OHIO VALLEY ELECTRIC CORPORATION
INDIANA- KENTUCKY ELECTRIC CORPORATION
3932 U. S. Route 23
P.O. Box 468
Piketon, Ohio 45661
740-289-7200
WRITER'S DIRECT DIAL NO:
(740) 897-7768

October 17, 2018

Mr. Bruno Pigott
Commissioner
Indiana Department of Environmental Management
100 N. Senate Avenue
Mail Code 50-01
Indianapolis, IN 46204-2251

Re: Indiana-Kentucky Electric Corporation
Clifty Creek Station
Notification of CCR Location Restrictions Posting

Dear Mr. Pigott:

In accordance with 40 CFR 257.107(e), the Indiana-Kentucky Electric Corporation (IKEC) is providing notification to the Commissioner (State Director) of the Indiana Department of Environmental Management that Coal Combustion Residual (CCR) units located at Clifty Creek Station in Madison, Indiana have undergone assessment by a qualified professional engineer and have been certified to be in compliance with the location restrictions outlined in 40 CFR 257.60 through 40 CFR 257.64. Reports documenting the process employed and final results of each assessment have been certified and posted to the facility's publically accessible internet site, as well as placed in the facility's operating record on October 17, 2018.

This information can be viewed at IKEC's publically accessible internet site at:

https://www.ovec.com/CCRCompliance.php

If you have any questions, or require any additional information, please call me at (740) 897-7768.

Sincerely,

Tim Fulk

Tim Fulk
Engineer II

TLF:klr

Stantec Consulting Services Inc.
11687 Lebanon Road, Cincinnati OH 45241-2012

October 16, 2018
File: 175534018
Revision 0

Indiana-Kentucky Electric Corporation
3932 U.S. Route 23
P.O. Box 468
Piketon, Ohio 45661

RE: Location Restrictions Compliance Demonstrations
CCR Landfill
EPA Final Coal Combustion Residuals (CCR) Rule
Clifty Creek Station
Madison, Jefferson County, Indiana

1.0 PURPOSE

This letter documents Stantec's certification of the location restrictions compliance demonstration for the Indiana-Kentucky Electric Corporation (IKEC) Clifty Creek Station's CCR Landfill. Included is a demonstration assessing the CCR Landfill for Unstable Areas. An existing CCR landfill not required to perform a compliance demonstration for Placement Above the Uppermost Aquifer, Wetlands, Fault Areas, or Seismic Impact Zones.

2.0 LOCATION RESTRICTION ASSESSMENT - UNSTABLE AREAS

An existing CCR landfill must be assessed to demonstrate that it meets the minimum location requirements for unstable areas as per 40 CFR 257.64(a)-(e).

3.0 SUMMARY OF FINDINGS

The attached compliance demonstration report outlines the relevant project setting and technical elements considered for the Unstable Areas location restriction demonstration. Based on this assessment, the Clifty Creek CCR Landfill is in compliance with the location restriction requirements in the Final CCR Rule.

4.0 QUALIFIED PROFESSIONAL ENGINEER CERTIFICATION

I, Stan A. Harris, being a Professional Engineer in good standing in the State of Indiana, do hereby certify, to the best of my knowledge, information, and belief:

1. that the information contained in this certification is prepared in accordance with the accepted practice of engineering;

RE: Location Restrictions Compliance Demonstrations
CCR Landfill
EPA Final Coal Combustion Residuals (CCR) Rule
Clifty Creek Station
Madison, Jefferson County, Indiana

2. that the information contained herein is accurate as of the date of my signature below; and

3. that the IKEC Clifty Creek Station's CCR Landfill meets all requirements specified for locations restrictions outlined within the EPA CCR Final Rule.

SIGNATURE Stan A. Harris DATE 10/16/18

ADDRESS: Stantec Consulting Services Inc.
11687 Lebanon Road
Cincinnati, Ohio 45241

TELEPHONE: (513) 842-8200

ATTACHMENTS: Clifty Creek CCR Landfill Unstable Areas Compliance Demonstration Report

STAN A. HARRIS
REGISTERED
No. PE19700150
STATE OF INDIANA
PROFESSIONAL ENGINEER
10/16/18

ATTACHMENT A
UNSTABLE AREAS COMPLIANCE DEMONSTRATION REPORT

Compliance Demonstration Report – Unstable Areas CCR Landfill Clifty Creek Station

Indiana-Kentucky Electric Corporation
Madison, Jefferson County, Indiana

Prepared for:
Indiana-Kentucky Electric Corporation
Piketon, Ohio

Prepared by:
Stantec Consulting Services Inc.
11687 Lebanon Road
Cincinnati, Ohio 45241

October 16, 2018

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1.0 PROJECT BACKGROUND

On April 17, 2015, the "Disposal of Coal Combustion Residuals (CCR) from Electric Utilities" (EPA Final CCR Rule) was published in the Federal Register. Stantec Consulting Services Inc. (Stantec) was contracted by the Indiana-Kentucky Electric Corporation (IKEC) to demonstrate proficiency regarding unstable areas at the Clifty Creek Station and evaluate compliance with §257.64 of the CCR Rule.

As required by §257.64 of the EPA Final CCR Rule, an owner or operator of an existing or new CCR landfill, existing or new CCR surface impoundment, or any lateral expansion of a CCR unit is required by October 17, 2018 to demonstrate that the unit is not located in an unstable area unless the owner or operator demonstrates that generally accepted good engineering practices have been incorporated into the design of the CCR unit to promote the geotechnical integrity of the unit in such a manner that structural components of the CCR unit will not be disrupted.

The following factors have been considered to determine whether the Landfill Runoff Collection Pond located at the Clifty Creek Station is in an unstable area:

- On-site or local soil conditions that may result in significant differential settling,
- On-site or local geologic or geomorphic features, and
- On-site or local human-made features or events (both surface and subsurface).

2.0 UNIT DESCRIPTION

In the late 1980s, IKEC converted ash sluicing to dry fly ash collection facilities at the plant and transitioned to a dry ash landfill. A restricted waste construction/operation permit application was submitted to the Indiana Department of Environmental Management (IDEM) in 1986 to begin landfilling boiler slag and fly ash produced by the Clifty Creek Station. IDEM approved the fly ash landfill permit application as a Type III restricted waste landfill in 1988, and operations began in 1991.

In December 2006, IKEC applied for a major modification to its landfill permit to modify the existing Type III landfill to a Type I landfill. The modification would enable the landfill to accept synthetic gypsum materials generated by the flue gas desulfurization (FGD) systems that were being constructed at that time. IKEC's major permit modification application proposed repurposing 109 acres of the originally permitted 200-acre Type III facility as a Type I facility to accept fly ash, boiler slag, synthetic gypsum, and other miscellaneous gypsum related materials. IDEM approved IKEC's major permit modification in April 2008. The CCR Landfill has a capacity of 13.9 million cubic yards (FMSM, 2006).

Figure 1 below presents an overview of the Clifty Creek Station and related appurtenances, and Figure 2 presents a more detailed overview of the CCR Landfill.

