	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

NOTES:

WELL DEVELOPMENT FIELD RECORD

JOB NAME: NIPSCO RMSGS
DEVELOPED BY: AN/B
STARTED DEVEL.: 6/14/19 (DATE) / 14:00 (TIME)
W.L. BEFORE DEVE: 14.32 (DEPTH) / 6/14/19 (DATE) / 8:32 (TIME)
WELL DEPTH: BEFORE DEVEL. 25.55'
STANDING WATER COLUMN (FT.)
SCREEN LENGTH

JOB NO.: 164817101
DATE OF INSTALL.
COMPLETED DEVEL.: 6/14/19 (DATE) / 15:30 (TIME)
W.L. AFTER DEVEL.: 14.32' (DEPTH) / 6/14/19 (DATE) / 15:25 (TIME)
AFTER DEVEL.: 25.56'
STANDING WELL VOLUME: gal.
DRILLING WATER LOSS: gal.

WELL NO. GAMW-57
SHEET 1 of 1
WELL DIA. (In) 2

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS: SPEC COND. (ms/cm)	ORP (mV)	TEMP (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
14:57		0.230	-115.0	12.06	8.09	5.97	4.20	2.5 gpm DTW
15:05		0.221	-124.6	12.00	8.16	2.12	2.32	
15:10		0.220	-129.1	11.91	8.21	5.90	1.59	
15:15		0.221	-126.2	11.86	8.19	5.30	1.90	
15:20		0.220	-125.7	11.58	8.19	5.45	1.45	15.43'
		= TOTAL VOLUME REMOVED (gal.)						

DEVELOPMENT METHOD:

Insect Repellant Used? Y/N

NOTES:

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO RMSGS
DEVELOPED BY ANB
STARTED DEVEL. 6/14/19 (DATE) 8:45 (TIME)
W.L. BEFORE DEVE 14.26 (DEPTH) 6/14/19 (DATE) ~~8:30~~ 9:30 (TIME)
WELL DEPTH: BEFORE DEVEL. 47.45*
STANDING WATER COLUMN (FT.)
SCREEN LENGTH 10 Ft.

JOB NO. 164817101
DATE OF INSTALL.
COMPLETED DEVEL. 6/14/19 (DATE) 14:00 (TIME)
W.L. AFTER DEVEL. 14.27 (DEPTH) 6/14/19 (DATE) 14:03 (TIME)
AFTER DEVEL. 47.45
STANDING WELL VOLUME
DRILLING WATER LOSS

WELL NO. GAMW-57B
SHEET 1 of 1
WELL DIA. (In) 2
gal.
gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC COND. (ms/cm)	ORP (mV)	TEMP (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
10:00		0.394	-128.2	12.49	6.81	2.47	overrange	2.5 gpm DTW
10:30		0.310	-105.2	12.22	8.18	1.46	Overrange	14.80'
11:00		0.306	-128.9	12.67	8.03	1.53	15.4	14.80'
11:15		0.307	-126.9	12.89	8.06	1.38	12.0	14.80'
11:45		0.305	-138.0	12.56	8.18	1.70	11.7	14.80'
12:00		0.305	-143.2	12.52	8.16	1.37	8.3	14.80'
14:00							4.8	14.80'
		= TOTAL VOLUME REMOVED (gal.)						

DEVELOPMENT METHOD:

Insect Repellant Used? Y/N

NOTES: Stopping at 14:00. Turbidity not dropping

G:\FORMS\Well Development Form

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO RMSGS
DEVELOPED BY AWS
STARTED DEVEL. 6/17/19 (DATE) 15:~~30~~15:10 (TIME)
W.L. BEFORE DEVE 9.09 (DEPTH) 6/17/19 (DATE) 15:10 (TIME)
WELL DEPTH: BEFORE DEVEL. 17.56'
STANDING WATER COLUMN (FT.)
SCREEN LENGTH 10'

JOB NO. 164817101
DATE OF INSTALL.
COMPLETED DEVEL. 6/17/19 (DATE) 16:35 (TIME)
W.L. AFTER DEVEL. 9.12 (DEPTH) 6/17/19 (DATE) 16:40 (TIME)
AFTER DEVEL. 17.58'
STANDING WELL VOLUME gal.
DRILLING WATER LOSS gal.

WELL NO GAMW-58
SHEET 1 of 1
WELL DIA. (In) 2

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS: SPEC COND. (ms/cm)	ORP (mV)	TEMP (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
6/17/19 15:~~30~~45		0.150	-4.0	11.11	7.39	3.09	9.20	2.5 GPM DTW
16:20 15:~~35~~		0.142	3.0	11.61	6.52	3.03	3.24	10.94'
16:25		0.141	11.8	10.98	6.49	2.70	1.38	10.94'
16:30		0.142	~~12.9~~	10.98	6.47	2.88	1.36	10.94'
16:35	2|2.5	0.142	12.0	10.90	6.47	2.68	1.06	10.94'
		2|2.5 = TOTAL VOLUME REMOVED (gal.)						

DEVELOPMENT METHOD:

Insect Repellant Used? Y/N

NOTES:

G:\FORMS\Well Development Form

217

WELL DEVELOPMENT FIELD RECORD

JOB NAME: NIPSCO RMSGS
DEVELOPED BY: ANB
STARTED DEVEL.: 6/17/19 (DATE) / 11:30 (TIME)
W.L. BEFORE DEVE: 9.18 (DEPTH) / 6/17/19 (DATE) / 11:26 (TIME)
WELL DEPTH: BEFORE DEVEL.: 32.79'
STANDING WATER COLUMN (FT.):
SCREEN LENGTH: 10'

JOB NO.: 164817101
DATE OF INSTALL.:
COMPLETED DEVEL.: 6/17/19 (DATE) / 15:10 (TIME)
W.L. AFTER DEVEL.: 9.18 (DEPTH) / 6/17/19 (DATE) / 15:10 (TIME)
AFTER DEVEL.: 37.81'
STANDING WELL VOLUME: gal.
DRILLING WATER LOSS: gal.

WELL NO.: GAMW-583
SHEET 1 of 1
WELL DIA. (In) 2

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS: SPEC COND. (ms/cm)	ORP (mV)	TEMP (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
6/17/19 12:00		0.440		12.30	6.48		Overrange	2.5 gpm DTW
12:10	Pumping stopped (left to help surveyors)							—
14:05	Pumping resumed							
14:15		0.318	-124.8	11.94	7.86	1.92	Overrange	—
14:30		0.300	-136.6	12.07	7.93	1.94	54.6	10.06
14:45		0.299	-139.8	12.07	7.97	1.82	6.44	10.86
15:00		0.299	-131.9	12.04	7.92	1.88	3.11	10.06
15:05		0.298	-132.8	12.09	7.91	1.74	2.95	10.06
15:10	262.5	0.298	-134.3	12.03	7.89	1.79	2.96	10.06
		262.5 = TOTAL VOLUME REMOVED (gal.)						

DEVELOPMENT METHOD:

Insect Repellant Used? Y/N

NOTES:

G:\FORMS\Well Development Form

WELL DEVELOPMENT FIELD RECORD

JOB NAME NIPSCO RMSGS
DEVELOPED BY ANB
STARTED DEVEL. 6/12/19 (DATE) 12:55 (TIME)
W.L. BEFORE DEVE 9.53 (DEPTH) 6/12/19 (DATE) 12:45 (TIME)
WELL DEPTH: BEFORE DEVEL. 17.20'
STANDING WATER COLUMN (FT.)
SCREEN LENGTH 10

JOB NO. 164817101
DATE OF INSTALL.
COMPLETED DEVEL. 6/12/19 (DATE)
W.L. AFTER DEVEL. ~~9.02~~ (DEPTH) 6/12/19 (DATE) 15:45 (TIME)
AFTER DEVEL. 17.22'
STANDING WELL VOLUME gal.
DRILLING WATER LOSS gal.

WELL NO. GAMW-59
SHEET 1 of 2
WELL DIA. (In) 2

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS: SPEC COND. (ms/cm)	ORP (mV)	TEMP (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
6/12/19 15:10	~~15.00~~ 15	1.497	-91.9	17.27	7.27	2.26	72.3	2.5 GPM DTW
15:20		1.417	-92.4	17.98	7.25	1.97	2.57	11.38'
15:30		1.425	-90.2	17.23	7.28	1.99	1.22	
15:40		1.420	-91.1	17.25	7.20	2.00	1.19	11.38'
		= TOTAL VOLUME REMOVED (gal.)						

DEVELOPMENT METHOD:

Insect Repellant Used? Y/N

NOTES:

WELL DEVELOPMENT FIELD RECORD

JOB NAME: NIPSCO RMSGS
DEVELOPED BY: ANB
STARTED DEVEL.: 6/12/19 (DATE) 16:20 (TIME)
W.L. BEFORE DEVE: 9.58 ft (DEPTH) 6/12/19 (DATE) 16:15 (TIME)
WELL DEPTH: BEFORE DEVEL.: 42.34 ft.
STANDING WATER COLUMN (FT.):
SCREEN LENGTH: 10 ft.

JOB NO.: 164817101
DATE OF INSTALL.:
COMPLETED DEVEL.: 6/12/19 (DATE) 12:35 (TIME)
W.L. AFTER DEVEL.: 9.58 (DEPTH) 6/11/19 (DATE) 12:40 (TIME)
AFTER DEVEL.: 42.38
STANDING WELL VOLUME: gal.
DRILLING WATER LOSS: gal.

WELL NO. GAMW-59B
SHEET 1 of 1
WELL DIA. (In) 2

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS: SPEC COND. (ms/cm)	ORP (mV)	TEMP (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
6/12/19 12:05	412.5	2.661	-86.2	14.97	7.20	3.00	6.72	2.5 gpm DTW
12:15		2.638	-99.2	14.57	7.48	3.06	3.75	9.84'
12:25		2.636	-98.9	14.44	7.47	3.02	2.65	9.84'
12:35		2.646	-99.8	14.46	7.48	3.09	3.64	9.84'
		= TOTAL VOLUME REMOVED (gal.)						

DEVELOPMENT METHOD:

Insect Repellant Used? Y/N

NOTES:

WELL DEVELOPMENT FIELD RECORD

JOB NAME: NIPSCO RMSGS
DEVELOPED BY: ANB
STARTED DEVEL.: 6/11/19 (DATE) / 14:30 (TIME)
W.L. BEFORE DEVE: 8.56 (DEPTH) / 6/11/19 (DATE) / 14:25 (TIME)
WELL DEPTH: BEFORE DEVEL.: 17.39 ft
STANDING WATER COLUMN (FT.):
SCREEN LENGTH: 10 ft

JOB NO.: 164817101
DATE OF INSTALL.:
COMPLETED DEVEL.: 16:35 (DATE) / 6/11/19 (TIME)
W.L. AFTER DEVEL.: 8.57 (DEPTH) / 6/11/19 (DATE) / 16:45 (TIME)
AFTER DEVEL.: 17.39
STANDING WELL VOLUME: gal.
DRILLING WATER LOSS: gal.

WELL NO.: GANW-60
SHEET 1 of 1
WELL DIA. (In): 2

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS: SPEC COND. (ms/cm)	ORP (mV)	TEMP (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
6/11/19 15:40		1.364	-91.0	14.40	7.44	2.05	5.46	2.5 GPM DTW: 10.69'
15:50		1.366	-83.6	14.30	7.41	2.00	6.0	2.5 GPM 10.69'
16:00		1.376	-67.3	14.27	7.41	2.00	4.99	2.5 GPM 10.69'
16:20		1.373	-62.4	14.29	7.41	2.00	4.33	2.5 GPM 10.69'
16:35		1.366	-67.8	14.23	7.41	2.00	4.35	2.5 GPM 10.69'
		= TOTAL VOLUME REMOVED (gal.)						

DEVELOPMENT METHOD:

Insect Repellant Used? Y/N

NOTES:

WELL DEVELOPMENT FIELD RECORD

JOB NAME: NIPSCO RMSGS
DEVELOPED BY: AWB
STARTED DEVEL.: 6/11/19 (DATE) 12:30 (TIME)
W.L. BEFORE DEVE: 8.48 ft. (DEPTH) 6/11/19 (DATE) 12:20 (TIME)
WELL DEPTH: BEFORE DEVEL. 42.58 ft.
STANDING WATER COLUMN (FT.)
SCREEN LENGTH: 10 Ft.

JOB NO.: 164817101
DATE OF INSTALL.:
COMPLETED DEVEL.: 6/11/19 (DATE) 14:20 (TIME)
W.L. AFTER DEVEL.: 9.14 (DEPTH) 6/11/19 (DATE) 14:25 (TIME)
AFTER DEVEL.: 42.59
STANDING WELL VOLUME: gal.
DRILLING WATER LOSS: gal.

WELL NO. GAMW-60B
SHEET 1 of 1
WELL DIA. (In) 2

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS: SPEC COND. (ms/cm)	ORP (mV)	TEMP (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
6/11/19 13:37	142.5	1.542	-82.3	16.44	7.66	1.63	2.74	2.5 gpm DTW: 9.14'
13:47		1.532	-101.9	14.20	7.80	1.62	3.95	2.5 gpm 9.14'
13:57		1.529	-120.0	14.38	7.90	1.63	2.16	2.5 gpm 9.14'
14:07		1.531	-120.7	13.91	7.96	1.66	1.63	2.5 gpm 9.14'
14:17	300	1.529	-120.3	14.04	7.92	1.64	1.95	2.5 gpm 9.14'

WELL DEVELOPMENT FIELD RECORD

JOB NAME: NIPSCO RMSGS
DEVELOPED BY: ANB
STARTED DEVEL.: 6/13/19 / (DATE / TIME)
W.L. BEFORE DEVE: 7.56 / 6/13/19 / 8:05 (DEPTH / DATE / TIME)
WELL DEPTH: BEFORE DEVEL.: 35.39'
STANDING WATER COLUMN (FT.):
SCREEN LENGTH: 10 Ft.

JOB NO.: 164817101
DATE OF INSTALL.:
COMPLETED DEVEL.: / (DATE / TIME)
W.L. AFTER DEVEL.: 8.16 / 6/13/19 / 12:50 (DEPTH / DATE / TIME)
AFTER DEVEL.: 35.43'
STANDING WELL VOLUME: gal.
DRILLING WATER LOSS: gal.

WELL NO.: GAMW-63B
SHEET: 1 of 1
WELL DIA. (In): 2

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS: SPEC COND. (ms/cm)	ORP (mV)	TEMP (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
6/13/19 8:30								2.5GPM DTW
11:20		1.751	-94.8	13.21	7.20	1.91	12.8	9.96'
11:30		1.747	-93.9	13.13	7.25	1.77	9.75	9.96'
11:40		1.747	-94.0	13.11	7.27	1.36	8.96	9.96'
11:50		1.736	-94.5	13.14	7.23	1.31	7.43	9.96'
12:00		1.732	-91.4	13.28	7.21	1.52	6.02	9.96'
12:45		1.736	-90.9	13.21	7.26	1.64	7.31	9.96'
		637.5 = TOTAL VOLUME REMOVED (gal.)						

DEVELOPMENT METHOD:

Insect Repellant Used? Y/N

NOTES: Spoke w/ Danielle. Confirmed well is not currently for sampling. Done purging at 12:45

WELL DEVELOPMENT FIELD RECORD

JOB NAME: NIPSCO RMSGS
DEVELOPED BY: ANB
STARTED DEVEL.: 6/13/19 (DATE) / 13:15 (TIME)
W.L. BEFORE DEVE: 5.90 (DEPTH) / 6/13/19 (DATE) / 13:00 (TIME)
WELL DEPTH: BEFORE DEVEL.: 33.22'
STANDING WATER COLUMN (FT.):
SCREEN LENGTH: 10 Ft.

JOB NO.: 164817101
DATE OF INSTALL.:
COMPLETED DEVEL.: 6/13/19 (DATE) / 15:00 (TIME)
W.L. AFTER DEVEL.: 5.90 (DEPTH) / 6/13/19 (DATE) / 15:08 (TIME)
AFTER DEVEL.: 33.26
STANDING WELL VOLUME: _____ gal.
DRILLING WATER LOSS: _____ gal.

WELL NO.: GAMW-64B
SHEET 1 of 1
WELL DIA. (In): 2

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS: SPEC COND. (ms/cm)	ORP (mV)	TEMP (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
6/13/19 14:30		1.087	-90.7	12.58	7.33	1.50	375	2.5 gpm DTW
6/13/19 14:40		1.065	-89.7	12.17	7.28	2.27	3.98	6.09'
14:50		1.062	-92.5	12.16	7.25	2.14	4.62	6.09'
15:00 14	300	1.063	-88.6	12.12	7.29	2.34	3.90	6.09'
		300	= TOTAL VOLUME REMOVED (gal.)					

DEVELOPMENT METHOD:

Insect Repellant Used? Y/N

NOTES:

GOLDER

WELL DEVELOPMENT FIELD RECORD

JOB NAME: NIPSCO LLC/RMSGS/IN
JOB #: 20141916
WELL ID: GMW-05B
DEVELOPED BY: R. Guzman
DATE OF INSTALL:
SHEET: 1 OF 1
STARTED DEVEL: 5/28/20 (DATE) 1340 (TIME) 1310
COMPLETED DEVEL: 5/28/20 (DATE) 1650 (TIME)
W.L. BEFORE DEVEL: 9.60 (DEPTH (FT.)) 5/28/20 (DATE) 0935 (TIME)
AFTER DEVEL: 9.62 (DEPTH (FT.)) 5/28/20 (DATE) 1653 (TIME)
WELL DEPTH (FT.): BEFORE DEVEL: 37.95
AFTER DEVEL: 38.10
WELL DIA. (In.): 2"
STANDING WATER COLUMN (FT.): 28.35
STANDING WELL VOLUME: 28.48 gal
SCREEN LENGTH (FT): 10
DRILLING WATER LOSS: N/A gal

DATE	TIME	VOLUME REMOVED (GALLONS)	FIELD PARAMETERS: SPEC. COND. (µS/cm)	ORP (mV)	TEMP. (°C)	pH (s.u.)	Diss. Oxygen (mg/L)	TURBIDITY (NTU)	WATER LEVEL	REMARKS (DTW, Pumping Rate, etc.)
05/28	1335	50	1604	-185	14.2	7.58	3.24	11.9	9.15	
"	1405	100	1611	-211	14.2	7.55	1.44	4.55	9.15	
"	1430	150	1592	-230	12.9	7.58	0.41	3.16	9.15	
"	1455	200	1668	-365	12.9	7.56	0.11	0.66	9.15	DO (0.11)
"	1520	250	1677	-386	12.9	7.52	0.10	0.25	9.15	
"	1545	300	1700	-415	12.9	7.48	0.09	0.15	9.15	
"	1610	350	1716	-441	12.9	7.48	0.09	0.10	9.15	
"	1635	400	1721	-458	12.9	7.47	0.08	0.06	9.15	
"	1640	410	1721	-467	12.9	7.47	0.08	0.07	9.15	
"	1645	420	1720	-468	12.9	7.46	0.08	0.06	9.15	
"	1650	430	1719	-469	12.9	7.47	0.08	0.05	9.15	
		430	= TOTAL VOLUME REMOVED (gal.)							

DEVELOPMENT METHOD: MONSOON TYPE PUMP, 2 GALS PER MIN, USED YSI PRODSS WITH FLOW THROUGH CELL.

NOTES:
CLEAR, SULFUR ODOR.

1" DIA. CASING CONTAINS .041 Gal./Ft. 2" DIA. CASING CONTAINS .163 Gal./Ft. 4" DIA. CASING CONTAINS .652 Gal./Ft.

GOLDER

WELL DEVELOPMENT FIELD RECORD

JOB NAME: NIPSCO LLC/RMSGS/IN
JOB #: 20141916
WELL ID: GMW-66B
DEVELOPED BY: R. GUZMAN
DATE OF INSTALL:
SHEET: 1 OF 1
STARTED DEVEL: 5/29/20 (DATE) 0950 (TIME)
COMPLETED DEVEL: 5/29/20 (DATE) 1308 (TIME)
W.L. BEFORE DEVEL: 14.54 (DEPTH (FT.)) 5/29 (DATE) 0935 (TIME)
AFTER DEVEL: 14.62 (DEPTH (FT.)) 5/29 (DATE) 1316 (TIME)
WELL DEPTH (FT.): BEFORE DEVEL: 47.80
AFTER DEVEL: 47.84
WELL DIA (In): 2
STANDING WATER COLUMN (FT.): 33.26
STANDING WELL VOLUME: 33.22 gal.
SCREEN LENGTH (FT): 10
DRILLING WATER LOSS: N/A gal.

DATE	TIME	VOLUME REMOVED (GALLONS)	FIELD PARAMETERS: SPEC. COND. (µS/cm)	ORP (mV)	TEMP. (°C)	pH (s.u.)	Diss. Oxygen (mg/L)	TURBIDITY (NTU)	WATER LEVEL REMARKS (DTW, Pumping Rate, etc.)
05/29	1015	50	2169	-98.9	14.2	7.18	0.14	42.5	14.72
"	1035	100	2105	-111	14.3	7.19	0.12	63.2	14.72
"	1100	150	2100	-114	14.3	7.20	0.11	13.1	14.72
"	1125	200	2104	-117	14.3	7.20	0.10	2.96	14.72
"	1150	250	2198	-121	14.2	7.17	0.09	4.45	14.72
"	1215	300	2197	-123	14.2	7.17	0.09	3.36	14.72
"	1235	350	2196	-125	14.2	7.17	0.09	3.80	14.72
"	1248	375	2197	-126	14.2	7.17	0.09	4.69	14.72
"	1258	385	2197	-127	14.2	7.17	0.08	3.29	14.72
"	1308	395	2197	-127	14.2	7.17	0.08	3.42	14.72

395 = TOTAL VOLUME REMOVED (gal.)

RG

DEVELOPMENT METHOD:

NOTES:
CLEAR — NO ODOR

1" DIA. CASING CONTAINS .041 Gal./Ft. 2" DIA. CASING CONTAINS .163 Gal./Ft. 4" DIA. CASING CONTAINS .652 Gal./Ft.

GOLDER

WELL DEVELOPMENT FIELD RECORD

JOB NAME: NIPSCO LLC/RMSGS/IN
JOB #: 20141916
WELL ID: GAMW-GTB
DEVELOPED BY: R. GARMAN
DATE OF INSTALL:
SHEET: 1 OF 1
STARTED DEVEL: 5/29/20 (DATE) 1340 (TIME)
COMPLETED DEVEL: 5/29/20 (DATE)
W.L. BEFORE DEVEL: 9.55 (DEPTH (FT.)) 5/29 (DATE) (TIME)
AFTER DEVEL: 9.58 (DEPTH (FT.)) 5/29 (DATE) 1530 (TIME)
WELL DEPTH (FT.): BEFORE DEVEL: 43.75
AFTER DEVEL: 43.85
WELL DIA. (In.): 2
STANDING WATER COLUMN (FT.): 34.20
STANDING WELL VOLUME: 34.27 gal.
SCREEN LENGTH (FT): 10
DRILLING WATER LOSS: N/A gal.