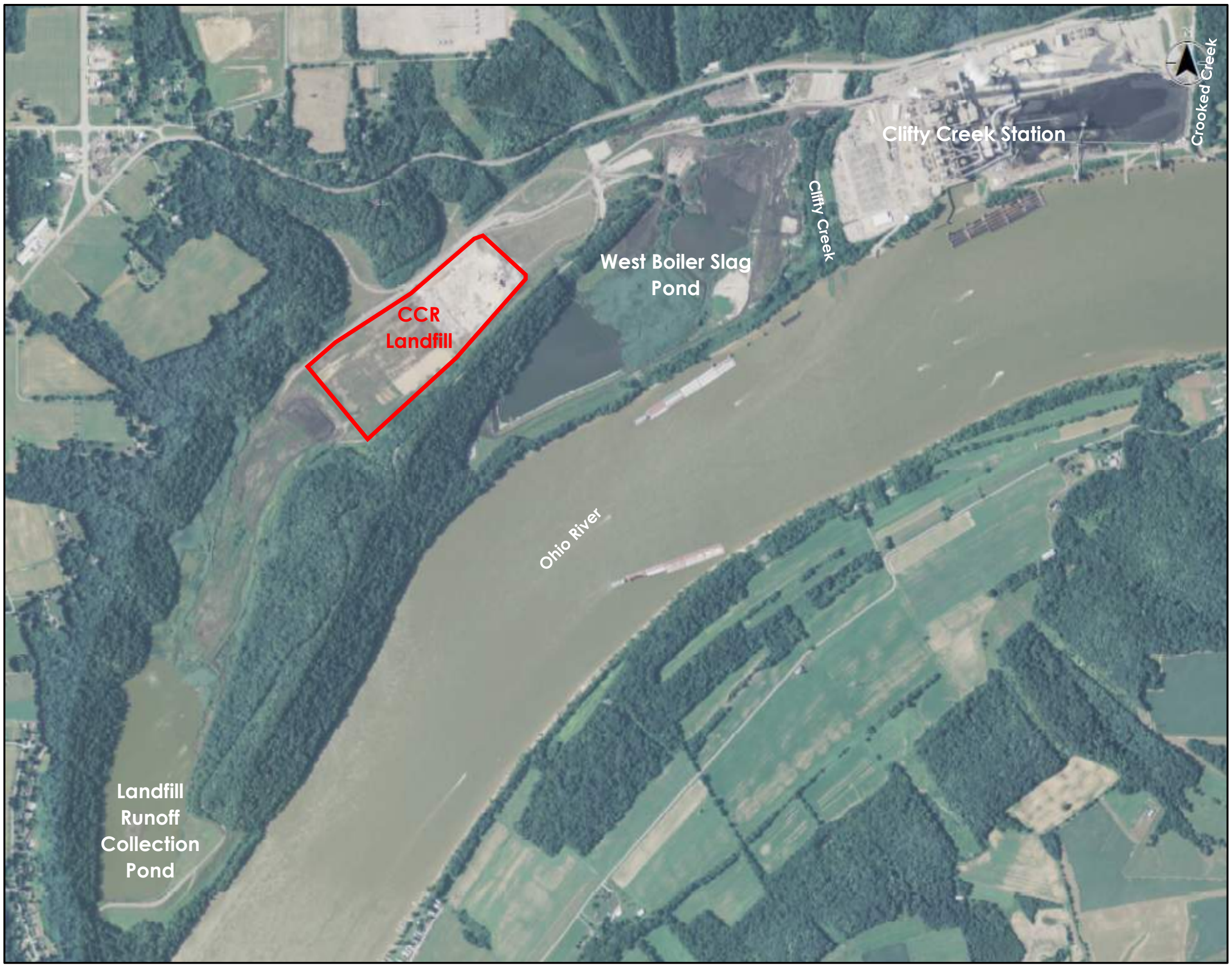

Figure 1. Aerial View of Clifty Creek Station

Figure 2. Aerial View of Clifty Creek Station CCR Landfill (from Stantec, 2018)

3.0 SOIL CONDITIONS (§257.64(B)(1))

Per §257.64(b)(1), the unstable areas demonstration must consider on-site or local soil conditions that may result in significant differential settling when determining whether the area is unstable.

Assessment of the soil conditions was completed considering the following criteria related to the CCR rule:

- Review inspection reports of the CCR unit that document deformations in the soils or movement of structural components indicating differential settlement of foundation soils.
- Review published soil surveys that indicate on-site or local presence of soft or compressible soil formation(s).

- Review documentation (including but not limited to geotechnical data reports, construction drawings, and field notes) containing information that may indicate the foundation materials are soft or compressible.

- Review results of existing analyses to confirm that any settlement of the unit would be marginal (within acceptable limits) and would not cause any unpermitted release of CCR into the environment.

3.1 BACKGROUND

IDEM regulations require monthly inspections of the CCR Landfill, which are performed by plant personnel. Inspections commenced in accordance with the CCR Rule as of October 17, 2015 and are being conducted at least once every seven days (Stantec, 2018). These inspections include observations of vegetative cover, crest and slope conditions, and hydraulic structures for any signs of deformations in the soil or movement of the structural components that would indicate differential settlement of the foundation soils.

The U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) maintains an online web soil survey tool that provides information of local soils for a user-specified area of interest. The soil survey indicated the side slopes of rock ridge (Devil's Backbone) to the south and the ridge flanks to the north of the CCR Landfill belong to the Eden-Caneyville complex (EgG). These soils are found on steep to very steep slopes ranging from 25 to 60 percent. The Eden-Caneyville complex consists of moderately deep and well-drained soils that formed on slopes facing the Ohio River and on back slopes facing adjacent to tributaries near the river. The Type III Closed Landfill (northeast of the CCR Landfill) is underlain by the Udorthents (Ud) soil unit. These soils are described as loamy with depths greater than 80 inches

Sixteen CPT borings were advanced across the surface of the fly ash pond in 1985. Fifteen of the borings included one Standard Penetration Test (SPT) in the clayey subsoil underlying the fly ash. Fine-grained silty clays and clayey silts were observed within the upper five feet of the subsoil (FMSM, 2006).

In 1992, SE Technologies conducted a geotechnical and hydrogeologic investigation of the area of the CCR Landfill. The investigation included the drilling of 18 borings, and the installation of 14 piezometers and 8 monitoring wells. Low-plasticity clays, silts, and sands were encountered during this investigation (FMSM, 2006).

In 2004 and 2005, 28 piezometers were installed in various locations around the Clifty Creek Station (AGES, 2007). Twelve of those piezometers were installed southwest of the Landfill Runoff Collection Pond, 3 piezometers were installed in the central portion of the CCR Landfill, and 13 were installed northeast of the CCR Landfill. A figure produced in this report indicates that the CCR Landfill is underlain by gray clay and Dillsboro Formation shale and limestone.

To support the Type I permit application, a surface and subsurface exploration of the existing CCR Landfill and adjacent ridge flanks in 2005 and 2006. The exploration consisted of 14 soil borings, 20 CPT borings, and geophysical testing in 3 borings located over the closed ash pond area and Type III CCR Landfill. An additional 29 soil borings were advanced along the adjacent ridge flanks. Sixteen soil groups were designated at the site based on the exploration. Foundation soils classified primarily as low-plasticity silts and clays (FMSM, 2006).

One exploratory soil boring was completed north of the CCR Landfill in 2015 to obtain geologic information specific to designing the CCR Rule monitoring networks (AGES, 2016). Nine monitoring wells were installed in 2015 at the CCR Landfill and Landfill Runoff Collection Pond. The boring logs from the exploratory soil borings and monitoring wells indicate that the subsurface conditions consist of silt, silty clay, and silty sand.

The active CCR Landfill has been designed, constructed, and operated to account for its foundation of hydraulically placed fly ash and foundation soils. One of two arrays of electronic vibrating wire piezometers, settlement plates, and automated data collection units have been installed prior to structural fill and subgrade construction of the Type I landfill construction (FMSM, 2006). The data is monitored as part of the plant's site inspections.

Appendix A includes the Web Soil Survey completed for the CCR Landfill (USDA, 2018). Additional geologic information is included in Section 4.0.

3.2 ASSESSMENT

The most recent annual inspection of the CCR Landfill (Stantec, 2018) includes several recommendations related to operations and maintenance issues. These issues include vegetation and erosion features in the active landfill. Indications of structural instability within the CCR Landfill have not been observed.

Historic soil reports and geotechnical exploration reports were reviewed for evidence of soft and compressible soils that may have been on site prior to the development of the CCR Landfill. For the purposes of this report, soft and compressible soils are fat clays, elastic silts, organic silts and clays, or highly organic soils (peat).

Design requirements were followed during construction of the landfill subgrade for a compacted, non-saturated surface for suitable bearing conditions (FMSM, 2006). Landfill design and continued operations monitor the subsurface settlement, piezometric conditions, and structural stability as part of site inspections.

3.3 CONCLUSION

Based on the assessment of the soil conditions, the CCR Rule-related criteria listed above have been met.

4.0 GEOLOGIC OR GEOMORPHOLOGIC FEATURES (§257.64(B)(2))

Per §257.64(b)(2), the unstable areas demonstration must consider on-site or local geologic or geomorphologic features when determining whether the area is unstable.

Assessment of the geologic or geomorphologic features was completed considering the following criteria related to the CCR rule:

- Review of published geologic maps that indicate on-site or local geomorphologic features such as:
  - Karst potential,
  - Known sinkhole outlines,
  - Known spring locations, and
  - Known landslide locations.
- Review of inspection reports of the CCR unit that document characteristic features of karstic formation (e.g. sinkholes, vertical shafts, sinking streams, caves, seeps, large springs, or blind valleys).
- Review documentation (including but not limited to geotechnical data reports, construction drawings, and field notes) containing information regarding the on-site or local geology and geomorphology.
- Review of hillshade mapping by the Indiana Geological Survey (IGS) based on 5-foot Digital Elevation Models (DEM) derived from 1.5-meter LiDAR data to identify areas susceptible to mass movement.

4.1 BACKGROUND

IDEM regulations require monthly inspections of the landfill facility, which are performed by plant personnel. Inspections of the landfill facility have commenced in accordance with the CCR Rule as of October 17, 2015 and are being conducted at least once every seven days (Stantec, 2018). These inspections include observations related to identifying characteristic features of karstic formations.

The Indiana Geological Survey (IGS) and Kentucky Geological Survey (KGS) maintain interactive geologic map information services that provides valuable, relevant information and retrievable data pertaining to geologic or geomorphologic features. Appendix B contains pertinent geologic and geomorphologic features from IGS and KGS mapping.

Physiographic mapping (IGS, 2018) indicates that the Clifty Creek Station is located in the Muscatatuck Plateau of the Southern Hills and Lowlands Region. The Muscatatuck Plateau is described as having broad till-covered uplands entrenched by major valleys.

According to quaternary geology mapping (IGS, 2018), the CCR Landfill is underlain by alluvium deposited during the Holocene age. The alluvium consists of silt, sand, and gravel deposits of and along present streams and includes some colluvium along valley margins.

Indiana bedrock geologic mapping (IGS) indicates that the bedrock underlying the CCR Landfill is in the Maquoketa Group of the Ordovician system. Bedrock in this group consists of limestone, dolomite, shale, and sandstone.

4.2 ASSESSMENT

The most recent annual inspection of the CCR Landfill (Stantec, 2018) includes several recommendations related to operations and maintenance issues. These issues include vegetation and erosion features in the active landfill not related to geologic or geomorphologic features.

Sinkhole areas and sinking stream basins associated with karst geology are not located in the footprint of the CCR Landfill (IGS, 2018). Large areas of known karst features are located in Lawrence, Washington, Orange, Harrison, and Floyd counties in Indiana, west of the Clifty Creek Station. Kentucky karst mapping (KGS, 2018) indicates that the Clifty Creek Station is near areas with low to medium karst potential.

The sinkhole inventory for southern Indiana and northern Kentucky developed by the IGS indicates that no sinkholes have been documented in the footprint of the CCR Landfill (IGS, 2018). However, three sinkholes are located within a one-mile radius of the CCR Landfill, as shown in the mapping located in Appendix B. Note that no karst sinkhole areas, cave density, karst springs, or karst dye points are shown within one mile of the unit. The sinkhole inventory was created to support a statistical regression analysis of potential sinkhole development areas based on sinkhole density and a sinkhole-development risk layer.

Three landslides are located within 3 miles of the Clifty Creek Station in Kentucky according to the KGS landslide inventory (KGS, 2018). Similar mapping was not available for Indiana.

Mapping does not indicate any faults or other geologic deficiencies to be present in the immediate area of the CCR Landfill (IGS, 2018; KGS, 2018).

The digital elevations models show no indication of areas susceptible to mass movement within the vicinity of the CCR Landfill (IGS, 2018).

4.3 CONCLUSION

Based on the assessment of the geologic and geomorphologic features, the CCR Rule-related criteria listed above have been met.

5.0 HUMAN-MADE FEATURES OR EVENTS (§257.64(B)(3))

Per §257.64(b)(3), the unstable areas demonstration must consider on-site or local human-made features or events when determining whether the area is unstable.

Assessment of the human-made features or events was completed considering the following criteria related to the CCR rule:

- Review inspection reports of the CCR unit that document indications of tension cracking, settlement, depressions, or deformation of the unit's structural components (embankments, spillways, outlets, liners, leachate collection systems, or final covers).
- Review of routine operations and inspections at the CCR Landfill to maintain precaution from human-induced events or forces that might impair the integrity of some or all the structural components responsible for preventing unpermitted release of CCR into the environment.
- Review instrumentation installed to monitor the CCR unit to ensure readings are maintained within documented tolerances.
- Review of maps and other resources to confirm that the CCR unit is not located:
    - On previously mined or quarried areas,
    - On areas that have undergone excessive drawdown of groundwater, or
    - On an old landfill.

5.1 BACKGROUND

IDEM regulations require monthly inspections of the landfill facility, which are performed by plant personnel. Inspections of the landfill facility have commenced in accordance with the CCR Rule as of October 17, 2015 and are being conducted at least once every seven days (Stantec, 2018). These inspections include observations that document indications of human-induced events or forces that could have impaired the integrity of any structural components, which are responsible for preventing the unpermitted release of CCR to the environment.

Nine monitoring wells were installed in 2015 at the CCR Landfill and Landfill Runoff Collection Pond to meet the monitoring network requirements of the CCR Rule (AGES, 2016).

Appendix C contains maps presenting the locations of mining activity, industrial waste sites, water wells, and oil and gas wells from available data and mapping in Indiana and Kentucky (IGS, 2018; KGS, 2018).

5.2 ASSESSMENT

The most recent annual inspection of the CCR Landfill (Stantec, 2018) includes several recommendations related to operations and maintenance issues. These issues include vegetation and erosion features in the active landfill that do not present a hazard to facility stability.

Mapping of mining activity in Indiana and Kentucky (IGS, 2018; KGS, 2018) indicates that no mines are located near the Clifty Creek Station. The nearest mine is located approximately 8 miles east of the site. There are no oil and gas wells located in the footprint of the CCR Landfill. There is one dry petroleum well located approximately one miles northeast of the CCR Landfill, and a 130-acre gas field is located approximately 3 miles east. The nearest industrial waste site is located approximately 1.5 miles east of the Clifty Creek Station. It is not expected that human events related to these industries or their operations pose any negative impact to the structural components of the CCR Landfill.

According to IGS mapping (ODNR, 2018c), there are no wells shown in the footprint of the CCR Landfill. There are four water wells owned by Hanover College approximately one mile southwest of the CCR Landfill. There are also two documented water wells owned by IKEC approximately one mile northeast of the CCR Landfill. Both wells were installed in 1957. As discussed in Section 5.1, 9 monitoring wells have been installed to meet the monitoring network requirements for the CCR Rule. Monitoring wells would not typically cause excessive drawdown of groundwater levels, thus posing no significant hazard.

5.3 CONCLUSION

Based on the assessment of the human-made features or events, the CCR rule-related criteria listed above have been met.

6.0 REFERENCES

Applied Geology and Environmental Science, Inc. (AGES) (2016). *Coal Combustion Residuals Regulation, Monitoring Well Installation Report, Indiana-Kentucky Electric Corporation, Clifty Creek Station, Madison, Indiana.* October.

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Stantec Consulting Services, Inc. (Stantec) (2018). *2017 CCR Rule Inspection. Clifty Creek Landfill.* Madison, Indiana. January 11.

United States Department of Agriculture (USDA) (2018). *Custom Soil Resource Report for Jefferson County, Indiana. Clifty Creek CCR Landfill.* Natural Resources Conservation Service. March 1.

Appendix A SOIL CONDITIONS

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Jefferson County, Indiana

Clifty Creek CCR Landfill

March 1, 2018

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

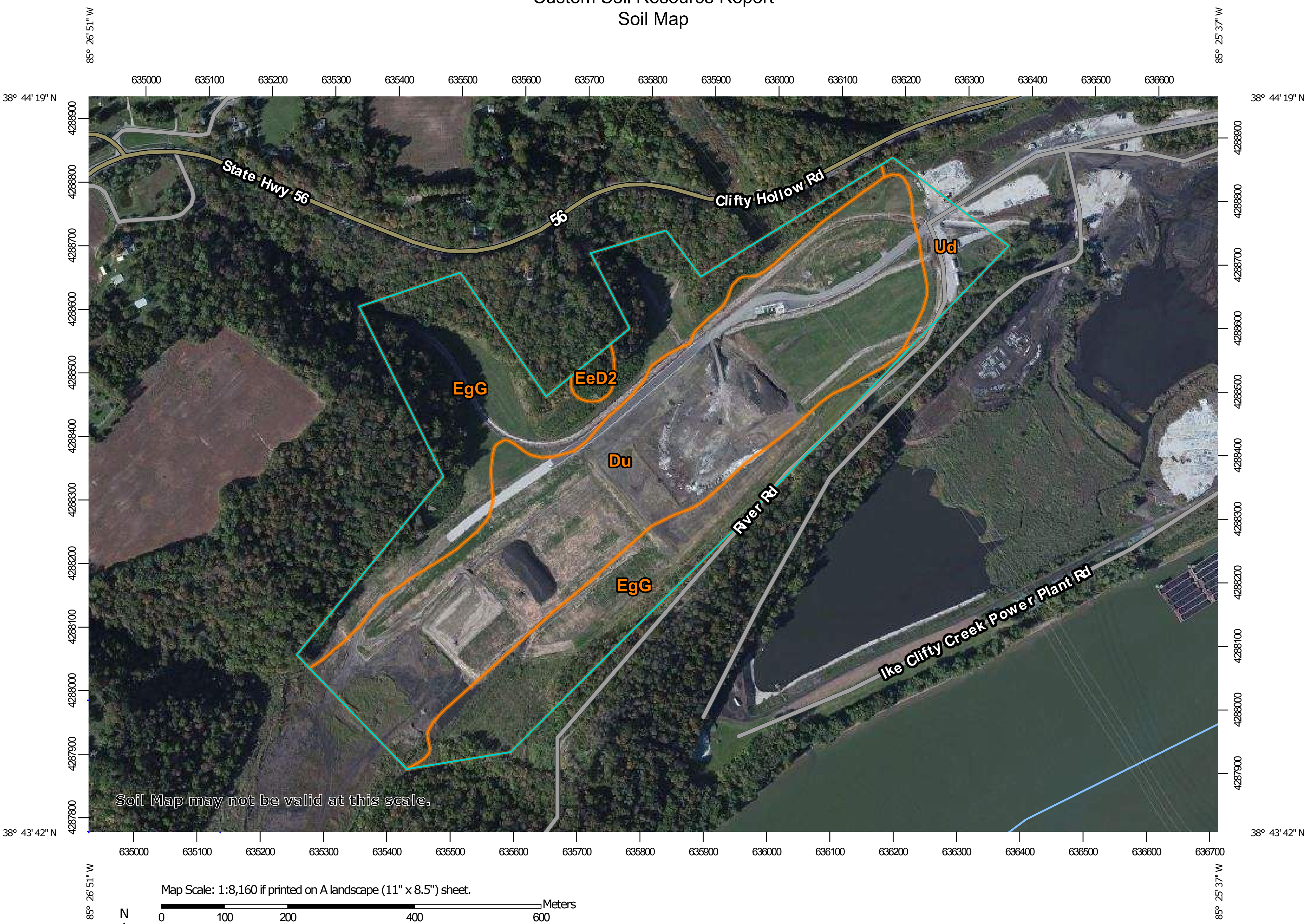
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map