DATE	TIME	VOLUME REMOVED (GALLONS)	FIELD PARAMETERS: SPEC. COND. (µS/cm)	ORP (mV)	TEMP. (°C)	pH (s.u.)	Diss. Oxygen (mg/L)	TURBIDITY (NTU)	WATER LEVEL	REMARKS (DTW, Pumping Rate, etc.)
05/29	1405	50	2290	-151	13.3	7.81	0.12	15.6	9.70	
"	1430	100	2279	-157	13.4	7.80	0.10	18.7	9.70	
"	1455	150	2291	-160	13.3	7.80	0.09	9.3	9.70	
"	1500	160	2292	-161	13.3	7.80	0.09	7.8	9.70	
"	1505	170	2293	-161	13.3	7.80	0.08	6.9	9.70	
"	1510	180	2294	-162	13.3	7.80	0.08	5.6	9.70	
"	1515	190	2294	-162	13.3	7.80	0.09	4.8	9.70	
"	1520	200	2294	-162	13.3	7.80	0.09	4.9	9.70	
		200	= TOTAL VOLUME REMOVED (gal.)							

DEVELOPMENT METHOD:

NOTES:
CLEAR, NO ODOR

1" DIA. CASING CONTAINS .041 Gal./Ft. 2" DIA. CASING CONTAINS .163 Gal./Ft. 4" DIA. CASING CONTAINS .652 Gal./Ft.

GOLDER

WELL DEVELOPMENT FIELD RECORD

JOB NAME: NIPSCO LLC/RMSGS/IN
JOB #: 20350612
WELL ID: GAMW-68
DEVELOPED BY: RG
DATE OF INSTALL:
SHEET ____ OF ____
STARTED DEVEL.: 9/1/20 (DATE) 1040 (TIME)
COMPLETED DEVEL.: 9/1/20 (DATE) 1200 (TIME)
W.L. BEFORE DEVEL.: 5.62 (DEPTH (FT.)) 9/1/20 (DATE) 1038 (TIME)
AFTER DEVEL.: 5.65 (DEPTH (FT.)) 9/1/20 (DATE) 1205 (TIME)
WELL DEPTH (FT.): BEFORE DEVEL. 16.11
AFTER DEVEL. 17.03
WELL DIA. (In.): 2"
STANDING WATER COLUMN (FT.):
STANDING WELL VOLUME: ____ gal.
SCREEN LENGTH (FT): 10
DRILLING WATER LOSS: ____ gal.

DATE	TIME	VOLUME REMOVED (GALLONS)	FIELD PARAMETERS: SPEC. COND. (µS/cm)	ORP (mV)	TEMP (°C)	pH (s.u.)	Diss. Oxygen (mg/L)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
9/1	1050	20	425	18.0	18.5	7.27	2.20	2945	
"	1100	40	408	-23.0	16.9	7.79	1.47	648	
"	1110	60	412	-41.9	16.6	7.80	1.04	240	
"	1120	80	409	-45.5	15.9	7.99	1.69	28.7	
"	1130	100	407	-52.5	15.8	7.97	1.10	6.98	
"	1140	120	409	-58.3	15.9	7.91	1.14	4.67	
"	1150	140	410	-56.5	16.2	7.96	1.21	4.33	
"	1200	160	411	-57.6	16.1	8.02	1.19	4.51	
		160	= TOTAL VOLUME REMOVED (gal.)						

DEVELOPMENT METHOD:

NOTES:

1" DIA. CASING CONTAINS .041 Gal./Ft. 2" DIA. CASING CONTAINS .163 Gal./Ft. 4" DIA. CASING CONTAINS .652 Gal./Ft.

GOLDER

WELL DEVELOPMENT FIELD RECORD

JOB NAME: NIPSCO LLC/RMSGS/IN
JOB #: 20350612
WELL ID: GAMW-68
DEVELOPED BY: RG
DATE OF INSTALL:
SHEET: ____ OF ____
STARTED DEVEL: 9/2/20 (DATE) 1030 (TIME)
COMPLETED DEVEL: 9/2/20 (DATE) 1140 (TIME) 1150
W.L. BEFORE DEVEL: 5.62 (DEPTH (FT.)) 9/2/20 (DATE) 1025 (TIME)
AFTER DEVEL: 5.62 (DEPTH (FT.)) 9/2/20 (DATE) ~~1145~~ RG (TIME)
WELL DEPTH (FT.): BEFORE DEVEL: 17.02
AFTER DEVEL: 17.02
WELL DIA. (In.): 2"
STANDING WATER COLUMN (FT.): 11.40
STANDING WELL VOLUME: 2.0 gal.
SCREEN LENGTH (FT): 10
DRILLING WATER LOSS: — gal.

DATE	TIME	VOLUME REMOVED (GALLONS)	FIELD PARAMETERS: SPEC. COND. (µS/cm)	ORP (mV)	TEMP. (°C)	pH (s.u.)	Diss. Oxygen (mg/L)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
9/2	1040	20	442	-21.5	18.3	7.90	2.80	3966	
"	1050	40	416	-34.8	16.9	7.78	1.92	16.6	
"	1100	60	406	-39.3	15.8	7.75	1.88	5.90	
"	1110	80	429	-52.8	16.8	7.89	1.57	4.83	
"	1120	100	416	-51.4	16.5	7.94	1.78	2.84	
"	1130	120	421	-54.1	16.9	7.90	1.60	1.93	
"	1140	140	418	-55.0	16.2	7.96	1.69	1.16	
		140	= TOTAL VOLUME REMOVED (gal.)						

DEVELOPMENT METHOD:

NOTES:

1" DIA. CASING CONTAINS .041 Gal./Ft. 2" DIA. CASING CONTAINS .163 Gal./Ft. 4" DIA. CASING CONTAINS .652 Gal./Ft.

GOLDER

WELL DEVELOPMENT FIELD RECORD

JOB NAME: NIPSCO LLC/RMSGS/IN
JOB #: 20350612
WELL ID: GMW 68B
DEVELOPED BY: RG
DATE OF INSTALL:
SHEET: ___ OF ___
STARTED DEVEL.: 9/1/20 (DATE) 1220 (TIME)
COMPLETED DEVEL.: 9/1/20 (DATE) 1340 (TIME)
W.L. BEFORE DEVEL.: 5.83 (DEPTH (FT.)) 9/1/20 (DATE) 1220 (TIME)
AFTER DEVEL.: 5.88 (DEPTH (FT.)) 9/1/20 (DATE) 1345 (TIME)
WELL DEPTH (FT.): BEFORE DEVEL. 34.57
AFTER DEVEL. 34.78
WELL DIA. (In.): 2"
STANDING WATER COLUMN (FT.):
STANDING WELL VOLUME: ___ gal.
SCREEN LENGTH (FT.): 10
DRILLING WATER LOSS: ___ gal.

DATE	TIME	VOLUME REMOVED (GALLONS)	FIELD PARAMETERS: SPEC. COND. (µS/cm)	ORP (mV)	TEMP (°C)	pH (s.u.)	Diss. Oxygen (mg/L)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
9/1	1230	20	360	-60.1	14.6	7.66	2.09	237.8	
"	1240	40	348	-97.8	13.9	7.68	0.89	227.7	
"	1250	60	344	-104.3	13.6	7.77	0.93	16.7	
"	1300	80	347	-100.5	13.7	7.81	0.96	9.3	
"	1310	100	348	-99.6	13.9	7.80	1.01	3.57	
"	1320	120	350	-96.1	14.0	7.80	1.04	3.35	
"	1330	140	345	-95.3	13.4	7.82	1.10	3.11	
"	1340	160	341	-94.6	13.5	7.80	1.20	3.04	
		160	= TOTAL VOLUME REMOVED (gal.)						

DEVELOPMENT METHOD:

NOTES:

1" DIA. CASING CONTAINS .041 Gal./Ft. 2" DIA. CASING CONTAINS .163 Gal./Ft. 4" DIA. CASING CONTAINS .652 Gal./Ft.

GOLDER

WELL DEVELOPMENT FIELD RECORD

JOB NAME: NIPSCO LLC/RMSGS/IN
JOB #: 20350612
WELL ID: GAMW-66B
DEVELOPED BY: RG
DATE OF INSTALL:
SHEET: ____ OF ____
STARTED DEVEL: 9/2/20 (DATE) 1210 (TIME)
COMPLETED DEVEL: 9/2/20 (DATE) [illegible] (TIME)
W.L. BEFORE DEVEL: 5.82 (DEPTH (FT.)) 9/2/20 (DATE) 1200 (TIME)
AFTER DEVEL: ____ (DEPTH (FT.)) 9/2/20 (DATE) ____ (TIME)
WELL DEPTH (FT.): BEFORE DEVEL: 34.76
AFTER DEVEL: ____
WELL DIA. (In.): 2"
STANDING WATER COLUMN (FT.): RG ~~29.6~~ 28.94
STANDING WELL VOLUME: ____ gal.
SCREEN LENGTH (FT): 10
DRILLING WATER LOSS: ____ gal.

DATE	TIME	VOLUME REMOVED (GALLONS)	FIELD PARAMETERS: SPEC. COND. (µS/cm)	ORP (mV)	TEMP. (°C)	pH (s.u.)	Diss. Oxygen (mg/L)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.)
9/2	1220	20	363	-61.9	15.0	7.64	1.94	172.1	
"	1230	40	347	-85.3	13.9	7.66	1.80	57.1	
"	1240	60	351	-94.7	14.1	7.74	1.76	3.42	
"	1250	80	349	-100.7	13.9	7.76	1.28	2.91	
"	1300	100	350	-103.6	14.2	7.75	1.38	1.24	
"	1310	120	350	-105.5	14.2	7.74	1.29	1.09	
"	1320	140	350	-107.1	14.2	7.74	1.32	0.91	
		140 = TOTAL VOLUME REMOVED (gal.)							

DEVELOPMENT METHOD:

NOTES:

1" DIA. CASING CONTAINS .041 Gal./Ft. 2" DIA. CASING CONTAINS .163 Gal./Ft. 4" DIA. CASING CONTAINS .652 Gal./Ft.

WELL DEVELOPMENT FIELD RECORD

JOB NAME RMSGS Landfill Well Replacement
JOB NO. 31404789.005 WELL NO. GAMW-72
DEVELOPED BY Travis Gennell
DATE OF INSTALL. 4/20/23 SHEET 1 OF 2
STARTED DEVEL. 5-18-23 / 15:23 (DATE / TIME)
COMPLETED DEVEL. 5-18-23 / 16:31 (DATE / TIME)
W.L. BEFORE DEVEL. 5.8 / 5/18 / 15:22 (DEPTH / DATE / TIME)
AFTER DEVEL. 5.7 / 5/18 / 16:32 (DEPTH / DATE / TIME)
WELL DEPTH: BEFORE DEVEL. 15
AFTER DEVEL. 15.1
WELL DIA. (In) 2
STANDING WATER COLUMN (FT.) 9.4
STANDING WELL VOLUME 1.53 gal.
SCREEN LENGTH 10'
DRILLING WATER LOSS NM gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (mS/cm)	TEMP. (C)	pH (s.u.)	TURB. (NTU)	REMARKS
15:23	0	1.55	-	-	-	
15:25	5	1.56	-	-	112	
15:27	10	1.61	-	-	1752	
15:29	15	1.30	-	-	1389	
15:31	20	1.67	-	-	976	
15:34	25	1.68	-	-	1820	
15:36	30	1.69	-	-	2099	
15:37	35	1.70	-	-	355	
15:39	40	1.69	-	-	1009	
15:41	45	1.69	-	-	1293	
15:45	50	1.69	-	-	1155	
15:52	55	1.67	-	-	2795	
15:54	60	1.68	-	-	1733	
15:56	65	1.70	-	-	1649	
15:59	70	1.69	-	-	1044	
16:01	75	1.68	-	-	383	
16:03	80	1.68	-	-	362	
16:05	85	1.68	-	-	312	
16:07	90	1.66	-	-	312	
		150= TOTAL VOLUME REMOVED (gal.)				

DEVELOPMENT METHOD:
Well was purge at 1.6 GPM, recordings happened after a five gallon bucket was filled. Surging commenced in between readings.