Map Scale: 1:8,160 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 100, 200, 400, 600

Feet: 0, 350, 700, 1400, 2100

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 16N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Jefferson County, Indiana
Survey Area Data: Version 19, Oct 2, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 3, 2011—Oct 4, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Du	Dumps	59.5	51.3%
EeD2	Eden silty clay loam, 12 to 25 percent slopes, eroded	1.0	0.9%
EgG	Eden-Caneyville complex, 25 to 60 percent slopes	50.6	43.6%
Ud	Udorthents, loamy	4.8	4.2%
Totals for Area of Interest		**115.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Jefferson County, Indiana

Du—Dumps

Map Unit Setting

National map unit symbol: 11csk
Elevation: 350 to 1,020 feet
Mean annual precipitation: 40 to 46 inches
Mean annual air temperature: 51 to 56 degrees F
Frost-free period: 150 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Dumps: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Dumps

Interpretive groups

Land capability classification (irrigated): None specified
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

EeD2—Eden silty clay loam, 12 to 25 percent slopes, eroded

Map Unit Setting

National map unit symbol: 11csl
Elevation: 400 to 1,020 feet
Mean annual precipitation: 40 to 46 inches
Mean annual air temperature: 51 to 56 degrees F
Frost-free period: 150 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Eden and similar soils: 82 percent
Minor components: 18 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Eden

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Clayey residuum over ordovician limestone and shale

Typical profile

Ap - 0 to 5 inches: silty clay loam
Bt - 5 to 23 inches: flaggy silty clay

Cr - 23 to 60 inches: bedrock

Properties and qualities

Slope: 12 to 25 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Minor Components

Carmel, eroded

Percent of map unit: 10 percent
Landform: Hills
Landform position (two-dimensional): Backslope, shoulder
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Woolper

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Footslope
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Switzerland

Percent of map unit: 3 percent
Landform: Hills
Landform position (two-dimensional): Summit, shoulder
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

EgG—Eden-Caneyville complex, 25 to 60 percent slopes

Map Unit Setting

National map unit symbol: 11csn
Elevation: 420 to 1,020 feet
Mean annual precipitation: 40 to 46 inches

Mean annual air temperature: 51 to 56 degrees F
Frost-free period: 150 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Eden and similar soils: 75 percent
Caneyville and similar soils: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Eden

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Clayey residuum over ordovician limestone and shale

Typical profile

A - 0 to 6 inches: flaggy silty clay
BA - 6 to 11 inches: flaggy silty clay
Bt - 11 to 39 inches: flaggy silty clay
Cr - 39 to 60 inches: weathered bedrock

Properties and qualities

Slope: 25 to 60 percent
Depth to restrictive feature: 20 to 40 inches to paralithic bedrock
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 30 percent
Available water storage in profile: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: D
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Description of Caneyville

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Clayey residuum over limestone

Typical profile

A - 0 to 8 inches: silt loam

Bt1 - 8 to 14 inches: silty clay loam
2Bt2 - 14 to 33 inches: clay
2R - 33 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 25 to 60 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Available water storage in profile: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: C
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

Ud—Udorthents, loamy

Map Unit Setting

National map unit symbol: 11ctx
Elevation: 350 to 1,020 feet
Mean annual precipitation: 40 to 46 inches
Mean annual air temperature: 51 to 56 degrees F
Frost-free period: 150 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents, loamy and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents, Loamy

Properties and qualities

Depth to restrictive feature: More than 80 inches
Natural drainage class: Moderately well drained
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Interpretive groups

Land capability classification (irrigated): None specified
Other vegetative classification: Trees/Timber (Woody Vegetation)
Hydric soil rating: No

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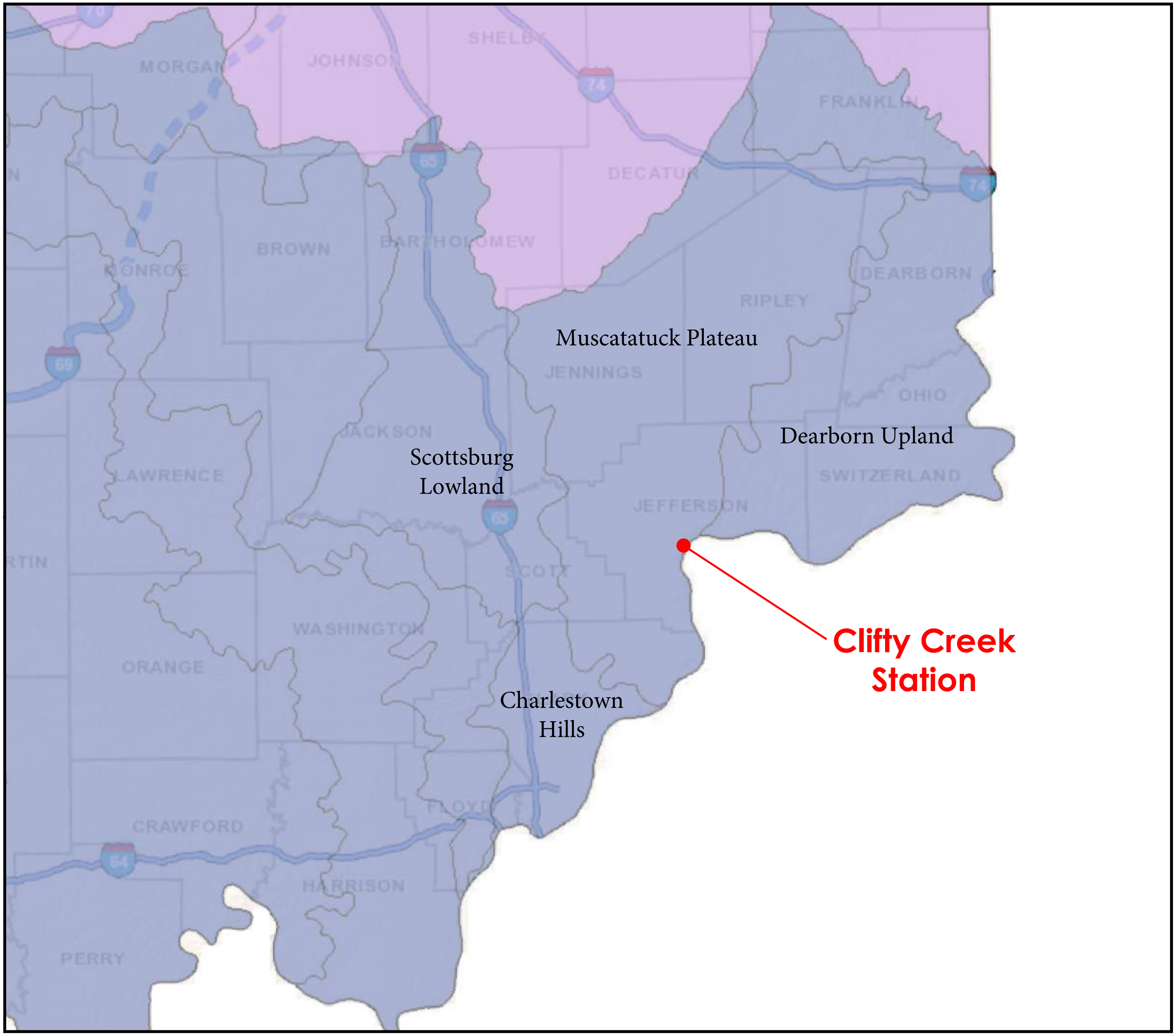
COMPLIANCE DEMONSTRATION REPORT –
UNSTABLE AREAS
CCR LANDFILL
CLIFTY CREEK STATION

October 16, 2018

Appendix B GEOLOGIC OR GEOMORPHOLOGIC CONDITIONS

Physiographic Regions

Date: 2/21/2018



Legend

Physiography

- Central Till Plain
- Maumee Lake Plain
- Northern Moraine and Lake
- Southern Hills and Lowlands

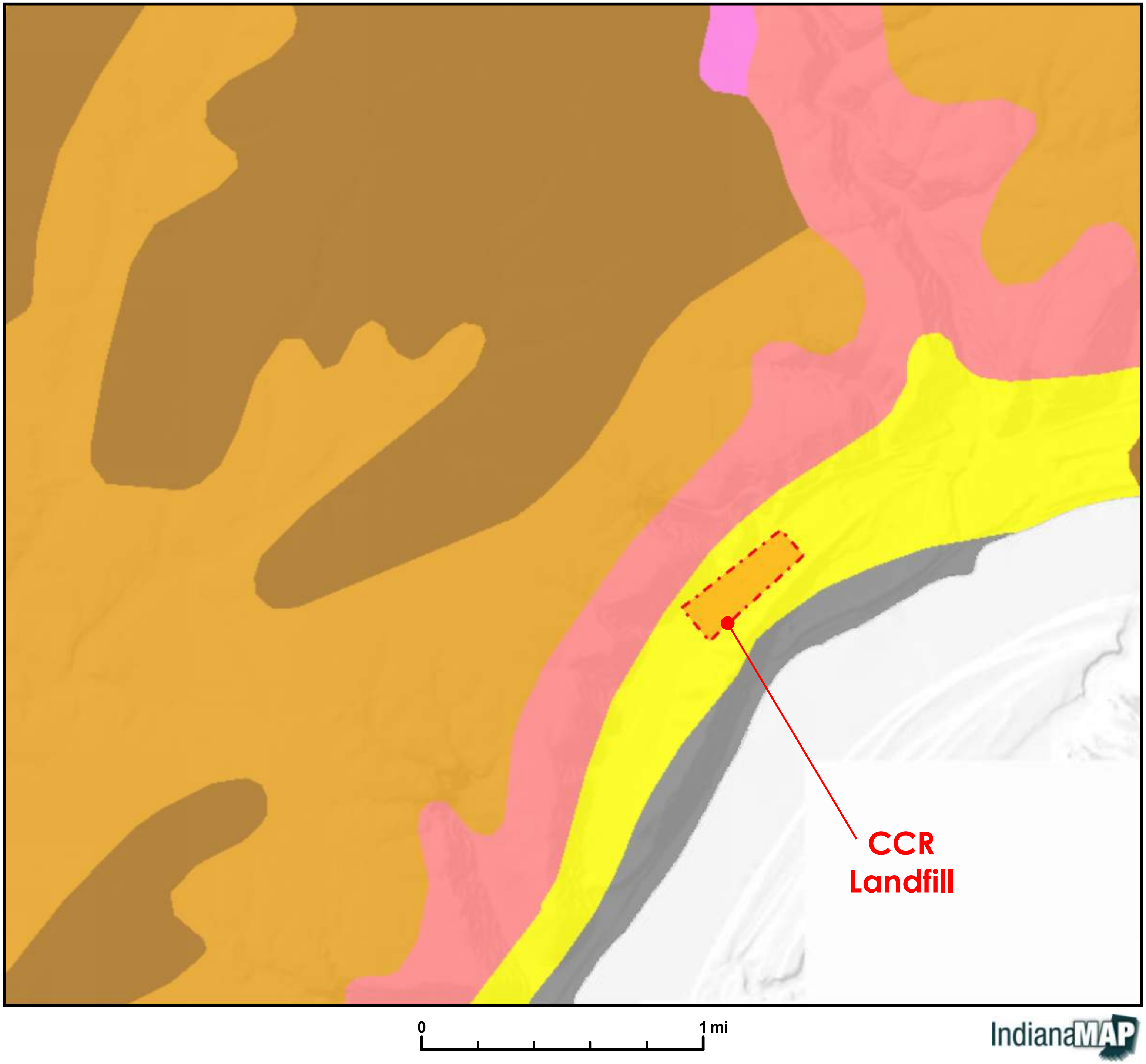
Author:

0 5 10 15 20 25 mi

IndianaMAP

Quaternary Geology

Date: 3/1/2018



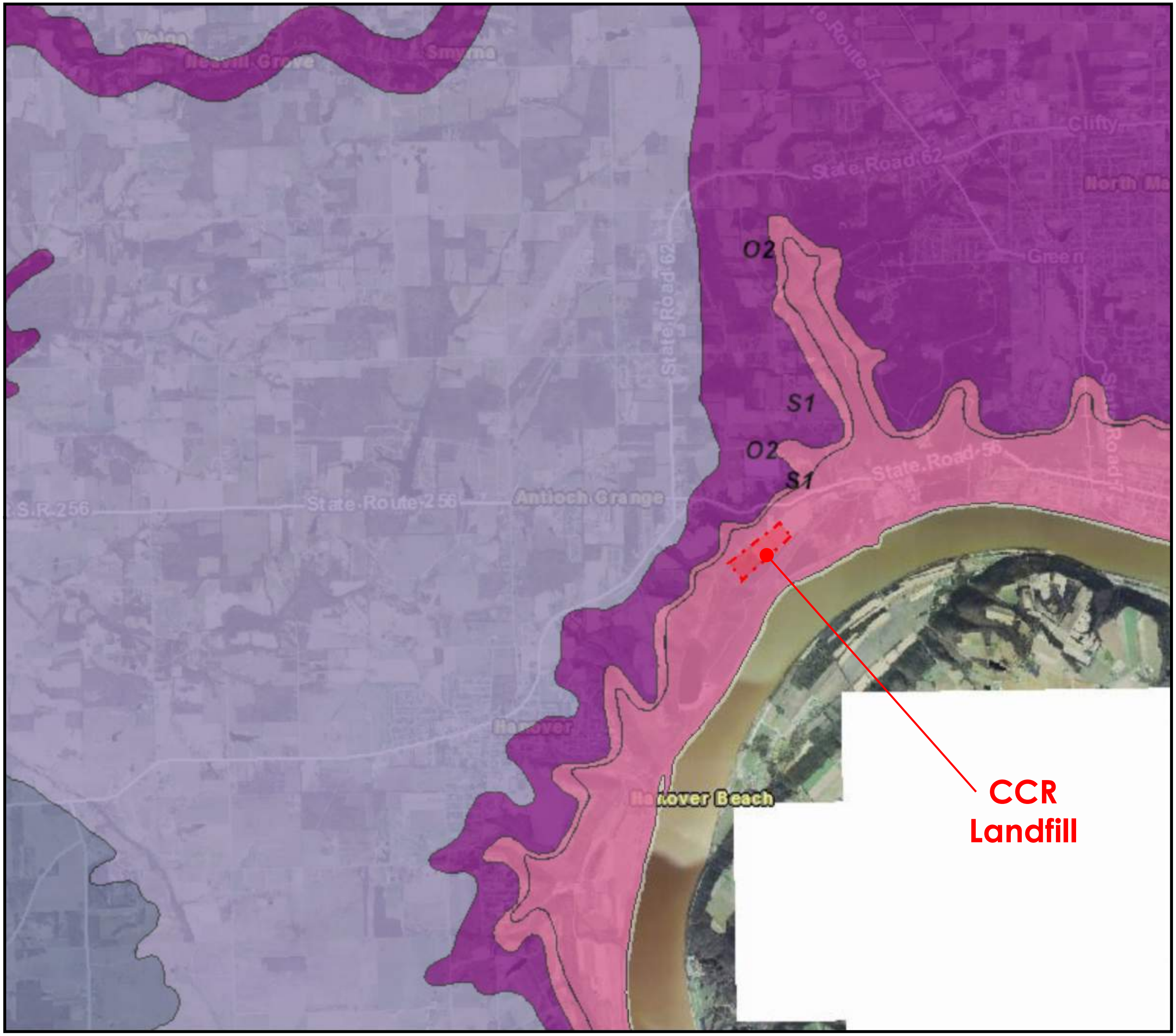
Legend

Quaternary Geology

- Holocene
- Wisconsinan
- Pre-Wisconsinan
- Silurian and Devonian
- Late Ordovician
- n.a.