NOTES:

WELL DEVELOPMENT FIELD RECORD

JOB NAME RMSGS Landfill Well Replacement
JOB NO. 31404789.005 WELL NO. GAMW-72
DEVELOPED BY Travis Gennell
DATE OF INSTALL. 4/20/23 SHEET 1 OF 2
STARTED DEVEL. 5-18-23 / 15:23 (DATE / TIME)
COMPLETED DEVEL. 5-18-23 / 16:31 (DATE / TIME)
W.L. BEFORE DEVEL. 5.8 / 5/18 / 15:22 (DEPTH / DATE / TIME)
AFTER DEVEL. 5.7 / 5/18 / 16:32 (DEPTH / DATE / TIME)
WELL DEPTH: BEFORE DEVEL. 15
AFTER DEVEL. 15.1
WELL DIA. (In) 2
STANDING WATER COLUMN (FT.) 9.4
STANDING WELL VOLUME 1.53 gal.
SCREEN LENGTH 10'
DRILLING WATER LOSS NM gal.

DATE/TIME	VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC. COND. (umhos/cm)	TEMP. (C)	pH (s.u.)	OTHER	REMARKS
16:10	95	1.68	-	-	269	
16:12	100	1.69	-	-	311	
16:14	105	1.68	-	-	236	
16:16	110	1.68	-	-	137	
16:17	115	1.69	-	-	68.1	
16:19	120	1.69	-	-	48.4	
16:21	125	1.68	-	-	27	
16:23	130	1.70	-	-	14.8	
16:25	135	1.70	-	-	8.04	
16:27	140	1.68	-	-	6.86	
16:29	145	1.69	-	-	4.32	
16:31	150	1.70	-		3.69	
	150 =	TOTAL VOLUME REMOVED (gal.)				

DEVELOPMENT METHOD: Final Turbidity - 3.69 NTU

NOTES:

GROUNDWATER/SURFACE WATER SAMPLING FORM

* Well Development

Page 1 of 1

Project Location NIPSCO/RMSGS | Surface Water ☐ | Groundwater ☒ | Sample Identification GAMW-74 (Well name)

Sampling Personnel R.G. | Date 6/22/23 | Start Time 1100 | Weather Sunny/82°

MEASUREMENT SUMMARY:

Measuring Point MARK | Depth to Water 6.28 | Depth to Product — | Product Thickness —

Total Casing Depth 17.65 | Well Diameter 2" | Approx. Pump Depth 14-16 Feet (bgs)

Screen Interval top bottom Feet (bgs)

SAMPLING SUMMARY:

Sampling Method: Grab ☐ Composite ☐ Grundfos ☐ ~~Bladder~~ Pump ☒ (MONSOON) Peristaltic Pump ☐ Bailer ☐

Pump Started 1115 | Pump Stopped 1215 | Total Gallons 120

Time (24-hr)	pH (S.U.)	SC (mS/cm)	Temp (°C)	Turb. (NTU)	Flow Rate (GAL ~~mL~~/min)	DTW (ft)	Drawdown (ft)	DO (mg/L)	ORP (mV)	TOTAL VOL
1120	7.16	0.708	11.3	1345	2.0	6.50	~~0.63~~ 0.22	0.63	-3.7	10.0
1125	7.19	0.692	11.3	689	"	6.50	—	0.52	-18.1	20.0
1130	7.18	0.690	11.3	296	"	6.50	—	0.42	-33.3	30.0
1135	7.19	0.668	11.3	448	"	6.50	—	0.59	-31.8	40.0
1140	7.14	0.669	11.3	135	"	6.50	—	0.48	-42.8	50.0
1145	7.10	0.665	11.3	31.5	"	6.50	—	0.36	-47.2	60.0
1150	7.09	0.662	11.3	14.2	"	6.50	—	0.35	-46.7	70.0
1155	7.01	0.659	11.4	8.54	"	6.50	—	0.34	-46.9	80.0
1200	6.94	0.656	11.4	6.29	"	6.50	—	0.31	-47.1	90.0
1205	6.90	0.649	11.3	4.02	"	6.50	—	0.26	-47.2	100.0
1210	6.87	0.647	11.3	2.69	"	6.50	—	0.24	-47.4	110.0
1215	6.86	0.646	11.3	2.06	"	6.50	—	0.22	-47.5	120.0
Stability: (3 readings)	± 0.1	3%	3%	10%*	NA	NA	NA	10%*	± 10	

*Turbidity - 10% when > 5 NTU, or 3 readings < 5 NTU; DO - 10% when > 0.5 mg/L, or 3 readings < 0.5 mg/L

Final:

Time	pH	SC	Temp	Turb.	Flow Rate (2gl PER MIN)	DTW	Drawdown	DO	ORP	GALS.
1215	6.86	0.646	11.3	2.06	2.0	6.50	0.22	0.22	-47.5	120.0

COMMENTS:

CALIBRATION: pH Calibration Buffers: 4 ☒ 7 ☒ 10 ☐ ORP Calibration 240 mV

* SC Reference Solution 1.413 mS/cm Turbidity Cal. Solution 0.0 NTUs

Sample Name GAMW-74 Time _____ VOCs ☐ SVOCs ☐ PAHs ☐ TOC ☐

Total Metals ☐ Dissolved Metals ☐ BTEX ☐ Total Cyanide ☐ Free Cyanide ☐

Other ☐ List: _____

MS/MSD _____ Blind Dup _____ Blind Dup Name _____ TB _____

TWD (~~AFTER~~) 17.68

WSP

GROUNDWATER/SURFACE WATER SAMPLING FORM

* WELL DEVELOPMENT

Page ____ of ____

Project Location NIPSCO/RMSGS Surface Water ☐ Groundwater ☒ Sample Identification GAMW-74B (Well name)

Sampling Personnel RG Date 6/22/23 Start Time 1225 Weather SUNNY/ 82°

MEASUREMENT SUMMARY:

Measuring Point MARK Depth to Water 6.05 Depth to Product — Product Thickness —

Total Casing Depth 30.75 Well Diameter 2" Approx. Pump Depth 25-28 Feet (bgs)

Screen Interval top ____ bottom ____ Feet (bgs)

SAMPLING SUMMARY:

Sampling Method: Grab ☐ Composite ☐ Grundfos ☐ MONSOON ~~Bladder~~ Pump ☒ Peristaltic Pump ☐ Bailer ☐

Pump Started 1230 Pump Stopped ____ Total Gallons ____

Time (24-hr)	pH (S.U.)	SC (mS/cm)	Temp (°C)	Turb. (NTU)	Flow Rate ~~GAL~~/min)	DTW (ft)	Drawdown (ft)	DO (mg/L)	ORP (mV)	
1235	6.96	4.562	10.8	2688	2.0	6.28	0.23	0.78	-50.9	10.0
1240	6.71	3.517	10.5	1696	"	6.28	—	0.35	-38.4	20.0
1245	6.71	4.069	10.6	1749	"	6.28	—	0.50	-39.1	30.0
1250	6.76	3.711	10.4	246	"	6.28	—	0.41	-39.3	40.0
1255	6.67	3.764	10.4	66.22	"	6.28	—	0.32	-37.6	50.0
1300	6.65	3.788	10.4	33.41	"	6.28	—	0.26	-36.6	60.0
1305	6.63	3.825	10.4	19.48	"	6.28	—	0.24	-36.5	70.0
1310	6.63	3.825	10.3	17.33	"	6.28	—	0.24	-36.3	80.0
1315	6.61	3.855	10.3	11.53	"	6.28	—	0.22	-36.1	90.0
1320	6.61	3.911	10.4	10.81	"	6.28	—	0.24	-35.8	100.0
1325	6.61	4.046	10.4	9.88	"	6.28	—	0.26	-35.4	110.0
1330	6.59	4.066	10.4	7.81	"	6.28	—	0.28	-34.8	120.0
1335	6.57	4.091	10.4	7.45	"	6.28	—	0.26	-34.2	130.0
1340	6.56	4.092	10.4	6.92	"	6.28	—	0.24	-34.1	140.0
1345	6.55	4.094	10.4	4.97	"	6.28	—	0.21	-33.7	150.0
1350	6.54	4.094	10.3	4.71	"	6.28	—	0.20	-33.5	160.0
1355	6.53	4.094	10.3	4.68	"	6.28	—	0.19	-33.4	170.0
Stability: (3 readings)	± 0.1	3%	3%	10%*	NA	NA	NA	10%*	± 10	

*Turbidity - 10% when > 5 NTU, or 3 readings < 5 NTU; DO - 10% when > 0.5 mg/L, or 3 readings < 0.5 mg/L

Final:

Time	pH	SC	Temp	Turb.	PER GAL Flow Rate	DTW	Drawdown	DO	ORP	GALS
1355	6.53	4.094	10.3	4.68	2.0	6.28	0.23	0.19	-33.4	170.0

COMMENTS: ____

CALIBRATION: pH Calibration Buffers: 4 ☒ 7 ☒ 10 ☐ ORP Calibration 240 mV

SC Reference Solution 1413 mS/cm Turbidity Cal. Solution 0.0 NTUs

Sample Name GAMW-74B Time ____ VOCs ☐ SVOCs ☐ PAHs ☐ TOC ☐

Total Metals ☐ Dissolved Metals ☐ BTEX ☐ Total Cyanide ☐ Free Cyanide ☐

Other ☐ List: ____

MS/MSD ____ Blind Dup ____ Blind Dup Name ____ TB ____

TWP (AFTER) 30.75

WSP

GROUNDWATER/SURFACE WATER SAMPLING FORM

WELL DEVELOPMENT

Project Location NASCO/RUBGS Surface Water ☐ Groundwater ☒ Sample Identification GAMW-73 (Well name)

Sampling Personnel RG Date 6/23/23 Start Time 0915 Weather CLOUDY/76°

MEASUREMENT SUMMARY:

Measuring Point MARK Depth to Water 6.10 Depth to Product — Product Thickness —

Total Casing Depth 17.45 Well Diameter 2" Approx. Pump Depth 14-16 Feet (bgs)

Screen Interval top bottom Feet (bgs)

SAMPLING SUMMARY:

Sampling Method: Grab ☐ Composite ☐ Grundfos ☐ MONSOON ~~Bladder~~ Pump ☒ Peristaltic Pump ☐ Bailer ☐

Pump Started 0940 Pump Stopped 1040 Total Gallons 120.0

Time (24-hr)	pH (S.U.)	SC (mS/cm)	Temp (°C)	Turb. (NTU)	Flow Rate (mL/min)	DTW (ft)	Drawdown (ft)	DO (mg/L)	ORP (mV)	TOTAL VOL
0945	7.26	1.021	11.1	1121	2.0	6.30	0.20	0.86	-44.1	10.0
0950	7.27	1.013	11.2	632	2.0	—	—	0.66	-49.3	20.0
0955	7.25	1.006	11.3	486	"	—	—	0.51	-53.9	30.0
1000	7.20	0.997	11.2	151.5	"	—	—	0.45	-55.5	40.0
1005	7.15	0.988	11.2	148.8	"	—	—	0.41	-56.6	50.0
1010	7.11	0.983	11.2	64.2	"	—	—	0.35	-57.5	60.0
1015	7.07	0.978	11.3	16.11	"	—	—	0.32	-56.6	70.0
1020	7.25	0.975	11.3	4.41	"	—	—	0.36	-56.3	80.0
1025	7.01	0.967	11.3	2.23	"	—	—	0.40	-54.4	90.0
1030	6.96	0.961	11.3	1.11	"	—	—	0.37	-52.3	100.0
1035	6.92	0.959	11.3	0.75	"	—	—	0.35	-50.2	110.0
1040	6.89	0.956	11.3	0.55	"	—	—	0.36	-50.1	120.0
Stability: (3 readings)	± 0.1	3%	3%	10%*	NA	NA	NA	10%*	± 10	

*Turbidity - 10% when > 5 NTU, or 3 readings < 5 NTU; DO - 10% when > 0.5 mg/L, or 3 readings < 0.5 mg/L

Final:

Time	pH	SC	Temp	Turb.	Flow Rate (GALS)	DTW	Drawdown	DO	ORP
1040				0.55	2.0	6.30	0.20		

GALS 120.0

COMMENTS:

CALIBRATION: pH Calibration Buffers: 4 ☒ 7 ☒ 10 ☐ ORP Calibration 240 mV

SC Reference Solution 1.413 mS/cm Turbidity Cal. Solution 0.0 NTUs

Sample Name GAMW-73 Time — VOCs ☐ SVOCs ☐ PAHs ☐ TOC ☐

Total Metals ☐ Dissolved Metals ☐ BTEX ☐ Total Cyanide ☐ Free Cyanide ☐

Other ☐ List:

MS/MSD — Blind Dup — Blind Dup Name — TB —

TWD (after) 17.45

WSP

GROUNDWATER/SURFACE WATER SAMPLING FORM

WELL DEVELOPMENT

Page ____ of ____

Project Location NASCO/RUSS Surface Water ☐ Groundwater ☒ Sample Identification GAMW-73B (Well name)

Sampling Personnel RS Date 6/23/23 Start Time ____ Weather PLEASANT / 77°

MEASUREMENT SUMMARY:

Measuring Point MARK Depth to Water 6.15 Depth to Product ____ Product Thickness ____

Total Casing Depth 30.95 Well Diameter 2" Approx. Pump Depth 26-28 Feet (bgs)

Screen Interval top ____ bottom ____ Feet (bgs)

SAMPLING SUMMARY:

Sampling Method: Grab ☐ Composite ☐ Grundfos ☐ MONSOON ~~Bladder~~ Pump ☒ Peristaltic Pump ☐ Bailer ☐

Pump Started 1045 Pump Stopped ____ Total Gallons ____

Time (24-hr)	pH (S.U.)	SC (mS/cm)	Temp (°C)	Turb. (NTU)	Flow Rate (mL/min)	DTW (ft)	Drawdown (ft)	DO (mg/L)	ORP (mV)	TOTAL GALS
1050	6.91	~~4.986~~ 9.056	11.1	1986	2.0	6.32	0.17	1.05	-51.3	10.0
1055	6.84	4.484	10.7	548	"	—	—	0.56	-48.1	20.0
1100	6.80	4.477	10.6	116	"	—	—	0.32	-49.7	30.0
1105	6.76	4.491	10.4	25.5	"	—	—	0.26	-45.9	40.0
1110	6.75	4.495	10.4	19.1	"	—	—	0.25	-45.7	50.0
1115	6.71	4.504	10.4	10.2	"	—	—	0.24	-45.1	60.0
1120	6.67	4.514	10.4	4.76	"	—	—	0.23	-45.8	70.0
1125	6.66	4.517	10.4	4.49	"	—	—	0.22	-44.3	80.0
1130	6.64	4.541	10.6	3.95	"	—	—	0.21	-43.7	90.0
1135	6.63	4.533	10.5	2.75	"	—	—	0.21	-43.1	100.0
1140	6.62	4.525	10.4	2.49	"	—	—	0.21	-42.6	110.0
1145	6.61	4.521	10.4	2.21	"	—	—	0.21	-41.9	120.0
Stability: (3 readings)	*± 0.1*	*3%*	*3%*	*10%**	*NA*	*NA*	*NA*	*10%**	*± 10*	

**Turbidity - 10% when > 5 NTU, or 3 readings < 5 NTU; DO - 10% when > 0.5 mg/L, or 3 readings < 0.5 mg/L*

Final:

Time	pH	SC	Temp	Turb.	Flow Rate (GAL/min)	DTW	Drawdown	DO	ORP
1145	6.61	4.521	10.4	2.21	2.0	6.32	0.17	0.21	-41.9

COMMENTS: ____

CALIBRATION: pH Calibration Buffers: 4 ☒ 7 ☒ 10 ☐ ORP Calibration 240 mV

SC Reference Solution 1.413 mS/cm Turbidity Cal. Solution 0.0 NTUs

Sample Name GAMW-73B Time ____ VOCs ☐ SVOCs ☐ PAHs ☐ TOC ☐

Total Metals ☐ Dissolved Metals ☐ BTEX ☐ Total Cyanide ☐ Free Cyanide ☐

Other ☐ List: ____

MS/MSD ____ Blind Dup ____ Blind Dup Name ____ TB ____

TWD (~~AFTER~~) 30.95

WSP

GROUNDWATER/SURFACE WATER SAMPLING FORM

WELL OBSERVATION

Page ____ of ____

Project Location NASCO/RMSES | Surface Water ☐ | Groundwater ☒ | Sample Identification GAMW-72B (Well name)

Sampling Personnel RG | Date 6/23/23 | Start Time 1200 | Weather PT CLOUDY / 76°

MEASUREMENT SUMMARY:

Measuring Point MARK | Depth to Water 8.66 | Depth to Product — | Product Thickness —

Total Casing Depth 34.22 | Well Diameter 2" | Approx. Pump Depth 30-33 Feet (bgs)

Screen Interval top ____ bottom ____ Feet (bgs)

SAMPLING SUMMARY:

Sampling Method: Grab ☐ | Composite ☐ | Grundfos ☐ | MONSOON ~~Bladder~~ Pump ☒ | Peristaltic Pump ☐ | Bailer ☐

Pump Started 1215 | Pump Stopped ____ | Total Gallons ____

Time (24-hr)	pH (S.U.)	SC (mS/cm)	Temp (°C)	Turb. (NTU)	Flow Rate (GAL/min)	DTW (ft)	Drawdown (ft)	DO (mg/L)	ORP (mV)	
1220	7.95	1.651	12.0	1235	2.0	8.90	0.24	0.57	-114	10.0
1225	7.60	1.793	12.0	265	"	—	—	1.17	-99.2	20.0
1230	7.38	1.776	12.0	65.2	"	—	—	0.52	-90.7	30.0
1235	7.26	1.770	12.0	21.1	"	—	—	0.41	-86.6	40.0
1240	7.11	1.767	12.0	7.34	"	—	—	0.35	-80.1	50.0
1245	7.02	1.759	11.9	3.24	"	—	—	0.34	-76.1	60.0
1250	6.91	1.755	12.0	1.35	"	—	—	0.31	-71.5	70.0
1255	6.88	1.751	11.9	1.18	"	—	—	0.29	-70.4	80.0
1300	6.84	1.742	11.8	0.81	"	—	—	0.29	-68.8	90.0
1305	6.82	1.743	11.9	0.63	"	—	—	0.28	-68.1	100.0
Stability: (3 readings)	± 0.1	3%	3%	10%*	NA	NA	NA	10%*	± 10	

**Turbidity - 10% when > 5 NTU, or 3 readings < 5 NTU; DO - 10% when > 0.5 mg/L, or 3 readings < 0.5 mg/L*

Final:

Time	pH	SC	Temp	Turb.	Flow Rate (GAL/MIN)	DTW	Drawdown	DO	ORP
1305	6.82	1.743	11.9	0.63	2.0	8.90	0.24	0.28	-68.1

COMMENTS: ____

CALIBRATION: pH Calibration Buffers: 4 ☒ 7 ☒ 10 ☐ | ORP Calibration 240 mV

SC Reference Solution 1.413 mS/cm | Turbidity Cal. Solution 0.0 NTUs

Sample Name GAMW-72B | Time ____ | VOCs ☐ | SVOCs ☐ | PAHs ☐ | TOC ☐

Total Metals ☐ | Dissolved Metals ☐ | BTEX ☐ | Total Cyanide ☐ | Free Cyanide ☐

Other ☐ List: ____

MS/MSD ____ | Blind Dup ____ | Blind Dup Name ____ | TB ____

TWD (AFTER) 34.22

WSP

WELL DEVELOPMENT FIELD RECORD

JOB NAME	RMSGS WDA		JOB NO.	31406779.011	WELL NO. GAMW-77
DEVELOPED BY	RCG		DATE OF INSTALL.	11/7/2023	SHEET 1 of 1
STARTED DEVEL.	11/10/2023	0940	COMPLETED DEVEL.	11/10/2023	1020
	DATE	TIME		DATE	TIME
W.L. BEFORE DEVEL.	9.61 ft	/ 11/10/23 0940	W.L. AFTER DEVEL.	/	/
	DEPTH	DATE TIME		DEPTH	DATE TIME
WELL DEPTH: BEFORE DEVEL.	21.82 ft btoc		AFTER DEVEL.		WELL DIA. (In) 2
STANDING WATER COLUMN (FT.)	15.21		STANDING WELL VOLUME	2.5	gal.
SCREEN LENGTH	10 ft		DRILLING WATER LOSS	NA	gal.

DATE/TIME		VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC COND. (ms/cm)	ORP (mV)	TEMP (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.) water level (feet bmp)
11/10/2023	9:45:00 AM	10	0.218	-103.1	11.6	9.22	1.14	952	10.20
11/10/2023	9:50:00 AM	20	0.208	-104.4	11.7	8.72	1.11	789	10.20
11/10/2023	9:55:00 AM	30	0.206	-102.1	11.7	8.68	0.99	485	10.20
11/10/2023	10:00:00 AM	40	0.195	-91.3	11.7	8.61	1.52	30.5	10.20
11/10/2023	10:05:00 AM	50	0.198	-89.9	11.7	8.55	1.35	10.2	10.20
11/10/2023	10:10:00 AM	60	0.202	-85.6	11.7	8.52	1.27	3.55	10.20
11/10/2023	10:15:00 AM	70	0.198	-81.2	11.7	8.49	1.29	1.31	10.20
11/10/2023	10:20:00 AM	80	0.197	-78.6	11.7	8.45	1.31	0.65	10.20

WELL DEVELOPMENT FIELD RECORD

JOB NAME	RMSGS WDA		JOB NO.	31406779.011	WELL NO. GAMW-78
DEVELOPED BY	RCG		DATE OF INSTALL.	11/8/2023	SHEET 1 of 1
STARTED DEVEL.	11/10/2023	1045	COMPLETED DEVEL.	11/10/2023	1135
	DATE	TIME		DATE	TIME
W.L. BEFORE DEVEL.	15.98 FT	11/10/23 / 1045	W.L. AFTER DEVEL.	/	/
	DEPTH	DATE TIME		DEPTH	DATE TIME
WELL DEPTH: BEFORE DEVEL.	22.30 ft btoc		AFTER DEVEL.		WELL DIA. (In) 2
STANDING WATER COLUMN (FT.)	6.32		STANDING WELL VOLUME	1.02	gal.
SCREEN LENGTH	10 ft		DRILLING WATER LOSS	NA	gal.

DATE/TIME		VOLUME REMOVED (GALS)	FIELD PARAMETERS SPEC COND. (ms/cm)	ORP (mV)	TEMP (C)	pH (s.u.)	Diss. Oxygen (mg/l)	TURBIDITY (NTU)	REMARKS (DTW, Pumping Rate, etc.) Water level (feet bmp)			
11/10/2023	11:00:00 AM	10	0.231	-42.5	12.6	8.45	8.61	2438	19.65			
11/10/2023	11:05:00 AM	20	0.225	-5.2	12.6	7.94	8.36	178	19.65			
11/10/2023	11:10:00 AM	30	0.222	9.3	12.6	7.74	8.3	89.9	19.65			
11/10/2023	11:15:00 AM	40	0.22	26.1	12.6	7.59	8.21	7.15	19.65			
11/10/2023	11:20:00 AM	50	0.218	32.6	12.6	7.52	8.19	2.35	19.65			
11/10/2023	11:25:00 AM	60	0.216	40.2	12.6	7.46	8.16	2.1	19.65			
11/10/2023	11:30:00 AM	70	0.213	46.3	12.6	7.44	8.13	1.96	19.65			
11/10/2023	11:35:00 AM	80	0.214	48.9	12.6	7.42	8.1	1.71	19.65			

APPENDIX E

Abandonment Logs

GROUNDWATER WELL DECOMMISSIONING

RECORD FORM

WELL ID	GAMW-21

PROJECT INFORMATION

Project Number: 164817101
Client: NIPSCO
Site Location: RMSWS-Landfill

Date: 4/5/18
Decommissioned by (Drilling Company): Earth Exploration
Supervised by: D. Sylva

GROUNDWATER WELL DATA

Reference Point Name: TOPVC
Position of Reference Point: ft ags

Standing Water Level (ft *BRP)			
Depth to product (ft *BRP)		Measured Well Depth (ft *BRP)	
Design Well Depth (ft *BRP)	18 ft bgs	Well Casing Type	PVC
Depth of Water in Column (f)		Inside Casing Diameter	2"
Bore Volume (gal)		Inside Casing Depth	
Screen Type	PVC	Screen Length	10 Ft
Surface Casing Type		Surface Casing Diameter	
Borehole Diameter (Known or Assumed)	6"		

*BRP - Below Reference Point

DECOMMISSIONING RECORD

Well Casing Removed? (Pulled Out/Drilled Out)	YES - Pulled out	Surface Casing Removed?	YES
Drill Rig	CME 55 Track		
Overdrilling Method	HSA	Overdrill Diameter	6"
Overdrill Depth	18 Ft	Grout Mix Ratio	50lbs / 24 gals
Calculated Volume Required		Grout Type	CETCO Grout

Backfilling Interval (from-to, ft) below ground level	0-18 Ft						
Number of cement bags used	13/4						
Volume of cement slurry injected (gal)	40						

NOTES

13/4 bags / 40 gallons

1455 begin drilling
1515 begin filling
1540 complete filling

Golder Associates

GROUNDWATER WELL DECOMMISSIONING

RECORD FORM

WELL ID	GAMW-22

PROJECT INFORMATION

Project Number: 1644817101 **Date:** 4/5/18

Client: NLPSCO **Decommissioned by (Drilling Company):** Forth Exploration

Site Location: RMSG Landfill **Supervised by:** D. Sylvia

GROUNDWATER WELL DATA

Reference Point Name: TOPVC

Position of Reference Point: ft ags

Standing Water Level (ft *BRP)			
Depth to product (ft *BRP)	NA	Measured Well Depth (ft *BRP)	
Design Well Depth (ft *BRP)	~~18~~ 35 ft bgs	Well Casing Type	PVC
Depth of Water in Column (f)		Inside Casing Diameter	2"
Bore Volume (gal)		Inside Casing Depth	
Screen Type	PVC	Screen Length	10 ft
Surface Casing Type		Surface Casing Diameter	
Borehole Diameter (Known or Assumed)	6"		

*BRP - Below Reference Point

DECOMMISSIONING RECORD

Well Casing Removed? (Pulled Out/Drilled Out)	YES - Pulled	Surface Casing Removed?	YES
Drill Rig	CME 55 Track		
Overdrilling Method	HSA	Overdrill Diameter	6"
Overdrill Depth	18 ft	Grout Mix Ratio	~~1 3/4 bag~~ 50 lb/24 gallon
Calculated Volume Required		Grout Type	CETCO Grout

Backfilling Interval (from-to, ft) below ground level	0-18	ft bgs					
Number of cement bags used	1 3/4						
Volume of cement slurry injected (gal)	40						

NOTES

1 3/4 bag in 40 gallons

1345 Start chilling

1255 Start filling

1420 Complete

Golder Associates

GROUNDWATER WELL DECOMMISSIONING

RECORD FORM

WELL ID	GAMW-22B

PROJECT INFORMATION

Project Number: 164817101
Client: NIPSCO
Site Location: RMSGS - Landfill

Date: 4/5/18
Decommissioned by (Drilling Company): Zoth Exploration
Supervised by: D Silva

GROUNDWATER WELL DATA

Reference Point Name: TOPVC
Position of Reference Point: ft ags

Standing Water Level (ft *BRP)			TOPVC
Depth to product (ft *BRP)	NA	Measured Well Depth (ft *BRP)	
Design Well Depth (ft *BRP)	35 / 18 ft bgs	Well Casing Type	PVC
Depth of Water in Column (f)		Inside Casing Diameter	2"
Bore Volume (gal)		Inside Casing Depth	
Screen Type	PVC	Screen Length	10ft
Surface Casing Type		Surface Casing Diameter	
Borehole Diameter (Known or Assumed)	8"		

*BRP - Below Reference Point

DECOMMISSIONING RECORD

Well Casing Removed? (Pulled Out/Drilled Out)	yes	Surface Casing Removed?	yes
Drill Rig	CME 55 Track		
Overdrilling Method	HSA	Overdrill Diameter	8in
Overdrill Depth	35 ft bgs	Grout Mix Ratio	1 3/4 bag / 40 gallons
Calculated Volume Required		Grout Type	CETCO Grout 50 lbs/ 24 ga

Backfilling Interval (from-to, ft) below ground level	0-35	ft bgs						
Number of cement bags used	2 3/4							
Volume of cement slurry injected (gal)	~80							

NOTES

1 3/4 bag in 40 gallons
1 bag in 20 gallons

1215 Start overdrilling
1255 complete overdrilling / start filling
1345 complete filling

Golder Associates

GROUNDWATER WELL DECOMMISSIONING

RECORD FORM

WELL ID	GAMW-21B

PROJECT INFORMATION

Project Number: 18481701 Date: 4/5/18

Client: NIPSCO Decommissioned by (Drilling Company): Earth Exploration

Site Location: RMSGS - Landfill Supervised by: DSylva

GROUNDWATER WELL DATA

Reference Point Name: Top PVC

Position of Reference Point: ft ags

Standing Water Level (ft *BRP)			
Depth to product (ft *BRP)	NA	Measured Well Depth (ft *BRP)	
Design Well Depth (ft *BRP)	34 ft bgs	Well Casing Type	PVC
Depth of Water in Column (f)		Inside Casing Diameter	2"
Bore Volume (gal)		Inside Casing Depth	
Screen Type	PVC	Screen Length	10 ft
Surface Casing Type		Surface Casing Diameter	
Borehole Diameter (Known or Assumed)	6"		

*BRP - Below Reference Point

DECOMMISSIONING RECORD

Well Casing Removed? (Pulled Out/Drilled Out)	Yes - Pulled	Surface Casing Removed?	Yes
Drill Rig	CME 55 Track		
Overdrilling Method	HSA	Overdrill Diameter	6"
Overdrill Depth	34 ft	Grout Mix Ratio	50 lbs / 24 gals
Calculated Volume Required		Grout Type	CETCO Grout

Backfilling Interval (from-to, ft) below ground level	0-34						
Number of cement bags used	2 1/2						
Volume of cement slurry injected (gal)	60						

NOTES

DEL ~~2~~ 1 3/4 bag in 40 gallons
3/4 bag in 20 gallons

1610 Start drilling
1630 begin Grouting
1700 complete

Golder Associates

GROUNDWATER WELL DECOMMISSIONING

RECORD FORM

WELL ID	GAMW-23

PROJECT INFORMATION

Project Number: 164817101
Date: 4/6/18
Client: NTP520
Decommissioned by (Drilling Company): Earth Exploration
Site Location: RMSGS - Landfill
Supervised by: D. Sylva

GROUNDWATER WELL DATA

Reference Point Name: TOPVC
Position of Reference Point: ft ags

Standing Water Level (ft *BRP)			
Depth to product (ft *BRP)	NA	Measured Well Depth (ft *BRP)	
Design Well Depth (ft *BRP)	19' bgs	Well Casing Type	PVC
Depth of Water in Column (f)		Inside Casing Diameter	2"
Bore Volume (gal)		Inside Casing Depth	
Screen Type	PVC	Screen Length	10'
Surface Casing Type		Surface Casing Diameter	
Borehole Diameter (Known or Assumed)	6"		

**BRP - Below Reference Point*

DECOMMISSIONING RECORD

Well Casing Removed? (Pulled Out/Drilled Out)	yes	Surface Casing Removed?	yes
Drill Rig	CME 55 track		
Overdrilling Method	HSA	Overdrill Diameter	6"
Overdrill Depth	19 ft bgs	Grout Mix Ratio	50lbs/ ~~40~~ 24 gallons
Calculated Volume Required		Grout Type	CETCO Grout

Backfilling Interval (from-to, ft) below ground level	0-19 ft bgs						
Number of cement bags used	1 3/4						
Volume of cement slurry injected (gal)	40						

NOTES

1 3/4 bag 40 gallons
0805 begin drilling
0820 begin filling
0840 complete

Golder Associates

3/30/2018

GAP-A-FM30
RL 0

GROUNDWATER WELL DECOMMISSIONING

RECORD FORM

WELL ID	GAMW-23B

PROJECT INFORMATION

Project Number: 164817101
Date: 4/6/18
Client: NIPSCO
Decommissioned by (Drilling Company): Earth Exploration
Site Location: RMJ08-Landfill
Supervised by: D. Syma

GROUNDWATER WELL DATA

Reference Point Name: TOpvc
Position of Reference Point: ft ags

Standing Water Level (ft *BRP)			
Depth to product (ft *BRP)		Measured Well Depth (ft *BRP)	
Design Well Depth (ft *BRP)	35 bgs	Well Casing Type	pvc
Depth of Water in Column (f)		Inside Casing Diameter	2"
Bore Volume (gal)		Inside Casing Depth	
Screen Type	pvc	Screen Length	10'
Surface Casing Type		Surface Casing Diameter	
Borehole Diameter (Known or Assumed)	6"		

**BRP - Below Reference Point*

DECOMMISSIONING RECORD

Well Casing Removed? (Pulled Out/Drilled Out)	yes	Surface Casing Removed?	yes
Drill Rig	CME 55 track		
Overdrilling Method	HSA	Overdrill Diameter	6"
Overdrill Depth	35' bgs	Grout Mix Ratio	50lbs/24 gals
Calculated Volume Required		Grout Type	CETCO Grout

Backfilling Interval (from-to, ft) below ground level	0-35'						
Number of cement bags used	3						
Volume of cement slurry injected (gal)	70						

NOTES

1 3/4 in 40 gallons
1 1/4 in 30 gallons

0840 begin drilling
0910 begin filling
0935 complete

Golder Associates

3/30/2018

GAP-A-FM30
RL 0

GROUNDWATER WELL DECOMMISSIONING

RECORD FORM

WELL ID GAMW-28

PROJECT INFORMATION

Project Number: 164817101
Client: NIPSCO
Site Location: RMGS-Landfill

Date: 5/6/18
Decommissioned by (Drilling Company): Earth Exploration
Supervised by: D. Silva

GROUNDWATER WELL DATA

Reference Point Name: TOPVC
Position of Reference Point: ft ags

Standing Water Level (ft *BRP)			
Depth to product (ft *BRP)	NA	Measured Well Depth (ft *BRP)	
Design Well Depth (ft *BRP)		Well Casing Type	PVC
Depth of Water in Column (f)		Inside Casing Diameter	2"
Bore Volume (gal)		Inside Casing Depth	
Screen Type	PVC	Screen Length	10'
Surface Casing Type	Metal	Surface Casing Diameter	4"
Borehole Diameter (Known or Assumed)	6"		

*BRP - Below Reference Point

DECOMMISSIONING RECORD

Well Casing Removed? (Pulled Out/Drilled Out)	YES	Surface Casing Removed?	Yes
Drill Rig	CME 55 Track		
Overdrilling Method	HSA	Overdrill Diameter	6"
Overdrill Depth	16 ft bgs	Grout Mix Ratio	80lbs/24 gallons
Calculated Volume Required		Grout Type	cetco grout

Backfilling Interval (from-to, ft) below ground level	0-16	ft					
Number of cement bags used	1 1/4 bags						
Volume of cement slurry injected (gal)	30 gals						