Bedrock Geology

Date: 3/1/2018



Regional Bedrock Geology (1:250,000)

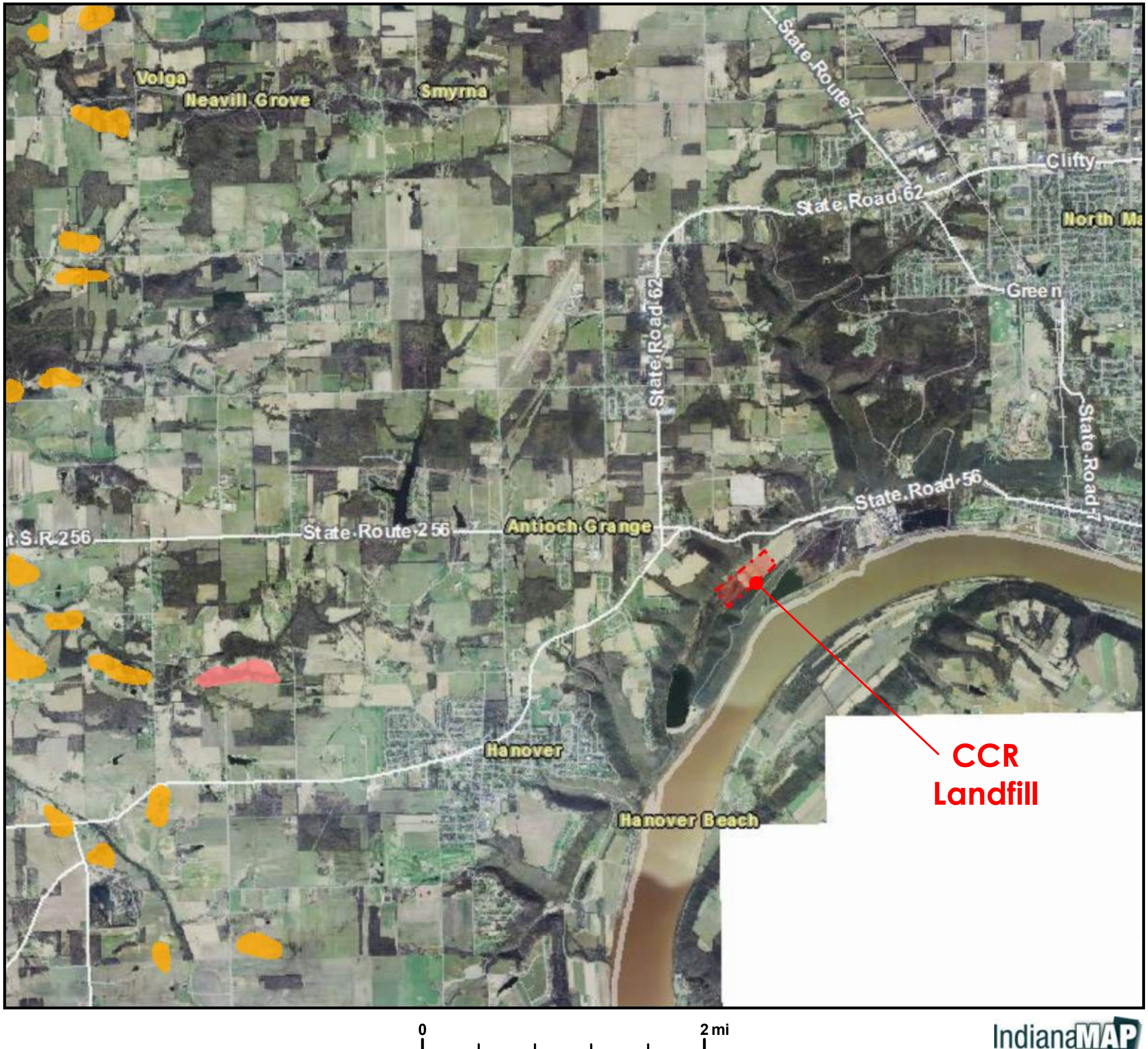
- DM - New Albany Formation
- D - Muscatatuck Group
- S1 - Niagaran Series
- O2- Maquoketa Group

0 2 mi

IndianaMAP

Karst Sinkhole Areas

Date: 3/1/2018



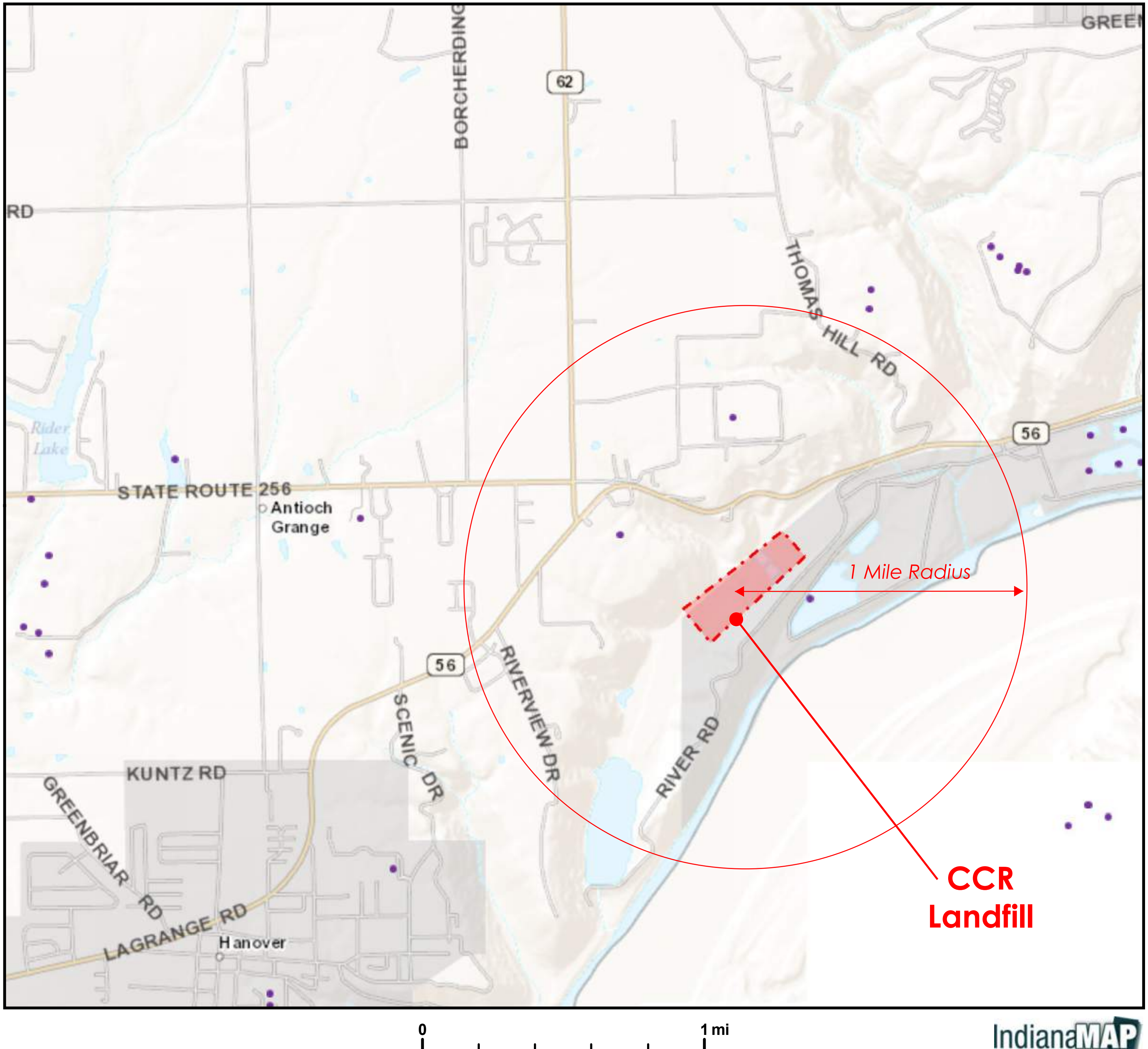
Legend

Sinkhole Area

Sinking Stream Basin

Sinkhole Inventory

Date: 3/1/2018

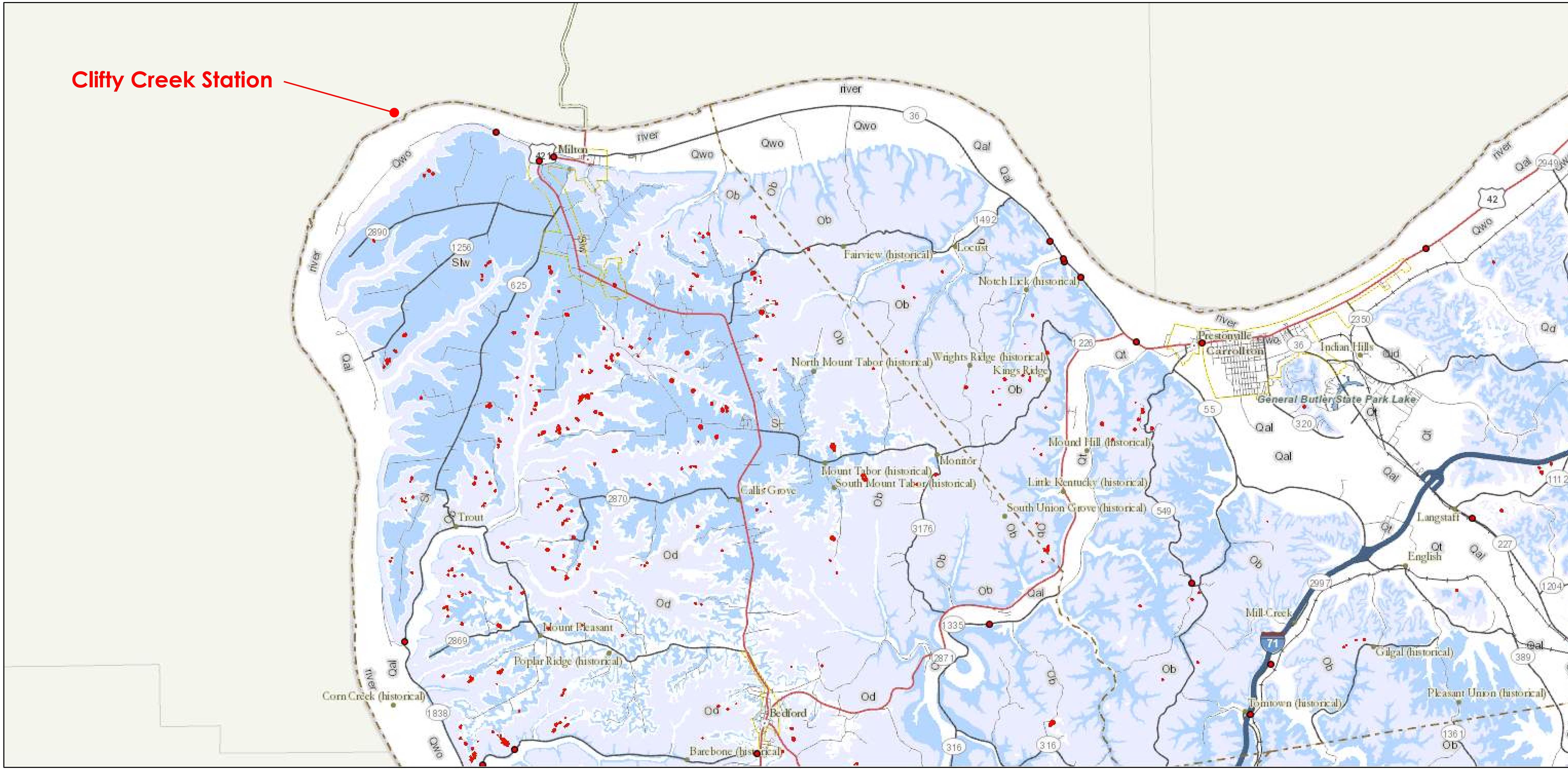


Legend

Sinkhole Inventory (2011)

IndianaMAP

Kentucky Geologic Map Information Service



March 1, 2018

Karst Potential Units
- very high
- high
- medium
- low
- non-karst

KGS Landslide Locations

KGS landslide inventory data
- KGS landslide inventory data

1:24,000 geologic map landslides
- 1:24,000 geologic map landslides

Landslide areas derived from LiDAR
- Landslide areas derived from LiDAR

Landslide areas derived from aerial photography
- Landslide areas derived from aerial photography

KGS Sinkholes

Kentucky Sinkhole Outlines
- Sinkhole

KGS Geology

24K Geologic Faults
- fault - concealed
- fault
- fault - inferred
- fault - scarp
- fault - secondary

1:100,000

0 1 2 4 mi

0 1.75 3.5 7 km

Kentucky Geological Survey
Kentucky Division of Geographic Information (DGI)

Indiana LiDAR Color Hillshade

Date: 3/1/2018

Legend

High : 1256

Low : 247

Author:

0   0.5 mi

IndianaMAP

Appendix C HUMAN-MADE FEATURES OR EVENTS

Mining

Date: 2/21/2018

Legend

- CoalMineUndergroundAffected
- Mines - Surface

Mine Entries

- Hoist
- Slope
- Other
- Unknown

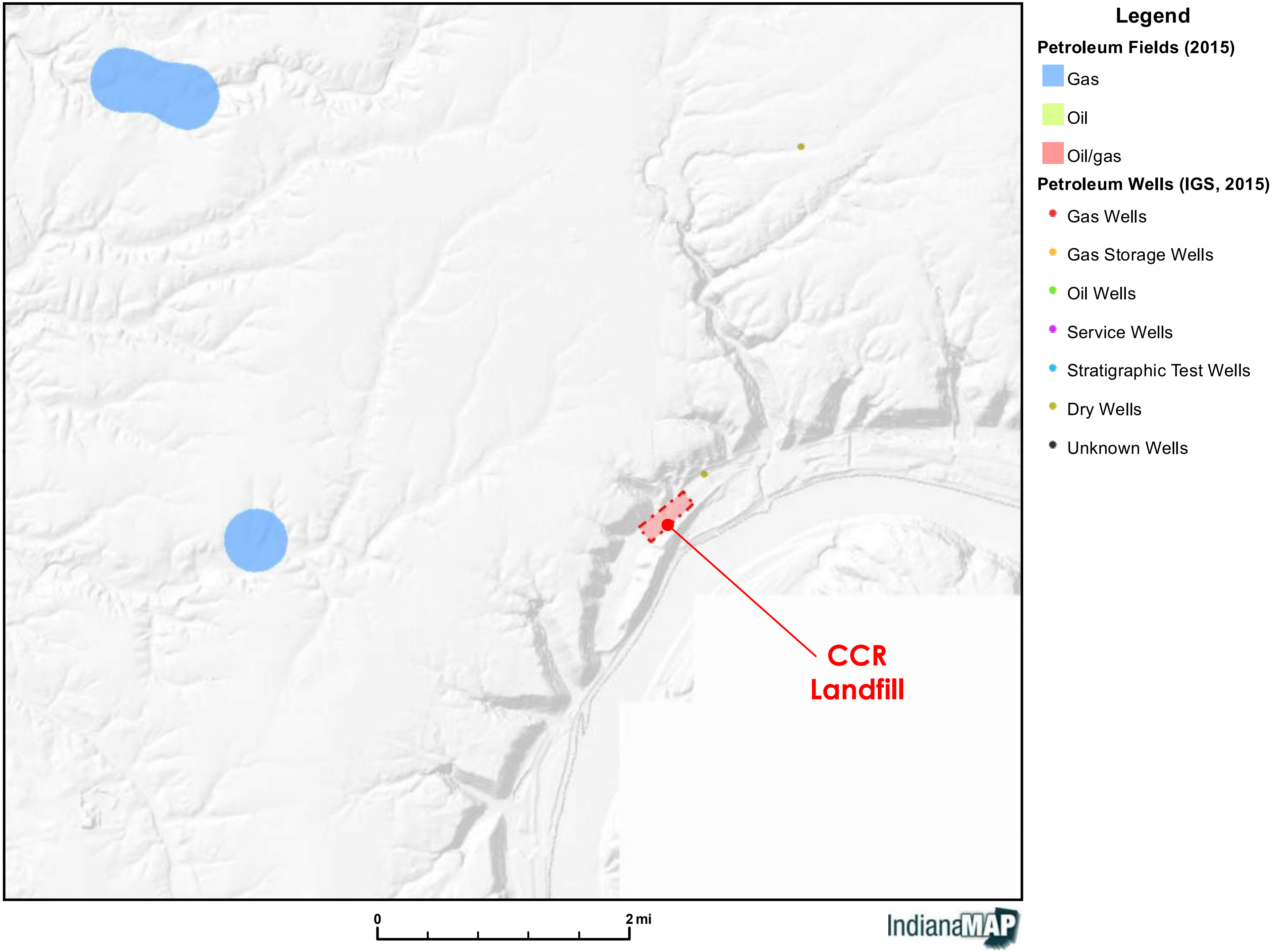
Author:

0 5 10 15 20 25 mi

IndianaMAP

Petroleum Wells/Fields

Date: 3/1/2018



Industrial Waste Sites

Date: 3/1/2018

Legend

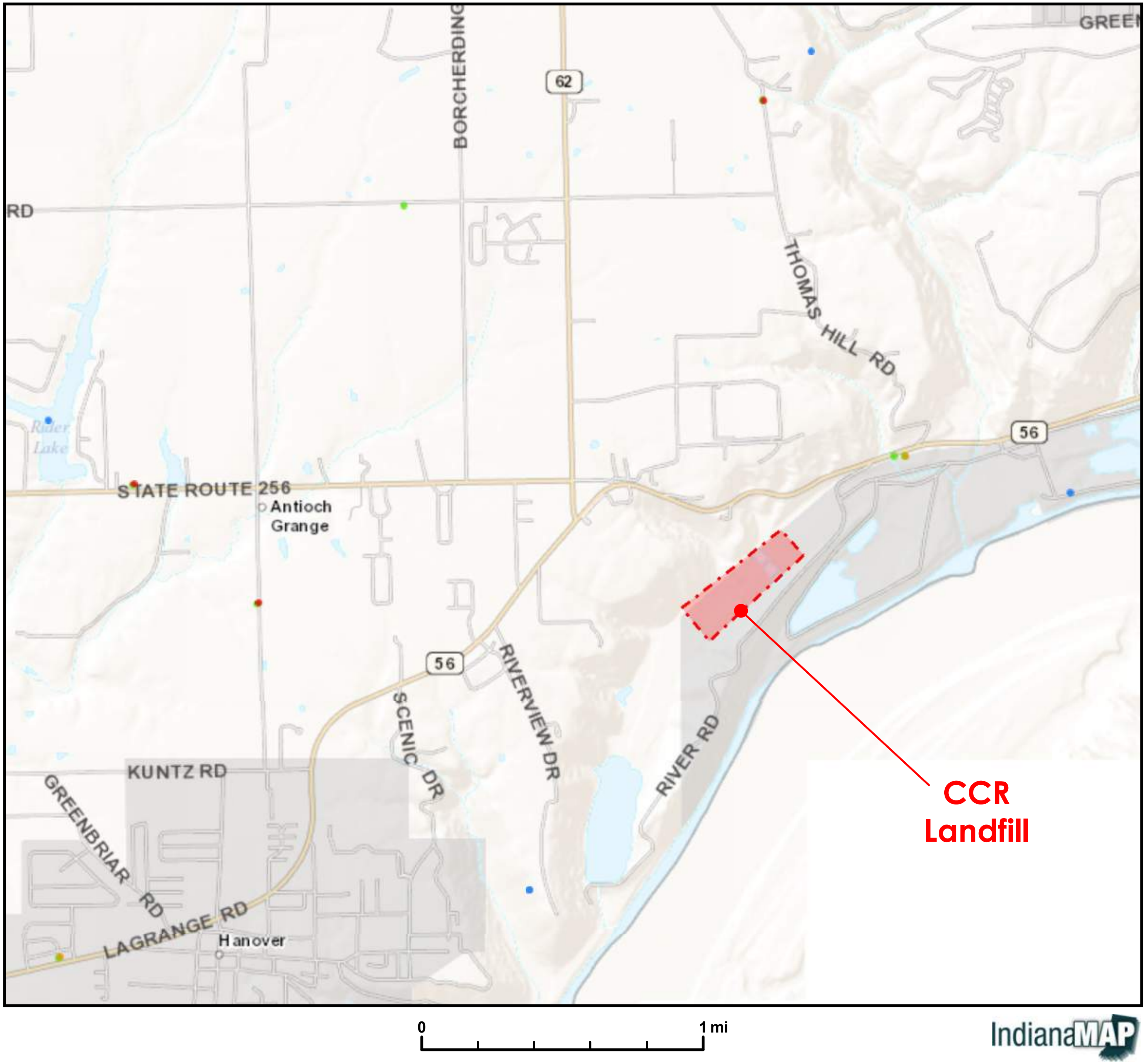
Industrial Waste Sites

0 2 mi

IndianaMAP

Water Wells

Date: 3/1/2018



Legend

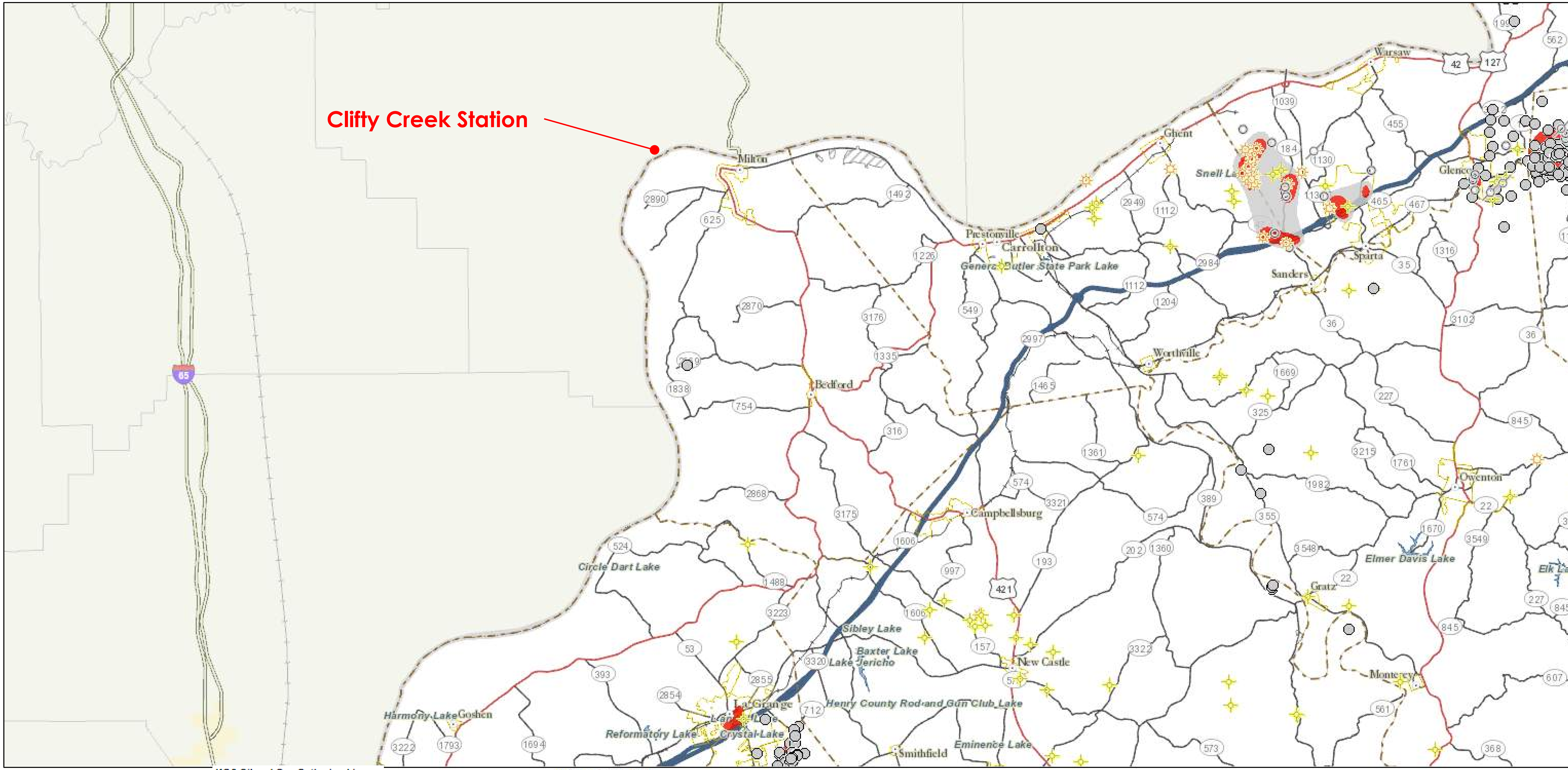
Water Wells (IDNR)

- Field Located
- Location Estimated

Water Wells (iLITH)

- 0 - 100
- 101 - 200
- 201 - 500
- 501 - 1000
- 1001 - 10000
- Observation Wells (USGS)

Kentucky Geologic Map Information Service



March 1, 2018

KGS Oil and Gas Gathering Lines

Oil and Gas Gathering Lines

- Other
- Oil and Gas Flow
- Oil and Gas Gathering
- Gas Flow
- Gas Gathering
- Oil Flow
- Oil Gathering
- Water Injection

KGS Oil and Gas Fields

KY Oil and Gas Fields

- Oil
- Gas
- Waterflood
- Big Sandy
- Consolidated

KY Oil and Gas Wells

- Other Well
- Service or Secondary Recovery Well
- Coal Bed Methane Gas Well
- Dry and Abandoned Well
- Gas Well
- Location
- Oil and Gas Well
- Oil Well

KGS Deviated Oil and Gas Wells

deviated well points

- deviated well point

deviated well traces

- approved deviated well (since 2006)

KGS Terminated Oil and Gas Records

KY Oil and Gas Terminated Permit

- Terminated Permit Well

KGS Non Coal Quarries

KY non coal quarries and pits

- Unknown
- Abandoned
- Active

Coal Borehole

- borehole

1:250,000

0 3 6 12 mi

0 4.75 9.5 19 km

Kentucky Geological Survey; KY Division of Oil and Gas
Kentucky Geological Survey; Kentucky Division of Oil and Gas
Kentucky Geological Survey
Kentucky Division of Geographic Information (DGI)

author: Kentucky Geological Survey