NOTES

1 1/4 bag in 30 gallons

1030 start drilling
1045 start filling
1100 complete

Golder Associates

GROUNDWATER WELL DECOMMISSIONING

RECORD FORM

WELL ID	GAMW-28B

PROJECT INFORMATION

Project Number: 164817101 Date: 4/6/18

Client: NIPSCO Decommissioned by (Drilling Company): Earth Exploration

Site Location: RMSGS - Landfill Supervised by: D. Sylvia

GROUNDWATER WELL DATA

Reference Point Name: TOPVC

Position of Reference Point: ft ags

Standing Water Level (ft *BRP)			
Depth to product (ft *BRP)	NA	Measured Well Depth (ft *BRP)	
Design Well Depth (ft *BRP)	29ft bgs	Well Casing Type	PVC
Depth of Water in Column (f)		Inside Casing Diameter	2"
Bore Volume (gal)		Inside Casing Depth	
Screen Type	PVC	Screen Length	10'
Surface Casing Type		Surface Casing Diameter	
Borehole Diameter (Known or Assumed)	6"		

*BRP - Below Reference Point

DECOMMISSIONING RECORD

Well Casing Removed? (Pulled Out/Drilled Out)	YES	Surface Casing Removed?	YES
Drill Rig	CME 55 Track		
Overdrilling Method	2 HSA	Overdrill Diameter	6"
Overdrill Depth	29ft bgs	Grout Mix Ratio	50lbs / 24 gals
Calculated Volume Required		Grout Type	Gasco Grout

Backfilling Interval (from-to, ft) below ground level	0-29ft bgs						
Number of cement bags used	DFS ~~3 1/4~~	2 3/4					
Volume of cement slurry injected (gal)	60 gals						

NOTES

1 1/2 in 30 gals
1 1/4 in 30 gals

1100
1030 Start drilling
DFS 1135 Start Filling
1215 complete, clean-up

Golder Associates

GROUNDWATER WELL DECOMMISSIONING

RECORD FORM

WELL ID	GAMW-29

PROJECT INFORMATION

Project Number: 31404789.005/02 **Date:** 25-Apr-23

Client: NIPSCO **Decommissioned by (Drilling Company):** Strata

Site Location: Wheatfield, IN, RMSGS Landfill **Supervised by:** Travis Gennell

GROUNDWATER WELL DATA

Reference Point Name: Topvc

Position of Reference Point:

Standing Water Level (m)			
Depth to product m)		Measured Well Depth (m)	
Design Well Depth m)	16 ft-bgs	Well Casing Type	PVC
Depth of Water in Column (m)		Inside Casing Diameter	2"
Bore Volume (Lt)		Inside Casing Depth	19
Screen Type	PVC	Screen Length	10'
Surface Casing Type		Surface Casing Diameter	
Borehole Diameter (Known or Assumed)	8'		

**BRP - Below Reference Point*

DECOMMISSIONING RECORD

Well Casing Removed? (Pulled Out/Drilled Out)	Yes (Pulled out)	Surface Casing Removed?	Yes
Drill Rig	Mobile B-57		
Overdrilling Method	HSA	Overdrill Diameter	4.25'
Overdrill Depth	16.5 ft-bgs	Grout Mix Ratio	
Calculated Volume Required		Grout Type	Cement Bentonite Mix

Backfilling Interval (from-to, m) below ground level	0-16.5						
Number of cement bags used	3						
Volume of cement slurry injected (lt)							

NOTES

3 bags cement (50 lbs)

20 gallons water

1/2 bag betonite (25 lbs)

2 bags betonite on top of grout

Drill 12:45-13:20

Fill 13:20-13:45

GROUNDWATER WELL DECOMMISSIONING

RECORD FORM

WELL ID	GAMW-29B

PROJECT INFORMATION

Project Number: 31404789.005 **Date:** 25-Apr-23

Client: NIPSCO **Decommissioned by (Drilling Company):** Strata

Site Location: Wheatfield, IN, RMSGS Landfill **Supervised by:** Travis Gennell

GROUNDWATER WELL DATA

Reference Point Name: Topvc

Position of Reference Point:

Standing Water Level (m)			
Depth to product m)		Measured Well Depth (m)	
Design Well Depth m)	36 ft-bgs	Well Casing Type	PVC
Depth of Water in Column (m)		Inside Casing Diameter	2"
Bore Volume (Lt)		Inside Casing Depth	39
Screen Type	PVC	Screen Length	10'
Surface Casing Type		Surface Casing Diameter	
Borehole Diameter (Known or Assumed)	8'		

**BRP - Below Reference Point*

DECOMMISSIONING RECORD

Well Casing Removed? (Pulled Out/Drilled Out)	Yes (Pulled out)	Surface Casing Removed?	Yes
Drill Rig	Mobile B-57		
Overdrilling Method	HSA	Overdrill Diameter	4.25'
Overdrill Depth	36.5 ft-bgs	Grout Mix Ratio	
Calculated Volume Required		Grout Type	Cement Bentonite Mix

Backfilling Interval (from-to, m) below ground level	0-36.5						
Number of cement bags used	4						
Volume of cement slurry injected (lt)							

NOTES

4 bags cement (50 lbs)

25 gallons water

1/2 bag bentonite (25 lbs)

2 bags betontie chips on top of grout

Drill 13:45-14:35

Fill 14:40-15:10

GROUNDWATER WELL DECOMMISSIONING

RECORD FORM

WELL ID	GAMW-30

PROJECT INFORMATION

Project Number: 31404789.005 **Date:** 25-Apr-23

Client: NIPSCO **Decommissioned by (Drilling Company):** Strata

Site Location: Wheatfield, IN, RMSGS Landfill **Supervised by:** Travis Gennell

GROUNDWATER WELL DATA

Reference Point Name: Topvc

Position of Reference Point:

Standing Water Level (m)			
Depth to product m)		Measured Well Depth (m)	
Design Well Depth m)	16 ft-bgs	Well Casing Type	PVC
Depth of Water in Column (m)		Inside Casing Diameter	2"
Bore Volume (Lt)		Inside Casing Depth	19
Screen Type	PVC	Screen Length	10'
Surface Casing Type		Surface Casing Diameter	
Borehole Diameter (Known or Assumed)	8'		

**BRP - Below Reference Point*

DECOMMISSIONING RECORD

Well Casing Removed? (Pulled Out/Drilled Out)	Yes (Pulled out)	Surface Casing Removed?	Yes
Drill Rig	Mobile B-57		
Overdrilling Method	HSA	Overdrill Diameter	4.25'
Overdrill Depth	16.5 ft-bgs	Grout Mix Ratio	
Calculated Volume Required		Grout Type	Cement Bentonite Mix

Backfilling Interval (from-to, m) below ground level	0-16.5						
Number of cement bags used	3						
Volume of cement slurry injected (lt)							

NOTES

3 bags cement (50 lbs)

20 gallons water

1/2 bag betonite (25 lbs)

2 bags betonite on top of grout

Drill 9:50-10:20

Fill 10:30-11:00

GROUNDWATER WELL DECOMMISSIONING

RECORD FORM

WELL ID	GAMW-30B

PROJECT INFORMATION

Project Number: 31404789.005 **Date:** 25-Apr-23

Client: NIPSCO **Decommissioned by (Drilling Company):** Strata

Site Location: Wheatfield, IN, RMSGS Landfill **Supervised by:** Travis Gennell

GROUNDWATER WELL DATA

Reference Point Name: topvc

Position of Reference Point:

Standing Water Level (m)			
Depth to product m)		Measured Well Depth (m)	
Design Well Depth m)	32 ft-bgs	Well Casing Type	PVC
Depth of Water in Column (m)		Inside Casing Diameter	2'
Bore Volume (Lt)		Inside Casing Depth	35
Screen Type	PVC	Screen Length	10'
Surface Casing Type		Surface Casing Diameter	
Borehole Diameter (Known or Assumed)	8"		

**BRP - Below Reference Point*

DECOMMISSIONING RECORD

Well Casing Removed? (Pulled Out/Drilled Out)	No (removed only above surface)	Surface Casing Removed?	Yes
Drill Rig	Mobile B-57		
Overdrilling Method	HSA	Overdrill Diameter	4.25'
Overdrill Depth	32.5 ft-bgs	Grout Mix Ratio	
Calculated Volume Required		Grout Type	Cement Bentonite Mix

Backfilling Interval (from-to, m) below ground level	0-32.5						
Number of cement bags used	4						
Volume of cement slurry injected (lt)							

NOTES

4 bags cement (50 lbs)

25 gallons water

1/2 bag bentonite (25 lbs)

2 bags betontie chips on top of grout

Drill 8:15-8:40

Fill 9:00-9:30

GROUNDWATER WELL DECOMMISSIONING

RECORD FORM

WELL ID	GAMW-38B

PROJECT INFORMATION

Project Number: 31404789.005 **Date:** 27-Apr-23

Client: NIPSCO **Decommissioned by (Drilling Company):** Strata

Site Location: Wheatfield, IN, RMSGS Landfill **Supervised by:** Travis Gennell

GROUNDWATER WELL DATA

Reference Point Name: Topvc

Position of Reference Point:

Standing Water Level (m)			
Depth to product m)		Measured Well Depth (m)	
Design Well Depth m)	29.5 ft-bgs	Well Casing Type	PVC
Depth of Water in Column (m)		Inside Casing Diameter	2"
Bore Volume (Lt)		Inside Casing Depth	32.5
Screen Type	PVC	Screen Length	10'
Surface Casing Type		Surface Casing Diameter	
Borehole Diameter (Known or Assumed)	8'		

**BRP - Below Reference Point*

DECOMMISSIONING RECORD

Well Casing Removed? (Pulled Out/Drilled Out)	Yes (Pulled out)	Surface Casing Removed?	Yes
Drill Rig	Mobile B-57		
Overdrilling Method	HSA	Overdrill Diameter	4.25'
Overdrill Depth	30 ft-bgs	Grout Mix Ratio	
Calculated Volume Required		Grout Type	Cement Bentonite Mix

Backfilling Interval (from-to, m) below ground level	0-30						
Number of cement bags used	4						
Volume of cement slurry injected (lt)							

NOTES

4 bags cement (50 lbs)

25 gallons water

1/2 bag bentonite (25 lbs)

2 bags betontie chips on top of grout

Drill 12:12-12:45

Fill 12:45-12:15

GROUNDWATER WELL DECOMMISSIONING

RECORD FORM

WELL ID	GAMW-38

PROJECT INFORMATION

Project Number: 31404789.005 **Date:** 27-Apr-23

Client: NIPSCO **Decommissioned by (Drilling Company):** Strata

Site Location: Wheatfield, IN, RMSGS Landfill **Supervised by:** Travis Gennell

GROUNDWATER WELL DATA

Reference Point Name: Topvc

Position of Reference Point:

Standing Water Level (m)			
Depth to product m)		Measured Well Depth (m)	
Design Well Depth m)	15 ft-bgs	Well Casing Type	PVC
Depth of Water in Column (m)		Inside Casing Diameter	2"
Bore Volume (Lt)		Inside Casing Depth	18
Screen Type	PVC	Screen Length	10'
Surface Casing Type		Surface Casing Diameter	
Borehole Diameter (Known or Assumed)	8'		

**BRP - Below Reference Point*

DECOMMISSIONING RECORD

Well Casing Removed? (Pulled Out/Drilled Out)	Yes (Pulled out)	Surface Casing Removed?	Yes
Drill Rig	Mobile B-57		
Overdrilling Method	HSA	Overdrill Diameter	4.25'
Overdrill Depth	15.5 ft-bgs	Grout Mix Ratio	
Calculated Volume Required		Grout Type	Cement Bentonite Mix

Backfilling Interval (from-to, m) below ground level	0-15.5						
Number of cement bags used	3						
Volume of cement slurry injected (lt)							

NOTES

3 bags cement (50 lbs)

20 gallons water

1/2 bag betonite (25 lbs)

2 bags betonite on top of grout

Drill 13:27-13:42

Fill 13:42-13:50

GROUNDWATER WELL DECOMMISSIONING

RECORD FORM

WELL ID	GAMW-39

PROJECT INFORMATION

Project Number: 31404789.005 **Date:** 27-Apr-23

Client: NIPSCO **Decommissioned by (Drilling Company):** Strata

Site Location: Wheatfield, IN, RMSGS Landfill **Supervised by:** Travis Gennell

GROUNDWATER WELL DATA

Reference Point Name: Topvc

Position of Reference Point:

Standing Water Level (m)			
Depth to product m)		Measured Well Depth (m)	
Design Well Depth m)	15 ft-bgs	Well Casing Type	PVC
Depth of Water in Column (m)		Inside Casing Diameter	2"
Bore Volume (Lt)		Inside Casing Depth	18
Screen Type	PVC	Screen Length	10'
Surface Casing Type		Surface Casing Diameter	
Borehole Diameter (Known or Assumed)	8'		

**BRP - Below Reference Point*

DECOMMISSIONING RECORD

Well Casing Removed? (Pulled Out/Drilled Out)	Yes (Pulled out)	Surface Casing Removed?	Yes
Drill Rig	Mobile B-57		
Overdrilling Method	HSA	Overdrill Diameter	4.25'
Overdrill Depth	15.5 ft-bgs	Grout Mix Ratio	
Calculated Volume Required		Grout Type	Cement Bentonite Mix

Backfilling Interval (from-to, m) below ground level	0-15.5						
Number of cement bags used	3						
Volume of cement slurry injected (lt)							

NOTES

3 bags cement (50 lbs)

20 gallons water

1/2 bag betonite (25 lbs)

2 bags betonite on top of grout

Drill 9:33-10:03

Fill 10:03-10:33

GROUNDWATER WELL DECOMMISSIONING

RECORD FORM

WELL ID	GAMW-39B

PROJECT INFORMATION

Project Number: 31404789.005 **Date:** 27-Apr-23

Client: NIPSCO **Decommissioned by (Drilling Company):** Strata

Site Location: Wheatfield, IN, RMSGS Landfill **Supervised by:** Travis Gennell

GROUNDWATER WELL DATA

Reference Point Name: Topvc

Position of Reference Point:

Standing Water Level (m)			
Depth to product m)		Measured Well Depth (m)	
Design Well Depth m)	29.75 ft-bgs	Well Casing Type	PVC
Depth of Water in Column (m)		Inside Casing Diameter	2"
Bore Volume (Lt)		Inside Casing Depth	32.75
Screen Type	PVC	Screen Length	10'
Surface Casing Type		Surface Casing Diameter	
Borehole Diameter (Known or Assumed)	8'		

**BRP - Below Reference Point*

DECOMMISSIONING RECORD

Well Casing Removed? (Pulled Out/Drilled Out)	Yes (Pulled out)	Surface Casing Removed?	Yes
Drill Rig	Mobile B-57		
Overdrilling Method	HSA	Overdrill Diameter	4.25'
Overdrill Depth	30.25 ft-bgs	Grout Mix Ratio	
Calculated Volume Required		Grout Type	Cement Bentonite Mix

Backfilling Interval (from-to, m) below ground level	0-30.25						
Number of cement bags used	4						
Volume of cement slurry injected (lt)							

NOTES

4 bags cement (50 lbs)

25 gallons water

1/2 bag bentonite (25 lbs)

2 bags betontie chips on top of grout

Drill 8:30-9:00

Fill 9:00-9:25

GROUNDWATER WELL DECOMMISSIONING

RECORD FORM

WELL ID	GAMW-40

PROJECT INFORMATION

Project Number: 31404789.005 **Date:** 26-Apr-23

Client: NIPSCO **Decommissioned by (Drilling Company):** Strata

Site Location: Wheatfield, IN, RMSGS Landfill **Supervised by:** Travis Gennell

GROUNDWATER WELL DATA

Reference Point Name: Topvc

Position of Reference Point:

Standing Water Level (m)			
Depth to product m)		Measured Well Depth (m)	
Design Well Depth m)	17 ft-bgs	Well Casing Type	PVC
Depth of Water in Column (m)		Inside Casing Diameter	2"
Bore Volume (Lt)		Inside Casing Depth	20
Screen Type	PVC	Screen Length	10'
Surface Casing Type		Surface Casing Diameter	
Borehole Diameter (Known or Assumed)	8'		

**BRP - Below Reference Point*

DECOMMISSIONING RECORD

Well Casing Removed? (Pulled Out/Drilled Out)	Yes (Pulled out)	Surface Casing Removed?	Yes
Drill Rig	Mobile B-57		
Overdrilling Method	HSA	Overdrill Diameter	4.25'
Overdrill Depth	17.5 ft-bgs	Grout Mix Ratio	
Calculated Volume Required		Grout Type	Cement Bentonite Mix

Backfilling Interval (from-to, m) below ground level	0-17.5						
Number of cement bags used	3						
Volume of cement slurry injected (lt)							

NOTES

3 bags cement (50 lbs)

20 gallons water

1/2 bag betonite (25 lbs)

2 bags betonite on top of grout

Drill 14:25-14:40

Fill 14:40-15:00

GROUNDWATER WELL DECOMMISSIONING

RECORD FORM

WELL ID	GAMW-40B

PROJECT INFORMATION

Project Number: 31404789.005 **Date:** 26-Apr-23

Client: NIPSCO **Decommissioned by (Drilling Company):** Strata

Site Location: Wheatfield, IN, RMSGS Landfill **Supervised by:** Travis Gennell

GROUNDWATER WELL DATA

Reference Point Name: Topvc

Position of Reference Point:

Standing Water Level (m)			
Depth to product m)		Measured Well Depth (m)	
Design Well Depth m)	31.5 ft-bgs	Well Casing Type	PVC
Depth of Water in Column (m)		Inside Casing Diameter	2"
Bore Volume (Lt)		Inside Casing Depth	34.5
Screen Type	PVC	Screen Length	10'
Surface Casing Type		Surface Casing Diameter	
Borehole Diameter (Known or Assumed)	8'		

**BRP - Below Reference Point*

DECOMMISSIONING RECORD

Well Casing Removed? (Pulled Out/Drilled Out)	Yes (Pulled out)	Surface Casing Removed?	Yes
Drill Rig	Mobile B-57		
Overdrilling Method	HSA	Overdrill Diameter	4.25'
Overdrill Depth	32 ft-bgs	Grout Mix Ratio	
Calculated Volume Required		Grout Type	Cement Bentonite Mix

Backfilling Interval (from-to, m) below ground level	0-32						
Number of cement bags used	4						
Volume of cement slurry injected (lt)							

NOTES

4 bags cement (50 lbs)

25 gallons water

1/2 bag bentonite (25 lbs)

2 bags betontie chips on top of grout

Drill 13:11-13:36

Fill 13:36-14:00

GROUNDWATER WELL DECOMMISSIONING

RECORD FORM

WELL ID	GAMW-41

PROJECT INFORMATION

Project Number: 31404789.005/02 **Date:** 26-Apr-23

Client: NIPSCO **Decommissioned by (Drilling Company):** Strata

Site Location: Wheatfield, IN, RMSGS Landfill **Supervised by:** Travis Gennell

GROUNDWATER WELL DATA

Reference Point Name: Topvc

Position of Reference Point:

Standing Water Level (m)			
Depth to product m)		Measured Well Depth (m)	
Design Well Depth m)	15 ft-bgs	Well Casing Type	PVC
Depth of Water in Column (m)		Inside Casing Diameter	2"
Bore Volume (Lt)		Inside Casing Depth	18
Screen Type	PVC	Screen Length	10'
Surface Casing Type		Surface Casing Diameter	
Borehole Diameter (Known or Assumed)	8"		

**BRP - Below Reference Point*

DECOMMISSIONING RECORD

Well Casing Removed? (Pulled Out/Drilled Out)	Yes (Pulled out)	Surface Casing Removed?	Yes
Drill Rig	Mobile B-57		
Overdrilling Method	HSA	Overdrill Diameter	4.25'
Overdrill Depth	15.5 ft-bgs	Grout Mix Ratio	
Calculated Volume Required		Grout Type	Cement Bentonite Mix

Backfilling Interval (from-to, m) below ground level	0-15.5						
Number of cement bags used	3						
Volume of cement slurry injected (lt)							

NOTES

3 bags cement (50 lbs)

20 gallons water

1/2 bag betonite (25 lbs)

2 bags betonite on top of grout

Drill 8:15-9:00

Fill 9:05-9:30

GROUNDWATER WELL DECOMMISSIONING

RECORD FORM

WELL ID	GAMW-41B

PROJECT INFORMATION

Project Number: 31404789.005 **Date:** 26-Apr-23

Client: NIPSCO **Decommissioned by (Drilling Company):** Strata

Site Location: Wheatfield, IN, RMSGS Landfill **Supervised by:** Travis Gennell

GROUNDWATER WELL DATA

Reference Point Name: Topvc

Position of Reference Point:

Standing Water Level (m)			
Depth to product m)		Measured Well Depth (m)	
Design Well Depth m)	27 ft-bgs	Well Casing Type	PVC
Depth of Water in Column (m)		Inside Casing Diameter	2"
Bore Volume (Lt)		Inside Casing Depth	30
Screen Type	PVC	Screen Length	10'
Surface Casing Type		Surface Casing Diameter	
Borehole Diameter (Known or Assumed)	8'		

**BRP - Below Reference Point*

DECOMMISSIONING RECORD

Well Casing Removed? (Pulled Out/Drilled Out)	Yes (Pulled out)	Surface Casing Removed?	Yes
Drill Rig	Mobile B-57		
Overdrilling Method	HSA	Overdrill Diameter	4.25'
Overdrill Depth	27.5 ft-bgs	Grout Mix Ratio	
Calculated Volume Required		Grout Type	Cement Bentonite Mix

Backfilling Interval (from-to, m) below ground level	0-27.5						
Number of cement bags used	4						
Volume of cement slurry injected (lt)							

NOTES

4 bags cement (50 lbs)

25 gallons water

1/2 bag bentonite (25 lbs)

2 bags betontie chips on top of grout

Drill 9:45-10:25

Fill 10:40-11:05

GROUNDWATER WELL DECOMMISSIONING

RECORD FORM

WELL ID	GAMW-55

PROJECT INFORMATION

Project Number: 19121567
Client: Nipsco
Site Location: RMSGS
Date: 6/8/19
Decommissioned by (Drilling Company): Layne
Supervised by: ANB

GROUNDWATER WELL DATA

Reference Point Name: TOPVC
Position of Reference Point: 667.62 ft ags

Standing Water Level (ft *BRP)	7.46ft.		
Depth to product (ft *BRP)	N/A	Measured Well Depth (ft *BRP)	18.68 ft. bgs
Design Well Depth (ft *BRP)	15 ft bgs	Well Casing Type	PVC
Depth of Water in Column (f)	11.22 ft.	Inside Casing Diameter	2"
Bore Volume (gal)	NM	Inside Casing Depth	8.68ft.
Screen Type	PVC	Screen Length	10 ft.
Surface Casing Type	Pro-tec	Surface Casing Diameter	—
Borehole Diameter (Known or Assumed)	6"		

**BRP - Below Reference Point*

DECOMMISSIONING RECORD

Well Casing Removed? (Pulled Out/Drilled Out)	Yes-Pulled out	Surface Casing Removed?	Yes
Drill Rig	SDC 500-2BEA		
Overdrilling Method	Sonic	Overdrill Diameter	6"
Overdrill Depth	19 ft.	Grout Mix Ratio	100 lbs/50 gallons
Calculated Volume Required	NM	Grout Type	Quikrete

Backfilling Interval (from-to, ft) below ground level	0-19ft						
Number of cement bags used	2						
Volume of cement slurry injected (gal)	50						

NOTES

13:30 - 14:10

Golder Associates



wsp.com